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Division of Fish, Game and Shellfisheries

Bureau of Fisheries

Nacote Creek Research Station

Analysis of the Fish Forage Base

in the Little Egg Harbor Estuary

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Investigation by:	Patrick J. Festa
Report by:	Patrick J. Festa
Station Leader:	Paul E. Hamer Asst. Chief, Bureau of Fisheries
Supervision:	A. Bruce Pyle, Chief Bureau of Fisheries
	Russell A. Cookingham Division Director

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ABSTRACT

The forage base for resident and migratory fish utilizing Little Egg Harbor Bay consists of at least one hundred and forty-two invertebrate and vertebrate taxa. Stomach content analyses conducted on 1,340 fish of 55 species provide estimates of the importance of each forage taxa to species and species-size group components of the fish populations. Over 300 species or genus level predator-prey relationships are documented. Through comparison of fish survey data and stomach contents, the relative predation impact of each fish species on selected forage populations was determined for the study period.

Little Egg Harbor contains a diverse biological community supported by at least four primary production modes. While the trophic structure of the estuary is extremely complex, the importance of calanoid copepods, certain gammarid amphipods, mysid shrimp and caridean shrimp to the production of desirable fish species is evident.

ACKNOWLEDGEMENTS

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INTRODUCTION

With the nation's increasing awareness of environmental conditions, the ecological importance of marine tidal estuaries has been a focal point of discussion, research and social action. With the advent of legislative controls on the development and use of estuaries, studies of ecological relationships within these areas have become subjects of political as well as scientific concern. In addition to increasing our scientific knowledge and our ability to manage populations of estuarine-associated organisms, these studies have become the basis of regulatory decisions on how estuarine areas may be used by man. As the philosophical arguments between "economic" and "environmental" interests mature and land use regulation becomes a fact of life, the need for detailed, site-specific evaluations of potential ecological impacts increases.

Trophic relationships existing in tidal estuaries have been studied by a number of researchers as reviewed by de Sylva (1975). General pathways of energy flow from sun to fish have been established. Estuarine food webs have been characterized as detritus-based or phytoplankton-based with primary consumers consisting of benthic invertebrates of zooplankton forms. Recreationally or commercially important fishes, with a few exceptions, are primary or secondary carnivores. While the role of various invertebrate and forage fish groups in estuarine food webs has been characterized, the species components and the relative importance of these groups to the production of fish has not generally been identified. This is particularly true of Middle Atlantic Coast systems. Regulatory action on proposed land uses within estuarine areas is, in most instances, based upon the evaluation of on-site data. Fisheries scientists are often called upon to collect and/or evaluate these data as to their relationship to the production of "desirable" fish species. While the overall value of estuaries to the production of fish in terms of providing both nursery and feeding habitat may be an accepted truth, the role of specific sites in the scheme of production must often be determined indirectly through analysis of invertebrate populations. This is especially true of estuaries which service transient populations of migratory fish species.

Without reference to the relative importance of given invertebrate taxa as food to given fish species, the evaluation of on-site data is difficult. Of necessity these data often consist solely of a list of species present and their densities. It is an intent of this paper to provide a reference source for documenting a number of species-specific invertebrate-fish relationships and to examine the relative importance of these relationships in one Middle Atlantic estuarine system.

The Little Egg Harbor study area (which includes Manahawkin Bay) is depicted in Figure 1. The estuary is separated from the Atlantic Ocean by a barrier beach island, Long Beach Island, which is commercially and residentially developed except for the southern tip. The west shore, south of Mill Creek, remains primarily in a natural state consisting of a broad Spartina marsh interspersed with tidal creeks. North of Mill Creek, a number of lagoon-type housing developments have replaced portions of the natural shoreline. The bay is shallow with natural depths generally less than 8 feet. A system of dredged channels runs along the periphery of the bay and into some of the tributary creeks. Fresh water inflow is limited, the primary sources being the Tuckerton, Westecunk and Mill Creeks. Data collected from July 1973 through February 1974 (Makai 1974) give a surface water temperature range of -2.2°C to 28°C and a salinity range of 21.4 ppt to 30.8 ppt in the bay proper. The study area has a total surface acreage of 25,563 acres.

Concurrent to this research, studies of nutrient chemistry, marsh and phytoplankton productivity, and benthic invertebrate and zooplankton distributions were conducted by Rutgers University. The New Jersey Division of Fish, Game and Shellfisheries concurrently studied finfish distribution, water chemistry and recreational use in the estuary. The collation of this research may provide the most detailed picture of an estuarine ecological system ever assembled.

Broad objectives of the present study were to identify the forage base being utilized by resident and migratory fishes in Little Egg Harbor and to describe the allocation of that base amongst the consumers. The data and findings obtained are organized in terms of which species consumed a given forage item and what items were consumed by a given fish species. While emphasis was placed on describing value of the various forage taxa to the overall fish community, the redundancy incurred by describing the diets of individual fish species was considered desirable since it allows practical reference to the data from both directions of interest.

METHODS

The diet components of the resident and migratory fish species utilizing Little Egg Harbor were identified through analysis of their stomach contents. Fish were collected at sampling stations which were previously selected for a study of fish distributions within the estuary. Collections were accomplished by seine, otter trawl, gill net and in one case by hook and line. The sampling was conducted over a two-year period with stations sampled once a month, except as prohibited by ice conditions or equipment failure. Figures 1 and 2 locate stations with the letter indicating seine, trawl, or gill net gears. In the final data analysis, stations were grouped into Inlet, Bay, Tidal Pool, Mill Creek and Lagoon habitat areas. This allowed for an overview of forage utilization within different sets of salinity, bottom type, spatial confinement and water quality parameters. The assignment of stations to these groups was somewhat subjective in that a number of stations were transitional. Stations at the mouths of tidal creeks, for example, shared both bay and creek characteristics, while lagoons connecting directly with Mill Creek has somewhat different characteristics than those situated deep in the lagoon complex.

Fish captured at these stations were immediately placed in marked containers of 10% formalin. Upon return from the field, a subsample of fish collected at each station was selected for stomach analysis. Selection was geared toward obtaining larger samples of those species which were abundant in the study area, and those species which were of importance in the regional recreational fishery. The sampling gears were generally assumed to be inefficient for the capture of larger game species such as

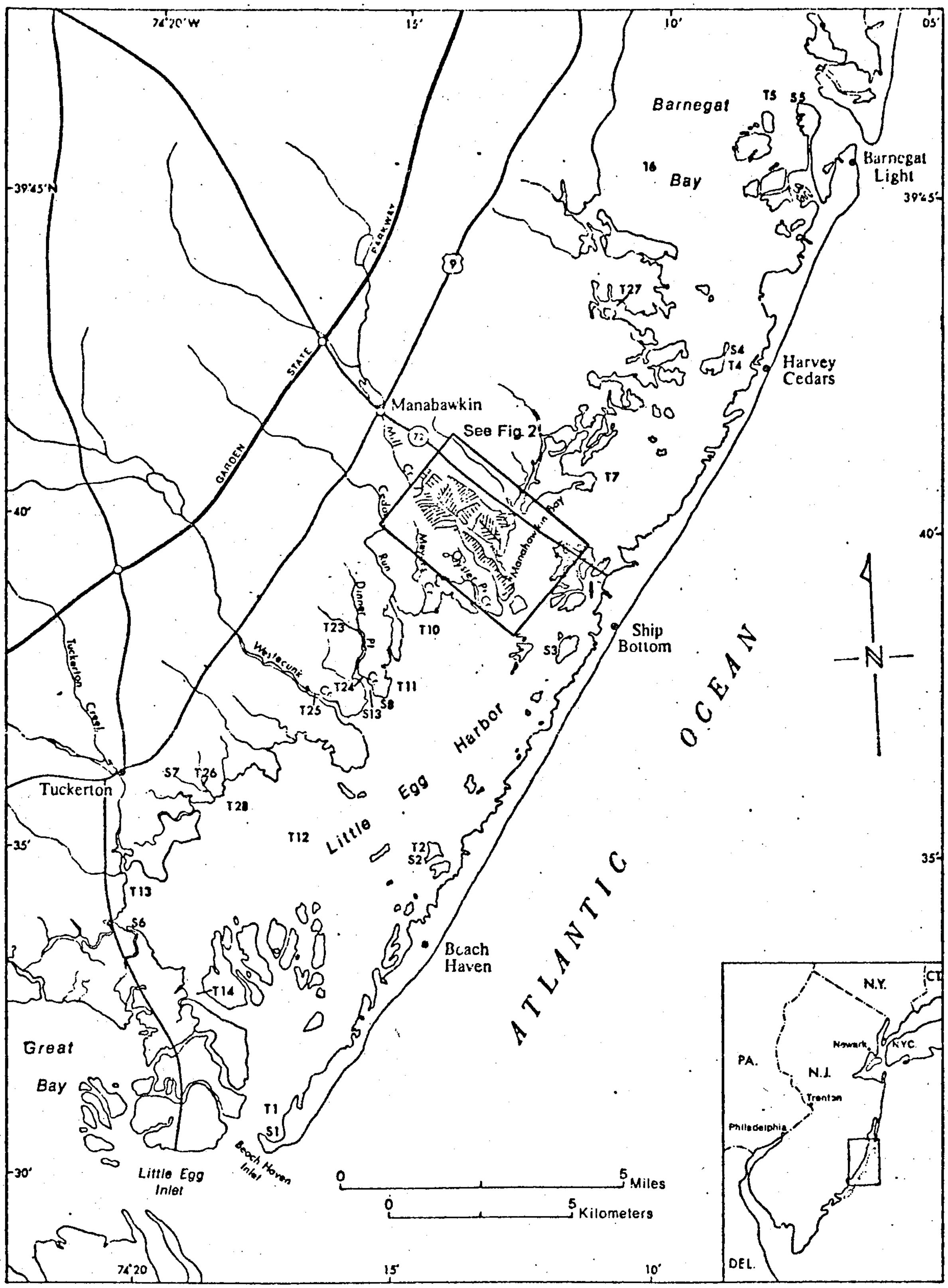
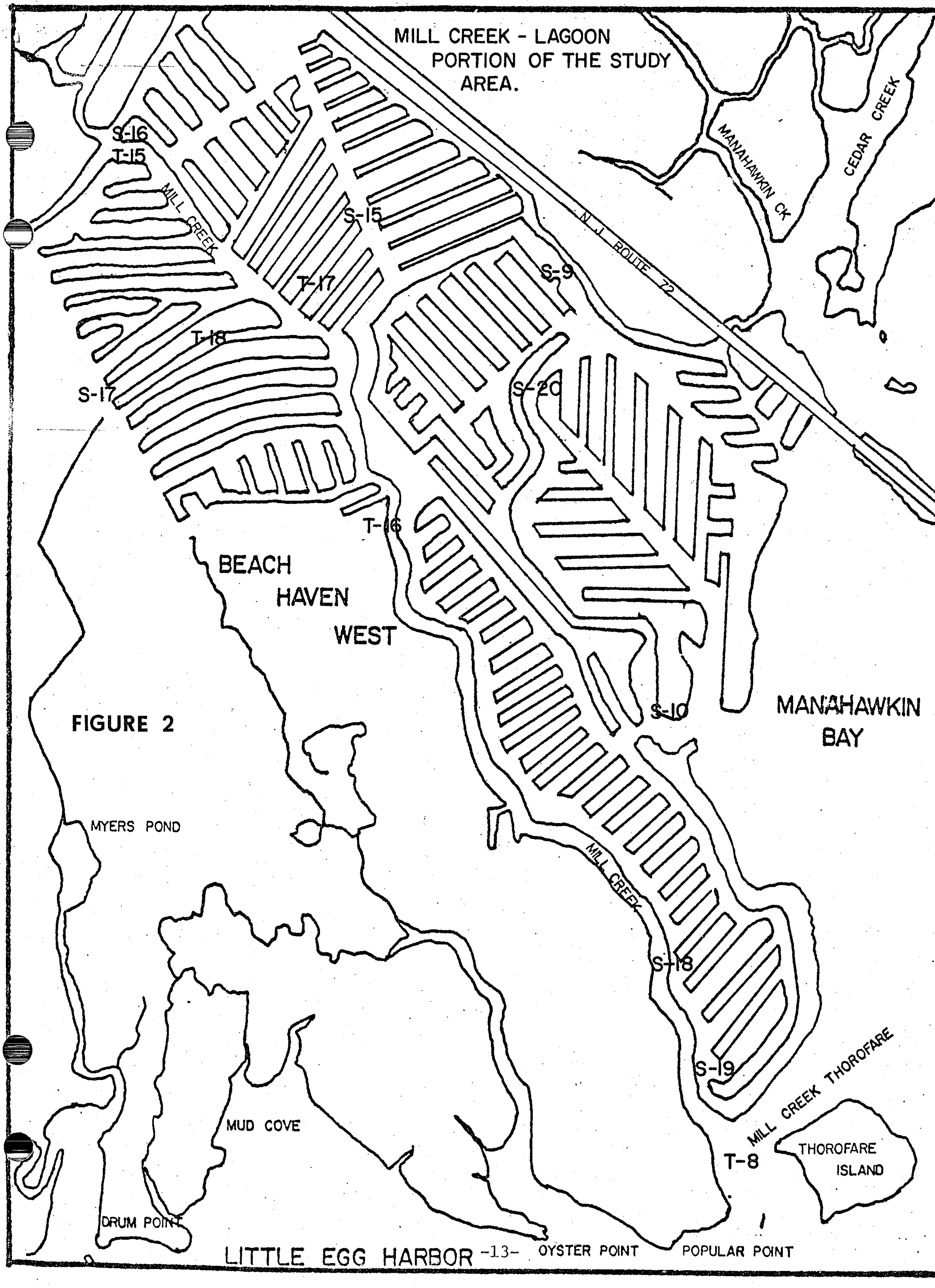


Figure 1. Study area and station location. Procuded by the Cartography Laboratory, Rutgers the State University.


MILL CREEK - LAGOON
PORTION OF THE STUDY
AREA.
MANAHAWKIN CK
CEDAR CREEK
N. J. ROUTE 72
MILL CREEK
S-16
T-15
S-15
T-17
S-9
T-18
S-17
S-20
T-16
BEACH
HAVEN
WEST
S-10
MANAHAWKIN
BAY
FIGURE 2
MYERS POND
MILL CREEK
S-18
S-19
MILL CREEK THOROFARE
MUD COVE
T-8
THOROFARE
ISLAND
DRUM POINT
LITTLE EGG HARBOR
OYSTER POINT
POPULAR POINT

adult weakfish, bluefish and striped bass in open bay and inlet areas; thus the sample is lacking in this respect. The striped bass sample was augmented by hook-and-line-caught fish. The Little Egg Harbor estuary functions as a nursery area for weakfish and bluefish and the sample did adequately represent young-of-the-year specimens.

Selected fish were weighed to the nearest gram and measured to the nearest centimeter. The stomachs of larger fish were removed and placed in vials of 10% buffered (sea water) formalin. Small fish were preserved whole prior to analysis. Stomachs were removed in a variety of ways depending on species morphology. Generally a cut was made anteriorly from anus to gill isthmus with additional incisions dorsally so that the skin could be folded back to expose the digestive tract. Hemostats were placed on the esophagus and intestine proximal to the stomach and the tract severed distal of the hemostats allowing the stomach to be removed with a minimum loss of contents. In species which lack a readily discernable stomach, such as the tautog, the anterior portion of the tract was removed with care taken to include bulging areas. Content analysis was accomplished as follows:

1. The stomach was opened on a gridded plastic culture dish by pinching the tissue to the plate with a scalpel or, in larger specimens, by slicing or cutting the stomach open longitudinally. The operation was carried out under a dissecting scope when necessary.
2. Contents were spread over a portion of the plate and items separated by type into different cells of the grid.
3. For identification, individuals were removed to a second plate and keyed. After all types were identified as far as possible, the organisms were counted and the smallest and largest in-

dividuals of each taxon measured via eyepiece micrometer to obtain a size range. In cases where numbers prohibited actual counts, as occurred with copepods in some species, the recovered organisms were spread over the grid as evenly as possible and counts made in five cells. Results were averaged and multiplied by the total number of cells (25).

4. The volume of each item group was determined by displacement in distilled water. Excess water was removed from the organisms prior to measurement by touching them with a piece of lens paper. The precision of volume measurements was dictated by item size. Large organisms required the use of large cylinders and measurements were to the nearest ml. Measurement to the nearest 0.05 ml was possible for intermediate-sized organisms or large numbers of small items such as mysid shrimp. Measurements in the .05 to .001 ml range were made with an altered 1 inch .01 ml pipet equipped with a magnifying glass (Figure 3). A log was kept on volumes of small species such as gammarids and copepods of various size ranges. From this log, average individual volumes by length were calculated using the mid-range length, number of individuals in the sample and total volume. This assumes a normal distribution with the mid-range equal to the mean length. In most cases the distribution of length was skewed to either larger or smaller individuals. However, it was assumed that the distributions approached normality over many samples. Regression lines, of the form Log Volume (ml) = Log Length (mm) x M + B, were developed on these calculations for assigning volumes to individual organisms which were too small and too few to measure directly

APPARATUS FOR DETERMINING VOLUMES IN .05 to .001 ml. RANGE

FIGURE 3

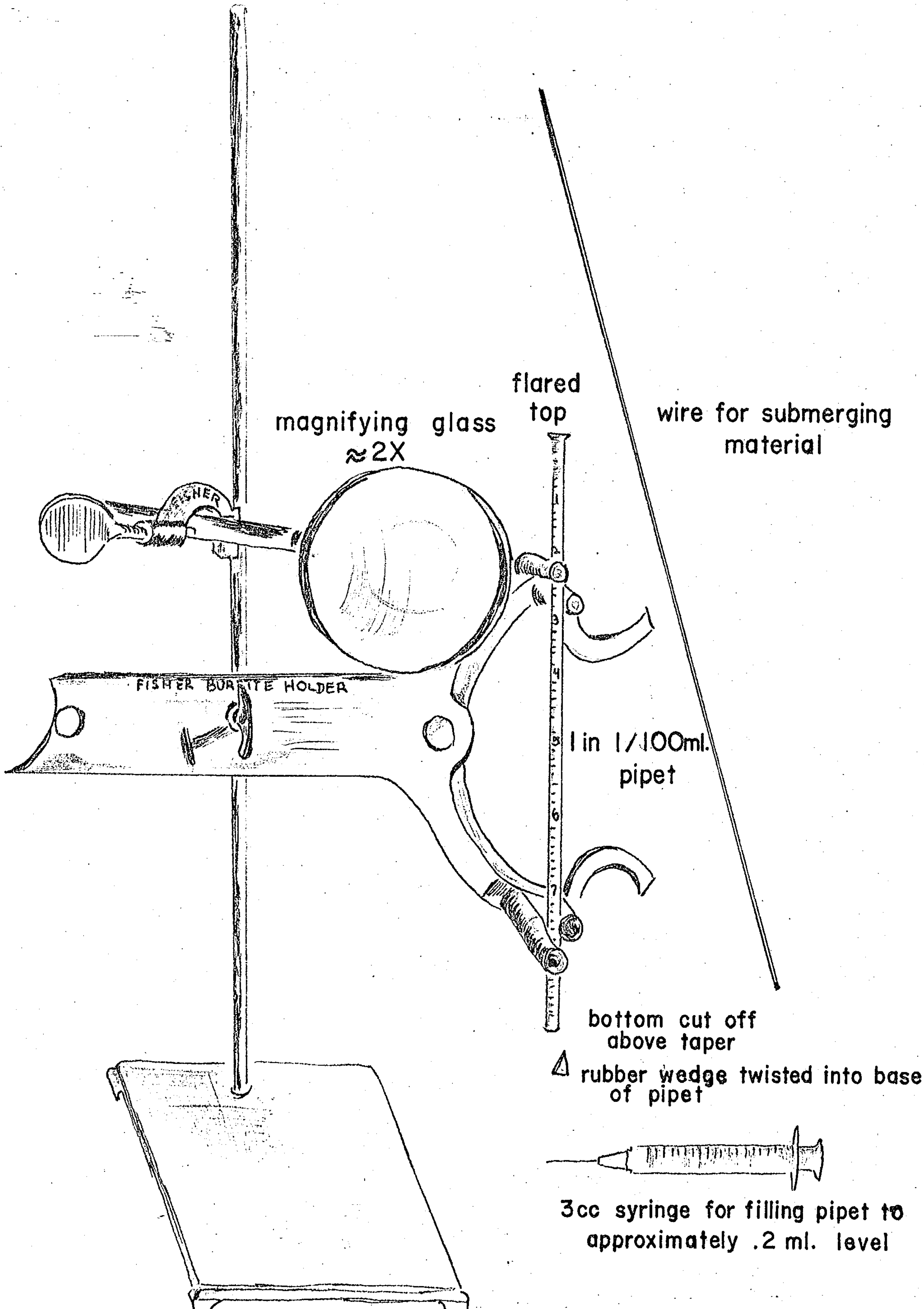
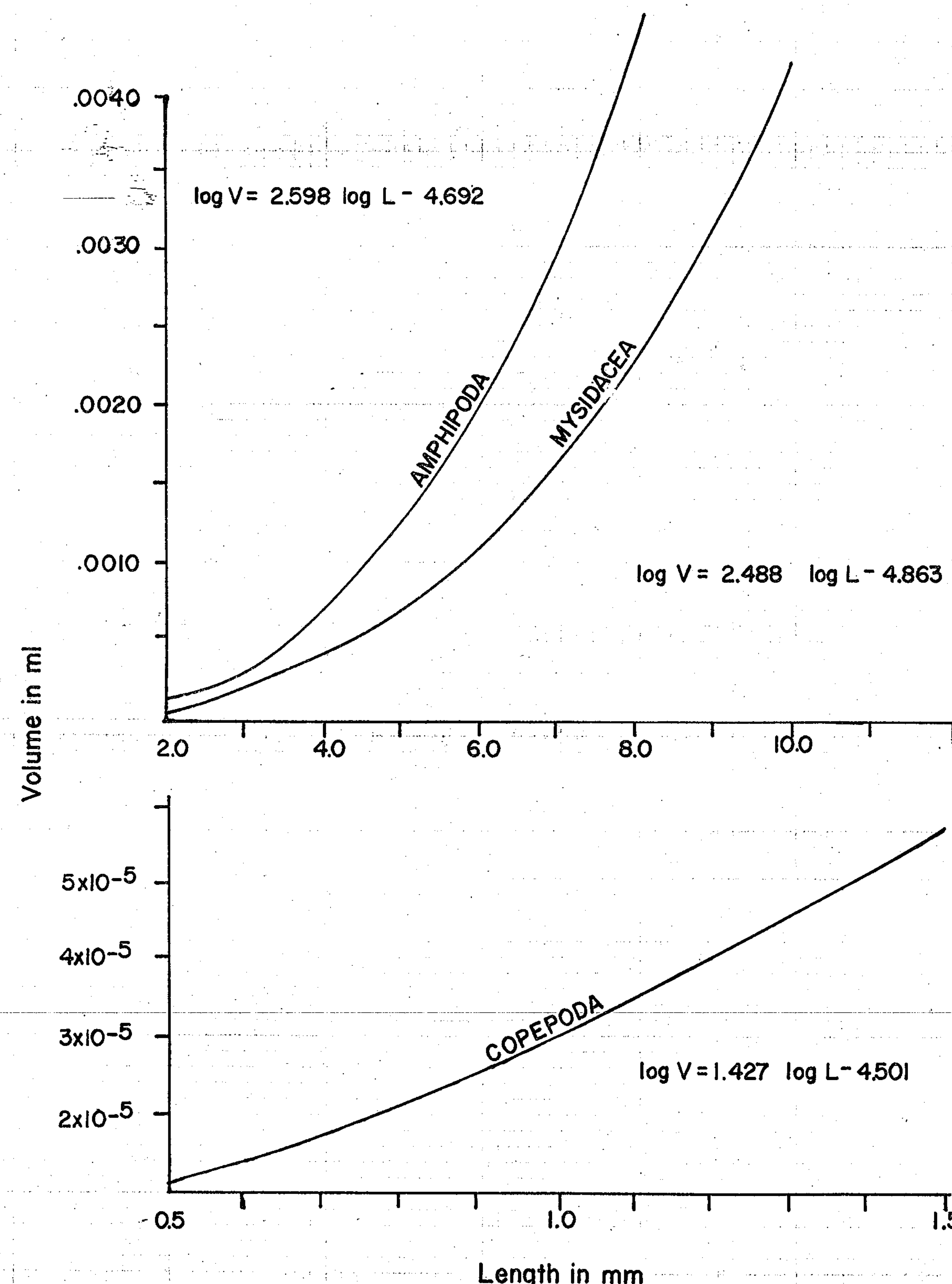


FIGURE 4

LENGTH – VOLUME RELATIONSHIPS CALCULATED FOR THREE INVERTEBRATE TAXA



(Figure 4). In cases where actual measurements were not available for estimating volume, geometrical calculations, on the basis of cylinders, spheres, etc, were used for estimation. Trace items, such as a few sediment grains or a bit of detritus were assigned a volume of .0005 ml.

5. Data sheets recorded fish species, fish length, weight, station of capture, date of capture, time and tide at capture, content items, number of each item type, volume of each type and size range. Water quality parameters at time of collections were catalogued in a fish distribution study (McClain 1977).

6. Data analysis was accomplished using the SAS-76 program package and computer facilities of Rutgers University, New Brunswick, New Jersey.

ALLOCATION AND RELATIVE UTILIZATION OF THE FORAGE BASE

One hundred and forty-two forage taxa were identified in the stomach contents of fifty-five fish species surveyed in the Little Egg Harbor estuary. The tables of Appendix I list the fish species from which each forage organism or group of organisms was recovered. For each consumer species, data are provided on the percent of its total stomach content volume composed of the particular forage item, the percent occurrence of the forage item in the sample and the average number (or volume) of forage items in each stomach. Where appropriate, a predation index rank is provided. The predation index was calculated as $A \times P \times 10^4$, with A equal to the total number of the given forage item recovered from the consumer stomachs divided by the number of consumer specimens examined (individuals/fish), and P equal to the proportion of McClain's total fish sample (Table 1). This index provides a relative measure of the predation impact which a particular consumer population had upon a given forage population in the study area during the study period. It weighs individual consumption rates by relative population size. For example, fourspine stickleback stomachs contained an average of 0.16 *Cymadusa compta* while lined seahorse stomachs contained an average of 13. Assuming that these averages represent an equal proportion of the number of *C. compta* consumed by each species during a unit of time, a given seahorse would consume 81 times as many *C. compta* as a stickleback. However, since there were far more sticklebacks than seahorses in the estuary (519:1 in McClain's survey), the stickleback population represented a greater predation threat to *C. compta* that did the seahorse population.

The tables of Appendix I indicate potential areas of interspecies competition. Data were not available for determining if food supply was a limiting factor for any of the fish species utilizing Little Egg Harbor, and thus there is little basis for firm conclusions on food competition versus food sharing relationships. The diversity of feeding habits observed would suggest, however, that interspecific competition is minimal.

The trophic structure of the Little Egg Harbor estuary is very complex. Use of the identified food resources is well divided among the various fish species present and often among size groups within these species. This division of the forage base adds stability to the trophic structure. The potential for competition is no doubt reduced by a number of the species-specific, predator-prey relationships observed as well as by the variety of food items available. This situation in turn is a function of the diversity of viable ecological niches present in the system. Such a condition allows for the concurrent production of a large variety of fish species of various life stages within the estuary.

It is important that, except as noted, the data presented here be considered only in the positive sense; i.e. utilization of a given organism by a given fish species is documented, whereas non-utilization is not. The absence of a given organism in the fish stomachs may be a function of sample size, station selection sampling procedures, or the organism's scarcity in the estuary. Low utilization of organisms known to be common in the study area are noted in the discussions of the various forage groups; however, conditions in other estuaries may well effect different patterns or degrees of use.

The following pages review findings on the allocation and relative utilization by fish of the various prey organisms identified.

Appendix I complements the discussion.

Sediment

Recognizable amounts of sediment occurred in the stomach contents of twenty-two fish species. Particles less than 50u were generally not detected or enumerated. It is presumed that, in most cases, sediment particles were ingested incidental to the capture of prey organisms. Fishes which feed on tube-dwelling amphipods and polychaetes would be expected to ingest sediment from the surrounding bottom and particles incorporated in the tubes themselves. The occurrence data is somewhat biased in favor of smaller fishes whose diet analyses generally required the use of higher microscope magnifications. This increased the chances of detecting small particles.

The ingestion of sediments may facilitate the digestive processes of algae or detritus-feeding fishes including the mullets and Atlantic menhaden. Of the fourteen mullet stomachs examined, all but one contained high proportions of sediment. Hildebrand and Schroeder (1928) note that white and striped mullet taken from Chesapeake Bay contained substantial quantities of mud. Baird (1873) observed large quantities of "mud" in the stomachs of menhaden collected from Great Egg Harbor, New Jersey.

There may be a significant nutritional value associated with algae and bacteria bound to these sediment particles. Such components possibly form a substantial portion of the energy intake of the mullets. On the basis of relative volumes consumed, such a contribution would appear to be minor in the other species. The relative propensity for the ingestion of sediment, as suggested in Appendix I, may be of interest in studies concerning the transfer of sediment-associated chemical compounds from the environment to fish.

Algae

Recognizable amounts of algae were observed in the stomachs of eighteen species of fish. Component groups included diatoms, filimentous and solitary greens and dinoflagellates. The Atlantic menhaden is known to be a phytoplankton feeder and this was apparent by the high occurrence of algae in the specimens examined. A number of other species contained diatoms - which, based on the mouth morphology of the species, were probably grazed from the substrate. Included in this group were banded killifish, planehead filefish, striped mullet and white mullet. Algae comprised 15.7 percent of the diet volume of banded killifish and 39.7 percent of the stomach contents recovered from two filefish specimens. Dinoglagellates formed an important component of the mummichog diet during the summer at the tidepool station.

As with vascular plant material, the role of algae in the production of fish within the estuary is, with the exception of menhaden, primarily associated with invertebrate forage production. The phytoplankton-copepod energy transfer is particularly important in the food chains of many small fish and ultimately to the diets of piscivorous species (Figures 5 and 6).

Vascular Plant Detritus

Plant fragments in various degrees of decomposition occured in thirty-five of the fish species examined. Whole sections of eelgrass blades were found in some of the larger specimens and were particularly evident in species consuming larger blue crabs, Callinectes sapidus. These included smooth dogfish, oyster toadfish and American eel. Smaller eelgrass fractions were observed in a number of other fishes. Most of the fibrous plant material recovered was not readily identifiable as to its source. Fragment sizes ranged down to microscopic proportions.

Of those fishes for which volumetric analyses were conducted, plant detritus was ingested in larger amounts by oyster toadfish, banded killifish and smooth dogfish. As a population, oyster toadfish consumed the largest amount of fibrous plant detritus in the study area. On the basis of occurrence data and qualitative observations, it appeared that this material comprised a major portion of the diet volume of white mullet and sheepshead minnow. Whether these species are capable of digesting fibrous plant material or ingest it to obtain associated algal and bacterial components is not known. Pyle (1964) noted that the stomachs of sheepshead minnows collected in Barnegat Bay, New Jersey also contained high proportions of detritus.

In most of the other fish species concerned, it is rather certain that the ingestion of plant detritus is incidental to the capture of other food. The opportunity for fish to obtain this material is very high; the observed volumes consumed are low. The highest percent occurrences of detritus in the fish stomachs by area was observed in the tidepool sample in association with the sheepshead minnow population.

A large portion of the invertebrate populations utilized by fish in Little Egg Harbor are known to be organic detritus feeders. In this sense, the production of desirable fish species is clearly associated with the availability of plant detritus. The pathways and quantifications of invertebrate utilization are subjects requiring further study.

Phylum Nemertea

American eel, brown bullhead and winter flounder specimens contained the remains of nemertean worms tentatively of the genus Cerebratulus. Nemerteans comprised 12.2% of the diet volume collected from winter flounder in the 22-33 cm size range although occurring in only two fish. These were the two largest flounder specimens collected.

Phylum Porifera

Portions of unidentified sponge occurred in the stomach contents of one summer flounder collected from the bay. Sponges apparently are of little direct food value to fishes in the system.

Phylum Cnidaria

Class Hydrozoa: Hydroid stolens and polyps occurred in generally small quantities in the stomach contents of thirteen fish species. They comprised 19.8% of the stomach content volume of the two planehead filefish examined, and may contribute substantially to the diet of this grazing species. Hydroid pieces were found in two of the three northern puffer specimens. This fish is presently scarce in the system (Festa 1977), but has been very abundant in past years. No consistent attempt was made to identify the taxa involved, the genus Campanularia was tentatively identified in one instance. Hydroids may provide habitat for various amphipods. In the overall fish sample, it is assumed that most ingestion occurred incidently to the capture of other foods. Occurrence in the sample was highest at the tidepool station in association with the sheepshead minnow and mummichog populations. A somewhat higher occurrence was noted in spring and fall collections.

Class Anthozoa: An unidentified anemone was found in the stomach of a windowpane collected at a bay station.

Phylum Platyhelminthes

Class Turbellaria: Fourteen species of fish contained turbellarians in their stomach contents. While not significant in terms of stomach volume, occurrence was high in a number of fish, particularly in bay anchovy. The role played by turbellarians is unclear. Specimens collected from the fish stomachs did not, in general, show signs of deterioration and apparently were not being digested by the fish. Most were in the size range of 0.5 to 0.7 mm., and all were presumed to be of the Order Neorhabdocoela.

Phylum Aschelminthes

Class Nematoda: Sixteen fish species had nematodes in their stomachs. These nematodes appeared to be immune from digestion. With a few exceptions, the cuticle of recovered nematodes was intact and showed no sign of dissolution. It is postulated that these nematodes were lodged in the stomachs feeding on materials ingested and partially digested by the fish. They were often found intertwined with other materials in the stomachs. A fifty percent or higher occurrence was observed in the sample of oyster toadfish, spot and tautog. The size of nematodes generally increased with the size of the fish specimens. Spot contained an average of 24.3 nematodes in their stomach contents. While nematode infestation did not appear to be correlated with any gross signs of emaciation, the effect on fish growth rates, particularly in spot, should be investigated.

These findings contrast with those of Odum and Heald (1972) who observed few nematodes in the stomachs of fish collected in the North River, Florida, although the organisms were common in benthic samples.

Phylum Bryozoa

Clumps of bryozoa were found in the stomach contents of one bullhead, one summer flounder, two tautog and one winter flounder. Bryozoans do not appear to be of direct value as fish food in the Little Egg Harbor system. Indirectly they may contribute to fish production by providing cover for various amphipods.

Phylum Mollusca

Class Gastropoda: Gastropod larvae occurred in the diets of six fish species. They were of most importance in bay anchovy, which contained an average of 12.5 larvae per fish. The contribution of gastropod larvae to the overall anchovy diet was low (1.9% total volume); however, during particular time periods the daily intake was significant. Larvae occurred in fish collected from May through August with high numbers encountered in individual anchovies taken on June 10th (136), July 1st (158) and July 9th (281). The July 9th specimen was taken from a lagoon station, the other two from bay stations. Gastropod larvae occurred in a higher percentage of tidal creek and bay station fish with no incidence in tide-pool specimens.

Adult gastropod forms were found in the stomachs of twelve fish species. At least five taxa were represented:

Genus Bittium: Bittium alternatum (Say) was the only species identified. It occurred in the diet of winter flounder and oyster toadfish. Unspeciated members of the genus occurred in fourspine stickleback, silver perch and tautog. Stickleback had the highest predation index rank followed by silver perch. Occurrence was limited to bay and inlet station fish. Bittium contributed little to the total volume of the stomach examined. Highest occurrence was observed in the tautog sample.

Genus Crepidula: This taxon comprised 55.4% of the total stomach content volume collected from three northern puffer and 99% of the content volume of a single 8 cm permit. The Genus also occurred in fourspine stickleback, oyster toadfish, tautog and winter flounder. In some cases only the soft body parts were recovered from the fish stomachs. With one exception, occurrence was limited to bay collected fish. During the sampling period, Crepidula apparently was not a major fish food source in the estuary. A relative increase in the northern puffer population, however, would be expected to increase the contribution of Crepidula to overall fish production.

Mitrella lunata (Say): This dove shell is found from Massachusetts to Texas (Abbott 1968). It occurred in the stomachs of one American eel, one oyster toadfish, one permit, and one winter flounder. No pattern was observed in terms of habitat or seasonal occurrence.

Family Nassariidae: Four individuals were recovered from the stomachs of one bullhead, two oyster toadfish, and one striped burrfish. These remains were tentatively identified as Ilyanassa obsoleta (Say). The species is abundant in many areas of Little Egg Harbor and its low occurrence in the fish sample indicates a disproportionately low utilization as fish food.

Haminoea solitaria (Say): This gastropod belongs to a group of genera commonly called "Bubble shells". Abbott notes that, while occasionally feeding on algae, these are generally carnivorous forms. H. solitaria occurred in the stomach contents of two oyster toadfish taken at bay station T9 and one winter flounder collected at inlet station T5.

In general, gastropods appear to contribute only minimally to the production of fish in Little Egg Harbor. The utilization of Gastropod larvae by bay anchovy represented the major trophic relationship observed in the survey sample. The relative value of gastropods in terms of fish production may be very sensitive to large fluctuations of the northern puffer population. In past years, this fish was a dominant species in the system.

Class Pelecypoda

Bivalve mollusks were present in the stomachs of sixteen species of fish. At least nine genera were represented. Since a large portion of the pelecypod component consisted of crushed and fragmented remains, it is probable that a number of other taxa were included in the unclassified category. In general, adult forms of this class were better represented in the stomach contents than the gastropods. Pelecypod siphons formed an important portion of the winter flounder diet.

Family Mytilidae: The blue mussel, *Mytilus edulis* (Linne), was identified in the diets of fourspine stickleback, lined seahorse, striped burrfish, and striped bass. An unidentified mussel occurred in the stomach contents of one spot. Although common in the area, the ribbed mussel *Modiolus demissus* (Dillwyn) is apparently not heavily utilized by fish in the system. The occurrence of mussels was limited to fish collected at bay and inlet stations.

Laevicardium mortoni (Conrad): This small cockle occurred in the stomach contents of a winter flounder taken at bay station T4.

Family Veneridae: The remains of whole venus clams were found in the stomachs of three spot and the one scup specimen. The survey sample gave no indication of heavy fish predation on hard clam, *Mercenaria mercenaria* (Linne), seed in the estuary. The occurrence of venus siphon tips, primarily *M. mercenaria*, in the diet of winter flounder is discussed in detail in the section on pelecypod siphons. That relationship represents the major utilization of the family by fish in the system.

Family Tellinidae: One unidentified tellin was recovered from a winter flounder stomach. The fish was collected at inlet station T5 in December.

Ensis directus (Conrad): The soft parts of one razor clam were collected in entirety from a winter flounder taken at a lower Mill Creek station. No portions of either valve were observed in the stomach. One individual was recovered from an oyster toadfish. This species may have contributed minimally to the siphon tips recovered from winter flounder.

Tagelus divisus (Spengler): The remains of one specimen were recovered from a winter flounder stomach.

Mya arenaria (Linne): An entire soft clam was found in the stomach contents of an American eel taken in Mill Creek. Outside the study area, the remains of a small soft clam were identified in the stomach of a mummichog collected in Raritan Bay. Siphon tips and seed clams of this species have been documented in the diet of winter flounder in other areas as discussed in the pelecypod siphon section.

Lyonsia hyalina (Conrad): Seven individuals were collected from the stomach of a single winter flounder taken at bay station T4. This was the only occurrence of the glassy lyonsia in the fish sample.

Solemya velum (Say): This species was identified in the diet of black seabass, smooth dogfish and tautog. All occurrences were in August. The seabass and tautog specimens were collected at bay station T2.

Pelecypod siphons: Portions of pelecypod siphons were observed in the stomachs of spot, white perch and winter flounder. This item contributed minimally to the diet of spot and white perch but was a major food source for winter flounder in the estuary.

Through direct comparison with intact siphons from the various large pelecypods found in the Little Egg Harbor System, it was determined that at least 75% of the siphon tips recovered from winter flounder were of *Mercenaria mercenaria*. This is the dominant large pelecypod in the study area, making up 91% by weight of dredge collections of Garlo et al. (1974). Of the remaining, less distinguishable tips, most appeared to be *M. mercenaria* siphons in more advanced stages of digestion. A few siphon tips from *Mya arenaria* were recovered from smaller flounder and at least one siphon of *Ensis directus* was observed. In contrast, *M. arenaria* siphons comprised 17% of the diet volume of four winter flounder collected over soft clam beds in Raritan Bay suggesting that the fish opportunistically attack either clam.

Pelecypod siphons accounted for 14.1% of the total stomach content volume collected from winter flounder in Little Egg Harbor. They occurred in 27.5% of the specimens examined at an average of 3.08 siphons per fish. Siphons were not heavily utilized by fish in the 3 to 11 cm size group, occurring in only 7.1% of the sample. Siphons were an important diet item in the 12 to 21 cm group of flounder, comprising 22.5% of the stomach contents volume and occurring in 29.3% of the sample. This contrasts with the findings of Frame (1974) who found only a 2.8% occurrence of siphons in 176 one-year old fish taken from the Weneatic River Estuary in Massachusetts. Larger fish (22-33 cm) consumed higher numbers of siphon tips averaging over six per specimen, but the relative importance of the item declined to 12.4% of the diet volume. Siphons occurred in over 50% of these larger winter flounder. One 29 cm specimen contained 82 siphon tips. This predator-prey relationship was observed throughout the study area with lower intensity in inlet stations and the fresher areas of tidal creeks. The highest utilization of hard clams occurred in the November to May period, reflecting the presence of adult winter flounder in the estuary.

The recovered siphon tips averaged 5.96 mm in width and had a mean length of 3.37 mm. There is no apparent relationship between the width of the siphon attacked and the length which the fish is able to remove (correlation coefficient = 0.54, n = 128).

The occurrence of pelecypod siphons in the diet of winter flounder has been documented by a number of investigators. Kurtz (1975) found that unidentified siphons comprised 0.63% and 17.38% by weight of the stomach contents of 469 winter flounder taken in Shinnecock and Great South Bay, Long Island. Of special interest is the paper of Medcof and MacPhail (1952), "The Winter Flounder - A Clam Enemy", which considered predation on soft clams along the coast of New Brunswick, Canada. Two thirds of the flounder specimens they examined contained soft clam siphons with an average of 16 per fish. Their study concluded that flounders can be enormously destructive of seed clams and that they injure adult clams by nipping off the ends of their siphons.

The effect of flounder predation on the Little Egg Harbor hard clam population is apparently not as severe as that described on soft clams in New Brunswick since young or entire hard clams were not present in the fish stomachs examined. Medcof and MacPhail found that mortality rates of Mya over a ten day period were not increased for specimens having 1/4 to 1/2 inch of their siphons cut off. Observations in the present study likewise suggest little direct mortality associated with flounder attacks on clam siphons. During the winter and early spring of 1974, 203 hard clams collected from the adjacent Great Bay estuary were examined as to the condition of their siphons. Overall, 47.3% of the sample displayed signs of recent or past siphon damage ranging in severity from disfiguration to the total absence of a siphon. In 18% of the specimens the siphonal tentacles were missing. These organs contain tactile and chemoreceptor cells (Morton 1958) which regulate particle intake and monitor water quality. The clams are apparently able to regenerate these tentacles. However, the temporary loss of tentacles would be assumed to have some negative effect on the general function of the animal. Clams in Little Egg Harbor are subject to repetitive attack. Many of the siphon tips recovered from the flounder stomachs had disfigured distal margins showing signs of healed or regenerated areas.

The hard clam - winter flounder relationship is interesting because, in a sense, the siphons represent a "renewable food resource" for the flounder which might be of consideration for aquaculture situations.

Pelecypod larvae: Larval stages of pelecypoda occurred in the stomach contents of one bay anchovy and one spot. Twenty-five larvae were recovered from the two fish. Both fish were collected in tidal creek stations; the anchovy on May 21st, the spot on August 30th.

Phylum Annelida

Class Oligochaeta: Unidentified oligochaetes occurred in the stomach contents of fourspine stickleback, pumpkinseed sunfish, spot and winter flounder. These worms were assumed to be of the family Tubificidae. With the possible exception of spot, oligochaetes do not appear to contribute significantly to the diet of fish populations in the estuary. Occurrence in spot was limited to three fish, two taken in Mill Creek and one from a bay station. The two Mill Creek fish contained 64 and 71 worms with the result that oligochaetes comprised 4.2% of the total stomach contents collected from the species. Overall, oligochaetes were found in the stomachs of seven individual fish. High densities of tubificid worms are often associated with organically rich sediments subject to anaerobic conditions. In studies of Upper New York Bay, in muddy sediments along previously dredged shorelines, densities as high as 10,969/m^2 have been recorded (Texas Inst., Inc. 1976). The utilization of tubificids by bottom feeding fishes may be expected to increase in such areas, however, they were not observed in the limited stomach analysis work conducted at that site.

Class Hirudinea: One unidentified leech was recovered from the stomach of a mummichog taken at Mill Creek Station S18 in June.

Class Polychaeta: Polychaetes as a group comprise one of the major fish food sources in the Little Egg Harbor estuary. Adult forms were observed in the diets of thirty-two fish species. They comprised over 10% of the stomach content volume in 16 species, over 30% in five. Larval forms occurred in low numbers in the diets of menhaden, bay anchovy, blueback herring, fourspine stickleback, striped killifish and winter flounder. Relatively higher utilization of larvae occurred in lagoon stations. No thorough attempt was made to identify larval forms, however, a large portion appeared to be spionids.

Due to the rapid deterioration of polychaetes in the fish stomachs, it was difficult to assess the relative contribution of the various component taxa to the fish diets. At least nineteen families were represented. Fifteen species were identified. To an extent, the unclassified groups listed in Appendix I might be proportioned relative to identified taxa; however, larger species or those species with distinctive hard body parts (jaws, setae, etc.) were somewhat less likely to occur in the unclassified category.

As a group, polychaetes were utilized throughout the year and in all habitats.

Family Phyllodocidae: Three species were identified in the fish stomachs: *Phyllodoce maculata*, *P. arenae* (Webster), and *Eumida sanguinea* (Oersted). Unspeciated individuals of the genus *Eteone* were also recovered. The family occurred in the diets of six fish species being of most importance in the naked goby sample (30.6% volume). Spot were determined to have the greatest predation impact on the family followed by the naked goby and mummichog. *Phyllodoce* was observed in fish taken at bay, lagoon, and Mill Creek stations. *Eteone* appeared to be more closely associated with the Mill Creek and tidepool stations, but also occurred in fish collected from bay and lagoon stations. The genus was also identified in the stomach contents of a spot taken in Raritan Bay. The single *Eumida* identified was found in a winter flounder collected at bay Station T2.

Family Aphroditidae: Two individuals were collected from the stomach contents of winter flounder. The remains could not be speciated. One flounder was taken at lagoon station S10 and one at bay station T2.

Family Polynoidae: Unidentified members of this family occurred in two winter flounder, one collected at inlet station T5 and one at bay station T2. A total of five individuals were observed.

Family Sigalionidae, Genus *Sthenelais*: One individual was identified in the stomach contents of a winter flounder collected in Mill Creek.

Family Syllidae: Two individuals were observed. One was in a fourspine stickleback collected at bay station T4 and one in a spot collected at bay station T11.

Family Glyceridae, Genus *Glycera*: A total of twenty-eight glycerids were identified in the stomach contents of Northern kingfish, white perch and winter flounder. _Glycera americana_ (Leidy) was the only species positively identified; however, it is likely that other species were involved. _G. dibranchiata_ (Ehlers) was recovered from one of 4 winter flounder collected in Raritan Bay, New Jersey. In Little Egg Harbor the genus was of importance in the diet of large winter flounder and comprised 9.9% of the stomach contents collected from two kingfish. Winter flounder had the greatest predation impact during the study period. Utilization was considerably higher in fish collected at inlet stations. No seasonal pattern was apparent.

Family Goniadidae: _Glyinde solitaria_ (Webster) and _Goniadella gracilis_ (Verrill) were tentatively identified. Occurrence was limited to winter flounder with most utilization by young-of-the-year fish. This family occurred in ten fish, nine of which were collected during the summer; eight of the ten were from bay stations.

Family Nephtyidae, Genus _Nephtys_: One small bluefish (10 cm), one spot and one large winter flounder contained _Nephtys_ remains. The bluefish and spot were collected from lagoon station T18 in July, the flounder was from a bay station.

Family Nereidae, Genus _Nereis_: _Nereis succinea_ (Frey and Leuchkart) was the dominant species observed although other unidentified species occurred in the fish stomachs. The rather distinctive prostomium, antennae, and jaws of this genus facilitated the recognition of quite skimpy and well-digested remains. It can be assumed that most occurrences were enumerated. The high utilization of this genus relative to other polychaete components as indicated by Appendix I is probably artifactual to some degree. Even so, this genus clearly represented one of the major polychaete taxa in the fish diets examined. It occurred in fifteen species, being of significant importance in the stomach contents of 6 to 10 cm bluefish, 11 to 13 cm oyster toadfish, and 12 to 21 cm winter flounder. With the exception of the tidepool station, occurrence was system-wide, from low salinity areas of Mill Creek to inlet-collected fish. Greatest predation impact on the genus was effected by Atlantic silversides, bay anchovy and winter flounder. Sanders et al. (1960) characterized the generic Nereis caudata in Barnstable Harbor, Massachusetts as an indiscriminate deposit feeder subsisting primarily on diatoms and detritus.

Family Spionidae: Three genera were identified in the stomachs of the sampled fish. The family occurred in seven species, being utilized to a larger extent by brown bullhead, spot and young-of-the-year winter flounder. Spot had the greatest predation impact on this group of polychaetes. Scolecolepides viridis (Verrill) was observed in stomach contents of bullhead and white perch collected in Mill Creek and winter flounder taken in the bay. The genus Polydora was dominant in the group, occurring in menhaden, anchovy, fourspine stickleback, spot, white perch, and winter flounder. P. ligni (Webster) was the only species identified. Relative occurrence of this species was highest in bay and tidal creek fish. Utilization was markedly higher during the spring.

Streblospio benedicti (Webster) was a diet item of winter flounder. Sixty-seven individuals were observed in the stomach contents of three flounder collected in Mill Creek. One occurrence was recorded for an inlet-collected fish. This species comprised 38% of the stomach content volume of four winter flounder collected in Raritan Bay.

Family Capitellidae: Component genera were not distinguished. Polychaetes of this family occurred in four fish species with heavy utilization by 3 to 21 cm winter flounder. They comprised 21.8% of the stomach content volume of eight naked goby specimens but occurred in only one of the fish. Overall utilization was highest during the summer. Somewhat greater use was observed in inlet-collected fish but the family was represented in all habitats except the tidepool.

Family Maldanidae: Cylmenella torquata (Leidy) was a stomach content component of scup and winter flounder. Occurrence was limited to bay station fish. Maldanopsis elongata occurred more frequently in the flounder sample and again was limited to bay stations. This species was also observed in the stomach contents of one grey snapper.

Family Terebellidae: This group was an important diet item for large winter flounder. It occurred in 48.9% of the sample comprising 16.5% of the content volume. Pista palmata (Verrill) was the major component and the only species identified. Other unidentified species were represented in the sample. P. palmata occurred primarily in bay-collected fish; however, ten specimens were observed in two flounder collected at the mouth of Mill Creek. Utilization by flounder was notably higher during the spring months. An unidentified terebellid was also collected from the one scup specimen examined.

Family Paraonidae, Genus Aricidea: Three individuals of this genus were identified in the stomach contents of one winter flounder taken at bay station T2.

Family Lumbrineridae, Genus Lumbrineris: Occurring in tautog and winter flounder, this group was observed in bay and tidal creek collected fish. L. tenuis (Verrill) was identified in winter flounder. A total of seven individuals from this genus was represented in the sample.

Family Arabellidae, Arabella iricolor (Montagu): Three individuals were encountered in the stomach contents of two winter flounder. One fish was collected at Bay Station T2 in March, the other at the mouth of Mill Creek (T8) also during March.

Family Sabellidae, Sabella microphthalma (Verrill): Identified in three winter flounder. The fish were taken at tidal creek, bay and Mill Creek stations.

Family Orbiniidae, Genus Scoloplos: This genus, as with a number of the other polychaete groups, was observed only in the stomachs of winter flounder. S. fragilis was identified as one component. In one case, thiry-five individuals were encountered in the stomach contents of one flounder. The fish was taken at bay station T2.

Family Ampharetidae, Hypaniola grayi: This was a major item in the stomach contents of one of two pumpkinseed sunfish taken in upper Mill Creek. The species was also identified in the diet of spot, striped killifish, white perch, and winter flounder. The occurrence of H. grayi was strongly associated with the Mill Creek specimens and to a lesser extent with lagoon stations. A few H. grayi did occur in bay and tidal creek station fish. Utilization was highest during the summer and spot were calculated to be the major predator population.

While the utilization of polychaetes was expectedly associated with bottom feeding fishes, pelagic and even planktonic feeding species including menhaden, anchovy and bluefish apparently took advantage of swarming and juvenile forms. The latter possibly suspended by current action. Winter flounder consumed the largest variety of polychaetes; however, a larger sample of other fish species might, to a degree, have reduced the observed differences in utilization. High use of errant forms, particularly Nereis, suggests that special attention should be given to this group in evaluating the forage value of benthic populations. As a group, polychaetes contribute at some level to all categories of fish production in the Little Egg Harbor estuary.

Phylum Arthropoda

Class Merostomata: Three young horseshoe crabs (*Limulus polyphemus*) were found in the stomach of a winter flounder collected at inlet station T1 in August. A 3.1 mm (width) specimen also occurred in the stomach contents of a winter flounder taken in Raritan Bay in September.

Class Arachnida: One water mite (Order Acari) was encountered in the stomach contents of a fourspine stickleback taken at lagoon station S15. Another occurred in a tidewater silverside collected in Upper Mill Creek. Both were winter collections.

Class Insecta: Insects occurred with surprising frequency in the fish stomachs examined. As a group, they were found in fish collected throughout the study area and during all seasons. Representatives of six orders were identified in the diets of 18 fish species.

Larval forms, primarily of the Dipteran Family Chironimidae, were ingested by 15 fish species and comprised 6.1 and 4.2% respectively of the stomach contents of hogchoker and rainwater killifish. Mummichog and tidewater silversides accounted for most of the predation on Chironimidae larvae. Utilization by fish in general was relatively higher during the winter and at the tidepool station. A plecopteran larva was recovered from a white perch collected at lagoon station G17 on January 29, 1974.

Adult insect forms comprised an important diet constituent of Atlantic needlefish. In small needlefish (5-16 cm) this group made up 41.7% of the diet volume. In larger specimens (24-58cm) adult insect forms represented 11.8% of the diet volume. Tidewater silversides, Atlantic silversides and striped killifish also consumed adult insects on a regular basis. The silversides were the most important predators in the system. Midges and winged ants occurred most frequently and it is assumed that these were taken from the water's surface. Coleoptera, Homoptera, and Hemiptera were also represented in the stomach contents. Expectedly, utilization of adult insects was highest during the summer months.

Class Crustacea, Subclass Branchiopoda, Order Cladocera: Occurring in seven fish species, cladocerans do not appear to be a major food resource for fish within the size ranges sampled in the Little Egg Harbor System. Although high numbers of cladocera were found in individual fish, their contribution to the overall diet in terms of stomach content volume was generally small. Greatest utilization was by bay anchovy. Relative occurrence was highest at lagoon and Mill Creek stations during the summer.

Subclass Ostracoda: At least ten fish species consumed ostracods. The subclass, however, contributed little to the total diet volume of these species. Bay anchovy represented the major predator on ostracods. Relative utilization of ostracods was highest during the spring and distributed over bay, Mill Creek and tidal creek stations. A lower rate of utilization was observed in lagoon-collected fish.

Subclass Copepoda: Copepods were found in the stomach contents of thirty-one of the fifty-five fish species examined. The occurrence of copepods was generally associated with small fish and planktivores (Figure 5). The subclass clearly represents a major share of the fish food resources in Little Egg Harbor and plays a significant part in the estuaries' role as a fish nursery area. Copepods were distinguished to the order level.

Order Calanoida: Comprising the major food source of zooplankton feeders, this order occurred in a total of 24 fish species. It was the dominant diet constituent of sandlance, larger alewife, bay anchovy and blueback herring. One blueback herring contained over 4,000 calanoids in its stomach. A total of 17 fish contained over 1,000 individuals. The bay anchovy population was calculated to have the greatest predation impact on calanoids. Relative utilization in the fish sample was highest at lagoon stations followed by tidal creek, Mill Creek, tidepool, bay and inlet station fish. Overall, calanoids occurred in 21.4% of the total fish sample. Percent occurrence in the total sample was markedly higher during the winter and spring months.

Order Harpacticoida: Harpacticoid copepods were identified in the stomach contents of twenty-two fish species. In general they were of less importance volumetrically than the calanoid component. High utilization by spot was observed, the order making up 13.7% of the diet volume of 3-10 cm fish and 10.3% in the 11-19 cm fish. As observed with the calanoids, harpacticoid utilization in the total sample was relatively higher during the winter and spring months. The distribution of harpacticoids in the sample indicated higher relative utilization by tidepool and Mill Creek fishes.

Order Cyclopoda: There was an unexpected paucity of this copepod component in the fish stomachs. A number of occurrences may have been masked in the abundance of calanoids encountered. Small numbers of cyclopods mixed with hundreds or thousands of calanoids in a given

FIGURE 5.

PERCENT OCCURRENCE OF FIVE MAJOR FORAGE CATAGORIES BY FISH LENGTH.

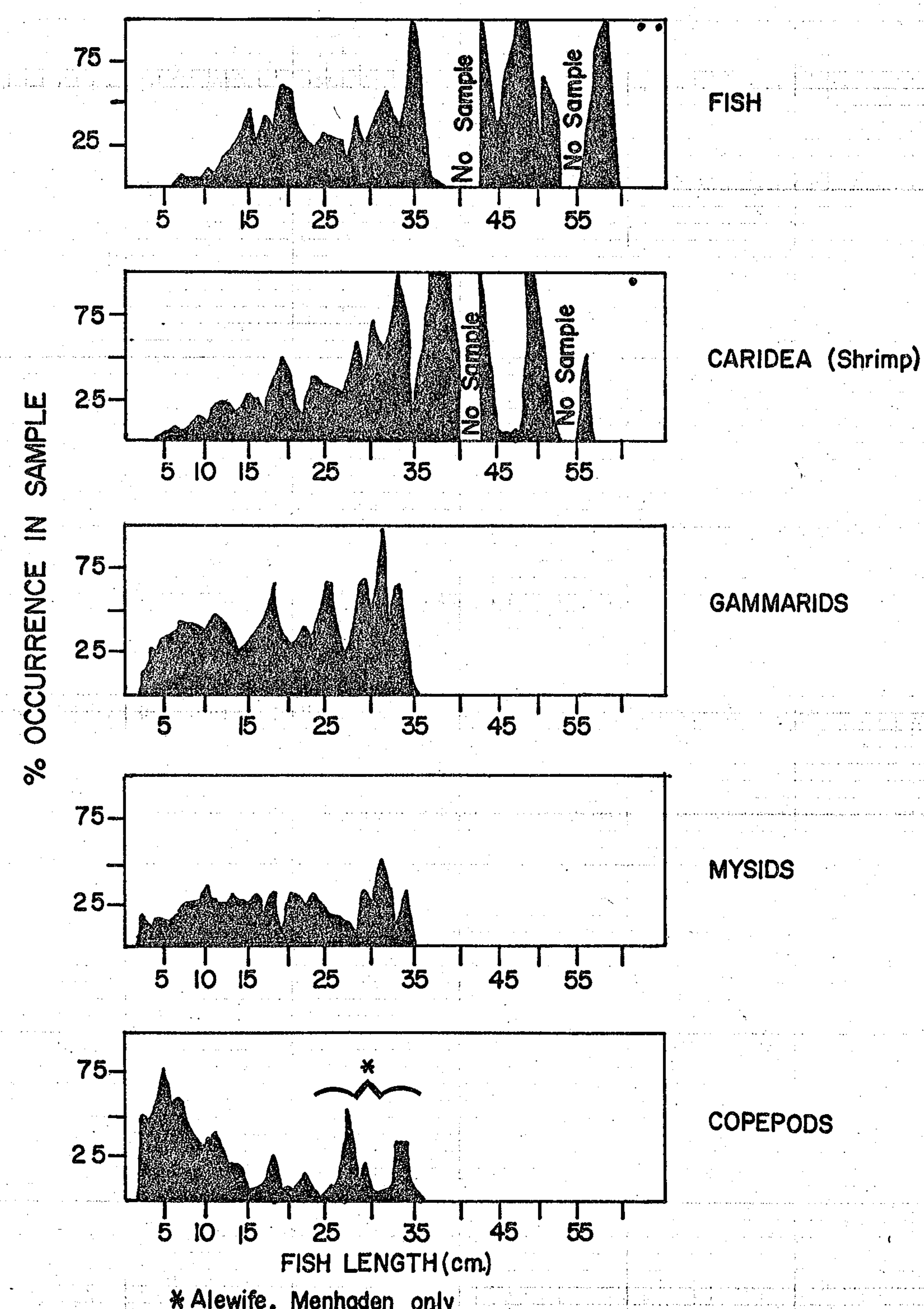
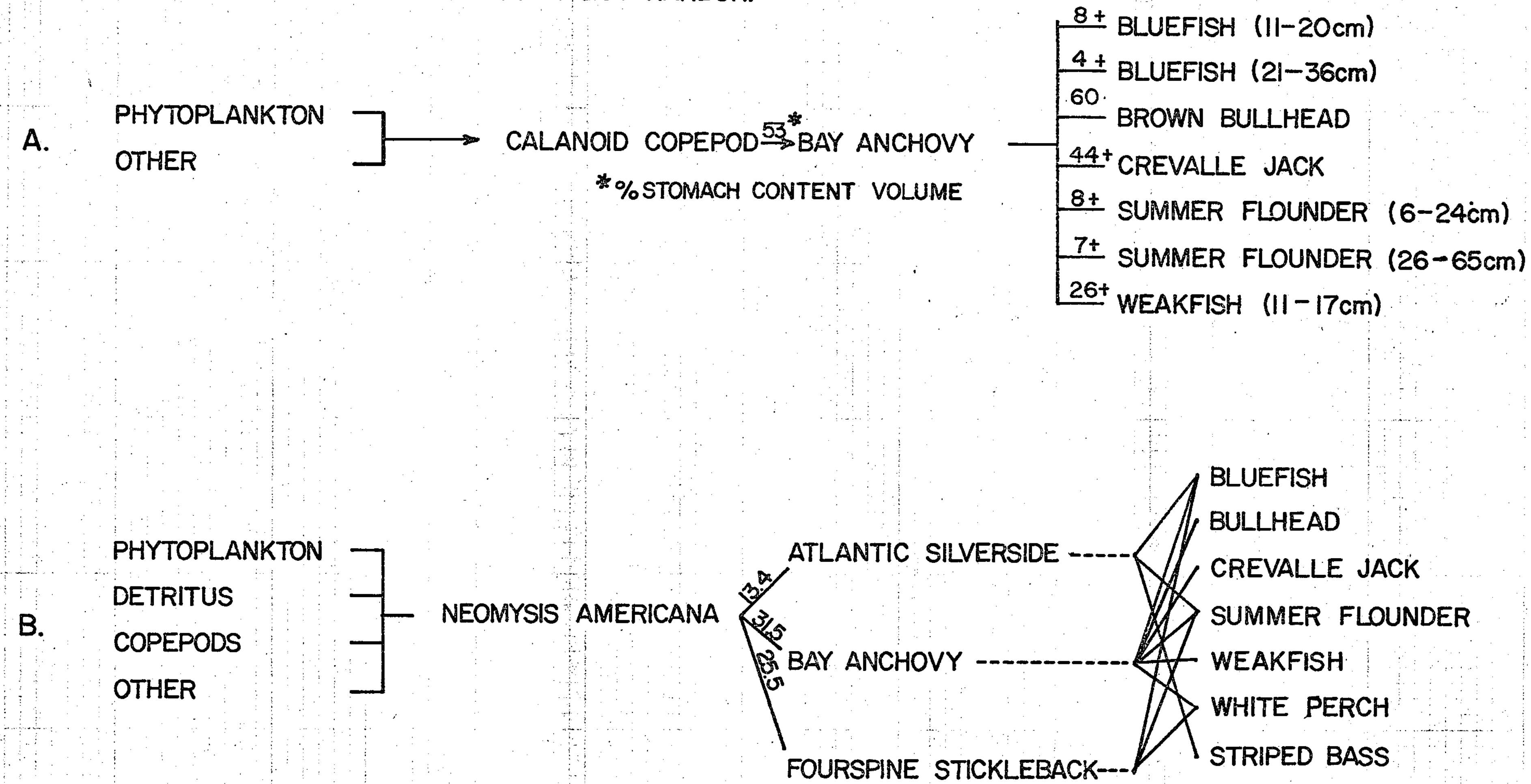


FIGURE 6 SOME SIMPLIFIED TROPHIC RELATIONSHIPS OBSERVED IN LITTLE EGG HARBOR.



stomach quite probably were overlooked.

The contribution of cyclopods to the fish diets examined was, at any account, minimal in terms of other copepod components. Cyclopods were only recognized in the stomach contents of two bay anchovies and one spot. All were collected from Mill Creek. Zooplankton studies presently underway in the estuary should provide information on the relative ambient concentrations of the three copepod orders.

Subclass Cirripedia: Barnacle remains were found in the stomach contents of four fish species, being of most importance volumetrically to tautog (0.6%). Barnacle larvae occurred in four species with highest occurrence in the menhaden and anchovy diets. Fish containing larvae were collected from May 21st through July 9th. Approximately half of these were taken on June 17th and 18th.

Subclass Malacostraca, Order Cumacea: Cumaceans occurred in the stomach contents of five fish species. They represented 3.1% of the diet volume of banded killifish, 2.9% of the 3-10 cm spot diet and 2.1% of the diet of young-of-the-year winter flounder. Occurrences exceeded 30% in killifish and young-of-the-year flounder. With one (March 25) exception, occurrence was limited to the summer months. Cumaceans were not recovered from the stomachs of fish taken at inlet, lagoon, or tidepool stations. Utilization appeared to be uniform throughout the bay, Mill Creek and tidal creek stations.

Orders Tanaidacea and Isopoda: This group of crustaceans contributed over 10% of the stomach content volume of banded killifish (10.5), Cunner (12.6) Grey Snapper (19.0), N. puffer (18.4), 4-13 cm oyster toadfish (19.9), striped killifish (16.8), and 6 to 16 cm tautog (63.3).

Overall they occured in 24 fish species. Eight taxa were identified.

The tanaids Tanais cavolini and Leptochelia savingnyi were of minor importance in the diets of the fish examined. A total of 75 T. cavolini were collected from spot, striped killifish, white perch and winter flounder. Seventy-two of these were from four spot taken in Mill Creek (T16) on August 28, 1973. A single L. savignyi was recovered from an anchovy taken in Mill Creek during May.

The isopod component was made up primarily of Cyathura polita, Idotea spp., Edotea triloba and Erichsonella spp. C. polita occurred in eight of the fish species studied and was of greatest importance in the diet of banded killifish (10.5% volume). This species was utilized by the total fish population to a greater extent in the Mill Creek and bay habitats. It did not occur in inlet or tidepool samples. Utilization was highest during the fall and not observed during the winter months.

Idotea balthica and Idotea phosphorea were identified in the fish stomach analyses with I. balthica dominating. As a group the genus occurred in thirteen species of fish. It comprised 19% of the stomach content volume collected from two grey snapper, 13.8% of the 4-13 cm oyster toadfish diet and 14.6% of the striped killifish diet. It was of most importance in the diet of 6-16 cm tautog contributing 47.2% of the total volume sampled. Larger oyster toadfish contained 1.93 individuals on the average and represented the major predator group on the genus. Utilization of I. balthica was highest in inlet-collected fish, while I. phosphorea was identified only in bay and tidal creek fish.

Edotea triloba comprised 12.6% of the stomach content volume of four young-of-the-year cunner. It contributed minimally to the diets of eight other species. As a population, Atlantic silversides were the major predators on E. triloba. Utilization occurred in all but the tidepool habitats with slightly higher use observed in inlet-collected fish. No use was recorded during the winter months.

The genus Erichsonella was found in the stomachs of seven fish species. In the sample of three northern puffer (3-11 cm) the genus constituted 18.4% of the stomach contents. It was of considerable importance to small (6-16 cm) tautog, comprising 15.7% of their diet volume. Two species, E. attenuata and E. filiformis were identified. The occurrence of E. attenuata was limited to the summer months; E. filiformis was identified in fish collected from spring through fall. Neither species occurred in fish collected from inlet, lagoon or the tidepool station.

The remains of one Cirolana sp. were tentatively identified in the stomach contents of a brown bullhead captured in upper Mill Creek (T15). This genus is a common parasite on the gills of fish, particularly bluefish, in the study area. A terrestrial "pill bug" (Fam. Oniscidae) was also found in the stomach of a bullhead taken at this Mill Creek station.

Order Amphipoda: The suborders Gammaridea and Caprellidea were represented in the stomach contents examined. Bousfield (1973) was the major text used in identification of the gammarids collected. Except where otherwise noted, his work is also the reference for comments on species habits, distributions and biology. Caprellids were not identified beyond the suborder.

Suborder Gammaridea: Twenty-six species of gammarid amphipods were identified in the sample. At least three additional species occurred but could only be identified to genus or family level. In all, thirteen families were represented in the diets of 38 finfish species in the study area. As a group, Gammarids comprised over 10% of the diet volume of Atlantic silversides (14.4%), banded killifish (41.3%), blueback herring (19.7%), cunner (70.5%), fourspine stickleback (34.2%), lined seahorse (71.2%), mummichog (13.9%), naked goby (40.0%), Northern pipefish (35.0%), planehead filefish (20.5%), pumpkinseed (15.9%), rainwater killifish (61.8%), spot (22.3%), striped killifish (11.8%), striped searobin (11.7%), threespine stickleback (25.1%), tidewater silversides (11.2%), white perch (10.4%), and young-of-the-year winter flounder (19.0%).

Gammarids occurred in fish stomachs collected from all six habitat types and during all periods of the year. Generally, they occurred more frequently in bay fish and during the summer; however, they do provide an important fish food resource in all habitats throughout the year. Utilization of the various families encountered is discussed in the following section.

Family Ampeliscidae: Ampelisca was the only genus identified in the stomach contents examined. Three species, Amplisca abita (Mills), A. vadorum (Mills), and A. verrilli (Mills) were represented.

A. abdita is a dominant benthic organism in the study area (Haskin and Ward). Durand and Nadeau (1972) encountered densities in excess of 5,000 individuals/m^2 in the neighboring Great Bay estuary. The species ranges from Maine to Florida and is found in marine to brackish water salinities (10 o/oo Bousfield). A. abdita occurred in the stomach contents of sixteen fish species. It was of particular importance in the diet of young winter flounder comprising 14.4% of the stomach volume, and occurring in 59% of the specimens examined. These 3 to 11 cm flounder contained an average of 8.3 A. abdita per fish. This amphipod represented ten percent or more of the stomach content volume collected from Atlantic silversides, cunner, lined seahorse, and naked goby. It was a frequent food item in 5 to 10 cm weakfish. Based on calculated predation indices for the study period, Atlantic silversides had the largest impact on the A. abdita population followed by spot, winter flounder and weakfish (Figure 7). Utilization of the species by fish was evenly spread over the spring, summer and fall months. It occurred in all habitats except the tidal pool. Heaviest utilization occurred in the tidal creek habitat with lowest occurrence in the lagoon areas.

Ampelisca vadorum ranges from the Gulf of St. Lawrence to Georgia, is larger than A. abdita and is generally found in coarser sediments. It is associated with somewhat higher salinities. A. vadorum occurred in the stomach contents of eight fish species. It was of most importance in the diet of large (22-33 cm) winter flounder which contained an average of 3.4 individuals per fish. Fourspine stickleback had the greatest impact on the population. The organism was not encountered in fish stomachs collected from inlet, lagoon or tidepool habitats. Highest relative utilization occurred in the bay during the spring months. Occurrence was most frequent in fish taken from stations T12 and T2.

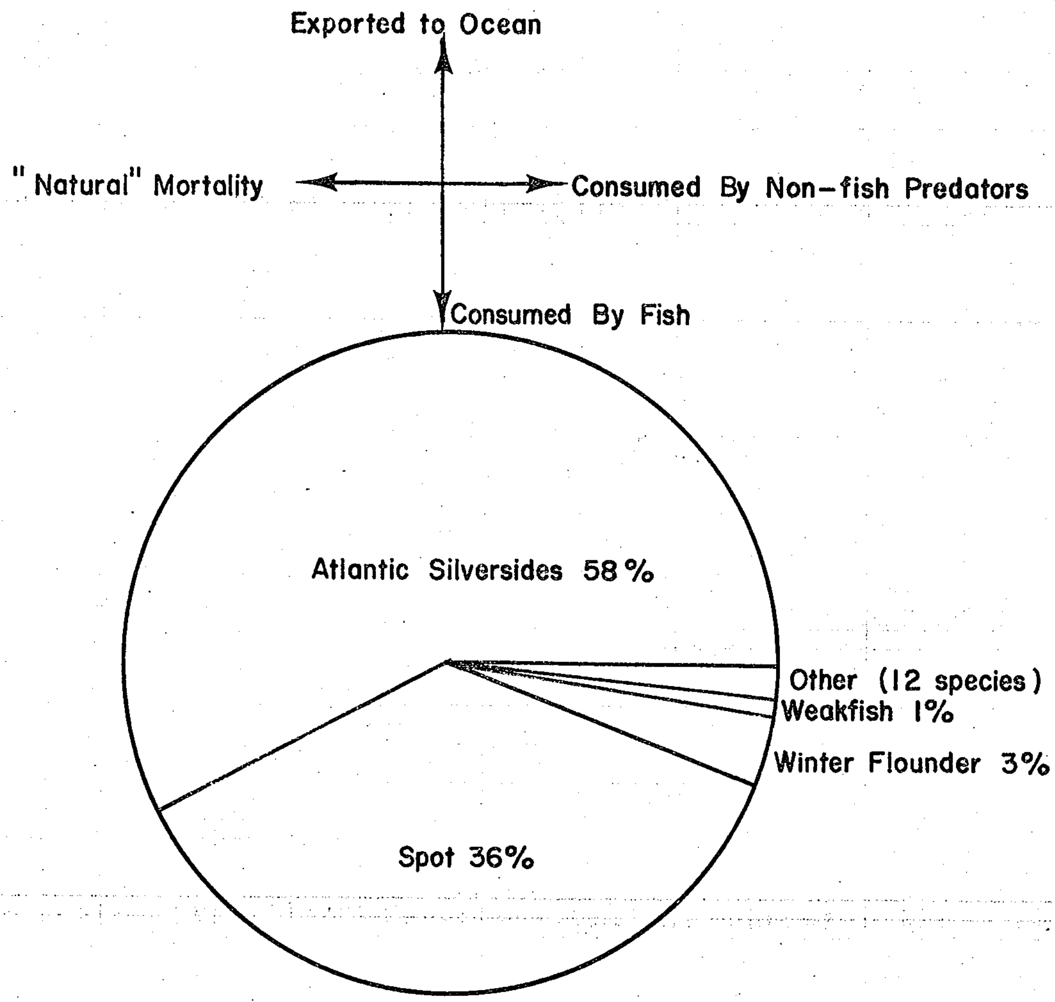
Three Ampelisca verrilli were identified in the stomach contents of two winter flounder. Both fish were collected in the bay.

Ampeliscids comprise an important fish food source in the Little Egg Harbor estuary. They are consumed directly by the young of at least seven recreationally or commercially valuable fish species and contribute to the diet of forage species utilized by other desirable fishes. Baird (1873) documented their presence in the diets of scup taken from Great Egg Harbor, New Jersey and summer flounder collected at Woods Hole, Mass. As postulated by Durand and Nadeau, the tube building activity of Ampeliscids may also act to stabilize bottom sediments and contribute to the production of other benthic forms.

Family Ampithoidae: Two species, Cymadusa compta (Smith) and Ampithoe longimana (Smith) were identified from the fish sample. C. compta dominated, occurring in the diet of seventeen fish species. It was a major item in the stomach contents of the lined seahorse and the Northern pipefish. The three species appear to be associated with eelgrass (Zostera) beds. C. compta frequents salinities as low as 5 0/00 (Bousfield). The stomachs of three seahorse specimens contained a total of 39 C. compta. Striped killifish, fourspine stickleback and Northern pipefish were the three major predators on this species in the study area. Odum and Heald (1972) identified C. compta as a food of juvenile fishes in Whitewater Bay, Florida. In Little Egg Harbor, relative utilization of this species was highest during the winter and at inlet and bay stations. Only one specimen was recovered from fish samples collected in lagoon areas. None occurred in tide-pool fish.

FIGURE 7.

FATE OF AMPELISCA ABDITA IN THE LITTLE EGG HARBOR ESTUARY.



Assumptions

1. The average number of A. abdita observed in the stomach contents of each species, represents an equal proportion of each species daily A. abdita intake.
2. The proportion of each fish species in McClain's (1977) fish survey is equal to the mean proportion of that species in the total fish population.

Ampithoe longimana occurred in the stomach contents of one silver perch and one winter flounder. Both fish were collected at bay stations. Bousfield notes this to be a species favoring higher salinities (to 22 $^{o}/oo$) which feeds on diatoms.

Family Aoridae: Some confusion exists over the genera included in this family. Bousfield includes Unciola and Leptocheirus while Gosner (1971) lists these with Families Corophiidae and Photidae, respectively. Data analyses for this paper, for consistency, followed Gosner's text which covers the whole gamut of estuarine invertebrates. The reader should consider the different groupings, however, when reviewing the Appendices.

Microdeutopus gryllotalpa (Costa) occurred in the diet of ten fish. It was of most importance, volumetrically, in the stomach contents of fourspine stickleback (3.2%) and striped killifish (4.3%). The stickleback had the greatest predation impact on the species followed by mummichog, spot, and striped killifish. Outside the study area, M. gryllotalpa was tentatively identified as a diet item for young-of-the-year striped bass in upper New York Bay (Festa, 1975). Bousfield lists its western Atlantic range as Cape Cod to Chesapeake Bay. It is associated with vegetation stands and under-water structures. The species occurred in fish collected throughout the study area with the exception of tidepool specimens. It had a markedly higher percentage of occurrence at inlet stations but was also recovered from a brown bullhead collected in a low salinity area of Mill Creek. Observed utilization was confined to the summer and fall months.

The minute Rudilemboides nageli (Bousfield) was identified in the stomach contents of four winter flounder. This species, ranging from Cape Cod to Georgia is associated with eelgrass beds (Bousfield). It occurred only at station S10 (Figure 2) from an August collection.

At least one species of the genus Lembos (Bate) was collected from fish within the study area. Occurrence was observed in striped searobins, tautog and winter flounder. It was found during the summer months in all habitat areas except the tidepool.

Family Bateidae: Batea catharinesis (Muller) occurred in two winter flounder. The fish were collected from two bay stations, once in July and once in October. This species is generally associated with gravel bottoms.

Family Corophiidae: Sixteen fish species contained amphipods of this family. Including the Genus Unciola, at least four species were represented in the fish stomach examined. (As previously noted, Bousfield includes Unciola within Aoridae). Small white perch (7-12 cm) utilized this group most extensively. Corophiids comprised 20.2% of the stomach content volume of two planehead filefish.

Members of the Genus Corophium were the most frequently encountered component of the family. They occurred in bay anchovy, mummichog, Northern pipefish, planehead filefish, silver perch, spot, tautog, white perch, weakfish and winter flounder. These amphipods were not routinely identified to species level in the stomach analysis, however, more than one species occurred including C. tuberculatum.

Erichthonius rubricornis (Smith) and Erichthonius brasiliensis (Dana) were both identified in the fish diets. E. rubricornis was recovered from fourspine stickleback, E. brasiliensis from fourspine stickleback and striped killifish. Unspeciated members of this genus also were identified in silver perch, planehead filefish, tautog and winter flounder. The genus occurred in summer and fall collections with highest occurrence in fish taken at inlet stations.

Unciola serrata (Shoemaker) was the only species identified in the genus Unciola although others probably occurred in the "unclassified" category. U. serrata was found in the stomach contents of a winter flounder collected from Mill Creek. Unspeciated members of the genus occurred in pinfish and tautog. Observed utilization was limited to Mill Creek and bay habitats.

Cerapus tubularis (Say) was encountered in the stomachs of fourspine stickleback, lined seahorse, Northern pipefish, Northern puffer, spot, summer flounder and winter flounder. It was not found in fish collected from tidepool, lagoon or inlet stations. Utilization was documented only for the summer months.

Family Gammaridae: Members of the family Gammaridae comprised the most widely utilized groups of amphipods in the study area. They were found in the stomach contents of twenty-four fish species, forming a substantial percent of the diet volume in cunner (34%), naked goby (24.9%), rainwater killifish (61.8%) and threespine stickleback (21.1%). The genera Gammarus, Elasmopus, Casco, Melita and Maera were included within this family following Gosner. Bousfield, however, places the latter four in a new family Melitidae.

Genus Gammarus: A number of species exist within the study area; however, with the exception of G. mucronatus (Say) these in general could not be readily distinguished from the remains collected from the fish stomachs. G. mucronatus was the major diet item observed in the sample of nine rainwater killifish; it also comprised 6.9% of the diet volume of mummichog. In total, this species was identified in the stomach contents of nine fish species. Mummichog had the greatest predation impact. G. mucronatus appeared to be utilized heavily during the winter months. It was a major fish food item in the tidepool habitat and in fish collected from lagoon stations. It was not recovered from inlet areas. Bousfield described G. mucronatus as a dominant tidepool species found in salinities down to 4 ^{o}/oo. Given the extreme conditions of salinity and temperature often occurring in these pools, the species must be tolerant of a wide range of environmental conditions.

Other species of Gammarus occurred in twelve fish species. They represented 21% of the diet of banded killifish, and were observed most frequently in fish collected from Mill Creek and lagoon stations.

Amphipods of the genus Gammarus have been documented in the diet of estuarine and marine fish at a number of sites outside this study area. Among many: Baird in tomcod, Microgadus tomcod, from New Haven Harbor, and in sea herring from Vineyard Sound; by Dexter (1947) in killifish and cunner at Cape Ann, Massachusetts and by the author Festa (1975) in striped bass, mummichog and Atlantic silversides from Upper New York Bay.

Elasmopus laevis (Smith): Bousfield notes that this species is often found intertidally under algae and stones and subtidally among eelgrass clumps. In the Little Egg Harbor study area, E. laevis was observed in the stomach contents of eleven fish species. The data indicate that it was of high importance in the diets of naked goby and young cunner. Spot had the greatest impact on the E. laevis population followed by fourspine stickleback. Highest percent occurrence was in fish collected during the summer from bay and inlet stations.

Casco bigelowi (Blake): was identified in the stomach of a single winter flounder collected in the bay during September. An unspeciated individual of the genus Melita was also recovered from a winter flounder collected in the bay. Melita nitida (Smith) occurred in the stomachs of two winter flounder collected from Raritan Bay, New Jersey (Festa 1975). Odum and Heald, in a study of Florida mangrove communities, found this species to be the most common in their benthic samples, but the least common of the major amphipod components found in fish stomachs. Maera danae (Stimpson) occurred in the stomachs of pinfish, tautog and winter flounder collected at two bay stations and one inlet station.

Families Lysianassidae, Hyalidae and Oedicerotidae: Two unclassified individuals belonging to the family Lysianassidae occurred in the stomachs of two black seabass collected from Mill Creek in June. A single unspeciated member of the family Hyalidae was recovered from a spotted hake stomach. The fish was taken in the bay during June. Monoculodes edwardsi (Holmes), a member of the family Oedicerotidae, was identified in the stomach contents of northern searobin and white perch. It occurred in bay, Mill Creek and lagoon collections, twice in May and once in January.

Family Photidae: Leptocheirus plumulosus (Shoemaker), which

Bousfield includes in the family Aoridae, was the major species encountered. _Microprotopus raneyi_ (Wigley) was the other species identified. _L. plumulosus_ was a dominant food item in the diet of 7 to 12 cm white perch. It also formed a significant portion of the stomach content volume in banded killifish and blueback herring. These three fish were the major predators on the species. Bousfield described the species as a brackish water, tube-dwelling amphipod. Its utilization by the white perch population apparently decreases as fish size increases. Seven to twelve centimeter fish contained an average of 15.7 _L. plumulosus_ in their stomachs; the 14 to 26 cm sample had 5.3. The amphipod did not occur in the seven 29 to 37 cm fish examined. Its occurrence was markedly associated with fish collected in the lower salinity areas of Mill Creek. It was found throughout the year. In total, _L. plumulosus_ was identified in the stomach contents of thirteen fish species.

Micropterus raneyi (Wigley 1966) was found in the stomach contents of nine winter flounder, seven of which were collected at bay stations. This species was utilized primarily during the summer months by young-of-the-year flounder.

Family Phoxocephalidae: _Paraphoxus spinosus_ (Holmes 1905) was the only family member identified. One individual was collected from a winter flounder stomach.

Family Talitridae: Six individuals, identified as _Orchestia platensis_ (Kroyer), were collected from the stomachs of one Atlantic silverside and one white perch. Both fish were collected in lagoons connecting to Mill Creek (S18; T17). Dexter identified this species as a food source of cunner and killifish at Cape Ann, Massachusetts.

Family Stenothoidae: Two species, Stenothoe minuta (Holmes) and Parametopella cypris (Holmes) were identified in the fish stomachs examined. S. minuta occurred in Northern pipefish, silver perch and winter flounder. P. cypris was collected from Northern puffer, striped searobin and a six centimeter weakfish. Bousfield notes that both of these species are associated with hydroid and ectoproct colonies. These are small forms; both reach approximately 2 mm in length.

Summary: The suborder Gammaridae clearly represents a major food resource for finfish utilizing the Little Egg Harbor area. Sufficient documentation exists to conclude that the suborder provides an important estuarine food source for fish along most of the Western Atlantic coast. The diversity of the component families and genera is such that all of the various benthic niches encountered in the study area appear to contain a representative member.

A number of specific gammarid-fish food coactions were apparent. Ampelisca abdita was heavily utilized by winter flounder. Gammarus mucronatus was associated with tidepool fishes, particularly rainwater killifish and mummichog. Cymadusa compta was a major food of northern pipefish and seahorses, both known to frequent eelgrass beds. Leptocheirus plumulosus was strongly associated with the low salinity areas of Mill Creek and was a staple for young white perch. The gammarids as a whole were more heavily utilized by resident fishes than by migratory species. With the exception of winter flounder, their role in the fish nursery functions of the estuary appears to be largely associated with the production of forage fishes. Competition (among the fishes) for the gammarid food resource is no doubt reduced by the various species-specific relationships observed.

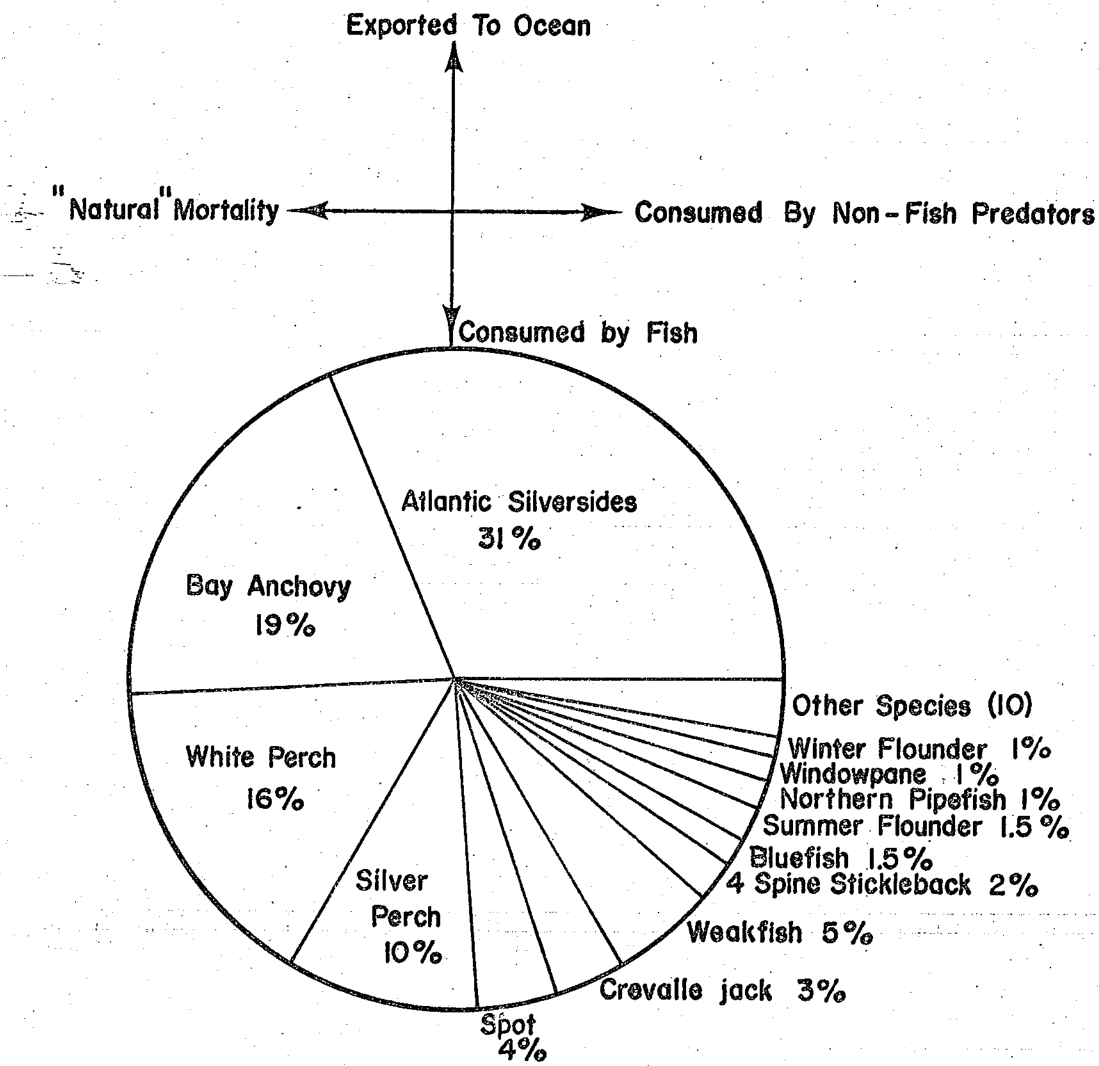
Order Mysidacea: In the transfer of energy from phototroph to fish, the mysid population of Little Egg Harbor can be thought of as a master gear. Occurring in the diet of twenty-four fish species, mysids accounted for more than 20% of the stomach content volume in alewife, bay anchovy, crevalle jack, both sticklebacks, pipefish, silver perch, 4-7 cm striped searobin, 14-37 cm white perch, and 5-17 cm weakfish. In an additional seven species, mysids contributed over 10% of the diet volume. Relative to the estuary's nursery function, mysids can be considered as a major "starter food" for summer flounder, alewife, weakfish and winter flounder. The white perch population, which represents the most important resident finfish species in terms of angler use, is dependent upon a mysid food source. Mysids also contribute significantly to the diet of forage species utilized by the piscivorous components of the food web.

Outside the study area there are numerous references on the importance of mysid shrimp in estuarine trophic structures. Odum and Heald observed that they are an important source of food for many fishes in the North River, Florida estuary. Van Engel and Joseph (1968) characterized Neomysis americana as one of the two most important fish food sources in the Upper York River. In his 1873 report, Baird notes the occurrence of mysids in the stomach content of summer flounder taken at Great Egg Harbor, New Jersey.

Two species were identified in the present study: Neomysis americana and Mysidopsis bigelowi. Neomysis was clearly the dominant form,

FIGURE 8.

FATE OF <u>NEOMYSIS</u> <u>AMERICANA</u> IN THE LITTLE EGG HARBOR ESTUARY



ASSUMPTIONS

1. The average number of Neomysis americana in the stomach contents of each species, represents an equal proportion of each species daily N. americana intake.

2. The proportion of each fish species in McClain's (1977) fish survey is equal to the mean proportion of that species in the total fish population.

being identified in twenty-three species. This was the major diet constituent of 6-13 cm alewife (99.5% volume), northern pipefish (58.6%), threespine stickleback (56.5%), and 5-10 cm weakfish (41.4% volume). Atlantic silversides and bay anchovy were the major predators on _N. americana_ (Figure 8). _Mysidopsis bigelowi_ was identified in the stomachs of nine fish species. With the exception of the three striped searobins examined, it contributed only a minor fraction of the mysid component.

Neomysis occurred in 18.4% of the total fish sample, _Mysidopsis_ in 1.5%. The two species were found together in a number of stomachs. Utilization of _N. americana_ was relatively higher in fish collected from tidal creek stations, followed by lagoon, bay and Mill Creek collected fish. The sequence for _Mysidopsis_ was bay, lagoon, tidal creek and Mill Creek. This species did not occur in fish taken from inlet stations. Neither species occurred in the tidepool fishes. The temporal distribution of occurrences indicated somewhat higher utilization of _Neomysis_ during winter and spring months. The occurrence of _Mysidopsis_ was markedly higher during the fall. Hopkins (1958) observed that _Mysidopsis_ populations in Indian River Inlet appear to peak in late fall and winter.

Neomysis americana also occurred in the stomachs of young striped bass and Northern pipefish collected at Caven Point, Upper New York Bay, and in winter flounder, bay anchovy, crevalle jack and spot taken at Conaskonk Point, Raritan Bay.

Order Decapoda: Decapods represented a major food source for the medium and larger sized fish in the estuary. Four infraorders are involved: Penaeidae, Caridea, Anomura and Brachyura.

Infraorder Penaeidae: One large shrimp of the Genus Penaeus occurred in the stomach of a summer flounder taken at bay station S2 in August. This genus was rarely encountered in the trawl collections of McClain and appeared to be of little importance as a fish food in the estuary.

Infraorder Caridea: Larval forms of caridean shrimp comprised 17.5% of the diet volume of 7-15 cm blueback herring and 3.6% of the volume collected from 6-10 cm bluefish. They were of nominal importance in another eight fish species. Occurrence in the fish stomachs was observed from April 22 through August 18th. A blueback herring collected at lagoon station G20 contained as estimated 500 larvae. The relative occurrence of caridean larvae in the fish stomachs was highest during spring and in lagoon and bay station samples. Larvae were not recovered from tidepool fish.

Grass shrimp of the genus Palaemonetes occurred in the diets of sixteen fishes. This group comprised a dominant food item in 6-10 cm bluefish and 22-33 cm winter flounder. It made up 60.5% of the stomach contents of the three pinfish examined, 16.2% of the black seabass diet, 16.8% of the silver perch diet, 33.8% in spotted hake, and 16.5% in 6-24 cm summer flounder. The genus occurred in fifteen fish species altogether. Two species represented were P. vulgaris and P. pugio. A third, P. intermedius, was tentatively identified.

Palaemonetes vulgaris occurred in 2.8% of the total fish sample. Found in the stomach contents of thirteen species, this was the dominant component of the genus. Utilization of both species was relatively higher during the winter and fall months. Occurrences of P. vulgaris were most frequent in bay-collected fish. _P. pugio_ was more common in inlet-collected specimens. Neither were taken from tidepool fish. The species were found concurrently in the stomachs of some fish. _P. pugio_ occurred in a total of nine species representing 15% of the diet volume in spotted hake. The species dominates in many of the estuaries of northern New Jersey and was identified in the stomachs of striped bass, mummichog and spot collected in a tributary of the Hackensack River.

A single shrimp of the genus _Hippolyte_ was identified from the stomach contents of a weakfish taken at bay station T2 in August.

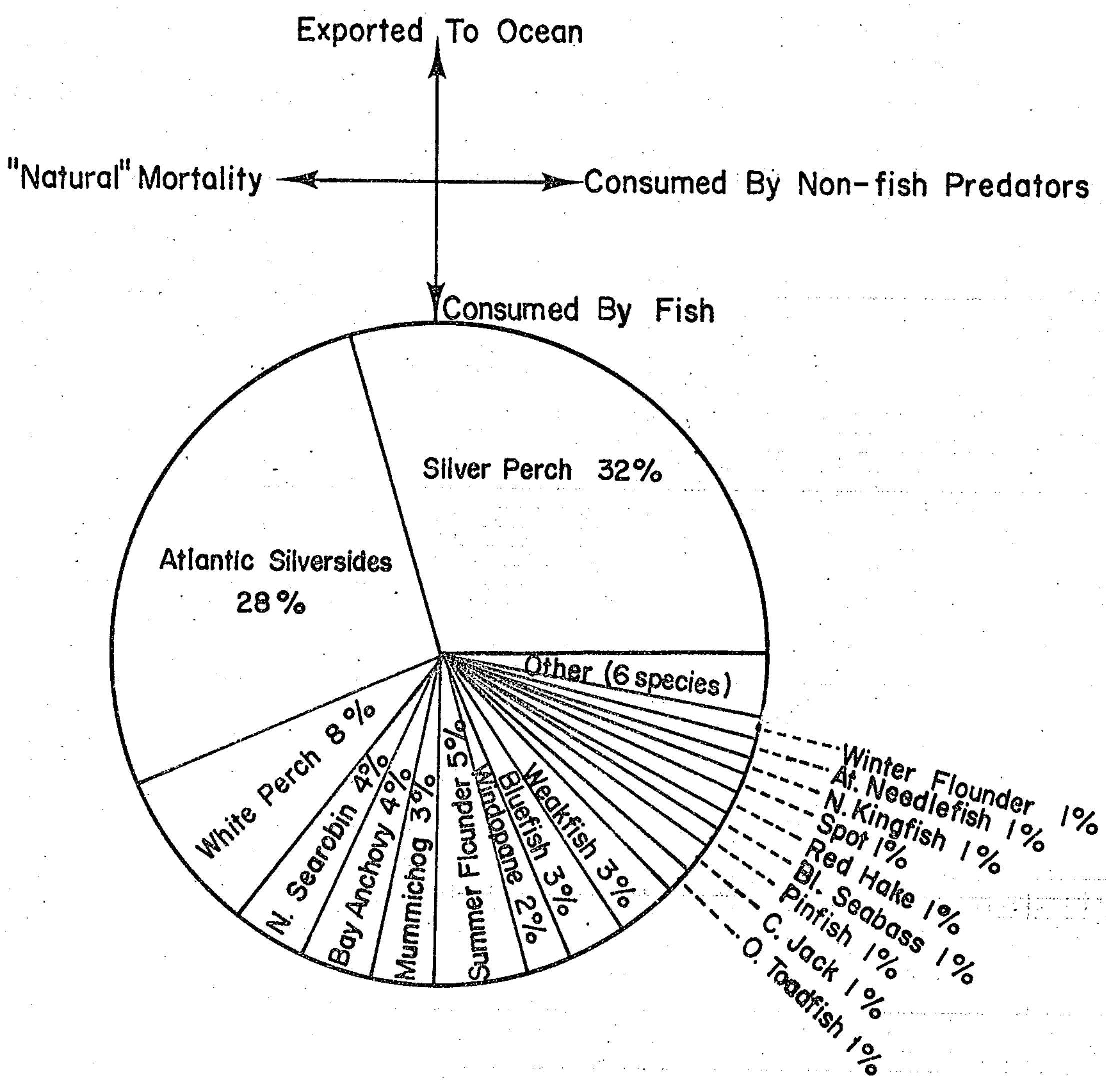
As a species _Crangon septemspinosa_ is the most widely utilized fish food organism in the estuary. Occurring in 26 of the fish species studied, _C. septemspinosa_ represented 6.5% of the total volume of material recovered from the fish sample. This shrimp was the dominant food item in the samples of Northern searobin, Northern kingfish, silver perch, spotted hake, 6-24 cm summer flounder, large white perch, and windowpane flounder. It contributed significantly to the diets of Atlantic silversides, seabass, crevalle jack, seahorse, mummichog, red hake and weakfish. The top three predators on the _Crangon_ population were silver perch, Atlantic silversides and white perch. (Figure 9) Percent occurrence of this species was greatest in inlet-collected fish but utilization was high throughout the estuary, with the exception of the tidepool station. It occurred in a somewhat larger proportion of fish taken during the fall and summer months. Again, using Baird as a historical reference, _Crangon_ was documented as a food source for striped bass, white perch, kingfish, weakfish, toadfish, summer flounder and hickory shad at Great Egg Harbor in 1872. In other cursory analyses conducted during the study, Crangon was found in the stomachs of striped bass, Atlantic tomcod, and mummichog in Upper New York Bay, in crevalle jack and mummichog from Raritan Bay and in white perch and striped bass from Oyster Creek, a tributary of neighboring Barnegat Bay. In the York River (Va.), Van Engel and Joseph found that *C. septemspinosa* comprised 25.2% of the diet volume of white perch, 12.2% of juvenile weakfish, 7.3% of the black drum diet and 44.0% of the southern kingfish contents. *Crangon septemspinosa* was also identified in the diet of winter flounder utilizing Long Island bays (Kurtz 1975).

The species clearly represents a major forage item throughout most of New Jersey's estuaries and deserves closer attention from ecologists in defining its environmental requirements and its tolerances to various forms of pollution.

Infraorder Anomura: Hermit crabs of the genus *Pagurus* occurred in the stomach contents of black seabass, striped burrfish and summer flounder. Burrfish were calculated to be the major predators on this genus. *P. longicarpus* was the only species identified.

Infraorder Brachyura: Larval forms of Brachyura occurred in the stomach contents of twelve fish species. They were of most importance, on a percent volume basis, to Atlantic silversides and 3-16 cm Atlantic needlefish, representing 3.1% and 4.9% of their respective diets. Larvae were found in the fish stomachs from June 10th through September 30th. High numbers were encountered on June 26th, July 9th and July 19th. The percentage of occurrence was highest in fish collected from inlet and

FIGURE 9.
FATE OF CRANGON SEPTEMSPINOSA IN THE LITTLE EGG HARBOR ESTUARY.



<u>Assumptions</u>

1. The average number of Cragon septemspinosa observed in the stomach contents of each species, represents an equal proportion of each species daily C. septemspinosa intake.

2. The proportion of each fish species in McClain's (1977) fish survey is equal to the mean proportion of that species in the total fish population.

bay stations. Larvae were not recovered from fish taken at the tide-pool station.

Adult crabs were of particular importance to the larger bottom-feeding fishes in the estuary. Occurring in eighteen species, brachyuran crabs accounted for over 20% of the diet volume in American eel, black seabass, oyster toadfish, smooth dogfish, striped burrfish and tautog. They also contributed significantly to the diets of bluefish, bullhead and summer flounder.

The lady or calico crab, Ovalipes ocellatus, was identified in the stomach contents of seabass and tautog, comprising 15.7% and 12.6% of their respective diet volumes. Five individuals were recovered, all from fish taken at bay stations during September.

Blue crabs, Callinectes sapidus, represented over 90% of the stomach content volumes of American eel and smooth dogfish, and 83.2% of the contents of the two striped burrfish examined. This species accounted for over ten percent of the diet volume in 21-36 cm bluefish, brown bullhead, 18-28 cm toadfish, and 26-65 cm summer flounder. Remains of both soft and hardshell stages were encountered with smaller instars representing most of the hardshell occurrences. One C. sapidus was found in the stomach of a winter flounder collected on February 27th. Other occurrences were limited to the period June 10th through November 8th. Relative utilization was highest in fish collected from tidal creek and Mill Creek stations.

Of the twelve fish species which consumed blue crabs, American eels and dogfish appear to have had the greatest predation impact on the crab population during the study period. A total of fifty-one blue crabs were identified in the fish stomachs examined. Smooth dogfish contained an average of 1.33 crabs/fish. If this were considered to be a minimum daily ration from June through September, 160 crabs would be consumed by each dogfish.

Mud crabs of the family Xanthidea occurred in fifteen fish species, being of special importance to the smaller oyster toadfish and 20-32 cm tautog. They comprised 26% of the stomach contents of black seabass and 21% of the smaller tautog contents. Three species of xanthid crabs were identified. Neopanope texanna appeared in the widest variety of fish species (11) followed by Rhithropanopeus harrisii (8) and Eurypanopeus depressus (3).

Neopanope was the major xanthid component in the tautog diet, Rhithropanopeus in the toadfish. A large portion of the xanthid remains found in the fish stomachs could not be identified to the species level. With one exception, mud crab occurrence in the fish diets was confined to the March 21st through November 14th period. The remains of one unidentified specimen were recovered from the stomach of a stickleback collected on January 16th. Xanthids occurred in fish collected from all habitats except the tidepool.

Phylum Chordata

Class Ascidiacea: Two tunicates of the family Molgulidae were recovered from the stomach contents of two winter flounder. Both fish were collected in March, one each from bay station T2 and T12.

Class Osteichthyes: Fish eggs appeared in the diet of eleven fish species. On a seasonal basis, they comprised a significant portion of the food intake of Atlantic silversides, striped killifish, and 7-12 cm white perch. The white perch fed heavily on fish eggs in Upper Mill Creek during

April and May. It is assumed that these were clupeid eggs. The occurrences in Atlantic silversides and striped killifish were associated with July collections at inlet stations. Overall, fish eggs were observed in fish stomachs from March 11th through July 19th. In the plankton-feeding anchovies the occurrence of fish eggs was confined to the May 21st through June 26th period.

Fish larvae occurred in a number of fish stomachs but at a much lower frequency than expected. Eight Fundulus larvae were recovered from the stomach of one tidewater silversides; Menidia larvae occurred in the Atlantic needlefish sample; other larval remains were not identifiable. Because of their relatively low occurrence and the problem of categorizing fish remains as larvae, young, etc., the larval forms were lumped with the "Class Osteichthyes, except eggs" category for data analysis purposes.

As with the polychaete component, a large portion of the fish remains recovered from the sampled stomachs could not be speciated. A portion of these remains consisted solely of backbones and in some cases only a few vertebrae. Even so, fifteen taxa were identified in the stomach contents, ten to the species level. Fish contributed to the diet of twenty-five fish species. On the basis of diet volume and percent occurrence, the following fishes and size groups were considered to be piscivorous within the Little Egg estuary: 24-58 cm Atlantic needlefish; 11-36 cm bluefish, inshore lizardfish, northern sennet, redfin pickerel, striped bass, 26-65 cm summer flounder, and 32-62 cm weakfish. In addition, fishes comprised over 50% of the diet volume of brown bullhead, crevalle jack, 18-28 cm oyster toadfish, red hake, and 11-17 cm weakfish.

Cannibalism was confirmed only in Atlantic needlefish and mummichog.

The second largest mummichog in the sample contained another surprisingly large mummichog in its stomach. This was the only occurrence of fish in the stomach contents of the 34 mummichogs examined. This occurrence, however, accounted for fifty percent of the total stomach content volume recovered from the species. This case exemplifies the need for considering both percent volume and percent occurrence data.

A total of 335 fish were recovered from the 1,340 fish stomachs examined. Of these 185 (55%) could be identified beyond the class level. The following list gives proportions of the various taxonomic groups in the fish stomachs and in the fish survey conducted by McClain. It assumed that the identified components of the recovered fish remains are representative of the unclassified component.

Taxon	Proportion of fish in stomachs	Proportion of fish in survey sample
Silversides (2 species)	.17	.32
Anchovies	.23	.27
Fourspine stickleback	.11	.15
Atlantic menhaden	.03	.02
Bothidae (Lefthanded flatfish)	.01	LT .01
Silver perch	.02	.01
Weakfish	.02	LT .01
Spot	.04	.05
Killifish (Fundulus spp.)	.15	.10
Naked goby	.06	.01
Searobin (Prionotus spp.)	.01	LT .01
Winter flounder	.01	.01
Atlantic needlefish	.01	.01
Northern pipefish	.01	.01
		cc = .915

There is a good degree of correlation in the two sets of proportions. As noted earlier, most of the striped bass analysed were taken by hook and line. All but one of the American sandlance recovered from the fish stomachs occurred in these bass so a comparison of proportions for this species is not appropriate.

There did seem to be a disproportionately high utilization of naked goby, primarily by winter flounder and black seabass. Ivlev's (1961) electivity index could be applied to these data, however, with the number of variables involved (species, habitat, gear type, etc.) any interpretation beyond the general relationship suggested in Table 1 would be rather meaningless.

Silversides (Family Antherinidae) were identified in the stomach contents of five species. Menidia menidia (Linnaeus) and Menidia beryllina (Cope) were common in McClain's collections. A third species, the rough silversides, Membras martinica (Goode and Bean) has been recorded in neighboring estuaries.

Silversides occurred in the stomachs during the summer and fall months. They comprised 71.9% of the diet volume of the larger needlefish, 44.1% of the Northern sennet stomach contents and 10.1% of the 11-20 cm bluefish diet volume.

Anchovies also were identified in the diets of five fish species and were particularly important, volumetrically, in the stomach content volume of brown bullhead taken in upper Mill Creek. Two fish collected on August 9th contained a total of nine anchovies. This occurrence is interesting in that it is difficult to imagine bullheads actively pursuing the pelagic anchovy unless the prey were disabled or trapped. In any case, the examination of a larger sample of bullhead will be necessary before conclusions on this relationship can be formulated. Crevalle jack and bluefish apparently had the greatest predation impact on anchovies during the study period. Occurrence of this forage species in the fish stomachs was confined to the June through October period. McClain identified two species in the study area, Anchoa mitchilli and A. hepsetus with the former dominating.

Fourspine stickleback (Apeletes quadracus) were identified in the stomach contents of six fish species in the study area. Oyster toadfish in the 18-28 cm size range had the highest calculated predation index. The species comprised 26% of the stomach content volume of 5-16 cm needlefish. Summer flounder in the 26-65 cm range averaged 0.38 sticklebacks per fish and were the third most important predator species on the fourspine stickleback population. All but two of the twenty sticklebacks recovered from the fish stomachs were found in bay-collected specimens. One stickleback occurred in the stomach of a white perch taken at lagoon station G17 in January. The other exception was recovered from a summer flounder taken at a tidal creek station.

Occurrences of American sandlance (Ammodytes americanus) were limited to inlet collected striped bass and windowpane specimens. All three species were associated with the higher salinity inlet sections of the study area. Sandlance comprised 30% of the stomach content volume of the striped bass sample. It is commonly postulated that bass follow schools of sandlance on their excursions into inlet areas from the ocean.

Menhaden (Brevoortia tyrannus) were identified in the stomach contents of bluefish and red hake. Occurrences were limited to fish taken at lagoon and tidal creek stations. The opportunity for trapping the menhaden in these habitats may function to increase utilization at these stations. This species represented the largest fish component in the 21-36 cm bluefish diet.

As a side note, during January of 1974 a heavy mortality of menhaden occurred in Oyster Creek, a tributary of neighboring Barnegat Bay. Oyster Creek receives the heated effluent from a nuclear generating station and the fish kill occurred after a plant shutdown. Twelve live striped bass in the 30-44 cm size range were captured by trawl during the ensuing investigation. These bass were gorged with menhaden in the 6-12 cm size range. A total of 38 menhaden were recovered from 12 stomachs.

Two flatfish of the family Bothidae were recovered from the stomach of a striped bass collected in Little Egg Inlet in November. Three silver perch (*Bairdiella chrysura*) occurred in the stomach contents of a 30 cm summer flounder taken at bay station T11 in October. Young-of-the-year weakfish (*Cynoscion regalis*) occurred in the stomachs of bluefish, one smooth dogfish and one striped bass. The bluefish and dogfish were collected during August at bay and tidal creek stations. The bass was taken in the inlet in October. Young spot occurred in the stomachs of bluefish and oyster toadfish. Spot comprised 54% of the total stomach contents collected from 18-28 cm toadfish.

Killifish of the genus *Fundulus* were identified in the diets of four fish species including the generic *F. heteroclitus* (Mummichog). Killifish appeared to be a staple of the young bluefish frequenting Mill Creek, lagoon and tidal creek stations. Of twenty-eight killifish recovered from the stomachs, only one occurred in a bay-collected fish, and none in inlet collections. Eight *Fundulus* larvae were observed in the stomach contents of a tidewater silverside which resulted in the silversides having the highest predation index on the genus. One killifish was recovered from each of two white perch collected at lagoon stations during November and January.

Gobiosoma bosci, the naked goby, occurred in four fish species. Winter flounder and black seabass were the major predators on this small bottom dweller, which was also consumed by bluefish and white perch.

The remains of two sea robins (*Prionotus spp.*) were recovered from the stomach of two summer flounder collected in August. One fish was taken in the bay, the other in a tidal creek. The bay-collected flounder was 65 cm in length and was the largest summer flounder examined. Two young-of-the-year winter flounder (*Pseudopleronectes americanus*) were also found in the stomach contents of a summer flounder. The fish was 35 cm in length and was collected in the bay during July.

The only occurrences of Atlantic needlefish (*Strongylura marina*) observed were in the stomach contents of other needlefish. The consumers were 8 and 7 cm long; the "consumees" were 3.2 and 4.3 cm long.

Northern pipefish, *Syngnathus fuscus*, were found in the stomachs of one American eel and one summer flounder. The fish were taken at Mill Creek and bay stations during June and July. Baird noted the occurrence of pipefish in the stomachs of Oyster toadfish taken in Great Egg Harbor Bay in 1872, and area fishermen have reported their occurrence in the stomachs of striped bass taken in Little Egg Harbor Inlet.

OBSERVATIONS ON THE DIETS OF FISH SPECIES UTILIZING THE LITTLE EGG HARBOR ESTUARY

The data collected do not lend themselves to a detailed analysis of food habits for all of the fifty-five fish species in the survey. Sample sizes were, because of scarcity in the system or study scope, too small to consider all of the size, spatial and temporal variations affecting diets. The sample sizes were selected with emphasis on numercially dominant species and species of direct management concern to the recreational fishery. Appendix II lists the various taxa recovered from the stomachs of each fish species and provides percent volume, percent occurrence and average content (ind/fish) data.

In this section, the sample will be considered on the "whole system" basis with reference to fish size groups where data permits. In this sense, the data presented in Appendix II reflect the "average" stomach contents of fish collected throughout the system, throughout the year. The following discussions highlight the findings presented in Appendix II. The appendix should be consulted for a complete picture of diet diversities and identified components. The degree of confidence associated with these findings is a function of sample size and this should be taken into account when referencing this data.

Alewife, *Alosa pseudoharengus*

The stomach contents of eleven alewives contained a minimum of nine invertebrate taxa. Six fish in the 6-13 cm size range fed heavily on *Neomysis americana* while the diet of five fish in the 27-34 cm size range was dominated by calanoid copepods. Calanoids appeared in only one of the smaller fish. This suggests that the younger fish pursue individual prey items while the adults, to a larger degree, filter feed on the zooplankton. The larger fish contained an average of over 2,000 calanoids in their stomachs.

American eel, _Anguilla rostrata_

Blue crab (_Callinectes sapidus_) remains dominated in the stomach contents recovered from ten eel specimens. Occurring in four fish, the crabs accounted for 90 percent of the content volume recovered. Xanthid crabs comprised the second most important diet group in terms of volume and occurrence. The remains of a pipefish were found in the stomach of one eel.

American sandlance, _Ammodytes americanus_

Calanoid copepods were the only organisms present in the stomach contents of the four sandlance specimens examined. These fish contained an average of 524 copepods in their stomachs.

Atlantic menhaden, _Brevoortia tyrannus_

Due to a thorough mixing of fine algae, detritus and sediment components in the stomachs, volumetric data could not be obtained for menhaden with the methods employed in the study. On the basis of subjective observations and occurrence data it was clear that algal matter comprised the major diet component in all three size groups examined. Calanoid copepods were second in terms of occurrence but probably ranked lower than the sediment component in total content volume. Smaller fish (4-8 cm) had more diverse diets than the larger specimens. The ingestion of harpacticoid copepods, polychaete larvae and turbellarians was markedly higher in the smaller size group.

Atlantic needlefish, _Strongylura marina_

Fish and adult insect forms were the major diet constituents for both size groups examined. Insects, predominantly dipteran midges and winged ants, were relatively more important in the stomach contents of the smaller fish (5-16 cm). Silversides, fourspine stickleback and other needlefish were recovered from the larger sample. This was one of two species for which cannibalism was confirmed.

Atlantic silversides, *Menidia menidia*

The diet of Atlantic silversides was very diverse. At least 21 taxa occurred in the stomachs of the 85 specimens examined. Items of greater importance, in terms of both volume and occurrence, included calanoid copepods, ampeliscid amphipods, *Neomysis americana* and fish eggs.

Banded killifish, *Fundulus diaphanus*

Amphipods dominated the stomach contents recovered from eighteen specimens. *Leptocheirus plumulosus* was a major component. Algae, polychaetes and the isopod *Cyathura polita* were also of importance in the stomachs examined.

Bay anchovy, *Anchoa mitchilli*

While at least 22 taxa were present in the diet of bay anchovies, calanoid copepods and mysid shrimp clearly formed the major forage base for this species during the study period. Together, Calanoida and *Neomysis americana* formed over 84% of the stomach content volume recorded from 101 specimens. Amphipods, primarily ampeliscids, were of tertiary importance.

Black seabass, *Centropristis striata*

Brachyuran crabs dominated the diet of the seventeen specimens examined. Component taxa included *Ovalipes*, *Callinectes* and Xanthidea.

Caridean shrimp were of secondary importance, forming 28% of the diet volume.

Blueback herring, Alosa aestivalis

Calanoid copepods, mysid shrimp, Leptocheirus plumulosus, and caridean larvae were the major stomach content components in 13 specimens ranging in length from 7 to 15 cm. Copepods formed the dominant food item, representing 48.5% of the diet volume and occurring in all of the fish examined. The stomachs contained an average of 973 copepods.

Bluefish, Pomatomus saltatrix

The sample of ninety-seven bluefish was divided into three size groups. Fish in the 6-10 cm length range fed primarily on grass shrimp (Palaemonetes), errant polychaete forms (Nereis and Nephtys), and fish. Silversides were the only fish prey identified in the fish remains observed.

The 11-20 centimeter group was essentially piscivorous with fish comprising 82 percent of the diet voume recovered from 62 specimens (Figure 10). Killifish (Fundulus) and silversides (Family Atherinidae) were the dominant forage species in terms of volumes consumed. Anchovies, while third in terms of volume, occurred most frequently in the stomachs. Other fish identified in the stomachs of this group were fourspine stickleback, Atlantic menhaden, weakfish, spot and naked goby. Grass shrimp were of less importance than sand shrimp (Crangon) in this group.

Twenty-one to thirty-six cm bluefish relied almost entirely on a diet of fish and crabs. Fish comprised 86 percent of the stomach contents recovered from 19 specimens and occurred in 84 percent of that sample.

Menhaden and killifish were the major forage species identified. Blue crab (*Callinectes*) remains occurred in two stomachs contributing 12 percent of the total sample volume. *Crangon septemspinosa* occurred in thirty-two percent of the specimens but comprised only 2 percent of the total stomach contents volume.

Brown bullhead, *Ictalurus nebulosus*

Although essentially a freshwater species, bullheads frequented the upper areas of Mill Creek and were taken in bottom salinities to 11.7 o/oo. Fish and polychaetes were the major groups recovered from the stomachs of five specimens. Anchovies formed 60% of the volume of the stomach contents collected. *Callinectes* remains contributed 13.2% of the volume and polychaetes, including *Nereis*, *Spionidae* and *Capitellidae*, contributed 16 percent.

Crevalle Jack, *Caranx hippos*

Nine specimens in the 4-13 cm size range contained mysid shrimp, *Crangon septemspinosa*, and fish remains. Anchovies comprised the largest volume percentage in the stomach contents; *Neomysis americana* occurred most frequently and contributed 30% of the total content volume.

Cunner, *Tautogolabrus adspersus*

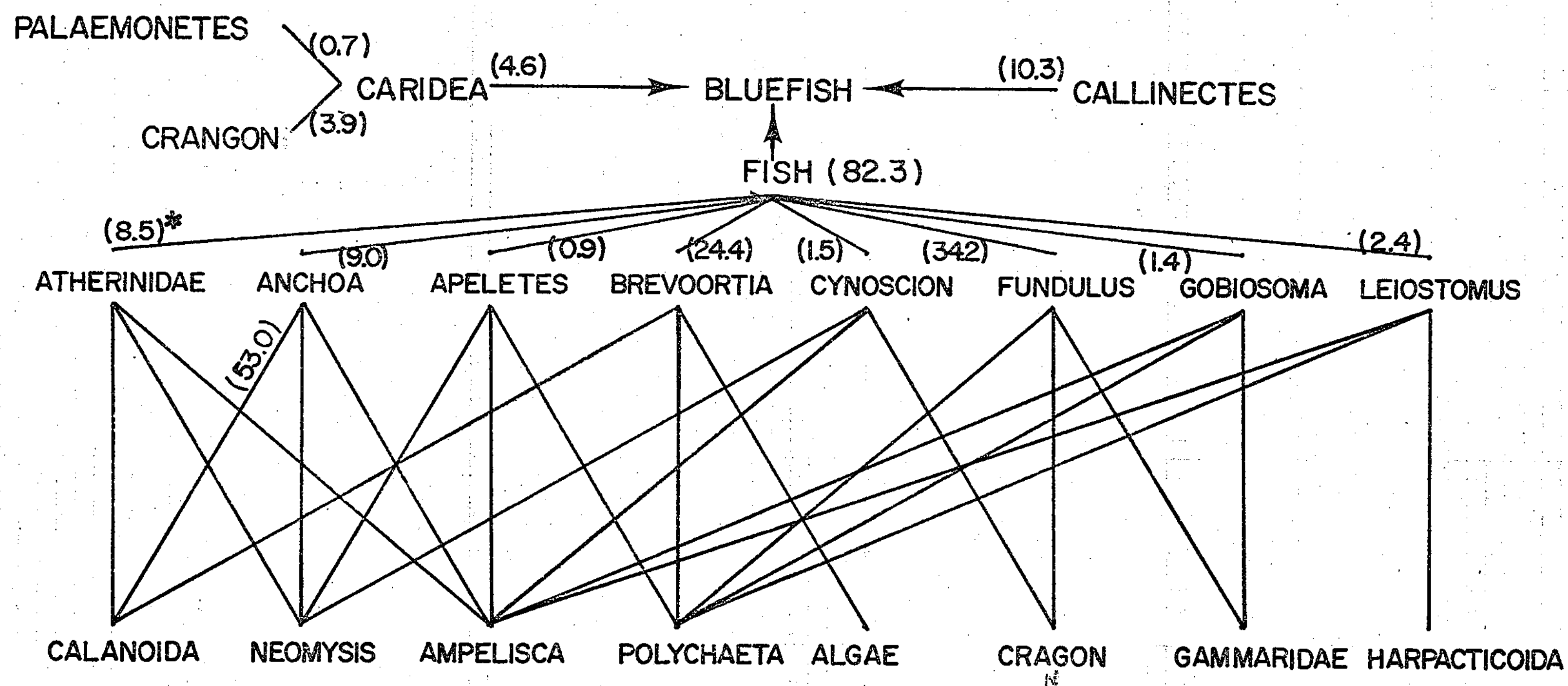
Gammarids, particularly *Ampelisca abdita* and *Elasmopus laevis*, were the major diet constituents of four young-of-the-year specimens. The isopod *Edotea triloba* was third in terms of content volume and occurred in two of the specimens.

Fourspine stickleback, *Apeltes quadracus*

The stomach contents of 76 specimens contained a minimum of 29 forage taxa. Among the more important food items in terms of relative volumes

FIGURE 10.

A PORTION OF THE FOOD WEB INVOLVING 11-20cm BLUEFISH



* Prorated Over Unidentified Fish Components

consumed and occurrence in the sample were Calanoid copepods and Neomysis americana. These two items comprised 38% of the diet volume. Six gammarid species were identified in the contents and the suborder, as a group, contributed 34 percent of the recovered food volume. Various mollusks, polychaetes and isopods also occurred in the stickleback diet.

Golden shiner, Notemigonus crysoleucas

Calanoid copepods and unidentified polychaete remains were the major content items identified in the stomachs of three specimens. Unclassified material consisting of hard, "seed-like" objects comprised 55% of the stomach contents.

Grey snapper, Lutjanus grissus

Two specimens contained a polychaete of the family Malanidae, one calanoid copepod, pelecypod remains, an isopod and one fish egg.

Hogchoker, Trinectes maculatus

Polychaetes dominated the stomach contents of seven specimens. Nereis sp. was the only component identified. Chironimidae larvae occurred in three fish and and were second in terms of volume of identified material.

Inshore lizardfish, Synodus foetens

Unidentified fish remains were the only items recovered from the stomachs of two specimens.

Lined seahorse, Hippocampus erectus

Cymadusa compta was the major food item recovered from the three specimens. Ampelisca abdita and small Crangon were of secondary importance in terms of volume. This was one of five species which contained the remains of mussels (Family Mytilidae). Seahorse prey items were surprisingly large considering the morphology of the seahorse mouth.

Mummichog, _Fundulus heteroclitus_

Seventeen taxa were identified in 34 specimens. Another mummichog, 4.1 cm in length, occurred in the stomach of the second-largest specimen (10 cm) and accounted for 50 percent of the total volume recovered from the species. More frequent diet components were _Gammarus mucronatus_, polychaetes and algae. Larger individuals are apparently quite aggressive, taking shrimp as well as other fish.

Naked goby, _Gobiosoma bosci_

Gammarids, particularly _Elasmopus laevis_ and polychaetes, including Phyllodocidae and Capitellidae were the major components in the stomachs of eight specimens.

Northern kingfish, _Menticirrhus saxatilis_

Crangon septemspinosa was the dominant item in the stomach contents of two specimens. Also identified were polychaetes of the family Capitellidae and _Gylcera americana_.

Northern pipefish, _Syngnathus fuscus_

Neomysis americana and _Cymadusa compta_ comprised over 90% of the stomach contents volume of twenty-one specimens. Calanoid copepods occurred frequently as did ampeliscids and turbellarians. A total of sixteen taxa were identified in the diet sample.

Northern puffer, _Sphoeroides maculatus_

Three young "blowfish" contained at least twelve different food items of which gastropods of the genus _Crepidula_ predominated. The specimens contained the remains of 24 Crepidula in total. Isopods, particularly Erichsonella, were of secondary importance.

Northern searobin, Prionotus carolinus

Crangon septemspinosa dominated the stomach contents of four specimens. It comprised 80% of the recovered volume and occurred in all four fish.

Northern sennet, Sphyraena borealis

This is a piscivorous species. Fish remains comprised 95% of the diet volume of seven specimens. Silversides was the only forage species identified. Mysids occurred in the smallest (10 cm) specimens.

Oyster toadfish, Opsanus tau

Two size groups were analysed; 4-13 cm and 18-28 cm fish. The smaller toadfish fed primarily on polychaetes, particularly Nereis, and on isopods and xanthid crabs. Idotea was the major isopod component. Crangon septemspinosa occurred in 20% of the sample (3 fish) and comprised 10% of the content volume recovered from this group. The diet volume of the larger size group was dominated by fish remains of which spot were the major component. Callinectes sapidus occurred in two of the fifteen specimens and contributed 12.4% of the total stomach volume. Isopods were of lesser importance volumetrically to the larger fish but were consumed at a higher rate (2.53/fish).

The larger fish also consumed quantities of eelgrass, possibly ingested during the capture of crabs. A number of large nematodes were also found enmeshed with the stomach content of five specimens.

Permit, Trachionotus falcatus

One specimen was examined. Its stomach contained the remains of 15 Crepidula and one Mitrella lunata.

Pinfish, Lagodon rhomboides

The stomach contents of three pinfish in the 6-11 cm length range contained Crangon, Palaemonetes and a variety of Gammarids. The shrimp comprised 94% of the diet volume.

Planehead filefish, Monacanthus hispidus

A 5 cm and a 13 cm specimen contained algae, hydroza, unidentified pelecypod remains, Corophiidae amphipods and Caprellid amphipods. Algae and hydroids contributed 60% of the content volume suggesting a grazing feeding mode for the species.

Pumpkinseed, Lepomis gibbosus

Two specimens collected from upper Mill Creek had fed primarily on polychaetes, particularly Hypaniola and Nereis. Gammarids including Leptocheirus plumulosus were of secondary importance.

Rainwater killifish, Lucania parva

The diet of nine specimens was dominated by Gammarus mucronatus, which contributed 62 percent of the total stomach content volume and occurred in six of the fish. The remaining contents included Nereis, copepods and Mysidacea.

Redfin pickerel, Esox americanus

The remains of an unidentified fish were recovered from the stomach of a 26 cm specimen collected in Mill Creek.

Scup, Stenotomus chrysops

The stomach contents of a single 14 cm scup contained six invertebrate taxa and the remains of an unidentified fish. Three polychaetes of the Family Maldanidae contributed approximately 38 percent of the content volume. The fish remains comprised 22.5% of the volume.

Sheepshead Minnow, _Cyprinodon variegatus_

The stomach contents of 29 specimens could not be partitioned volumetrically because of the mixture of sediment, algae and detritus components occurring in a number of the fish. Algae, including diatoms and filimentous forms, appeared to form the bulk of the ingested material. Less important forage items included copepods, hydroid stolens and Chironimidae larvae. The diet indicates that the species obtains its food primarily by grazing the substrate.

Silver perch, _Bairdiella chrysura_

This is apparently quite an aggressive species, feeding mainly upon mysid and Caridean shrimp. Twenty-six specimens in the 3-12 cm size range contained a total fifty-six sand and grass shrimp. _Crangon septemspinosa_ was the dominant form. Fish remains occurred in the stomachs of four specimens. Seventeen forage taxa were identified in the sample.

Smooth dogfish, _Mustelus canis_

Blue crabs, _Callinectes sapidus_, occurred in the stomachs of ten of the twelve dogfish examined. The crabs constituted over ninety percent of the diet volume. Fish remains were observed in two specimens and these included a young-of-the-year weakfish.

Spot, _Leiostomus xanthurus_

Spot had a very diverse diet with a minimum of 32 forage taxa occurring in the sample of 92 fish. Ampeliscid amphipods and Harpacticoid copepods were major food sources for the 3-10 cm group, while polychaetes and, to a lesser extent, ampeliscids predominated in the 11-19 cm group. It is suggested by their diet that spot are opportunistic bottom feeders.

Young spot are very abundant in many years; however, few reach a catchable or marketable size while in Little Egg Harbor. While spot represent a food source, at least for oyster toadfish and bluefish, it is unlikely that predation occurs on a significant portion of the population. The species thus removes a great biomass of forage from the system upon its out-migration in the fall.

Spotted hake, Urophycis regius

Caridean shrimp dominated the stomach contents of 16 specimens in the 5-19 cm size range. Palaemonetes and Crangon accounted for over 80% of the diet volume recovered from this sample. Other food sources identified included Neomysis, xanthid crabs, fourspine stickleback and Gammarid amphipods.

Striped burrfish, Chilomycterus schoepfi

Two specimens (23 and 25 cm) contained a variety of mollusks and crabs with Callinectes dominating in terms of volume. Xanthid crabs occurred in both specimens with a total of six individuals recovered. The remains of a hermit crab (Pagurus sp.) were found in the stomach contents of one fish.

Striped bass, Morone saxatilis

A total of eleven specimens in the size range of 43-58 cm were examined. Fish remains occurred in nine of these specimens and comprised approximately 94% of the total food volume recovered. Sandlance dominated the identified portion of these remains. Other components consisted of silversides, weakfish and the remains of a left-handed flounder. Crangon septemspinosa contributed six percent of the diet volume.

Striped killifish, *Fundulus majalis*

The stomach contents of thirteen striped killifish were composed of 14 identified taxa and an amount of unidentified "mucus-like" material. Polychaetes, isopods and amphipods contributed about equally to forty percent of the diet volume. *Idotea* formed 14% of the volume. Fish eggs were important seasonally. Sediment was recovered from the stomachs of six fish.

Striped mullet, *Mugil cephalus*

Algae and sediment were the only materials recovered from the stomachs of four specimens.

Striped searobin, *Prionotus evolans*

Mysid shrimp, including both *Neomysis* and *Mysidopsis*, dominated the stomach contents of three 11-16 cm specimens. Gammarid amphipods, *Crangon* and xanthids were of secondary importance.

Summer flounder, *Paralichthys dentatus*

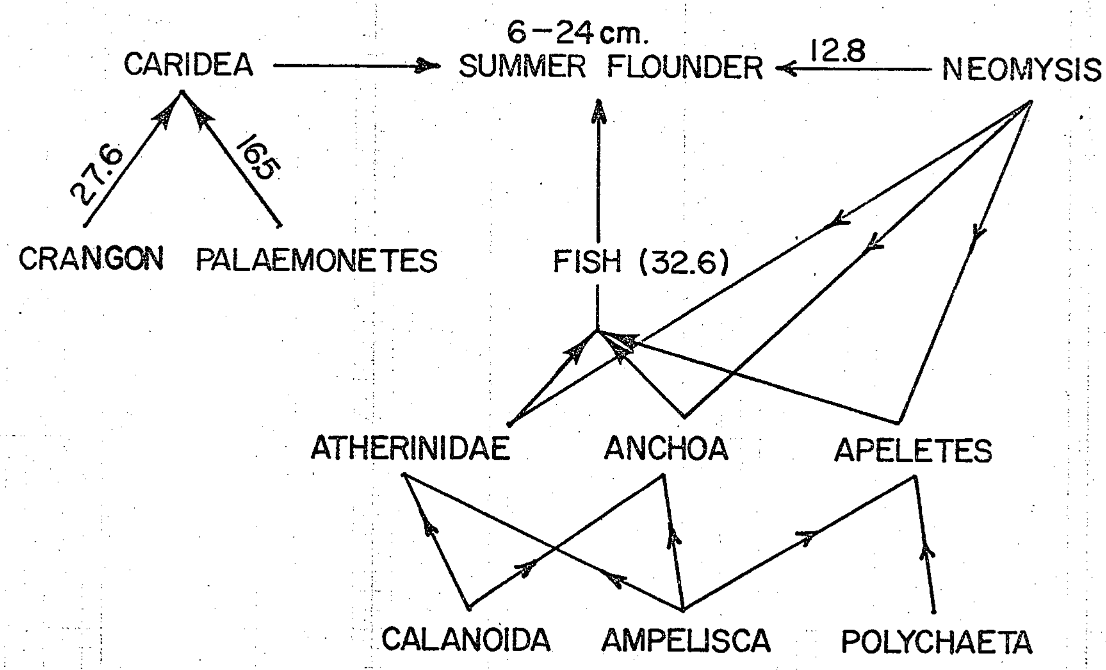
Fish remains comprised 32.6% of the diet volume of 6-24 cm specimens and 74.3% of the volume recovered from 25-65 cm specimens. In the smaller group, anchovies, sticklebacks and silversides were identified. The fish component was supplemented by mysid and caridean shrimp, of which *Crangon* was of somewhat more importance (Figure 11).

At least seven species of fish occurred in the stomachs of the larger size group. These included silversides, anchovies, sticklebacks, silver perch, searobins, winter flounder and pipefish. Brachyuran crabs, primarily *Callinectes*, were of secondary importance in this size group.

Tautog, *Tautoga onitis*

The two size groups of tautog consumed similar varieties of

FIGURE II. A PORTION OF THE FOOD WEB INVOLVING 6–24 cm SUMMER FLOUNDER.



invertebrates, but the relative importance of given items differed considerably between the groups. Six to sixteen cm fish (18 specimens) depended heavily on isopods, especially Idotea, while this taxon contributed little to the diet volume of fish in the 20-32 cm size range. All of the larger fish (7) contained brachyuran crabs which composed 87% of the total diet volume. Crabs occurred in less than half of the smaller fish sample and contributed only 23% of the stomach content volume.

At least 24 forage taxa occurred in the overall tautog sample. The two size groups shared at least 8 of these. Mollusks occurred in the larger fish but not in the smaller specimens. The inverse was true for copepods, barnacles and fish remains.

Threespine stickleback, Gasterosteus aculeatus

Neomysis americana, gammarids and calanoid copepods were the major constituents in the stomach contents of six specimens. Neomysis contributed 56.5% of the total content volume and occurred in four fish.

Tidewater silversides, Menidia beryllina

Thirty-seven specimens ranging in length from four to nine centimeters were examined. Thirteen taxa were identified in their stomach contents with copepods dominating in terms of volume, occurrence and numbers. Gammarids including Leptocheirus plumulosus were of secondary importance. Larval killifish were recovered from the stomach of one specimen.

Weakfish, Cynoscion regalis

The importance of fish in the weakfish diet increased with specimen length while the relative importance of mysid and Crangon components decreased. Neomysis americana dominated the diet of twenty-seven 5-10 cm weakfish, occurring in 78% of the sample and contributing 41.4% of the contents volume. Fish remains were second in terms of volume for this group and Crangon third. Gammarids, particularly Ameplisca, were second in terms of occurrence (59%) but contributed only 6.6% of the diet volume.

Fish remains were the major diet item for the 11-17 cm group of weakfish. (Figure 12). Anchovies were the only identified component. Neomysis had a high occurrence in the stomachs of this size group but contributed less to the total food volume (23%) than it did in the smaller fish. Gammarids occurred infrequently.

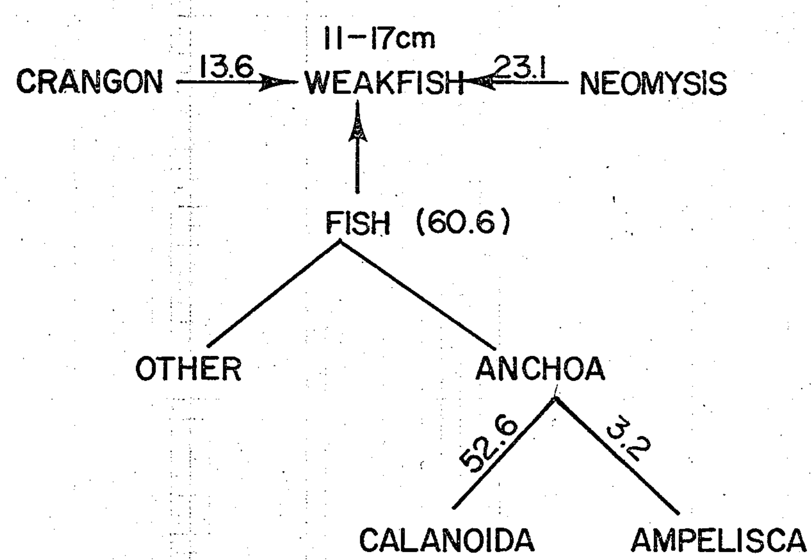
The stomachs of 32 cm specimen and a 62 cm specimen contained unidentified fish remains, polychaete remains, and one Crangon. Fish remains accounted for over 99% of the total volume.

White perch, Morone americana

The sample of seventy-nine white perch was separated into three size groups. Based on length frequency distribution these groups were assumed to represent the one, two and three plus age groups.

Eighteen specimens in the 7-12 cm length range contained at least 10 forage taxa. Gammarids, particularly Leptocheirus plumulosus and Corophiidae, represented the major food source in terms of total volume for this group. Neomysis occurred most frequently and contributed approximately 10% of the diet volume. Fish remains, including Fundulus, occurred in the stomachs of three specimens. Fish eggs, which were tentatively identified as Clupeid eggs, were seasonally important both in terms of volume and occurrence.

FIGURE 12. A PORTION OF THE FOOD WEB INVOLVING 11-17cm WEAKFISH.



Neomysis and *Crangon* were of increased importance in the 14-26 cm group of perch. Together, these constituted 61.2% of the diet volume. Gammarids were second to mysids in terms of occurrence with six component taxa identified. As a group, the gammarids contributed 11.2% of the diet volume. Fish and fish eggs were of less importance to this size group. One fourspine stickleback and one naked goby were identified in the fifty-four specimen sample.

The diet of seven perch in the 29-37 cm size range was dominated by *Crangon septemspinosa*, which contributed 62% of the volume and occurred in five fish. Killifish (*Fundulus* sp.) were recovered from one specimen. Mysids were of secondary importance in this group.

White mullet, *Mugil curema*

Eleven white mullet ranging in length from 3 to 14 centimeters were examined. Stomach contents were composed of sediment, plant detritus and algae. No animal components were observed.

Windowpane, *Scophthalmus aquosus*

Crangon, *Neomysis* and American sandlance were the major constituents in the stomachs of four specimens. One sandlance occurred in one windowpane, contributing approximately 12% of the total food volume recovered from the sample. Three hundred and sixty-two mysids represented 10% of the volume and thirty-two *Crangon* comprised 56% of the food volume.

Winter flounder, *Pseudopleuronectes americanus*

Mollusks comprised approximately 15% of the total stomach contents recovered from 142 flounder. Ten molluscan species contributed to the diet. Four hundred and thirty-seven pelecypod siphon tips were recovered from the stomach samples. On the basis of terminal pigmentation, size, shape and tentacle configuration, approximately 75% of these siphons were unmistakably from Mercenaria mercenaria. Of the remaining tips, most appeared to be hard clam siphons which were partially digested. A few Mya arenaria (soft clam) siphons were identified and at least one razor clam (Ensis directus). Pelecypod siphons comprised over 14% of the winter flounder diet.

The fish averaged 3.08 siphon tips per specimen in the total sample. In the 12-21 cm length group, the siphons comprised 22.5% of the diet volume with an average of 3.85 tips per fish. In the 22-33 cm group, the siphons represented a lower volume percentage, but actual consumption increased to an average of 6.16 tips per specimen. Siphons did not contribute significantly to the diet of the 3-11 cm group occurring in only four of fifty-six specimens.

Polychaetes comprised approximately thirty-five percent of the overall winter flounder diet and were the dominant forage group both in terms of volume and frequency of occurrence. At least 27 species are being utilized within Little Egg Harbor. In the 3-11 cm length group, Maldanopsis elongata and members of the genera Phyllodoce and Nereis and families Capitellidae and Spionidae were of importance. In the 12-21 cm group, Glycera americana, Nereis succinae, Pista palmata and Capitellids were of volume importance, while Pista and Glycera were major items in the 22-33 cm group. In the total sample, P. palmata occurred most frequently with Capitellids, Nereis spp. Polydora lingni and Hypaniola grayi following. On an average, each specimen contained 8.4 polychaetes.

A large variety of crustaceans were utilized by winter flounder with amphipods and decapods occurring most frequently. Harpacticoid copepods and cumaceans were consumed regularly by small fish but did not comprise a major portion of their diet volume. The isopod, Cyathura polita occurred in 14.1% of the stomachs, forming approximately one percent of the diet volume in medium and large size fish.

An average of 12.8 amphipods per fish existed in the total sample. This constituted 6.5% of the diet volume. Amphipods were of major importance in the diet of small fish with Ampelisca abdita clearly dominating (14.4% volume). The larger ampeliscid, A. vadorum, was found in smaller numbers, but, because of its size, formed an almost equal portion of the diet volume in large fish and exceeded A. abdita in the 12-21 cm group. In total, ampeliscids accounted for 4.6% of the diet volume, occurring at a rate of 9.8 individuals per fish. Other amphipods which occurred frequently or formed a significant portion of the sample volume were Cymadusa compta, Microdeutopus gryllotalpa, Corophium spp. and Elasmopus laevis.

The mysid shrimp, Neomysis americana, occurred in 9.3% of the total fish sample and comprised 10.8% of the diet volume of the small and medium length specimens.

Decapods were of considerable importance in the diets of larger fish comprising 26.1% of the volume collected from the 22-33 cm length group. Palaemonetes vulgaris was the major species consumed. Crangon septemspinosa formed 4.7% of the diet volume in the 12-21 cm length group. Mud crabs including Neopanope texana and Rhithropanopeus harrisii occurred in 20% of the large fish sample.

A number of other items were consumed by the sampled flounder. Four naked gobies, Gobiosoma bosci, were the only fish identified in the stomachs. Nemertean remains, probably Cerabratulus sp., were found in four stomachs. Two of these occurred in the two largest (33 cm.) fish examined. Nematodes occurred in 15.7% of the sampled fish. A young horseshoe crab (3.2 cm width) was found in an 18 cm specimen. Thirty-seven percent of the stomachs contained recognizable amounts of fibrous plant detritus which comprised about one percent of the total diet volume.

THE FORAGE BASE BY HABITAT AREA

The stomach analysis survey included fish collected from forty-nine stations within the Little Egg Harbor estuary. These stations were segregated into six habitat types to examine spatial differences in the forage base. The word "habitat" is loosely used, being applied to morphological and salinity characteristics. Sampling intensity and the fish species composition of the sample varied from habitat to habitat. The classification of borderline or transitional stations was subjective, and there was always the possibility that a fish collected in one habitat had actually fed in another. Given these uncertainties and variations, few firm conclusions can be drawn on habitat-forage interactions; however the following sections discuss certain relationships which are suggested by the data.

Inlet: Sixteen fish species totaling 58 individuals were collected from six inlet stations. At the time of collection, salinities at these stations ranged from 22.0 to 30.1 ppt, and dissolved oxygen levels ranged from 6.6 to 10.3 mg/1. Surface measurements were applied to seine samples, bottom measurements to trawl collections. Four stations were located in Beach Haven Inlet and two in Barnegat Inlet.

A total of thirty-nine forage taxa were collected from the inlet specimens (Table 6). *Limulus polyphemus* and sandlance, *Ammodytes americanus*, were the only forage items unique to this habitat. *Mytilus edulis* was the most frequently occurring mollusk, while *Nereis spp*. and *Glycera spp*. were the major polychaete components in the sampled fish. *Cymadusa compta* and *Microdeutopus gryllotalpa* were the most frequently occurring amphipods. *Idotea balthica* was the dominant isopod component. *Crangon* occurred in the stomachs much more than Palaemonetes, and sandlance had the highest percent occurrence of the forage fish components.

Of seventeen flounder collected at inlet stations only one contained siphon tips, this indicates that siphons are not an important diet item for winter flounder utilizing inlet areas.

Fish eggs were a major seasonal diet component of Atlantic silversides taken at inlet stations.

The calanoid copepod-to-sandlance-to striped bass food chain was one clearly identified relationship associated with the inlet habitat.

Bay: The open bay habitat was the most intensively-sampled area of the estuary. Stomach analyses were conducted on 430 fish of forty-one species. A total of seventeen stations were surveyed. Salinity minimums at these stations ranged from 16.6 to 28.3 ppt at the time of sampling. Maximum salinities ranged from 26.9 to 31.8 ppt. Dissolved oxygen levels ranged from 5.2 to 12.7 mg/1.

Little Egg Harbor Bay is shallow with natural depths generally less than eight feet. A series of dredged channels cross the bay with depths to 20 feet as these channels approach the inlet. Sediment composition ranges from silt to gravel beach. Large areas of the bay are vegetated with dense eelgrass beds.

A total of 94 forage taxa were identified in bay-collected fish. Calanoid and harpacticoid copepods, and Neomysis in association with the smaller fish occurred most frequently in the overall sample. Crangon was encountered most frequently in the larger fish. The remaining forage species were evenly proportioned in terms of percent occurrence over the sample of bay-collected fish with the range of occurrences for given species running from 0.2 to 9.3 percent.

Bittium and siphon tips of *Mercenaria* associated with the winter flounder sample accounted for the most frequent mollusk-fish incidents. *Nereis spp.*, *Polydora spp.* and *Pista palmata* were the most frequently occurring polychaetes.

Of the six isopods identified, *Cyathura polita* was encountered most often, followed by *Idotea balthica*. A total of twenty-six amphipod species were identified in the stomachs of bay-collected fish. Of these *Ampelisca abdita* and *Cymadusa compta* occurred most often. *Crangon septemspinosa* was the most heavily utilized shrimp species, and *Neopanope* was the dominant xanthid component.

Fourspine stickleback, followed by silversides and anchovies, were the most frequently encountered forage fish species.

Overall, the trophic structure of the open bay is extremely complex. A large number of food chain associations can be developed from the data obtained. The *Mercenaria* siphon tip - winter flounder relationship was strongest in this habitat. A number of associations including the eelgrass community were present, including *Cymadusa* - pipefish. The importance of eelgrass, *Zostera marina*, in the trophic structure of Little Egg Harbor is a subject needing further study. Beyond providing habitat for a variety of amphipod and isopod forage species, it is likely that eelgrass detritus represents a major portion of the trophic base in the estuary. Briggs and O'Connor (1971) in a comparison of vegetated and open sand bottoms in Great South Bay, New York found that many estuarine fishes displayed a marked preference for the eelgrass habitat.

Tidal Creeks: Eight sampling stations were located in natural tidal creeks. From these, a total of 108 fish of twenty-eight species were examined. The tidal creek stations were differentiated from Mill Creek stations in that they received little fresh water input, and they had totally undeveloped shorelines consisting of *Spartina* marsh. Essentially, these creeks represent confined extensions of the bay. Bottom sediments consisted primarily of muds. At time of sampling, minimum salinities at these stations ranged from 5.5 to 26.8 ppt and dissolved oxygen minimums ranged from 2.6 to 6.9 mg/l.

Forty-eight forage taxa were identified in the stomach analysis. Insects of the Order Coleoptera were the only forage taxon unique to this habitat. Only one occurrence was observed. Mollusk components were *Mitrella*, *Solemya* and siphon tips of *Mercenaria*. *Polydora spp*. was the most frequently encountered polychaete component. There was a high occurrence of copepods and mysids in the small fish examined. *Ampelisca abdita* clearly dominated the amphipod component in the stomachs of tidal creek fish. As in the other habitats, *Crangon* occurred more frequently than *Palaemonetes*. Of the forage fish species (6 taxa), *Fundulus* in association with young-of-the-year bluefish, had the highest percentage of occurrence.

Mill Creek: Six stations were sampled in Mill Creek. The stomachs of 287 fish of 36 species were analysed.

Mill Creek stations ranged from seasonally fresh water areas to essentially bay-type areas at the mouth of the creek. Most of the shoreline of Mill Creek has been developed or disturbed by lagoon and bulkhead construction. Minimum salinities at the sampling stations ranged from less than 1 to 19.1 ppt at time of sampling. Maximum salinities ranged from 8.9 to 30.9 ppt. Dissolved oxygen levels ranged from 0.8 to 12.7 mg/l.

A total of 70 forage taxa were identified from fish collected within the creek. This degree of variety relative to the tidal creek stations is possibly attributable to the number of salinity regimes occurring in Mill Creek.

Mercenaria siphon tips, associated with the winter flounder specimens collected in the lower portions of the creek were the most frequently encountered mollusk component. *Nereis spp.* was the polychaete most often encountered. *Hypaniola grayi* followed *Nereis* in terms of frequency of occurrence. The overall occurrence of *Hypaniola* was strongly associated with Mill Creek stations. *Cyathura polita* and *Idotea balthica* respectively were the most frequently encountered isopods. In higher salinity areas, *Ampelisca abdita* was commonly observed in the fish stomachs. The occurrence ratio of *Crangon* to *Palaemonetes* was closer in Mill Creek than in the other habitats; however, *Crangon* still dominated. Anchovies and naked goby were the major forage fish components while fish eggs were important seasonally to white perch in upstream areas. Calanoid copepods and *Neomysis* represented the dominant zooplankton forage.

Lagoons: Two hundred and thirty-nine fish of thirty-one species were collected from eleven lagoon stations. The lagoon complex (Figure 2) consists of manmade channels cut into upland or filled areas adjacent to Mill Creek. The character of these lagoons differs greatly, depending upon their distance from the creek or bay. Interior lagoons are poorly flushed and frequently stratified during the summer. Oxygen depletion of bottom waters occurred at these times. Lagoons connecting directly to Mill Creek had higher flushing rates, exhibited better water quality and were accessible to fish moving through Mill Creek. The lagoons varied in age from approximately 20 years old to newly-dug, unbulkheaded sections. Bottom sediments in the older lagoons consisted of deep, very fine organic muds, while the new lagoons still contained some sandy or gravel-sand bottom areas. Salinity minimums at lagoon stations ranged from 2.8 to 19.7 ppt. Dissolved oxygen minimums ranged from 0.0 to 7.4 mg/l at the time of sampling.

A total of 47 forage taxa were identified in the stomachs of fish collected from lagoon stations. The occurrence of a clam siphon in a single flounder specimen represented the only occurrence of mollusks in this habitat. Nereis spp, followed by Hypaniola and Polydora were the major polychaete components. As a group, amphipods were encountered less frequently in lagoon fish than in fish collected in other habitats. Gammarus mucronatus occurred most frequently. The lagoon sample contained a high proportion of fish species which, in other habitats, fed heavily on amphipods. These included spot, stickleback, white perch and silversides. Pelagic food components including Calanoid copepods, Neomysis and Crangon occurred in proportions equivalent to those observed in other areas of the estuary. Menhaden and killifish were the most frequently encountered fish items, and occurred primarily in bluefish stomachs.

Tidal Pool: One hundred and eighteen* fish of four different species were collected from a tidepool located in the Spartina marsh adjacent to Dinner Point Creek. Salinity in the pool ranged from 15.8 to 30.3 ppt at the time of sampling, temperatures ranged from 6.5 to 33.0°C

* Only forty-four of these were included in the overall data analysis due to a lack of volumetric data.

and dissolved oxygen concentrations ranged from 5.0 to 6.9 mg/l.

In addition to the seven invertebrate taxa listed in Table 6, gastropod larvae and hydrozoan pieces were found in the stomachs of these fish specimens. Algae (including filamentous green, diatom and dinoflagellate components) represented the major food source for sheepshead minnow and mummichog in terms of diet importance. Harpacticoid copepods and Cladocera were the dominant foods of tidewater silversides, while rainwater killifish fed primarily on Chironimidae larvae and Gammarus mucronatus. The relative importance of these items varied from season to season. Dinoflagellates occurred most frequently in the summer sample, diatoms in the fall and filimentous algae in the winter and spring. Chironimidae larvae were second in terms of overall occurrence (Tables 7-8) and were found in all seasons. Importance as listed in Table 7 is based on qualitative observations as to which component contributed the most volume to the contents of individual fish stomachs.

SEASONAL COMPONENTS OF THE FORAGE BASE

Table 6 lists the occurrence of the various taxa in the fish stomachs by season. The months of March, April and May were considered as spring; June, July and August as summer, September, October and November as fall, and December, January and February as winter. A larger proportion of the fish sample was collected during the summer, and therefore a larger variety of forage species might be expected in that sample.

Taxa which occurred more frequently in the stomachs during the spring than in other seasons included Mercenaria (siphon tips), Polydora, Pista, Calanoida, Harpacticoida, Ampelisca vadorum, Neomysis and fish eggs. The siphon tips, Pista and A. vadorum were major components of adult winter flounder which were actively feeding during these months prior to emigration from the bay. Perch utilization of Clupeid eggs in Upper Mill Creek accounted for the high occurrence of fish eggs during the spring. The spring fish population contained a high proportion of small resident species including stickleback and perch. This increased the percent occurrence of Neomysis relative to the summer months when a variety of larger fish were present in the estuary.

The presence of migratory predator species including bluefish, weakfish and summer flounder in the estuary during the summer and fall months is reflected by the increased occurrence of fish, Crangon and crab components during these seasons.

During the winter months fish activity in the system is essentially limited to white perch, winter flounder and small resident species including sticklebacks and silversides. Mollusk and polychaete forage components are utilized rather exclusively by winter flounder during these months. Palaemonetes occurred as frequently as Crangon in the overall sample with Palaemonetes dominating the flounder diet and Crangon the perch diet. A total of thirty-eight taxa were identified in the winter sample. Calanoid copepods and Neomysis continued to dominate the diet of small fish.

DIET DIVERSITY

The relative diversity of the diets of thirty-three fish species-size groups were examined using the formula:

Diversity = $P_i \log_{10} P_i$ (adapted from Shannon and Weaver, 1963) where P_i = the proportion on the basis of numbers of individuals, of the i th prey species in the total diet sample. The base 10 log is considered appropriate since most of the diets involved over ten prey species. The stomach contents of ten individual fish from each species-size group were pooled for the analysis. The ten fish were randomly selected from the total stomach analysis sample. For each group, the minimum number of species contained in the stomachs was determined. Prey items which were identified to higher taxonomic levels were proportioned over identified component species.

Results of the analysis are presented in Table 9. Black seabass had the highest diet diversity; 11 to 17 cm weakfish, the lowest. These data indicate, to a degree, the flexibility of the feeding patterns of the various species-size groups examined. High diversity values might suggest a high capacity for adaptation to changes in the forage base, whereas low values suggest a lower tolerance. It is important to note the size ranges involved since an increased spread would be expected to result in increased diversity. Species-to-species comparisons are thus more meaningful for sample groups of similar size ranges.

As a general finding, the diet diversity of fish within a species increased with fish size. Examples of this include oyster toadfish, bluefish, summer flounder, white perch and spot. Medium-sized winter flounder and weakfish were the exceptions.

The diversity data are not necessarily consistent with the distribution of percent volume data observed for various forage items in given fish species samples. This is due to the fact that there were wide ranges in the size of prey items consumed by fish of certain species. As an example, 90% of the diet volumes of American eel and smooth dogfish consisted of blue crab remains, yet these fish had relatively high diet diversities in terms of types and numbers of prey organisms. For this reason, using diet diversity as an index of a species capacity for adapting to changes in available forage populations would require an analysis of volumetric as well as numerical proportions.

SUMMARY AND RECOMMENDATIONS

Carbon fixation in the Little Egg Harbor estuary is accomplished by phytoplankton, sedentary algae, *Spartina* marsh and submerged eelgrass beds, etc. The relative contribution of each component to the ultimate production of fish is unknown since few of the observed fish food chains can be linked to a single phototrophic group. The diversity exhibited at the phototroph level is multiplied by each ensuing trophic level, resulting in a complexity which essentially defies the construction of an inclusive schematic overview. The fish forage base consists of a mixture of primary consumers, carnivores and omnivores, which include at least one hundred and forty-two taxa. Diets of the surveyed fish species are very flexible. Forty-seven different prey species were identified in the stomach contents of one size group of winter flounder. The stomach contents of a subsample of ten fish of thirty-three different species-size group combinations contained an average of twelve diffferent prey taxa.

The complexity of the Little Egg trophic structure provides a stability and variety in the system's forage base which allows for the concurrent production of at least sixty-four species of fish (McClain 1977). This diversity, however, does not preclude the fact that certain organisms play more important roles than others in the transfer of energy from plant to fish. Table 10 lists some of the forage taxa which were found to be of particular importance in the diets of various fishes. These can be considered as key organisms in the trophic structure of the estuary. *Calanoid copepods*, *Neomysis americana*, various gammarids, and *Crangon septemspinosa* were identified as major characters in the food chains of many of the fish species surveyed, and loss of these organisms would no doubt be reflected in changes in the diversity and species composition of fish populations. This group, which contains planktivores, detritivores and omnivores, exemplified the value of a multi-faceted primary production base.

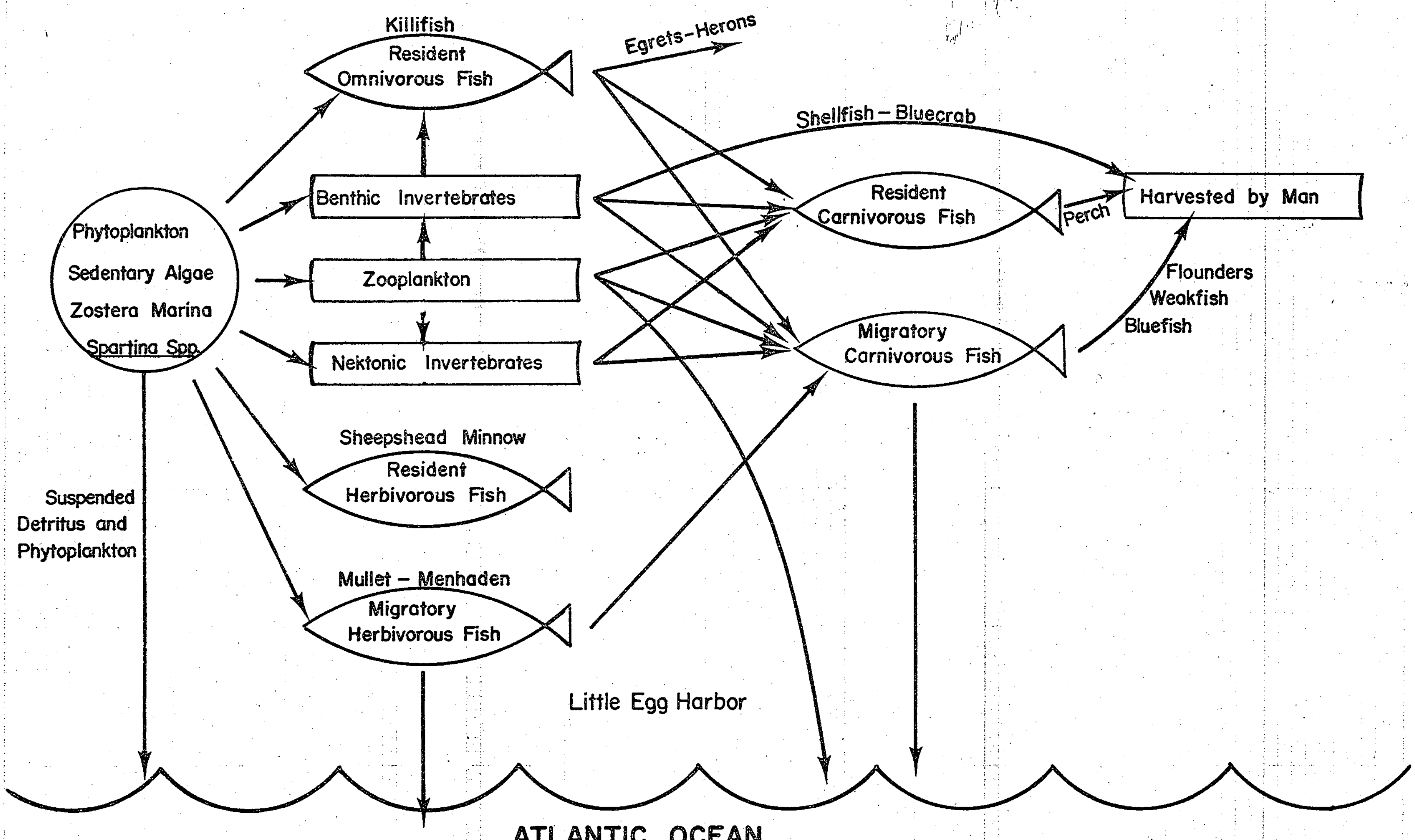
Of the estuarine food web types characterized by deSylva (1975), the Little Egg Harbor trophic structure appears to be most similar to that of the Delaware River estuary. Most of the invertebrate species identified in Little Egg are assumedly detritus-feeders; however, the the importance of phytoplankton-feeding taxa, including Calanoida and Mysidea, would tend to equalize the value of the phytoplankton base in terms of total energy flow. A quantitative examination of invertebrate diets would serve to identify the relative contribution of each energy pathway in the production of fish. Such a study will be necessary to complete analysis of the Little Egg Harbor trophic structure.

The tidal estuaries of New Jersey, including Little Egg Harbor, are utilized by a large number of migratory fish species, thus, at any given time a substantial portion of the fish biomass in these systems is composed of transient fishes. These include winter flounder, weakfish, bluefish, menhaden, summer flounder, seabass and others. Because of this, much of the energy fixed within the estuarine fish fauna is ultimately exported to the ocean. (Figure 13)

Since two-thirds of the recreationally and commercially important fish species along the Atlantic coast are estuarine-dependent at some life stage (McHugh 1976), the study of estuarine food webs has a number of fish management implications. Fluctuations on the abundance of

FIGURE 13

PATHWAYS OF CARBON FLOW THROUGH THE LITTLE EGG HARBOR ESTUARY



estuarine forage organisms may have profound effects on the year-to-year abundance of harvestable fish. In spite of this, management and environmental protection actions have generally been geared to tolerance levels exhibited by target fish species, ignoring the possibly higher sensitivity of their forage base to pollution and habitat loss.

The concept of forage management in estuaries should be further explored by fisheries scientists. A primary need is the development of systematic methods for evaluating the forage potential of given estuarine areas. The present study provides some insight in this respect:

1. Forage base assessments must consider planktonic, benthic and nektonic invertebrate populations to provide an accurate picture of fish food potential.
2. Assessment must consider the species composition as well as the densities of these invertebrate populations.

The monitoring of key forage populations in representative estuaries will be a necessary step in developing and implementing predictive models of fish abundance. In New Jersey waters, mysid and caridean shrimp populations would be obvious candidates. At a minimum, forage species management should include the protection of critical habitats and the maintenance of acceptable water quality conditions. This will require defining optimal salinity, dissolved oxygen and temperature regimes as well as determining the tolerances of key species to various chemical contaminants. Pertinent data should be catalogued from existing literature and, as necessary, developed through new research. Physical habitat preferences of important forage organisms also need to be defined and this knowledge incorporated in fisheries management activities. Considering the multi-species benefits which might be accrued by shifting invertebrate production from unutilized to heavily-utilized forms, the ultimate management concept of actively manipulating populations of forage organisms is deserving of thought.

Table 1. Sample of fishes collected from Little Egg Harbor and Manahawkin Bay for stomach content analysis

Species	Number examined	Number with empty stomachs	Final sample size
Alewife, Alosa pseudoharengus	12	1	11
American eel, Auguilla rostrata	11	1	10
American sandlance, Ammodytes americanus	4	0	4
Atlantic menhaden, Brevoortia tyrannus	42	0	42
Atlantic needlefish, Strongylura marina	20	0	20
Atlantic silversides, Menidia menidia	89	4	85
Banded killifish, Fundulus diaphanus	18	0	18
Bay anchovy, Anchoa mitchilli	108	7	101
Black seabass, Centropristis striata	18	1	17
Blueback herring, Alosa aestivalis	17	0	17
Bluefish, Pomatomus saltatrix	126	29	97
Brown bullhead, Ictalurus nebulosus	5	0	5
Crevalle jack, Caranx hippos	11	2	9
Cunner, Tautogolabrus adspersus	4	0	4
Fourspine stickleback, Apeltes quadracus	80	4	76
Golden shiner, Notemigonus crysoleucas	3	0	3
Grey snapper, Lutjanus griseus	2	0	2
Hogchoker, Trinectes maculatus	10	3	7
Inshore Lizzardfish, Synodus foetens	2	0	2
Lined seahorse, Hippocampus erectus	3	0	3
Hummichog, Fundulus heteroclitus	87	8	81 *(35)
Naked goby, Gobiosoma bosci	9	1	8
Northern kingfish, Menticirrhus saxatilis	2	0	2
Northern pipefish, Syngnathus fuscus	21	0	21
Northern puffer, Sphoeroides maculatus	3	0	3
Northern searobin, Prionotus carolinus	4	0	4
Northern sennet, Sphyraena borealis	7	0	7
Oyster toadfish, Opsanus tau	35	5	30
Permit, Trachinotus falcatus	1	0	1
Pinfish, Lagodon rhomboides	3	0	3
Planehead filefish, Monacanthus hispidus	3	1	2
Pumpkinseed sunfish, Lepomis gibbosus	2	0	2
Rainwater killifish, Lucania parva	20	9	15 *(9)
Red hake, Urophycis chuss	4	1	3
Redfin pickerel, Esox americanus	2	1	1
Scup, Stenotomus chrysops	1	0	1

Table 1. continued

Species	Number examined	Number with empty stomachs	Final sample size
Sheepshead minnow, Cyprinodon variegatus	52	7	48 *(23)
Silver perch, Bairdiella chrysura	28	2	26
Smooth dogfish, Mustelus canis	12	0	12
Spot, Leiostomus xanthurus	94	1	93
Spotted hake, Urophycis regius	18	1	17
Striped burrfish, Chilomycterus schoepfi	2	0	2
Striped bass, Morone saxatilis	13	2	11
Striped killifish, Fundulus majalis	16	3	13
Striped mullet, Musil cephalus	5	1	4
Striped searobin, Prionotus evolans	3	0	3
Summer flounder, Paralichthys dentatus	41	3	38
Tautog, Tautoga onitis	25	0	25
Threespine stickleback, Gasterosteus aculeatus	6	0	6
Tidewater silversides, Menidia beryllina	43	4	39 *(37)
White perch, Morone americana	80	1	79
White mullet, Mugil curema	11	0	11
Weakfish, Cynoscion regalis	51	0	51
Windowpane flounder, Scophthalmus acuosus	4	0	4
Winter flounder Pseudopleuronectes americanus	147	6	141
Number of species 55 Total	1449	109	1340 *(1266)

* Only a portion of those specimens collected in the tidepool habitat were included in the overall analyses due to a lack of volumetric data. Number in parentheses is sample included in Appendix I and II.

Table 2. Total length (cm) ranges of fish in the stomach analysis sample and the proportion of each species in fish collections in Little Egg Harbor (McClain 1977).

Species	Sample Length Range	Proportion x 10^{-4}
Alewife	6 - 13	5.6
Alewife	27 - 34	4.7
American eel	11 - 61	14.2
American sandlance	9 - 12	22.2
Atlantic menhaden	4 - 8	57.5
Atlantic menhaden	11 - 16	124.2
Atlantic menhaden	25 - 28	40.0
Atlantic needlefish	5 - 16	20.0
Atlantic needlefish	24 - 58	5.8
Atlantic silversides	3 - 13	2592.9
Banded killifish	3 - 10	151.5
Bay anchovy	5 - 11	2705.2
Black seabass	6 - 21	6.4
Blueback herring	7 - 15	58.4
Bluefish	6 - 10	5.0
Bluefish	11 - 20	28.9
Bluefish	21 - 36	8.6
Brown bullhead	21 - 35	2.5
Crevalle jack	4 - 13	19.5
Cunner	3 - 5	1.1
Fourspine stickleback	2 - 6	1451.8
Golden shiner	15 - 18	1.1
Grey snapper	4 - 5	2.5
Hogchoker	2 - 17	29.5
Inshore lizardfish	10 - 14	0.6
Lined seahorse	8 - 12	2.8
Mummichog	3 - 11	722.3
Naked goby	3 - 5	61.1
Northern kingfish	15 - 19	1.7
Northern pipefish	9 - 21	84.2
Northern puffer	2 - 11	1.7
Northern searobin	8 - 18	2.8
Northern sennet	10 - 17	20.3
Oyster toadfish	4 - 13	34.7
Oyster toadfish	18 - 28	38.6

Table 2 (continued)

Species	Sample Length Range	Proportion x 10^{-4}
Permit	8	0.8
Pinfish	6 - 11	4.7
Planehead filefish	5 - 13	5.6
Pumpkinseed	9 - 10	0.6
Rainwater killifish	3 - 4	37.8
Red hake	8 - 20	1.1
Redfin pickerel	26	0.3
Scup	14	1.4
Sheepshead minnow	3 - 5	43.1
Silver perch	3 - 12	139.7
Smooth dogfish	39 - 56	5.0
Spot	3 - 10	180.9
Spot	11 - 19	283.2
Spotted hake	5 - 19	8.3
Striped burrfish	23 - 25	3.3
Striped bass	43 - 58	0.3
Striped killifish	4 - 13	42.5
Striped mullet	11 - 16	1.7
Striped searobin	4 - 7	0.6
Summer flounder	6 - 24	7.8
Summer flounder	26 - 65	4.7
Tautog	6 - 16	9.4
Tautog	20 - 32	3.3
Threespine stickleback	5 - 7	5.3
Tidewater silversides	4 - 9	615.6
White perch	7 - 12	29.7
White perch	14 - 26	45.6
White perch	29 - 37	6.1
White mullet	3 - 14	36.1
Weakfish	5 - 10	26.4
Weakfish	11 - 17	11.7
Weakfish	32 - 62	0.6
Windowpane	15 - 34	2.2
Winter flounder	3 - 11	30.3
Winter flounder	12 - 21	34.2
Winter flounder	22 - 33	30.6

Table 3. Identified Components of the Fish Forage Base in Little Egg Harbor

Sediment

Plant detritus

Algae

Porifera

Hydrozoa

Anthozoa, Actiniaria

Turbellaria

Nemertea

Nematoda

Bryozoa

Gastropoda

- *Bittium alternatum*
- *Crepidula spp.* (slipper shells)
- *Mitrella lunata*
- *Ilyanassa obsoleta* (Eastern Mud Snail)
- *Haminoea solitaria*

Pelecypoda

- *Mytilus edulis* (blue mussel)
- *Laevicardium mortoni*
- *Mercenaria mercenaira* (hard-shell clam)
- Fam. Tellinidae
- *Tagelus divisus*
- *Ensis directus* (razor clam)
- *Mya arenaria* (soft-shell clam)
- *Lyonsia hyalina*
- *Solemya velum*

Table 3 (continued)

Oligochaeta

Hirudinea

Polychaeta (polychaete worms)

- <u>Phyllodoce maculata</u>
- <u>Phyllodoce arenae</u>
- <u>Eumida sanguinea</u>
- <u>Eteone spp.</u>
- Fam. Aphroditidae
- Fam. Polynoidae
- <u>Stenelais spp.</u>
- <u>Glycera americana</u>
- Fam. Goniadidae
- <u>Nephtys spp.</u>
- Fam. Syllidae
- <u>Nereis succinea</u>
- Fam. Capitellidae
- <u>Clymenella torquata</u>
- <u>Maldanopsis elongata</u>
- <u>Scolecolepides viridis</u>
- <u>Polydora ligni</u>
- <u>Streblospio benedicti</u>
- <u>Aricidea sp.</u>
- <u>Lumbrineris tenuis</u>
- <u>Arabella iricolor</u>
- <u>Scoloplos fragilis</u>
- <u>Hypaniola grayi</u>
- <u>Pista palmata</u>
- <u>Sabella microphthalma</u>

Table 3 (continued)

<u>Limulus polyphemus</u>

Arachnida, Order Acari

Insecta

    Order Plecoptera

    Order Diptera

    Order Coleoptera

    Order Hymenoptera

    Order Homoptera

    Order Hemiptera

Cladocera

Ostracoda

Copepoda

    Order Calanoida

    Order Harpacticoida

    Order Cyclopoda

Cirripedia

Cumacea

Isopoda and Tanaidacea

    <u>Tanais cavolini</u>

    <u>Leptochelia savignyi</u>

    <u>Cyathura polita</u>

    <u>Cirolana sp.</u>

    <u>Idotea balthica</u>

    <u>Idotea phosphorea</u>

    <u>Edotea triloba</u>

    <u>Erichsonella attenuata</u>

    <u>Erichsonella filiformis</u>

    Fam. Oniscidae

Table 3 (continued)

Amphipoda

Ampelisca abdita

Ampelisca vadorum

Ampelisca verrilli

Ampithae longimana

Cymadusa compta

Rudilemboides naglei

Microdeutopus gryllotalpa

Lembos sp.

Batae catharinensis

Corophium spp.

Erichthonius rubricornis

Erichthonius brasiliensis

Unciola serrata

Cerapus tubularis

Gammarus spp.

Gammarus mucronatus

Elasmopus leavis

Casco bigelowi

Melita sp.

Maera danae

Fam. Lysianassidae

Fam. Hyalidae

Monoculodes edwardsi

Microprotopus ranei

Table 3 (continued)

Leptocheirus plumulosus

Paraphoxus spinosus

Orchestia platensis

Stenothoe minuta

Parametopella cypris

Suborder Caprellidae

Order Mysidacea (Mysid Shrimp)

Neomysis americana

Mysidopsis bigelowi

Order Decapoda

Penaeus sp. (Shrimp)

Palaemonetes vulgaris (Grass Shrimp)

Palaemonetes pugio (Grass Shrimp)

Hippolyte sp.

Crangon septemspinosa (Sand Shrimp)

Pagurus longicarpus (Long-armed Hermit Crab)

Ovalipes ocellatus

Callinectes sapidus (Blue Claw Crab)

Neopanope texanna (Mud Crab)

Rhithropanopeus harrissii (Mud Crab)

Eurypanopeus depressus (Mud Crab)

Aslidiacea, Fam. Molgulidae

Osteichthyes

Menidia menidia (Atlantic silversides)

Anchoa mitchilli (Bay anchovy)

Table 3 (continued)

Apeletes quadracus (Fourspine stickleback)

Ammodytes americanus (American sandlance)

Brevoortia tyrannus (Atlantic menhaden)

Fam. Bothidae (Lefthand flatfishes)

Bairdiella chrysura (Silver perch)

Cynoscion regalis (Weakfish)

Leiostomus xanthurus (Spot)

Fundulus heteroclitus (Mummichog)

Gobiosoma bosci (Naked goby)

Prinonotus spp. (Sea robins)

Pseudopleuronectes americanus (Winter flounder)

Strongylura marina (Atlantic needlefish)

Syngnathus fuscus (Northern pipefish)

Table 4. Breakdown of Litter Egg Harbor Sample by Habitat Type

Species \ Habitat	Inlet	Bay	Tidal Creeks	Mill Creek	Artificial Lagoons	Tidal Pool	Total
Alewife		2	1	2	6		11
American eel		1	2	6	1		10
American sandlance	4						4
Atlantic menhaden			8	9	25		42
Atlantic needlefish		17	1	1	1		20
Atlantic silversides	8	29	20	17	11		85
Banded killifish				15	3		18
Bay anchovy		41	31	21	8		101
Black seabass	2	7	1	6	1		17
Blueback herring		1	5	5	6		17
Bluefish	1	28	21	16	31		97
Brown bullhead				5			5
Crevalle jack		1	4	1	3		9
Cunner	3	1					4
Fourspine stickleback		37		17	22		76
Golden shiner				3			3
Grey snapper		2					2
Hogchoker				3	4		7
Inshore lizardfish		2					2
Mummichog		8	1	5	6	61	81
Naked goby		1		4	3		8
Northern kingfish					2		2
Northern pipefish		15	1	5			21
Northern puffer		3					3
Northern searobin		4					4
Northern sennet		7					7
Oyster toadfish		14	5	11			30
Permit				1			1
Pinfish		3					3

Table 4. Continued

Species \ Habitat	Inlet	Bay	Tidal Creek	Mill Creek	Artificial Lagoons	Tidal Pool	Total
Planehead filefish	2						2
Pumpkinseed				2			2
Rainwater killifish		1		1	5	8	15
Red hake		2	1				3
Redfin pickerel					1		1
Scup		1					1
Sheepshead minnow		1		2	6	39	48
Silver perch		18	5	1	2		26
Smooth dogfish		7	5				12
Spot	3	24	29	22	15		93
Spotted hake		12	1	4			17
Lined seahorse	2	1					3
Striped burrfish		1		1			2
Striped bass	10		1				11
Striped killifish	1	3		2	7		13
Striped mullet		2			2		4
Striped searobin			1	1	1		3
Summer flounder	1	18	9	8	2		38
Tautog	1	13	3	8			25
Threespine stickleback		1	4		1		6
Tidewater silversides		1	2	19	7	10	39
White perch		1	2	32	44		79
White mullet			5	1	5		11
Weakfish	1	20	22	5	3		51
Windowpane	2	2					4
Winter flounder	17	77	17	25	5		141
Total	58	430	208	287	239	118*	1340

* The stomachs of 74 tidepool specimens were only qualitatively evaluated.

Table 5. Breakdown of Litter Egg Harbor Sample by Season of Collection

Spring = March, April, May
Fall = September, October, November
Summer = June, July, August
Winter = December, January, February

Species \ Season	Spring	Summer	Fall	Winter
Alewife	7	2		2
American eel	2	8		
American sandlance			4	
Atlantic menhaden		33	9	
Atlantic needlefish		20		
Atlantic silversides	33	34	7	11
Banded killifish		14	2	2
Bay anchovy	40	59	2	
Black seabass		14	3	
Blueback herring	5	4		4
Bluefish		79	18	
Brown bullhead	1	2	2	
Crevalle jack		9		
Cunner		3	1	
Fourspine stickleback	18	18		40
Golden shiner		3		
Grey snapper		2		
Hogchoker	2		5	
Inshore lizardfish		2		
Mummichog	1	8	6	19
Naked goby		5	3	
Northern kingfish			2	
Northern pipefish	7	12	2	
Northern puffer		3		
Northern searobin	2	2		
Northern sennet		7		
Oyster toadfish	1	26	3	
Permit		1		
Pinfish		3		
Planehead filefish		1	1	
Pumpkinseed	2			
Rainwater killifish	2	6		1
Red hake	1	2		
Redfin pickerel			1	
Scup			1	

Table 5. Continued

Species \ Season	Spring	Summer	Fall	Winter
Sheepshead minnow	12	2	3	12
Silver perch		6	20	
Smooth dogfish		12		
Spot		79	13	
Spotted hake	5	10		
Lined seahorse		3		
Striped burrfish		2		
Striped bass	1		10	
Striped killifish		9	4	
Striped mullet			2	2
Striped searobin		2	1	
Summer flounder	1	29	8	
Tautog	1	14	9	1
Threespine stickleback	3			3
Tidewater silversides	1	18		18
White perch	13	19	17	30
White mullet		8	3	
Weakfish		32	19	
Windowpane		3	1	
Winter flounder	32	64	28	18
# Species	24	46	32	14
# Fish	193	694	210	163

Table 6. Percent Occurrence of Forage Taxa by Habitat and Season

Forage Species \ Fish	Inlet	Bay	Tidal Creeks	Mill Creek	Lagoon	Tidal Pool	Spring	Summer	Fall	Winter
	58	430	208	287	239	118	193	694	210	163
Bittium alternatum		3.4					0.5	0.3		
Crepidula spp.		2.1		0.3			0.5	1.2		0.6
Mitrella lunata		1.7	0.5	0.7				0.4		0.6
Nassariidae		0.5		0.7				0.4	0.5	
Haminoae solitaria	1.7	0.5						0.4		
Mytilus edulis	3.4	0.5					0.5	0.3	0.5	
M. mercenaria (siphons)	1.7	7.0	1.4	2.1	0.4		10.9	0.7	5.2	2.5
Lyonsia hyalina		0.2					0.5			
Solomya velum		0.5	0.5					0.4		
Oligochaeta		0.5		1.4	0.4		1.0	0.3	1.0	0.6
Phyllodoce maculata		0.7		0.7	0.4		1.0	0.6		
Phyllodoca arenae		0.2		0.3			1.0			
Eteone spp.		0.5		1.0	0.4	1.7	0.5	0.7		0.6
Polynoidae	1.7	0.2					0.5	0.1		
Stenelais spp.				0.3			0.5			
Glycera spp.	8.6	1.2		0.3	0.4		1.0	1.0	1.0	1.2
Goniadidae	1.7	1.9		0.3				1.3		0.6
Nephyts spp.		0.2			0.8			0.3	0.5	
Nereis spp.	10.3	3.3	1.9	4.9	3.8		3.1	4.5	4.3	0.6
Capitellidae	6.9	1.4	1.0	0.3	0.8			1.9	0.5	0.6
Clymenella torquata		0.9					0.5	0.1	1.0	
Maldanopsis elongata		1.9						0.3	1.9	1.2
Scolecolepides viridis		0.7		0.7			0.5	0.6		
Polydora spp.		3.3	3.8	0.7	1.3		9.3	1.0	1.0	
Streblospio benedicti	1.7			1.0				0.6		
Aricidae sp.		0.2					0.5			
Lumbrineris spp.		0.9	0.5					0.6		0.6
Arabella iricolor		0.2		0.3			1.0			
Scoloplos spp.	1.7	0.2		0.3			0.5	0.3		
Hypaniola grayi		0.7	1.0	3.1	1.3		1.6	1.9		0.6
Pista palmata		4.0		1.0			6.7	0.1	1.4	1.8
Sabella microphthalma		0.2	0.5	0.3			1.0	0.1		
Limulus polyphymus	1.7							0.1		

Table 6. Continued

Forage Species \ # Fish	Inlet	Bay	Tidal Creeks	Mill Creek	Lagoon	Tidal Pool	Spring	Summer	Fall	Winter
	58	430	208	287	239	118	193	694	210	163
Plecoptera					0.4					0.6
Diptera (Adult & Larvae)		1.9	0.5	15.0	12.1	27.1	5.2	8.1	5.7	8.0
Coleoptera			0.5				0.5			
Hymenoptera	1.7	1.6	0.5					1.3		
Homoptera		0.5		0.7	0.4			0.7		
Hemiptera				0.3					0.5	
Cladocera		1.9		2.8	2.5	1.7		2.9	0.1	0.6
Ostracoda		5.6	4.8	6.3	1.3	5.9	10.4	4.8	1.0	0.6
Calanoida	8.6	18.8	21.6	25.8	24.3	7.6	43.0	14.1	14.8	36.2
Harpacticoida	6.9	14.0	10.6	20.6	10.9	27.1	23.8	13.8	8.6	16.6
Cyclopoda				1.0			0.5	0.3		
Cirripedia (larvae)			1.9	2.4	2.1		0.5	2.2		
Cumacea		3.3	4.3	5.2			0.5	5.3		
Tanais cavolini		0.2		1.7	0.4			1.0		
Leptochelia savignyi				0.3			0.5			
Cyathura polita		3.7	1.0	7.7	2.1		4.7	3.2	6.7	
Idotea balthica	10.3	2.8	1.0	5.2			1.6	4.6		
Idotea phosphorea		0.7	0.5				0.5	0.4		
Edotea triloba	3.4	1.4	1.4	2.8	0.4		1.0	2.0	1.9	
Erichsonella attenuata		1.2		1.0				1.2		
Erichsonella filiformis		0.5	0.5	1.0			0.5	0.6	0.5	
Oniscidae				0.3				0.1		
Ampelisca abdita	1.7	9.3	12.5	7.7	1.3		8.3	8.8	6.2	1.2
Ampelisca vadorum		4.9	1.9	1.0			9.8	0.9	0.5	1.2
Ampelisca verrilli		0.7					0.5			1.2
Ampithoe longimana		0.5					0.5	0.1		
Cymadusa compta	8.6	6.3	1.9	3.1	0.4		2.1	3.6	4.3	4.9
Rudilemboides naglei		0.9						0.6		
Microdeutopus gryllotalpa	8.6	1.1	1.4	1.7	0.8			2.4	1.4	
Lembos sp.	1.7	0.2	1.0		0.4			0.7		
Batae catharinensis		0.5						0.1	0.5	
Corophium spp.	5.2	4.7	1.9	2.8	2.5		1.4	4.0	3.3	1.8
Erichthonius rubricornis		0.2						0.1		
Erichthonius brasiliensis		0.5			0.4			0.3	0.5	

Table 6. Continued

Forage Species \ # Fish	Inlet	Bay	Tidal Creeks	Mill Creek	Lagoon	Tidal Pool	Spring	Summer	Fall	Winter
	58	430	208	287	239	118	193	694	210	163
Unciola serrata				1.0			1.0	0.1		
Cerapus tubularis	1.7	0.9	0.5	0.7				1.2		
Gammarus sp.		0.7	1.4	5.2	3.3	6.8	3.1	2.2	0.5	4.3
Gammarus mucronatus		0.7	0.5	1.0	3.8	4.2	1.5	1.4	1.4	3.1
Elasmopus leavis	3.4	4.7	0.5	2.4	0.4		0.5	3.9	1.0	0.6
Casco bigelowi	1.7	0.2							1.0	
Melita sp.		0.2					0.5			
Maera danae	3.4	0.7						0.3	1.4	
Lysianassidae				0.7				0.3		
Hyalidae		0.2						0.1		
Monoculodes edwardsi		0.2		0.3	0.4		1.0			0.6
Microprotopus ranei	1.7	1.6	0.5				0.5	1.2		
Leptocheirus plumulosus	1.7			12.9	3.3		1.0	6.2	4.2	1.8
Paraphoxus spinosus		0.2						0.1		
Orchestia platensis				0.3	0.4			0.1	0.5	
Stenothoe minuta		0.5		0.3			0.5	0.3		
Parametopella cypris		0.5	0.5					0.4		
Caprellidae	3.4	0.7		0.7				1.0		
Neomysis americana	3.4	18.1	32.2	12.2	20.9		34.7	11.2	21.4	25.8
Mysidopsis bigelowi		2.8	0.5	0.3	2.1			1.6	3.3	0.6
Penaeus sp.		0.2						0.1		
Palaemonetes vulgaris	1.7	5.1	1.9	1.7	1.3		2.1	2.0	3.3	6.1
Palaemonetes pugio	1.7	1.2	1.0	1.0			0.5	0.7	1.4	1.2
Hippolyte sp.		0.2						0.1		
Crangon septemspinosa	22.4	15.6	15.4	5.2	7.5		5.7	12.4	17.6	6.1
Pagurus longicarpus		0.2							0.5	
Ovalipes ocellatus		0.5							1.0	
Callinectes sapidus	1.7	2.1	6.3	4.5	1.7			4.3	4.3	0.6
Neopanope texanna	1.7	4.9		3.5	0.4		2.6	3.2	2.9	
Rhithropanopeus harrisii		1.2	1.4	2.1	1.3		1.0	1.8	1.0	
Eurypanopeus depressus				0.3			1.6	0.2		
Menidia spp.	1.7	1.9		0.7	0.4			1.6	1.4	
Anchoa spp.	1.7	1.2	1.4	1.7	0.8			2.0	1.0	
Apeletes quadracus		2.3	0.5		0.4			1.3	1.0	0.6
Ammodytes americanus	12.1							0.1	2.8	

Table 6. Continued

Forage Species \ # Fish	Inlet	Bay	Tidal Creeks	Mill Creek	Lagoon	Tidal Pool	Spring	Summer	Fall	Winter
	58	430	208	287	239	118	193	694	210	163
Brevoortia tyrannus			1.0		1.3			0.6	0.5	
Bairdiella chrysura		0.2							0.5	
Cynoscion regalis	1.7	0.2	0.5					0.3	0.5	
Leiostomus xanthurus		0.5	0.5					0.4		
Fundulus spp.	0.2	2.9	0.3	2.1			1.3	1.4	0.6	
Gobiosoma bosci		0.5		1.4	0.4		1.0	0.1	1.0	1.
Pseudopleuronectes americanus		0.2						0.1		
Syngnathus fuscus	0.2		0.3					0.2		

Table 7. Rank in Importance of Food Items in Tidal Pool (S8)

Content Item	% Importance*	% Occurrence
Dinoflagelates	33.1	59.9
Algae other than diatoms or dinoflagellates	29.7	55.1
Chironimidae larva	11.0	22.0
Harpacticoid copepods	5.9	27.1
Diatoms	4.2	78.0
Copepods-nondescript	3.4	5.9
Gammarus mucronatus	3.4	4.2
Fibrous plant remains	2.5	13.6
Gammarus sp. remains	1.7	6.8
Cladoccera	1.7	1.7
Calanoid copepods	0.8	7.6
Adult insect remains	0.8	3.4
Copepod nauplii	0.8	3.4
Polychaete remains	0.8	1.7
Ostracoda	--	5.9
Nematodes	--	5.1
Hydroid remains	--	4.2
Cycloid scales	--	3.4
Chironimidae pupa	--	1.7
Gastropod larva	--	0.8

RANK OF FOOD GROUPS BY IMPORTANCE

All algae	67.0
Insects	11.8
Copepods	10.9
Amphipods	5.1
Detritus	2.5

* % of sample in which this item was qualitatively determined to contribute the highest volume proportion in the stomach contents.

Table 8. Stomach Content Analysis for Tide Pool Fishes by Season - All Species Combined

Seasons	Summer		Fall		Winter		Spring		Total	
Sample Size	46		29		30		13		118	
Content Item	%O*	%I**	%O	%I	%O	%I	%O	%I	%O	%I
Algae except diatoms & dinoflagellates	10.9	2.2	82.8	65.5	80.0	33.3	92.3	38.5	55.1	29.7
Dinoflagellates	82.6	73.9	31.0	10.3	26.7	3.3	84.6	7.7	55.9	33.1
Diatoms	45.7		93.1	6.9	63.3	10.0	84.6		78.0	4.2
Chironimidae larva	26.1	13.0	10.3	6.9	23.3	13.3	30.8	7.7	22.0	11.0
Fibrous plant remains	6.5	2.2	24.1	6.9			46.2		13.6	2.5
Cladocera	4.3	4.3							1.7	1.7
Copepoda-nondescript			6.9	3.4	10.0	6.7	15.4	7.7	5.9	3.4
Gammarid remains	6.5	2.2	3.4		13.3	3.3			6.8	1.7
Harpacticoid copepods	28.3		17.2		33.3	20.0	30.8	7.7	27.1	5.9
Gastropod larva			3.4						0.8	
Calanoid copepods	8.7		3.4		3.3		30.8	7.7	7.6	0.8
Cycloid scales	4.3		6.9						3.4	
Chironimidae pupa			6.9						1.7	
Ostracoda	15.2								5.9	
Adult insect remains	8.7	2.2							3.4	0.8
Nematodes	6.5		6.9				7.7		5.1	
Gammarus mucronatus					6.7	6.7	23.1	15.4	4.2	3.4
Hydroid remains							23.1		4.2	
Polycheate remains									1.7	0.8
Copepod nauplii							30.8	7.7	3.4	0.8
										99.8

**Percent importance. See Table 7.

* % of sample in which this item was qualitatively determined to contribute the highest volume proportion in the stomach contents.

Table 9. Diet Diversity Based on Numbers of Prey Organisms Consumed

Species	Size Range (cm)	Minimum Number of Prey Species	Total Number of Individuals	(N10) Diet Diversity Index	D.D. Rank
Black seabass	6-21	20	83	1.052	1
Tautog	6-16	15	137	0.996	2
Winter flounder	12-21	21	472	0.974	3
Mummichog	3-11	12	34	0.960	4
Oyster toadfish	18-28	16	77	0.941	5
American eel	11-61	11	27	0.931	6
Winter flounder	3-11	21	206	0.907	7
Oyster toadfish	4-13	10	46	0.902	8
Winter flounder	22-33	33	899	0.775	9
Bluefish	11-20	7	22	0.756	10
Summer flounder	26-65	13	101	0.749	11
Spotted hake	5-19	12	84	0.742	12
Striped killifish	4-13	13	115	0.725	13
White perch	14-26	18	1,109	0.718	14
Atlantic needlefish	5-16	8	155	0.674	15
Smooth dogfish	39-56	6	27	0.638	16
Spot	11-19	24	1,278	0.632	17
Northern pipefish	9-21	13	239	0.601	18
Atlantic silver-sides	3-13	11	313	0.571	19
Silver perch	3-12	11	152	0.545	20
Bluefish	21-36	4	16	0.528	21
Striped bass	43-58	6	83	0.495	22
Bluefish	6-10	10	434	0.452	23
Fourspine stickleback	2-6	9	142	0.428	24
Banded killifish	3-10	7	81	0.389	25
Summer flounder	6-24	11	692	0.372	26
White perch	7-12	9	1,167	0.370	27
Weakfish	5-10	11	317	0.267	28
Spot	3-10	9	1,869	0.263	29
Bay anchovy	5-11	10	1,399	0.191	30
Tidewater silver-sides	4-9	7	2,087	0.136	31
Blueback herring	7-15	9	11,516	0.121	32
Weakfish	11-17	5	680	0.091	33

Table 10. Fish forage taxa of greater importance in the Little Egg Harbor Estuary

Forage taxon	High importance in the diet of:
Plant material: Algae and plant detritus	Menhaden, mullet, filefish, sheepshead minnow, mummichog
Gastropoda	permit, northern puffer
Mercenaria mercenaria (siphons)	winter flounder
Phyllodocidae	naked goby
Nereis spp.	oyster toadfish, pumpkinseed, bluefish, winter flounder
Capitellidae	naked goby, winter flounder
Terebellidae	winter flounder
Insecta	Atlantic needlefish
Calanoida	alewife, American sandlance, bay anchovy, blueback herring, stickleback
Harpacticoida	spot
Cyathura polita	banded killifish
Idotea spp.	oyster toadfish, striped killifish, tautog, grey snapper
Ampelisca abdita	Atlantic silversides, cunner, winter flounder
Cymadusa compta	seahorse, pipefish
Corophiidae	filefish, white perch
Gammarus mucronatus	rainwater killifish
Elasmopus leavis	cunner, naked goby
Leptocheirus plumulosus	banded killifish, blueback herring, white perch

Table 10 (continued)

Forage taxon	High importance in the diet of:
Neomysis americana	alewife, Atlantic silversides, bay anchovy, crevalle jack, stickleback, pipefish, silver perch, searobin, summer flounder, white perch, weakfish
Palaemonetes vulgaris	alewife, bluefish, pinfish, silver perch, spotted hake, winter flounder
Crangon septemspinosa	kingfish, searobin, pinfish, red hake, silver perch, spotted hake, summer flounder, white perch, weakfish, windowpane
Callinectes sapidus	American eel, smooth dogfish, striped burrfish
Neopanope texanna	tautog
Rhithropanopeus harrisii	oyster toadfish
fish eggs	Atlantic silversides, striped killifish, white perch
silversides	Atlantic needlefish, bluefish, northern sennet
anchovies	crevalle jack, weakfish
stickleback	Atlantic needlefish
American sandlance	striped bass
Atlantic menhaden	bluefish
spot	oyster toadfish
killifish	bluefish, white perch

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APPENDIX I

Allocation of the forage base in Little Egg Harbor

Definition:

Sample size:	The number of consumer stomachs examined which contained food. Fish with empty stomachs were excluded from the analyses.
% Volume:	Of the total volume of material recovered from the sample of consumer stomachs; the percent composed of the given forage item.
% Occurrence:	Percent of the consumer stomachs which contained the given forage item.
ml x 10^{-4}/fish:	The average volume of the forage item recovered from the stomachs of the consumer species.
ind/fish:	The average number of the given forage organisms recovered from the stomachs of the consumer species.
P.I. Rank:	An estimate of the relative predation impact which the consumer species had upon the population of the forage taxon. P.I. was determined by multiplying ind/fish by the proportion of the consumer species in fish population surveys. (see text)
Abbreviation LT.L:	Less than 0.1%.

hb
ss

Sediment

Consumer Species	Size Range of Consumer (cm)	Sample Size	% Volume	% Occurrence	mlx10-4/ Fish
Atlantic menhaden	4-8	19	-	21.1	-
Atlantic menhaden	11-16	15	-	40.0	-
Atlantic menhaden	25-28	8	-	37.5	-
Banded killfish	3-10	18	7.8	55.6	6.8
Bay anchovy	5-11	101	0.2	5.0	0.2
Bluefish	11-20	62	LT.1	1.6	0.08
Brown bullhead	21-35	5	0.9	40.0	158.0
Crevalle jack	4-13	9	LT.1	27.2	1.1
Fourspine stickleback	2-6	76	0.6	3.9	0.3
Hogchoker	2-17	7	2.1	42.9	7.1
Mummichog	3-11	34	0.7	14.7	1.9
Naked goby	3-5	8	1.9	25.0	1.1
Northern pipefish	9-21	21	LT.1	4.8	0.2
Pumpkinseed	9&10	2	0.4	100.0	5.0
Sheepshead minnow	3-5	29	-	20.7	-
Spot	3-10	48	1.1	10.4	1.1
Spot	11-19	44	0.8	9.1	3.4
Striped bass	43-58	11	LT.1	9.1	90.9
Striped killifish	4-13	13	9.4	46.2	12.0
Striped mullet	11-16	4	-	100.0	-
Striped searobin	4-7	3	1.4	33.3	1.7
Tautog	6-16	18	LT.1	5.6	1.5
Tautog	20-32	7	0.1	14.3	19.2
Tidewater silversides	4-9	37	LT.1	2.7	0.02
White perch	14-26	54	LT.1	1.9	0.1
White mullet	3-14	11	-	90.9	-
Winter flounder	3-11	56	0.4	25.0	1.8
Winter flounder	12-21	41	LT.1	9.8	2.4
Winter flounder	22-33	45	0.4	15.6	64.6

Plant detritus

Consumer Species	Size Range of Consumer (cm)	Sample Size	% Volume	% Occurrence	mlx10-4/ Fish
Alewife	6-13	6	0.2	33.3	2.0
Alewife	27-34	5	1.1	20.0	22.0
American eel	11-61	10	0.4	30.0	201.0
Atlantic menhaden	11-16	15	-	26.7	-
Atlantic menhaden	25-28	8	-	12.5	-
Atlantic silversides	3-13	85	1.2	10.6	6.0
Banded killifish	3-10	18	6.7	16.7	6.0
Bay anchovy	5-11	101	0.2	4.0	0.2
Black seabass	6-21	17	LT.1	5.9	1.8
Blueback herring	7-15	13	0.2	15.4	0.7
Bluefish	6-10	16	LT.1	6.3	0.3
Bluefish	11-20	62	0.6	17.7	60.9
Bluefish	21-36	19	0.6	15.8	158.9
Brown bulkhead	21-35	5	0.1	80.0	23.0
Cunner	3-5	4	2.3	25.0	1.3
Fourspine stickleback	2-6	76	0.5	5.3	0.2
Golden shiner	15-18	3	1.0	33.3	1.7
Hogchoker	2-17	7	0.6	28.3	2.1
Mummichog	3-11	34	0.6	14.7	1.5
Naked goby	3-5	8	1.1	12.5	0.6
Northern kingfish	15-19	2	0.2	50.0	5.0
Northern puffer	2-11	3	2.8	66.7	25.0
Northern searobin	8-18	4	0.3	50.0	12.5
Oyster toadfish	4-13	15	2.2	26.7	28.3
Oyster toadfish	18-28	15	11.7	33.3	3579.3
Pumpkinseed	9&10	2	0.2	50.0	2.5
Sheepshead minnow	3-5	29	-	34.5	-
Smooth dogfish	39-56	12	5.5	75.0	5544.2
Spot	3-10	48	0.1	2.1	0.1
Spot	11-19	44	0.4	34.1	1.8
Spotted hake	5-19	16	1.9	12.5	31.6
Striped burnfish	23&25	2	1.3	100.0	585.0
Striped killfish	4-13	13	0.6	15.4	0.8
Summer flounder	6-24	25	0.2	24.0	9.8
Summer flounder	26-25	13	1.1	38.5	770.0
Tautog	6-16	18	LT.1	16.7	0.8
Tautog	20-32	7	2.3	85.7	306.4

Plant detritus (con't)

Consumer Species	Size Range of Consumer (cm)	Sample Size	% Volume	% Occurrence	mlx10-4/ Fish
White perch	7-12	18	LT.1	5.6	0.3
White perch	14-26	54	1.1	31.5	59.4
White mullet	3-14	11	-	63.7	-
Weakfish	11-17	22	LT.1	9.1	1.6
Windowpane	15-34	4	LT.1	50.0	2.5
Winter flounder	3-11	56	0.5	25.0	2.2
Winter flounder	12-21	41	0.4	29.3	19.4
Winter flounder	22-33	45	1.2	57.8	223.9

Algae

Consumer Species	Size Range of Consumer (cm)	Sample Size	% Volume	% Occurrence	mlx10-4/ Fish
Alewife	27-34	5	1.5	40.0	29.0
American eel	11-61	10	0.1	10.0	50.0
Atlantic menhaden	4-8	19	-	68.4	-
Atlantic menhaden	11-16	15	-	100.0	-
Atlantic menhaden	25-28	8	-	87.5	-
Atlantic silversides	3-13	85	LT.1	7.1	0.3
Banded killifish	3-10	18	15.7	38.9	13.6
Blueback herring	7-15	13	LT.1	7.7	0.4
Fourspine stickleback	2-6	76	0.5	7.9	0.2
Golden shiner	15-18	3	1.0	33.3	1.7
Mummichog	3-11	34	1.4	44.1	3.7
Northern pipefish	9-21	21	0.2	4.8	0.8
Planehead filefish	5-13	2	39.7	50.0	500.0
Rainwater killifish	3-4	9	3.5	22.2	0.7
Sheepshead minnow	3-5	29	-	96.6	-
Spot	11-19	44	LT.1	2.3	0.1
Striped mullet	11-16	4	-	100.0	-
Threespine stickleback	5-7	6	2.0	16.7	0.9
Tidewater silversides	4-9	37	1.4	24.3	0.5
White mullet	3-14	11	-	54.5	-

Phylum Porifera

Consumer Species	Size Range of Consumer (cm)	Sample Size	% Volume	% Occurrence	mlx10-4/ Fish
Summer flounder	26-65	13	1.5	7.7	0.11

Phylum Cnidaria
Class Hydrozoa

Consumer Species	Size Range of Consumer (cm)	Sample Size	% Volume	% Occurrence	mlx10-4/ Fish
Atlantic silversides	3-13	85	0.5	2.4	2.4
Bay anchovy	5-11	101	LT.1	1.0	0.001
Blueback herring	7-15	13	LT.1	7.7	0.38
Cunner	3-5	4	2.3	25.0	1.25
Mummichog	3-11	34	0.1	8.8	0.30
Northern puffer	2-11	3	0.4	66.7	3.33
Phanehead filefish	5&13	2	19.8	50.0	250.
Sheepshead minnow	3-5	29	-	13.8	-
Spot	3-10	48	0.2	4.2	0.21
Spot	11-19	44	0.1	11.4	0.57
Striped killifish	4-13	13	0.3	7.7	0.38
Tautog	6-16	18	0.8	16.7	11.67
White perch	14-26	54	LT.1	1.9	0.09
Winter flounder	3-11	56	LT.1	1.8	0.36
Winter flounder	12-21	41	0.5	7.3	24.6
Winter flounder	22-33	45	0.4	8.9	81.3

Class Anthozoa
Order Actiniaria

Consumer Species	Size Range of Consumer (cm)	Sample Size	% Volume	% Occurrence	Ind/ Fish
Windowpane	15-34	4	LT.1	25.0	0.25

Phylum Platyhelminthes
Class Turbellaria

Consumer Species	Size Range of Consumer (cm)	Sample Size	% Volume	% Occurrence	Fish
Atlantic menhaden	4-8	19	1.2	21.1	0.42
Bay anchovy	5-11	101	1.0	41.6	2.38
Blueback herring	7-15	13	LT.1	7.7	0.08
Bluefish	11-20	62	LT.1	1.6	0.16
Fourspine stickleback	2-6	76	0.1	7.9	0.18
Naked goby	3-5	8	1.9	25.0	0.38
Northern pipefish	9-21	21	0.9	23.8	1.95
Northern puffer	2-11	3	LT.1	33.3	0.33
Rainwater killifish	3-4	9	3.1	22.2	0.22
Spot	3-10	48	0.3	10.4	0.21
Spot	11-19	44	0.1	11.4	0.32
Striped killifish	4-13	13	LT.1	7.7	0.08
Striped searobin	4-7	3	4.5	33.3	3.67
Tidewater silersides	4-9	37	0.3	10.8	0.22
Winter flounder	3-11	56	LT.1	19.6	0.38
Winter flounder	12-21	41	LT.1	2.4	0.02

Phylum Nemertea

Consumer Species	Size Range of Consumer (cm)	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
American eel	11-61	10	LT.1	10.0	0.1	1
Brown bullhead	21-35	5	0.1	20.0	0.2	4
Winter flounder	12-21	41	1.5	2.4	0.02	3
Winter flounder	22-33	45	12.2	4.4	0.04	2

Phylum Aschelminthes
Class Nematoda

Consumer Species	Size Range of Consumer (cm)	Sample Size	% Volume	% Occurrence	Ind/ Fish
Atlantic silversides	3-13	85	LT.1	1.2	0.01
Banded killifish	3-10	18	LT.1	5.6	0.11
Bay anchovy	5-11	101	LT.1	2.0	0.02
Cunner	3-5	4	0.2	25.0	0.25
Fourspine stickleback	2-6	76	2.4	10.5	0.59
Mummichog	3-11	34	LT.1	14.7	0.21
Northern pipefish	9-21	21	LT.1	9.5	0.14
Oyster toadfish	4-13	15	2.0	60.0	2.00
Oyster toadfish	18-28	15	0.7	53.3	4.73
Red hake	8-20	3	0.2	33.3	2.00
Spot	3-10	48	1.7	50.0	20.85
Spot	11-19	44	1.1	50.0	28.00
Spotted hake	5-19	16	LT.1	18.8	0.38
Striped killifish	4-13	13	0.1	30.8	1.69
Summer flounder	6-24	25	LT.1	4.0	0.04
Tautog	6-16	18	0.9	55.6	13.89
Tautog	20-32	7	LT.1	42.9	4.71
White perch	14-26	54	LT.1	1.9	0.02
Winter flounder	3-11	56	LT.1	21.4	4.11
Winter flounder	12-21	41	LT.1	17.1	2.15
Winter flounder	22-33	45	LT.1	6.7	0.40

Phylum Bryozoa

Consumer Species	Size Range of Consumer (cm)	Sample Size	% Volume	% Occurrence	mlx10-4/ Fish
Brown bullhead	21-35	5	LT.1	20.0	14.00
Summer flounder	6-24	25	LT.1	4.0	0.20
Tautog	20-32	7	2.1	28.6	285.71
Winter flounder	3-11	56	2.1	1.8	8.93

Phylum Mollusca
Class Gastropoda - Larval Forms

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Atlantic menhaden	4-8	19	-	5.3	0.11	5
Atlantic silversides	3-13	85	LT.1	2.4	0.56	2
Bay anchovy	5-11	101	1.9	27.7	12.5	1
Northern puffer	2-11	3	LT.1	33.3	3.0	6
Spot	3-10	48	LT.1	2.1	0.02	7
Spot	11-19	44	LT.1	2.3	1.25	3
Tidewater silversides	4-9	37	LT.1	2.7	0.14	4

Class Gastropoda - Adult Forms Total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/ Fish
American eel	11-61	10	LT.1	10.0	0.10
Atlantic silversides	3-13	85	LT.1	1.2	0.01
Brown Bullhead	21-35	5	0.1	20.0	0.20
Fourspine stickleback	2-6	76	0.3	2.6	0.12
Northern puffer	2-11	3	55.4	66.7	8.00
Oyster toadfish	18-28	15	4.2	33.3	0.60
Permit	8	1	100.0	100.0	16.0
Silver perch	3-12	26	LT.1	3.8	0.04
Spot	11-19	44	LT.1	2.3	0.07
Striped burrfish	23&25	2	1.7	50.0	0.50
Tautog	20-32	7	0.7	42.9	5.43
Winter flounder	12-21	41	0.3	4.9	0.12
Winter flounder	22-33	45	LT.1	8.9	0.16

Genus Bittium

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Fourspine stickleback	2-6	76	0.2	1.3	0.01	1
Oyster toadfish	18-28	15	LT.1	6.7	0.06	5
Silver perch	3-12	26	LT.1	3.8	0.04	2
Tautog	20-32	7	0.1	28.6	1.57	3
Winter flounder	12-21	41	0.1	2.4	0.02	6
Winter flounder	22-33	45	LT.1	4.4	0.09	4

Genus Crepidula

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Fourspine stickleback	2-6	76	LT.1	1.3	0.11	1
Northern puffer	2-11	3	55.4	66.7	8.0	3
Oyster toadfish	18-28	15	LT.1	6.7	0.07	5
Permit	8	1	99.0	100.	15.0	4
Tautog	20-32	7	0.6	42.9	3.86	2
Winter flounder	12-21	41	LT.1	2.4	0.07	6
Winter flounder	22-23	45	LT.1	2.2	0.04	7

Mitrella lunata

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
American eel	11-61	10	LT.1	10.0	0.1	1
Oyster toadfish	18-28	15	LT.1	6.7	0.07	2
Permit	8	1	1.0	100.0	1.0	3
Winter flounder	22-33	45	LT.1	2.2	0.02	4

Family Nassariidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Brown bullhead	21-35	5	0.1	20.0	0.2	3
Oyster toadfish	18-28	15	3.3	13.3	0.13	1
Striped burrfish	23&25	2	1.7	50.0	0.50	2

Haminoea solitaria

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Oyster toadfish	18-28	15	0.8	13.3	0.27	1
Winter flounder	12-21	41	0.1	2.4	0.02	2

Class Plecypoda
Larval Forms

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Bay anchovy	5-11	101	LT.1	1.0	0.01	2
Spot	11-19	44	LT.1	2.3	0.59	1

Class Pelecypoda
Adult Forms Total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
American eel	11-61	10	1.0	10.0	0.1	8
Black seabass	6-21	17	3.9	5.9	0.18	17
Brown bullhead	21-35	5	0.5	20.0	0.2	14
Fourspine stickleback	2-6	76	3.0	1.3	0.08	4
Grey snapper	4&5	2	2.4	50.0	0.5	9
Lined seahorse	8-12	3	1.3	33.3	0.33	13
Oyster toadfish	18-28	15	0.4	6.7	0.07	11
Planehead filefish	5&13	2	9.9	50.0	0.5	10
Scup	14	1	0.1	100.0	2.0	10
Smooth dogfish	39-56	12	0.1	8.3	0.08	16
Spot	3-10	48	2.4	10.4	0.31	5
Spot	11-19	44	5.7	6.8	1.68	1
Striped burrfish	23&25	2	1.1	50.0	0.5	7
Striped bass	43-58	11	0.3	9.1	0.09	18
Tautog	20-32	7	0.5	14.3	0.29	12
White perch	14-26	54	0.3	3.7	0.07	15
Winter flounder	3-11	56	0.2	7.1	0.14	6
Winter flounder	12-21	41	22.7	34.1	3.9	3
Winter flounder	22-33	45	13.8	53.3	6.27	2

Family Mytilidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Fourspine stickleback	2-6	76	3.0	1.3	0.08	1
Lined seahorse	8-12	3	1.3	33.3	0.33	4
Spot	11-19	44	LT.1	2.3	0.02	2
Striped burrfish	23&25	2	1.1	50.0	0.50	3
Striped bass	43-58	11	0.3	9.1	0.09	5

Laevicardium mortoni

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Winter flounder	22-33	45	LT.1	2.2	0.02

Family Veneridae*

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	% Ind/Fish	P.I. Rank
Scup	14	1	0.1	100.0	2.0	3
Spot	3-10	48	1.7	4.2	0.15	2
Spot	11-19	44	2.9	2.3	1.59	1

*Does not include siphon tips

Family Tellinidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Winter flounder	23-33	45	LT.1	2.2	0.02

<u>Tagelus divisus</u>

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Winter flounder	12-21	41	LT.1	2.4	0.02

Enis directus

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Oyster toadfish	18-28	15	0.4	6.7	0.06	1
Winter flounder	12-21	41	0.2	2.4	0.02	2

Mya arenaria

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
American eel	11-61	10	1.0	10.0	1.0

Lyonsia hyalina

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Winter flounder	22-33	45	1.2	2.2	0.16

Solemya velum

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Black seabass	6-21	17	3.9	5.9	0.18	1
Smooth dogfish	39-56	12	LT.1	8.3	0.08	3
Tautog	20-32	7	0.5	14.3	0.14	2

Siphon Tips - Class Pelecypoda

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Spot	11-19	44	2.7	2.3	0.05	3
White perch	14-26	54	LT.1	1.9	0.02	5
Winter flounder	3-11	56	0.2	7.1	0.4	4
Winter flounder	12-21	41	22.5	29.3	3.85	2
Winter flounder	22-23	45	12.4	51.1	6.02	1

Phylum Annelida
Class Oligochaeta

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Fourspine stickleback	2-6	76	0.3	2.6	0.34	2
Pumpkinseed	9&10	2	0.4	50.0	0.5	4
Spot	11-19	44	4.2	6.8	3.09	1
Winter flounder	3-11	56	LT.1	1.8	0.02	3

Class Hirudinea

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Mummichog	3-11	34	0.1	2.9	0.03

Class Polychaeta - larval forms

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Atlantic menhaden	4-8	19	-	15.8	0.58	2
Atlantic menhaden	11-16	15	-	6.7	0.07	5
Bay anchovy	5-11	101	1.0	5.0	0.21	1
Blueback herring	7-15	13	LT.1	7.7	0.46	3
Fourspine stickleback	2-6	76	LT.1	1.3	0.01	4
Spot	3-10	48	LT.1	2.1	0.02	6
Striped killifish	4-13	13	0.3	7.7	0.08	7
Winter flounder	3-11	56	LT.1	1.8	0.02	8

Class Polychaeta - Total Adult Forms

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Atlantic menhaden	4-8	19	-	5.3	1.42
Atlantic menhaden	11-16	15	-	6.7	0.07
Atlantic needlefish	5-16	15	3.2	20.0	0.20
Atlantic silversides	3-13	85	8.0	3.5	0.20
Banded killifish	3-10	18	10.1	33.3	0.33
Bay anchovy	5-11	101	1.0	13.9	0.76
Black seabass	6-21	17	LT.1	11.8	0.12
Bluefish	6-10	16	28.6	25.0	0.50
Bluefish	11-20	62	LT.1	3.2	0.03
Brown bullhead	21-35	5	16.0	40.0	25.8
Cunner	3-5	4	2.3	25.0	0.25
Fourspine stickleback	2-6	76	6.7	10.5	0.18
Golden shinner	15-18	3	22.5	33.3	0.33
Grey snapper	4&5	2	23.7	50.0	0.50
Hogchoker	2-17	7	48.4	57.1	0.57
Lined seahorse	8-12	3	4.0	33.3	0.33
Mummichog	3-11	34	3.3	14.7	0.18
Naked goby	3-5	8	52.4	25.0	0.50
Northern kingfish	15&19	2	20.6	50.0	2.0
Northern puffer	2-11	3	18.4	33.3	0.67
Oyster toadfish	4-13	15	23.0	33.3	0.60
Planehead filefish	5&13	2	9.9	50.0	0.50
Pumpkinseed	9&10	2	79.6	100.0	8.0
Rainwater killifish	3-4	9	11.8	11.1	0.11
Scup	14	1	37.6	100.0	4.0
Silver perch	3-12	26	0.3	3.8	0.04
Smooth dogfish	39-56	12	LT.1	8.3	0.08
Spot	3-10	48	6.4	29.2	1.10
Spot	11-19	44	29.4	31.8	6.32
Striped bass	43-58	11	0.1	9.1	0 09
Striped killifish	4-13	13	10.8	38.5	2.38
Tautog	6-16	18	3.6	11.1	0.17
Tautog	20-32	7	1.2	42.9	0.57

Class Polychaeta - Total Adult Forms (con't)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
White perch	7-12	18	7.7	38.9	0.39
White perch	14-26	54	3.7	31.5	0.76
White perch	29-37	7	1.8	28.5	0.29
Weakfish	5-10	27	LT.1	3.7	0.04
Weakfish	11-17	22	LT.1	4.5	0.05
Weakfish	32-62	2	LT.1	50.0	0.50
Winter flounder	3-11	56	61.2	83.9	6.98
Winter flounder	12-21	41	41.4	65.9	9.50
Winter flounder	22-3	45	33.1	77.8	9.20

Family Phyllodocidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Black seabass	6-21	17	LT.1	5.9	0.06	8
Fourspine stickleback	2-6	76	2.3	1.3	0.01	6
Mummichog	3-11	34	LT.1	2.9	0.03	4
Naked goby	3-5	8	30.6	25.0	0.38	3
Spot	3-10	48	0.2	6.3	0.15	2
Spot	11-19	44	0.7	6.8	0.16	1
Winter flounder	3-11	56	4.1	21.4	0.68	5
Winter flounder	22-33	45	LT.1	6.7	0.16	7

Family Aphroditidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Winter flounder	3-11	56	LT.1	1.8	0.02	2
Winter flounder	12-21	41	1.2	2.4	0.02	1

Family Polynoidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Winter flounder	12-21	41	LT.1	2.4	0.10	1
Winter flounder	22-33	45	0.1	2.2	0.02	2

Genus Stenelais

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Winter flounder	22-33	45	0.3	2.2	0.02

Family Syllidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Fourspine stickleback	2-6	76	0.1	1.3	0.01	1
Spot	11-19	44	LT.1	2.3	0.02	2

Genus Glycera

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Northern kingfish	15&19	2	9.9	50.0	0.50	5
White perch	14-26	54	1.2	1.9	0.02	4
Winter flounder	3-11	56	0.3	3.6	0.04	3
Winter flounder	12-21	41	5.2	7.3	0.12	2
Winter flounder	22-33	45	8.3	11.1	0.42	1

Family Goniadidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Winter flounder	3-11	56	11.0	14.3	0.21	1
Winter flounder	12-21	41	9.9	4.9	0.05	2

Genus Nephtys

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Bluefish	6-10	16	11.2	6.3	0.13	3
Spot	11-19	44	2.7	2.3	0.02	1
Winter flounder	22-33	41	0.7	2.4	0.05	2

Genus Nereis

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Atlantic needlefish	5-16	15	1.2	6.7	0.07	15
Atlantic silversides	3-13	85	8.0	2.4	0.19	1
Bay anchovy	5-11	101	0.4	4.0	0.05	2
Bluefish	6-10	16	17.4	18.8	0.38	13
Bluefish	11-20	62	LT.1	3.2	0.03	16
Brown bullhead	21-35	5	0.5	20.0	0.20	19
Hogchoker	2-17	7	5.4	14.3	0.14	10
Oyster toadfish	4-13	15	20.1	26.7	0.47	5
Pumpkinseed	9&10	2	50.3	50.0	1.00	17
Rainwater killifish	3-4	9	11.8	11.1	0.11	9
Silver perch	3-12	26	0.3	3.8	0.04	8
Spot	3-10	48	0.3	2.1	0.06	6
Spot	11-19	44	3.7	6.8	0.07	4
Tautog	20-32	7	LT.1	14.3	0.14	20
White perch	14-26	54	0.3	3.7	0.04	14
White perch	29-37	7	1.8	28.6	0.29	11
Weakfish	11-17	22	LT.1	4.5	0.05	18
Winter flounder	3-11	56	3.5	7.1	0.23	7
Winter flounder	12-21	41	12.4	24.4	1.27	3
Winter flounder	22-33	45	LT.1	4.4	0.04	12

Family Spionidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Atlantic menhaden	4-8	19	0.3	5.2	1.42	5
Bay anchovy	5-11	101	0.2	5.9	0.24	2
Brown bullhead	21-35	5	7.1	40.0	20.2	8
Fourspine stickleback	2-6	76	0.1	3.9	0.08	3
Spot	11-19	44	6.9	4.5	4.84	1
White perch	14-26	54	LT.1	1.9	0.04	9
Winter flounder	3-11	56	4.6	25.0	1.98	6
Winter flounder	12-21	41	2.1	17.0	1.71	7
Winter flounder	22-33	45	1.1	11.1	2.82	4

Family Capitellidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Brown bullhead	21-35	5	0.1	20.0	0.4	6
Naked goby	3-5	8	21.8	12.5	0.13	3
Northern kingfish	15&19	2	9.9	50.0	1.0	4
Winter flounder	3-11	56	11.5	12.5	1.61	2
Winter flounder	12-21	41	12.6	9.8	5.32	1
Winter flounder	22-33	45	LT.1	2.2	0.04	5

Family Maldanidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Grey snapper	4&5	2	23.7	50.0	0.5	5
Scup	14	1	37.5	100.0	3.0	3
Winter flounder	3-11	56	13.1	5.4	0.09	4
Winter flounder	12-21	41	2.2	4.9	0.37	1
Winter flounder	22-33	45	0.5	8.9	0.16	2

Family Terebellidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Scup	14	1	LT.1	100.0	1.0	3
Winter flounder	3-11	56	2.6	3.6	0.04	4
Winter flounder	12-21	41	3.6	9.8	0.32	2
Winter flounder	22-33	45	16.5	48.9	4.0	1

Genus Aricidea

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Winter flounder	22-23	45	LT.1	2.2	0.07

Genus Lumbrineris

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Tautog	20-32	7	1.0	14.3	0.29	2
Winter flounder	3-11	56	2.6	5.4	0.07	1
Winter flounder	22-33	45	LT.1	2.2	0.02	3

Arabella iricolor

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Winter flounder	22-33	45	1.1	4.4	0.07

Sabella microphthalma

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	ind/fish
Winter flounder	12-21	41	0.3	7.3	0.07

Genus Scoloplos

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Winter flounder	3-11	56	LT.1	1.8	0.02	3
Winter flounder	12-21	41	LT.1	2.4	0.02	2
Winter flounder	22-33	45	0.2	2.2	0.77	1

Hypaniola grayi

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Pumpkinseed	9&10	2	21.0	50.0	6.5	7
Spot	3-10	48	4.6	4.2	0.6	2
Spot	11-19	44	5.8	4.5	0.75	1
Striped killifish	4-13	13	0.1	7.7	0.23	4
White perch	14-26	54	LT.1	1.9	0.06	6
Winter flounder	3-11	56	1.5	14.3	0.70	3
Winter flounder	22-33	45	0.1	4.4	0.11	5

Phylum Arthropoda

Class Merostomata
Limulus polyphemus

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Winter flounder	12-21	41	LT.1	2.4	0.07

Class Arachnida
Order Acari

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Fourspine stickleback	2-6	76	LT.1	1.3	0.01	2
Tidewater silversides	4-9	37	LT.1	2.7	0.03	1

Class Insecta
All forms - Total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Alewife	6-13	6	0.2	33.3	0.33
Atlantic needlefish	5-16	15	41.7	46.7	5.00
Atlantic needlefish	25-58	5	11.8	60.0	8.00
Atlantic silversides	3-13	85	1.1	14.1	0.74
Banded killifish	3-10	18	2.2	16.7	1.06
Bay anchovy	5-11	101	0.3	6.9	0.10
Blueback herring	7-15	13	0.3	7.7	0.23
Bluefish	6-10	16	0.2	6.3	0.06
Brown bullhead	21-35	5	0.2	60.0	0.80
Fourspine stickleback	2-6	76	0.3	3.9	0.07
Hogchoker	2-17	7	6.1	42.9	1.57
Mummichog	3-11	34	2.1	32.4	2.00
Pumpkinseed	9&10	2	1.3	50.0	1.00
Rainwater killifish	3-4	9	4.2	22.2	0.89
Sheepshead minnow	3-5	29	-	3.4	0.03
Spot	3-10	48	LT.1	2.1	0.02
Spot	11-19	44	0.9	18.2	0.50
Striped killifish	4-13	13	4.0	15.4	0.15
Tidewater silversides	4-9	37	6.8	18.9	0.51
White perch	7-12	18	2.1	27.8	2.11
White perch	14-26	54	1.1	33.3	3.24
White perch	29-37	7	LT.1	14.3	0.71

Class Insecta
Larval Forms, Total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Alewife	6-13	6	0.1	16.7	0.17
Atlantic silversides	27-34	85	LT.1	1.2	0.02
Banded killifish	3-10	18	2.3	16.7	1.06
Bay anchovy	5-11	101	0.2	6.9	0.09
Blackback herring	7-15	13	0.4	7.7	0.23
Brown bullhead	21-35	5	0.2	60.0	0.80
Fourspine stickleback	2-6	76	0.3	4.0	0.07
Hogchoker	2-17	7	6.1	42.9	1.57
Mummichog	3-11	34	2.0	29.4	1.94
Pumpkinseed	9&10	2	1.3	50.0	1.00
Rainwater killifish	3-4	9	4.2	22.2	0.89
Sheepshead minnow	3-5	29	-	3.4	0.03
Spot	3-10	48	LT.1	2.1	0.02
Spot	11-19	44	0.9	18.2	0.50
Tidewater silversides	4-9	37	0.6	8.1	1.03
White perch	7-12	18	2.1	27.8	2.11
White perch	14-26	54	1.1	31.5	3.11
White perch	29-37	7	LT.1	14.3	0.71

Family Chironimidae
Larval Forms

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Alewife	6-13	6	0.1	16.7	0.17	16
Banded killifish	3-10	18	2.3	16.7	1.06	4
Bay anchovy	5-11	101	0.2	6.9	0.09	3
Blueback herring	7-15	13	0.4	7.7	0.23	11
Brown bullhead	21-35	5	0.2	60.0	0.80	14
Fourspine stickleback	2-6	76	0.3	4.0	0.07	6
Hogchoker	2-17	7	6.1	42.9	1.57	9
Mummichog	3-11	34	2.0	26.5	1.88	1
Pumpkinseed	9&10	2	1.3	50.0	1.00	17
Rainwater killifish	3-4	9	4.2	22.2	0.89	10
Sheepshead minnow	3-5	29	-	3.45	0.03	15
Spot	3-10	48	LT.1	2.1	0.02	13
Spot	11-19	44	0.5	13.6	0.32	7
Tidewater silversides	4-9	37	0.6	8.1	1.03	2
White perch	7-12	18	2.1	27.8	2.11	8
White perch	14-26	54	1.0	27.8	3.09	5
White perch	29-37	7	LT.1	14.3	0.71	12

Class Insecta
Adult Forms, Total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Alewife	6-13	6	0.1	16.7	0.17	9
Atlantic needlefish	5-16	15	41.7	46.7	5.00	3
Atlantic needlefish	24-58	5	11.8	60.0	8.00	4
Atlantic silversides	3-13	85	1.1	14.1	0.72	1
Bay anchovy	5-11	101	0.1	1.0	0.01	6
Bluefish	6-10	16	0.2	6.3	0.06	10
Mummichog	3-11	34	0.1	5.9	0.06	5
Striped killifish	4-13	13	4.0	15.4	0.15	7
Tidewater silversides	4-9	37	6.3	13.5	0.41	2
White perch	14-26	54	LT.1	3.7	0.13	8

Class Crustacea
Subclass Branchiopoda
Order Cladocera

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Atlantic menhaden	4-8	19	-	26.3	9.6	4
Atlantic needlefish	5-16	15	LT.1	6.7	0.67	5
Atlantic silversides	3-13	85	LT.1	3.5	1.96	2
Bay anchovy	5-11	101	2.2	7.9	35.35	1
Northern puffer	2-11	3	LT.1	33.3	0.33	7
Spot	3-10	48	LT.1	2.1	0.02	6
Tidewater silversides	4-9	37	0.5	8.1	1.89	3

Subclass Ostracoda

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Alewife	27-34	5	LT.1	20.0	1.40	8
Atlantic silversides	3-13	85	LT.1	1.2	0.01	7
Bay anchovy	5-11	101	0.2	30.7	0.98	1
Blueback herring	7-15	13	LT.1	15.4	0.77	6
Fourspine stickleback	2-6	76	LT.1	3.9	0.07	3
Northern puffer	2-11	3	LT.1	66.7	2.33	10
Spot	3-10	48	LT.1	4.7	0.35	5
Spot	11-19	44	LT.1	9.1	0.27	4
Spotted hake	5-19	16	LT.1	6.3	0.13	12
Tidewater silversides	4-9	37	0.3	5.4	0.30	2
Winter flounder	3-11	56	0.2	10.7	0.13	11
Winter flounder	22-33	41	LT.1	2.4	0.20	9

Subclass Copepoda - Total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Alewife	6-13	6	LT.1	16.7	0.83
Alewife	27-34	5	65.5	100.0	2077.8
American sandlance	9-12	4	100.0	100.0	523.75
Atlantic menhaden	4-8	19	-	68.4	39.6
Atlantic menhaden	11-16	15	-	33.3	28.4
Atlantic menhaden	25-28	8	-	75.0	98.75
Atlantic needlefish	5-16	15	LT.1	6.7	1.67
Atlantic silversides	3-13	85	9.2	42.4	101.81
Banded killifish	3-10	18	0.2	11.1	0.61
Bay anchovy	5-11	101	53.6	87.1	148.16
Blueback herring	7-15	13	48.5	100.0	972.62
Bluefish	6-10	16	0.2	18.75	9.0
Bluefish	11-20	62	LT.1	1.6	0.02
Brown bullhead	21-35	5	LT.1	20.0	0.20
Cunner	3-5	4	0.5	75.0	1.0
Fourspine stickleback	2-6	76	14.9	73.7	19.87
Golden shiner	15-18	3	20.1	33.3	108.0
Grey snapper	4&5	2	1.9	50.0	0.5
Hogchoker	2-17	7	LT.1	14.3	0.28
Mummichog	3-11	34	LT.1	17.6	0.29
Northern pipefish	9-21	21	2.1	42.9	18.9
Northern puffer	2-11	3	LT.1	33.3	0.67
Oyster toadfish	4-13	15	LT.1	6.7	0.80
Rainwater killifish	3-4	9	5.0	44.4	2.67
Sheepshead minnow	3-5	29	-	27.6	-
Silver perch	3-12	26	LT.1	11.5	1.38
Spot	3-10	48	33.5	91.7	170.33
Spot	11-19	44	11.2	70.5	204.09
Spotted hake	5-19	16	0.1	25.0	3.75
Striped killifish	4-13	13	0.4	15.4	4.38
Striped searobin	4-7	3	0.4	33.3	1.0
Tautog	6-16	18	LT.1	11.1	0.17
Threespine stickleback	5-7	6	12.3	83.3	11.5
Tidewater silversides	4-9	37	70.7	81.1	73.2
White perch	7-12	18	0.2	11.1	5.72
White perch	14-26	54	5.5	14.8	170.0
Winter flounder	3-11	56	LT.1	28.6	1.50

Order Calanoida

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Alewife	6-13	6	LT.1	16.7	0.83	23
Alewife	27-34	5	65.5	100.0	2077.8	6
American sandlance	9-12	4	100.0	100.0	523.75	5
Atlantic menhaden	4-8	19	-	63.2	19.42	12
Atlantic menhaden	11-16	15	-	20.0	28.27	9
Atlantic menhaden	25-28	8	-	37.5	67.5	11
Atlantic silversides	3-13	85	9.2	40.0	101.73	2
Bay anchovy	5-11	101	52.6	77.2	143.83	1
Blueback herring	7-15	13	48.2	100.0	962.9	3
Bluefish	6-10	16	0.2	18.8	9.0	21
Bluefish	11-20	62	LT.1	1.6	0.02	30
Cunner	3-5	4	0.4	50.0	0.75	28
Fourspine stickleback	2-6	76	12.4	50.0	14.37	4
Golden shiner	15-18	3	19.6	33.3	104.33	17
Grey snapper	4&5	2	1.9	50.0	0.5	25
Mummichog	3-11	34	LT.1	5.9	0.09	19
Northern pipefish	9-21	21	1.4	33.3	10.57	13
Northern puffer	2-11	3	LT.1	33.3	0.67	26
Rainwater killifish	3-4	9	3.9	22.2	1.78	18
Sheepshead minnow	3-5	29	-	10.3	-	?
Silver perch	3-12	26	LT.1	11.5	1.35	15
Spot	3-10	48	0.4	4.2	1.42	14
Spot	11-19	44	0.9	29.5	11.68	10
Spotted hake	5-19	16	0.1	25.0	3.75	22
Striped searobin	4-7	3	0.4	33.3	1.0	29
Tautog	6-16	18	LT.1	11.1	0.11	27
Threespine stickleback	5-7	6	12.0	66.7	11.0	20
Tidewater silversides	4-9	37	13.6	37.8	15.5	7
White perch	7-12	18	0.2	11.1	5.72	16
White perch	14-26	54	5.5	14.8	170.0	8
Winter flounder	3-11	56	LT.1	7.1	0.07	24

Order Harpacticoida

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Atlantic menhaden	4-8	19	-	21.1	19.37	6
Atlantic menhaden	11-16	15	-	20.0	0.13	16
Atlantic menhaden	25-28	8	-	12.5	0.13	19
Atlantic needlefish	5-16	15	LT.1	6.7	1.67	14
Atlantic silversides	3-13	85	LT.1	7.1	0.08	9
Bay anchovy	5-11	101	0.6	42.6	3.38	3
Blueback herring	7-15	13	0.4	46.2	9.69	7
Brown bullhead	21-35	5	LT.1	20.0	0.20	23
Cunner	3-5	4	0.1	25.0	0.25	24
Fourspine stickleback	2-6	76	2.0	42.1	4.47	4
Golden shiner	15-18	3	0.4	33.3	3.67	20
Hogchoker	2-17	7	LT.1	14.3	0.29	17
Mummichog	3-11	34	LT.1	14.7	0.21	8
Northern pipefish	9-21	21	LT.1	19.0	0.43	12
Oyster toadfish	4-13	15	LT.1	6.7	0.80	15
Rainwater killifish	3-4	9	1.1	22.2	0.89	13
Sheepshead minnow	3-5	29	-	13.8	-	?
Silver perch	3-12	26	LT.1	3.8	0.04	18
Spot	3-10	48	13.7	35.4	88.17	2
Spot	11-19	44	10.3	59.1	191.45	1
Striped killifish	4-13	13	0.4	15.4	4.38	10
Tautog	6-16	18	LT.1	5.6	0.06	22
Threespine stickleback	5-7	6	0.2	16.7	0.33	21
Tidewater silversides	4-9	37	1.0	24.3	2.24	5
Winter flounder	3-11	56	LT.1	25.0	1.43	11

Order Cyclopoda

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Bay anchovy	5-11	101	LT.1	2.0	0.02	1
Spot	11-19	44	LT.1	2.3	0.05	2

Subclass Cirripedia - Adult Forms

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Bluefish	6-10	62	LT.1	1.6	0.02	5
Tautog	6-16	18	0.6	5.6	0.11	2
White perch	14-26	54	0.2	1.9	0.02	3
Winter flounder	3-11	56	LT.1	1.8	0.02	4
Winter flounder	22-33	45	LT.1	4.4	0.04	1

Subclass Cirripedia - larval Forms

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Atlantic menhaden	4-8	19	-	15.8	0.21	4
Atlantic silversides	3-13	85	LT.1	1.2	0.01	3
Bay anchovy	5-11	101	LT.1	10.9	0.22	1
Tidewater silversides	4-9	37	LT.1	2.7	0.05	2

Subclass Malacostraca
Order Cumacea

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Banded killifish	3-10	18	3.1	38.9	0.83	1
Bay anchovy	5-11	101	LT.1	2.0	0.03	3
Spot	3-10	48	2.9	12.5	0.50	2
Spot	11-19	44	0.1	5.5	0.09	6
Tidewater silversides	4-9	37	0.1	5.4	0.05	5
Winter flounder	3-11	56	2.1	30.4	1.52	4
Winter flounder	27-33	45	LT.1	2.2	0.02	7

Orders Tanaidacea and Isopoda - Total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
American eel	11-61	10	0.1	10.0	0.50
Atlantic silversides	3-13	85	LT.1	1.2	0.01
Banded killifish	3-10	18	10.5	16.7	0.44
Bay anchovy	5-11	101	LT.1	2.0	0.02
Black seabass	6-21	17	3.0	35.3	1.12
Brown bullhead	21-35	5	2.3	80.0	5.60
Cunner	3-5	4	12.6	50.0	3.25
Fourspine stickleback	2-6	76	6.1	3.9	0.04
Grey snapper	4&5	2	19.0	50.0	0.50
Mummichog	3-11	34	0.6	2.9	0.03
Naked goby	3-5	8	0.3	12.5	0.13
Northern pipefish	9-21	21	0.5	14.3	0.29
Northern puffer	2-11	3	18.4	66.7	1.33
Oyster toadfish	4-13	15	19.9	46.7	0.87
Oyster toadfish	18-28	15	2.9	33.3	2.53
Scup	14	1	2.3	100.0	1.0
Silver perch	3-12	26	0.1	3.8	0.04
Spot	3-10	48	1.1	12.5	0.17
Spot	11-19	44	2.1	15.9	1.77
Spotted hake	5-19	16	0.5	18.8	0.19
Striped burrfish	23&25	2	0.6	50.0	1.00
Striped killifish	4-13	13	16.8	30.8	1.54
Tautog	6-16	18	63.3	55.6	3.56
Tautog	20-32	7	1.7	42.9	1.00
Tidewater silversides	4-9	37	0.3	2.7	0.03
White perch	14-26	54	0.3	9.3	0.17
Winter flounder	3-11	56	1.0	17.9	0.30
Winter flounder	12-21	41	3.7	26.8	0.51
Winter flounder	22-33	45	1.5	26.7	0.76

Tanais cavolina

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Spot	11-19	44	1.1	9.1	1.64	1
Striped killifish	4-13	13	0.4	7.7	0.08	2
White perch	14-26	54	LT.1	1.9	0.02	3
Winter flounder	3-11	56	LT.1	1.8	0.02	4

Leptochelia savignyi

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Bay anchovy	5-11	101	LT.1	1.0	0.01

Cyathura polita

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Banded killifish	3-10	18	10.5	16.7	0.44	1
Brown bullhead	21-35	5	1.7	80.0	3.00	7
Oyster toadfish	4-13	15	6.1	20.0	0.33	6
Scup	14	1	2.3	100.0	1.00	11
Spot	3-10	48	0.5	8.3	0.10	5
Spot	11-19	44	1.0	9.1	0.11	2
Tidewater silversides	4-9	37	0.3	2.7	0.03	3
White perch	14-26	54	0.3	9.3	0.15	8
Winter flounder	3-11	56	0.4	7.1	0.11	10
Winter flounder	12-21	41	0.9	14.6	0.15	9
Winter flounder	22-33	45	0.9	22.2	0.60	4

Genus Cirolana

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Brown bullhead	21-35	5	LT.1	20.0	0.2

Genus Idotea

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
American eel	11-61	10	LT.1	10.0	0.3	10
Black seabass	6-21	17	2.9	29.4	1.06	8
Fourspine stickleback	2-6	76	6.0	2.6	0.03	3
Grey snapper	4&5	2	19.0	50.0	0.5	14
Northern pipefish	9-21	21	0.3	9.5	0.19	6
Northern puffer	2-11	3	LT.1	33.3	0.33	16
Oyster toadfish	4-13	15	13.8	26.7	0.53	5
Oyster toadfish	18-28	15	2.4	33.3	1.93	1
Silver perch	3-12	26	0.1	3.8	0.04	9
Spotted hake	5-19	16	0.5	18.8	0.19	12
Striped burrfish	23&25	2	0.6	50.0	1.0	11
Striped killifish	4-13	13	14.6	15.4	1.38	2
Tautog	6-16	18	47.2	33.3	2.17	4
Tautog	20-32	7	1.0	14.3	0.42	13
Winter flounder	12-21	41	2.7	12.2	0.36	7
Winter flounder	22-33	45	0.5	4.4	0.04	15

Edotea triloba

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
Atlantic silversides	3-13	85	LT.1	1.2	0.01	1
Brown bullhead	21-35	5	0.1	40.0	2.2	6
Cunner	3-5	4	12.6	50.0	3.3	8
Fourspine stickleback	2-6	76	LT.1	1.3	0.01	3
Mummichog	3-11	34	0.5	2.9	0.03	2
Naked goby	3-5	8	0.3	12.5	0.13	4
Spot	3-10	48	0.2	2.1	0.02	9
Spot	11-19	44	LT.1	2.3	0.02	5
Striped killifish	4-13	13	1.8	7.7	0.08	10
Winter flounder	3-11	56	0.5	12.5	0.18	7
Winter flounder	22-33	45	LT.1	4.4	0.11	11

Genus Erichsonella

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish	P.I. Rank
American eel	11-61	10	0.1	10.0	0.20	5
Blackseabass	6-21	17	LT.1	5.9	0.06	8
Northern pipefish	9-21	21	0.1	4.8	0.05	4
Northern puffer	2-11	3	18.4	33.3	1.0	6
Oyster toadfish	18-28	15	0.4	20.0	0.60	1
Spot	3-10	48	0.4	2.1	0.04	3
Tautog	6-16	18	15.7	33.3	1.22	2
Tautog	20-32	7	0.6	28.6	0.43	7

Family Oniscidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Brown bullhead	21-35	10	0.5	10.0	0.10

Order Amphipoda
Suborder Gammaridea - Total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
American eel	11-61	10	0.1	20.0	0.70
Atlantic silversides	3-13	85	14.4	14.1	4.33
Banded killifish	3-10	18	41.3	50.0	5.67
Bay anchovy	5-11	101	4.1	11.9	0.33
Black seabass	6-21	17	0.6	47.1	2.12
Blueback herring	7-15	13	19.7	15.4	2.92
Bluefish	6-10	16	0.4	6.3	0.06
Brown bullhead	21-35	5	3.4	80.0	15.40
Cunner	3-5	4	70.5	50.0	5.75
Fourspine stickleback	2-6	76	34.2	29.0	1.11
Hogchoker	2-17	7	0.9	28.6	0.29
Lined seahorse	8-12	3	71.2	100.	16.67
Mummichog	3-11	34	13.9	44.1	1.15
Naked goby	3-5	8	40.0	50.0	1.88
Northern pipefish	9-21	21	35.0	47.6	2.19
Northern puffer	2-11	3	2.5	66.7	2.33
Northern searobin	8-18	4	7.6	50.0	6.50
Oyster toadfish	4-13	15	0.7	13.3	0.27
Oyster toadfish	18-28	15	0.5	33.3	1.53
Pinfish	6-11	3	6.5	100.0	2.33
Planehead filefish	5&13	2	20.5	100.0	10.50
Pumpkinseed	9&10	2	15.9	50.0	21.0
Rainwater killifish	3-4	9	61.8	66.7	2.89
Red hake	8-20	3	5.5	33.3	0.67
Scup	14	1	0.1	100.0	1.00
Silver perch	3-12	26	1.9	34.6	1.23
Spot	3-10	48	49.5	68.8	16.06
Spot	11-19	44	14.7	59.1	28.27
Spotted hake	5-19	16	1.3	31.3	0.69
Striped burrfish	23&25	2	LT.1	50.0	0.50
Striped killifish	4-13	13	11.8	38.5	1.23

Order Amphipoda
Suborder Gammaridea - Total (con't)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/Fish
Striped searobin	4-7	3	11.7	66.7	3.00
Summer flounder	6-24	25	0.5	32.0	1.08
Summer flounder	26-65	13	LT.1	7.7	0.08
Tautog	6-16	18	7.8	72.2	7.83
Tautog	20-32	7	LT.1	42.9	0.57
Threespine stickleback	5-7	6	25.1	33.3	0.33
Tidewater silversides	4-9	37	11.2	16.2	0.62
White perch	7-12	18	53.3	50.0	27.06
White perch	14-26	54	11.2	38.9	9.20
White perch	29-37	7	0.2	42.9	0.57
Weakfish	5-10	27	6.6	59.3	5.37
Weakfish	11-17	22	0.1	18.2	0.55
Windowpane	15-34	4	LT.1	25.0	0.25
Winter flounder	3-11	56	19.0	80.4	11.27
Winter flounder	12-21	41	10.2	70.7	8.37
Winter flounder	22-33	45	5.6	64.4	18.16

Genus Ampelisca - Total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
American eel	11-61	10	LT.1	10.0	0.20	16
Atlantic silversides	3-13	85	10.1	8.2	4.15	1
Bay anchovy	5-11	101	3.2	4.0	0.25	4
Black seabass	6-21	17	LT.1	17.7	0.24	20
Cunner	3-5	4	30.6	25.0	1.50	19
Fourspine stickleback	2-6	76	3.5	1.3	0.09	9
Lined seahorse	8-12	3	13.2	33.3	3.33	13
Naked goby	3-5	8	15.1	37.5	1.25	11
Northern pipefish	9-21	21	2.4	14.3	0.38	12
Northern puffer	2-11	3	1.8	33.3	1.00	18
Northern searobin	8-18	4	LT.1	25.0	0.25	24
Pinfish	6-11	3	0.4	66.7	1.00	15
Scup	14	1	0.1	100.0	1.00	21
Silver perch	3-12	26	0.2	15.4	0.69	10
Spot	3-10	48	32.5	33.3	10.94	3
Spot	11-19	44	13.2	36.4	26.94	2
Spotted hake	5-19	16	0.7	12.5	0.31	17
Striped searobin	4-7	3	5.7	33.3	1.33	23
Summer flounder	6-24	25	LT.1	8.0	0.08	25
Tautog	6-16	18	LT.1	5.6	0.11	22
Weakfish	5-10	27	6.2	44.4	5.11	8
Weakfish	11-17	22	0.1	13.6	0.50	14
Winter flounder	3-11	56	14.6	62.5	8.46	6
Winter flounder	12-21	41	2.1	41.5	4.05	7
Winter flounder	22-33	45	4.9	44.4	16.40	5

Ampelisca abdita

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Atlantic silversides	3-13	85	10.0	5.9	4.13	1
Bay anchovy	5-11	101	0.3	1.0	0.01	11
Black seabass	6-21	17	LT.1	11.8	0.18	15
Cunner	3-5	4	30.6	0.25	1.50	14
Lined seahorse	8-12	3	13.2	33.3	3.33	12
Naked goby	3-5	8	15.1	37.5	1.25	9
Northern pipefish	9-21	21	2.2	9.5	0.33	10
Northern searobin	8-18	4	LT.1	25.0	0.25	20
Pinfish	6-11	3	0.4	33.3	0.67	13
Silver perch	3-12	26	LT.1	7.7	0.62	8
Spot	3-10	48	4.1	4.2	2.85	3
Spot	11-19	44	8.9	15.9	22.1	2
Striped searobin	4-7	3	5.7	33.3	1.33	18
Summer flounder	6-24	25	LT.1	8.0	0.08	19
Tautog	6-16	18	LT.1	5.6	0.11	17
Weakfish	5-10	27	4.8	33.3	4.2	6
Weakfish	11-17	22	LT.1	4.5	0.09	16
Winter flounder	3-11	56	14.4	58.9	8.34	5
Winter flounder	12-21	41	0.5	22.0	2.80	7
Winter flounder	22-33	45	1.7	17.8	10.93	4

Ampelisca vadorum

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Atlantic silversides	3-13	85	LT.1	1.2	0.01	4
Black seabass	6-21	17	LT.1	5.9	0.06	10
Fourspine stickleback	2-6	76	3.5	1.3	0.09	1
Northern puffer	2-11	3	1.8	33.3	1.00	6
Silver Perch	3-12	26	0.1	7.7	0.08	5
Spotted hake	5-19	16	0.5	6.3	0.13	8
Weakfish	5-10	27	LT.1	3.7	0.04	9
Winter flounder	3-11	56	0.1	3.6	0.05	7
Winter flounder	12-21	41	1.4	19.5	1.20	3
Winter flounder	22-33	45	1.5	22.2	3.40	2

Family Ampithoidia - Total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
Black seabass	6-21	17	LT.1	11.8	0.12
Fourspine stickleback	2-6	76	6.0	4.0	0.16
Lined seahorse	8-12	3	56.7	66.7	13.0
Mummichog	3-11	34	1.6	5.9	0.06
Northern pipefish	9-21	21	31.8	9.5	0.86
Northern searobin	8-18	4	6.7	50.0	4.50
Oyster toadfish	4-13	15	0.4	6.7	1.20
Oyster toadfish	18-28	15	0.2	6.7	0.13
Red hake	8-20	3	5.5	33.3	0.67
Silver perch	3-12	26	1.7	19.2	0.34
Spotted hake	5-19	16	0.6	18.8	0.31
Striped burrfish	23&25	2	LT.1	50.0	0.50
Striped killifish	4-13	13	6.1	15.4	0.85
Summer flounder	6-24	25	0.1	4.0	0.04
Tautog	6-16	18	6.2	22.2	3.67
Tautog	20-32	7	LT.1	14.3	0.14
White perch	11-17	54	0.5	3.7	0.22
Weakfish	5-10	27	LT.1	3.7	0.04
Windowpane	15-34	4	LT.1	25.0	0.25
Winter flounder	3-11	56	0.5	5.4	0.09
Winter flounder	12-21	41	3.0	7.3	0.93
Winter flounder	22-33	45	0.4	11.1	0.47

Cymadusa compta

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Black seabass	6-21	17	LT.1	5.9	0.06	20
Fourspine stickleback	2-6	76	6.0	4.0	0.16	2
Lined seahorse	8-12	3	56.7	66.7	13.0	6
Mummichog	3-11	34	1.6	5.9	0.06	5
Northern pipefish	9-21	21	31.8	9.5	0.86	3
Northern searobin	8-18	4	6.7	50.0	4.50	11
Oyster toadfish	4-13	15	0.4	6.7	0.13	15
Oyster toadfish	18-28	15	0.2	6.7	1.20	4
Red hake	8-20	3	5.5	33.3	0.67	17
Silver perch	3-12	26	0.5	15.4	0.19	9
Spotted hake	5-19	16	0.6	18.8	0.31	14
Striped killifish	4-13	13	6.1	15.4	0.85	1
Summer flounder	6-24	25	0.1	4.0	0.04	21
Tautog	6-16	18	6.2	22.2	3.67	7
Tautog	20-32	7	LT.1	14.3	0.14	19
White perch	14-26	54	0.5	3.7	0.22	12
Weakfish	5-10	27	LT.1	3.7	0.04	16
Windowpane	15-34	4	LT.1	25.0	0.25	18
Winter flounder	3-11	56	0.5	5.4	0.09	13
Winter flounder	12-21	41	3.0	7.3	0.93	8
Winter flounder	22-33	45	0.4	11.1	0.47	10

Family Aoridae - Total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
Black seabass	6-21	17	LT.1	5.9	0.06
Brown bullhead	21-35	5	LT.1	20.0	0.40
Fourspine stickleback	2-6	76	3.2	2.6	0.20
Mummichog	3-11	34	0.6	2.9	0.29
Planehead filefish	5&13	2	0.3	50.0	0.50
Spot	3-10	48	0.4	4.2	0.10
Spot	11-19	44	0.2	4.5	0.05
Striped killifish	4-13	13	4.3	7.7	0.15
Striped searobin	4-7	3	5.7	33.3	1.33
Tautog	6-16	18	LT.1	5.6	0.17
Tautog	20-32	7	LT.1	14.3	0.14
Weakfish	5-10	27	LT.1	3.7	0.04
Winter flounder	3-11	56	0.5	16.1	0.43
Winter flounder	12-21	41	0.5	9.8	0.80
Winter flounder	22-33	45	LT.1	2.2	0.04

Family Corophiidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Bay anchovy	5-11	101	0.3	4.0	0.04	3
Fourspine stickleback	2-6	76	1.8	2.6	0.04	5
Lined seahorse	8-12	3	1.2	33.3	0.33	19
Mummichog	3-11	34	1.1	2.9	0.09	4
Northern pipefish	9-21	21	LT.1	9.5	0.10	12
Northern puffer	2-11	3	LT.1	33.3	0.67	16
Pinfish	6-11	3	5.5	33.3	1.00	13
Planehead filefish	5&13	2	20.2	100.0	10.00	6
Silver perch	3-12	26	LT.1	11.5	0.08	11
Spot	3-10	48	LT.1	2.4	0.02	14
Spot	11-19	44	0.6	18.2	0.89	2
Striped killifish	4-13	13	0.8	7.8	0.08	15
Summer flounder	6-24	25	LT.1	4.0	0.12	18
Summer founder	26-65	13	LT.1	7.7	0.08	20
Tautog	6-16	18	1.1	27.8	2.00	9
White perch	7-12	18	15.7	11.1	11.06	1
White perch	14-26	54	0.1	7.4	0.44	8
Weakfish	5-10	27	LT.1	3.7	0.04	17
Winter flounder	3-11	56	0.4	19.6	0.48	10
Winter flounder	12-21	41	LT.1	2.4	0.02	21
Winter flounder	22-33	45	0.2	17.8	1.02	7

Family Gammaridae - Total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
American eel	11-61	10	0.1	10.0	0.40
Atlantic silversides	3-13	85	0.1	2.4	0.02
Banded killifish	3-10	18	4.3	22.2	0.44
Black seabass	6-21	17	0.4	23.5	1.06
Bluefish	6-10	16	0.4	6.3	0.06
Cunner	3-5	4	34.9	50.0	2.00
Fourspine stickleback	2-6	76	0.9	2.6	0.03
Mummichog	3-11	34	7.1	14.7	0.47
Naked goby	3-5	8	24.9	25.0	0.63
Northern pipefish	9-21	21	LT.1	4.8	0.10
Northern searobin	8-18	4	0.4	25.0	1.50
Pinfish	6-11	3	0.6	33.3	0.33
Pumpkinseed	9&10	2	8.4	50.0	6.00
Rainwater killifish	3-4	9	61.8	66.7	2.89
Silver perch	3-12	26	LT.1	3.9	0.04
Spot	3-10	48	1.0	4.2	0.25
Spot	11-19	44	0.2	9.1	0.52
Striped killifish	4-13	13	0.8	7.7	0.15
Summer flounder	6-24	25	LT.1	4.0	0.08
Tautog	6-16	18	0.4	11.1	1.00
Tautog	20-32	7	LT.1	14.3	0.29
Threespine stickleback	5-7	6	21.1	16.7	0.17
Tidewater silversides	4-9	37	1.4	2.7	0.03
White perch	7-12	18	2.1	16.7	0.22
White perch	14-26	54	6.6	18.5	3.19
White perch	29-37	7	0.1	28.6	0.43
Weakfish	5-10	27	0.3	7.4	0.07
Winter flounder	3-11	56	1.7	19.6	0.70
Winter flounder	12-21	41	1.0	9.8	1.02
Winter flounder	22-33	45	LT.1	13.3	0.13

Gammarus mucronatus

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
American eel	11-61	10	0.1	10.0	0.40	6
Atlantic silversides	3-13	85	LT.1	1.2	0.01	3
Bluefish	6-10	16	0.4	6.3	0.06	10
Mummichog	3-11	34	6.9	11.8	0.44	1
Naked goby	3-5	8	2.2	12.5	0.13	5
Rainwater killifish	3-4	9	61.8	66.7	2.89	2
Silver perch	3-12	26	LT.1	3.9	0.04	7
White perch	14-26	54	0.2	5.6	0.44	4
White perch	29-37	7	0.1	28.6	0.43	8
Winter flounder	3-11	56	LT.1	1.8	0.02	9

Elasmopus leavis

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Black seabass	6-21	17	0.2	23.5	0.65	8
Cunner	3-5	4	34.9	50.0	2.00	10
Fourspine stickleback	2-6	76	0.6	1.3	0.01	2
Naked goby	3-5	8	22.7	12.5	0.50	3
Northern searobin	8-18	4	0.4	25.0	1.50	7
Spot	11-19	44	0.2	6.8	0.50	1
Striped killifish	4-13	13	0.8	7.7	0.15	6
Tautog	6-16	18	LT.1	5.6	0.22	11
Tautog	20-32	7	LT.1	14.3	0.29	14
White perch	14-26	54	LT.1	1.9	0.06	9
Weakfish	5-10	27	0.3	7.4	0.07	12
Winter flounder	3-11	56	1.5	16.1	0.63	5
Winter flounder	12-21	41	0.5	4.9	0.78	4
Winter flounder	22-33	45	LT.1	4.4	0.04	13

Family Photidae - Total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
Atlantic silversides	3-13	85	2.2	1.2	0.04
Banded killifish	3-10	18	16.1	22.2	1.72
Bay anchovy	5-11	101	0.5	2.0	0.02
Blueback herring	7-15	13	19.7	15.4	2.92
Brown bullhead	21-35	5	3.3	40.0	14.2
Fourspine stickleback	2-6	76	0.4	1.3	0.01
Hogchoker	2-17	7	0.7	14.3	0.14
Mummichog	3-11	34	0.3	2.9	0.03
Pumpkinseed	9&10	2	7.5	50.0	15.00
Spot	3-10	48	0.2	2.1	0.15
Spot	11-19	44	0.2	6.8	0.30
Summer flounder	6-24	25	0.4	12.0	0.76
Tidewater silversides	4-9	37	3.4	5.4	0.08
White perch	7-12	18	35.4	38.9	15.72
White perch	14-26	54	3.9	27.8	5.31
Winter flounder	3-11	56	0.6	14.3	0.75
Winter flounder	12-21	41	0.3	7.3	0.59

Leptocheirus plumulosus

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Banded killifish	3-10	18	16.1	22.2	1.72	2
Bay anchovy	5-11	101	0.5	2.0	0.02	6
Blueback herring	7-15	13	19.7	15.4	2.92	4
Brown bullhead	21-35	5	3.3	40.0	14.2	8
Fourspine stickleback	2-6	76	0.4	1.3	0.01	12
Hogchoker	2-17	7	0.7	14.3	0.14	15
Mummichog	3-11	34	0.3	2.9	0.03	10
Pumpkinseed	9&10	2	7.5	50.0	15.0	13
Spot	3-10	48	0.2	2.1	0.15	9
Spot	11-19	44	0.2	6.8	0.30	5
Summer flounder	6-24	25	0.4	12.0	0.76	14
Tidewater silversides	4-9	37	3.4	5.4	0.08	7
White perch	7-12	18	35.4	38.9	15.7	1
White perch	14-26	54	3.9	25.9	5.30	3
Winter flounder	12-21	41	0.3	4.9	0.56	11

Family Lysianassidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
Black seabass	6-21	17	LT.1	11.8	0.12

Family Hyalidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
Spotted hake	5-19	16	LT.1	6.3	0.06

Microdeutopus gryllotalpa

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Black seabass	6-21	17	LT.1	5.9	0.06	13
Brown bullhead	21-35	5	LT.1	20.0	0.40	12
Fourspine stickleback	2-6	76	3.2	2.6	0.20	1
Mummichog	3-11	34	0.6	2.9	0.29	2
Planehead filefish	5&13	2	0.3	50.0	0.50	7
Spot	3-10	48	0.4	4.2	0.10	3
Spot	11-19	44	0.2	4.5	0.05	4
Striped killifish	4-13	13	4.3	7.7	0.15	5
Tautog	6-16	18	LT.1	5.6	0.17	9
Weakfish	5-10	27	LT.1	3.7	0.04	11
Winter flounder	3-11	56	0.1	5.4	0.07	8
Winter flounder	12-21	41	LT.1	7.3	0.12	6
Winter flounder	22-33	45	0.91	2.2	0.04	10

Monoculodes edwardsi

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Northern Searobin	8-18	4	0.5	25.0	0.25	3
White perch	7-12	18	LT.1	5.6	0.06	1
White perch	29-37	7	LT.1	14.3	0.14	2

Batae catharinensis

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Winter flounder	3-11	56	LT.1	1.2	0.02	2
Winter flounder	12-21	41	0.3	2.4	0.10	1

Paraphoxus spinosus

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
Winter flounder	3-11	56	LT.1	1.8	0.02

Orchestia platensis

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Atlantic silversides	3-13	85	0.5	1.2	0.05	1
White perch	14-26	54	LT.1	1.9	0.04	2

Family Stenothoidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Northern pipefish	9-21	21	0.5	4.8	0.67	1
Northern puffer	2-11	3	LT.1	33.3	0.33	5
Silver perch	3-12	26	LT.1	3.9	0.04	2
Striped searobin	4-7	3	0.3	33.3	0.33	6
Weakfish	5-10	27	LT.1	3.7	0.04	3
Winter flounder	22-33	45	LT.1	2.2	0.02	4

Suborder Caprellidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Cunner	3-5	4	7.0	25.0	0.50	5
Fourspine stickleback	2-6	76	LT.1	2.6	0.03	1
Northern pipefish	9-21	21	1.4	9.5	0.33	2
Planehead filefish	5&13	2	0.1	50.0	0.50	4
Striped killifish	4-13	13	0.3	7.7	0.08	3

Order Mysidacea - Total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
Alewife	6-13	6	99.5	50.0	13.67
Alewife	27-34	5	5.2	20.0	2.50
Atlantic silversides	3-13	85	13.7	28.2	2.14
Bay anchovy	5-11	101	31.8	22.8	1.38
Black seabass	6-21	17	0.5	11.8	0.35
Blueback herring	7-15	13	11.4	30.8	2.08
Bluefish	6-10	16	0.1	6.3	0.13
Bluefish	11-20	62	2.8	12.9	15.85
Bluefish	21-36	19	LT.1	5.3	0.05
Brown bullhead	21-35	5	LT.1	20.0	0.20
Crevalle jack	4-13	9	30.4	77.8	31.00
Fourspine stickleback	2-6	76	26.0	13.2	0.26
Lined seahorse	8-12	3	9.0	33.3	0.33
Naked goby	3-5	8	2.4	25.0	0.38
Northern pipefish	9-21	21	58.6	47.6	2.95
Northern sennet	10-17	7	5.1	14.3	2.57
Rainwater killifish	3-4	9	10.6	11.1	0.11
Scup	14	1	7.5	100.0	5.00
Silver perch	3-12	26	20.4	57.7	14.04
Spot	3-10	48	0.1	2.1	0.02
Spot	11-19	44	8.9	20.5	3.27
Spotted hake	5-19	16	10.6	31.3	3.63
Striped searobin	4-7	3	76.3	100.0	6.33
Summer flounder	6-24	25	14.2	52.0	41.68
Summer flounder	26-65	13	0.4	23.1	1.69
Threespine stickleback	5-7	6	56.5	66.7	1.17
White perch	7-12	18	10.5	72.2	8.67
White perch	14-26	54	43.8	63.0	44.31
White perch	29-37	7	20.0	57.1	73.71
Weakfish	5-10	27	43.4	8.15	18.52
Weakfish	11-17	24	23.1	72.7	37.86
Windowpane	15-34	4	10.2	50.0	90.50
Winter flounder	3-11	56	10.8	3.6	0.50
Winter flounder	12-21	41	10.8	22.2	5.07
Winter flounder	22-33	45	LT.1	6.7	0.07

Neomysis americana

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Alewife	6-13	6	99.5	50.0	13.67	17
Alewife	27-34	5	5.2	20.0	2.50	22
Atlantic silversides	3-13	85	13.4	22.4	2.07	1
Bay anchovy	5-11	101	31.5	19.8	1.24	2
Black seabass	6-21	17	0.5	11.8	0.35	27
Blueback herring	7-15	13	8.0	23.1	1.23	18
Bluefish	6-10	16	0.1	6.3	0.13	30
Bluefish	11-20	62	2.1	9.7	10.34	11
Bluefish	21-36	19	LT.1	5.3	0.05	31
Brown bullhead	21-35	5	LT.1	20.0	0.20	32
Crevalle jack	4-13	9	30.3	77.8	30.78	6
Fourspine stickleback	2-6	76	25.5	11.8	0.25	10
Lined seahorse	8-12	3	9.0	33.3	0.33	29
Northern pipefish	9-21	21	58.6	47.6	2.95	14
Northern sennet	10-17	7	5.1	14.3	2.57	19
Scup	14	1	7.5	100.0	5.00	25
Silver perch	3-12	26	18.3	42.3	11.81	4
Spot	11-19	44	6.1	15.9	2.61	5
Spotted hake	5-19	16	10.6	31.3	3.63	20
Striped searobin	4-7	3	42.2	66.7	3.00	23
Summer flounder	6-24	25	12.8	44.0	36.28	12
Summer flounder	26-65	13	0.4	23.1	1.69	24
Threespine stickleback	5-7	6	56.5	66.7	1.17	26
White perch	7-12	18	10.5	66.7	8.67	13
White perch	14-26	54	43.8	63.0	44.31	3
White perch	29-37	7	20.0	57.1	73.71	8
Weakfish	5-10	27	41.4	77.8	17.59	7
Weakfish	11-17	22	23.1	72.7	37.86	9
Windowpane	15-34	4	10.2	50.0	90.50	15
Winter flounder	3-11	56	10.8	3.6	0.50	21
Winter flounder	12-21	41	10.8	22.0	5.07	16
Winter flounder	22-33	45	LT.1	6.7	0.07	28

Mysidopsis bigelowi

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Atlantic silversides	3-13	85	LT.1	1.2	0.01	25
Bluefish	11-20	62	0.7	3.2	5.52	19
Crevalle jack	4-13	9	LT.1	22.2	0.22	36
Naked goby	3-5	8	2.2	12.5	0.25	27
Silver perch	3-12	26	2.1	23.1	2.23	11
Spot	11-19	44	2.7	2.3	0.57	18
Striped searobin	4-7	3	34.2	33.3	3.33	30
Summer flounder	6-24	25	1.4	12.0	5.36	23
Weakfish	5-10	27	1.9	7.4	0.85	26

Order Decapoda
Infraorder Penaeidea
Genus Penaeus

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
Summer flounder	6-24	25	2.5	4.0	0.04

Infraorder Caridea
- larval forms -

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Alewife	6-13	6	LT.1	16.7	0.17	10
Atlantic needlefish	5-16	15	0.1	6.7	0.60	6
Atlantic silversides	3-13	85	0.1	5.9	0.42	2
Bay anchovy	5-11	101	0.2	7.9	0.15	3
Blueback herring	5-15	13	17.5	23.1	38.62	1
Bluefish	6-10	16	3.6	18.8	16.75	4
Fourspine stickleback	2-6	76	LT.1	1.3	0.01	5
Northern pipefish	9-21	21	LT.1	4.8	0.05	8
Spot	11-19	44	LT.1	2.3	0.02	7
White perch	14-26	54	LT.1	3.7	0.06	9

Genus Palaemonetes - Total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
Alewife	27-34	5	21.5	40.0	0.60
Atlantic silversides	3-13	85	LT.1	1.2	0.04
Black seabass	6-21	17	16.2	23.5	0.59
Bluefish	6-10	16	33.5	18.8	3.38
Bluefish	11-20	62	0.1	4.8	0.06
Mummichog	3-11	34	5.6	2.9	0.03
Northern searobin	8-18	4	7.9	25.0	0.25
Oyster toadfish	18-28	15	1.0	20.0	0.20
Pinfish	6-11	3	60.5	33.3	1.33
Silver perch	3-12	26	16.8	19.2	0.42
Smooth dogfish	39-56	12	0.6	25.0	0.58
Spotted hake	5-19	16	33.8	12.5	0.44
Summer flounder	6-24	25	16.5	12.0	0.28
Summer flounder	26-65	13	1.4	7.7	0.54
White perch	14-26	54	5.5	3.7	0.69
White perch	29-37	7	1.4	14.3	0.29
Weakfish	5-10	27	1.7	3.7	0.07
Windowpane	15-34	4	7.5	25.0	1.75
Winter flounder	12-21	41	3.5	7.3	0.07
Winter flounder	22-33	45	22.2	28.9	2.58

Palaemonetes vulgaris

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Alewife	27-34	5	20.7	20.0	0.40	12
Black seabass	6-21	17	3.5	11.8	0.18	13
Bluefish	6-10	16	24.5	12.5	3.25	4
Bluefish	11-20	62	0.1	3.2	0.03	14
Northern searobin	8-18	4	7.9	25.0	0.25	15
Oyster toadfish	18-28	15	0.4	6.7	0.07	9
Pinfish	6-11	3	60.5	33.3	1.33	5
Silver perch	3-12	26	12.3	11.5	0.19	3
Smooth dogfish	39-56	12	0.6	25.0	0.58	8
Spotted hake	5-19	16	18.8	12.5	0.38	7
Summer flounder	6-24	25	10.0	8.0	0.20	11
Summer flounder	26-65	13	1.4	7.7	0.54	10
White perch	14-26	54	4.8	3.7	0.63	2
Window pane	15-34	4	5.9	25.0	1.50	6
Winter flounder	22-33	45	19.3	24.4	2.27	1

Palaemonetes pugio

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Bluefish	6-10	16	8.9	6.3	0.13	8
Mummichog	3-11	34	5.6	2.9	0.03	1
Oyster toadfish	18-28	15	0.5	6.7	0.07	3
Silver perch	3-12	26	3.4	3.9	0.08	2
Spotted hake	5-19	16	15.0	6.3	0.06	9
Summer flounder	6-24	25	5.5	4.0	0.04	10
White perch	26-65	7	1.4	14.3	0.29	5
Weakfish	5-10	27	1.7	3.7	0.07	4
Winter flounder	12-21	41	1.2	2.4	0.02	7
Winter flounder	22-33	45	0.5	4.4	0.04	6

Crangon septemspinosa

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Alewife	27-34	5	5.2	20.0	0.20	33
Atlantic needlefish	24-58	5	4.9	40.0	0.60	22
Atlantic silversides	3-13	85	12.0	3.5	0.08	2
Bay anchovy	5-11	101	LT.1	1.0	0.01	6
Black seabass	6-21	17	11.6	52.9	0.94	17
Bluefish	6-10	16	6.0	18.8	0.31	26
Bluefish	11-20	62	5.5	22.6	0.52	11
Bluefish	21-36	19	1.8	31.6	0.47	21
Cravalle jack	4-13	9	16.2	33.3	0.44	15
Lined seahorse	8-12	3	13.2	33.3	0.33	27
Mummichog	3-11	34	11.2	2.9	0.03	7
Northern kingfish	15&29	2	79.2	100.0	3.00	20
Northern searobin	8-18	4	80.4	100.0	9.75	5
Oyster toadfish	4-13	15	10.4	20.0	0.27	13
Pinfish	6-11	3	33.0	66.7	1.33	16
Red hake	8-20	3	39.9	66.7	5.33	18
Silver perch	3-12	26	43.6	53.9	1.73	1
Smooth dogfish	39-56	12	0.4	25.0	0.50	23
Spot	11-19	44	2.2	2.3	0.02	19
Spotted hake	5-19	16	47.7	50.0	1.63	12
Striped bass	43-58	11	5.9	36.4	3.27	31
Striped searobin	4-7	3	5.7	33.3	0.33	29
Summer flounder	6-24	25	27.6	40.0	2.56	8
Summer flounder	26-65	13	6.9	53.9	3.92	9
Tautog	6-16	18	3.7	11.1	0.11	30
Tautog	20-32	7	LT.1	28.6	0.29	32
White perch	7-12	18	1.7	5.6	0.06	25
White perch	14-26	54	17.4	11.1	0.67	3
White perch	29-37	7	62.0	71.4	4.57	4
Weakfish	5-10	27	19.2	25.9	0.33	14
Weakfish	11-17	22	13.6	36.4	1.23	12
Weakfish	32-62	2	0.7	50.0	0.50	34
Windowpane	15-34	4	56.2	50.0	8.00	10
Winter flounder	3-11	56	2.2	1.8	0.04	28
Winter flounder	12-21	41	4.7	7.3	0.15	20
Winter flounder	22-33	45	0.5	6.7	0.07	24

Genus Hippolyte

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
Weakfish	5-10	27	2.1	3.7	0.04

Infraorder Anomura
Genus Pagurus

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Black seabass	6-21	17	1.7	5.9	0.06	2
Striped burrifsh	23&25	2	2.2	50.0	1.00	1
Summer flounder	26-65	13	0.1	7.7	0.08	3

Infraorder Brachyura
larval forms

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Alewife	6-13	6	0.2	16.7	0.83	8
Atlantic menhadon	4-8	19	-	5.3	1.68	4
Atlantic needlefish	5-16	15	4.9	20.0	46.9	3
Atlantic silversides	3-13	85	3.1	11.8	5.09	1
Bay anchovy	5-11	101	1.2	20.8	1.78	2
Bluefish	6-10	16	0.4	25.0	4.06	6
Cunner	3-5	4	2.4	25.0	0.75	9
Lined seahorse	8-12	3	1.3	33.3	0.33	10
Northern pipefish	9-21	21	0.4	14.3	0.76	5
Northern searobin	8-18	4	LT.1	25.0	0.25	11
White perch	14-26	18	LT.1	1.9	0.19	7
Winter flounder	3-11	56	LT.1	1.8	0.02	12

Infraorder Brachyura
adult forms total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
American eel	11-61	10	93.9	50.0	0.90
Atlantic silversides	3-13	85	5.2	2.4	0.07
Black seabass	6-21	17	55.2	70.6	1.53
Bluefish	11-20	62	9.1	3.2	0.03
Bluefish	21-36	19	12.2	10.5	0.11
Brown bullhead	21-35	5	13.4	80.0	1.00
Fourspine stickleback	2-6	76	0.1	1.3	0.01
Northern pipefish	9-21	21	0.4	4.8	0.05
Northern searobin	8-18	4	3.8	25.0	0.75
Oyster toadfish	4-13	15	39.5	40.0	0.67
Oyster toadfish	18-28	15	22.4	33.3	0.87
Smooth dogfish	39-56	12	90.7	83.3	1.33
Spot	3-10	48	0.1	2.1	0.02
Spot	11-19	44	5.4	2.3	0.02
Spotted hake	5-19	16	5.6	6.3	0.06
Striped burrfish	23&25	2	93.1	100.0	4.00
Summer flounder	6-24	25	5.5	20.0	0.44
Summer flounder	26-65	13	14.2	30.8	0.31
Tautog	6-16	18	23.1	44.4	1.39
Tautog	20-32	7	87.1	100.0	7.86
White perch	14-26	54	7.1	9.3	0.11
Weakfish	5-10	27	0.9	3.7	0.07
Weakfish	11-17	22	0.9	4.5	0.05
Winter flounder	12-21	41	0.8	14.6	0.22
Winter flounder	22-33	45	4.5	24.4	1.18

<u>Ovalipes ocellatus</u>

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Black seabass	6-21	17	15.7	5.9	0.12	2
Tautog	20-32	7	12.6	14.3	0.43	1

Callinectes sapidus

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
American eel	11-61	10	90.9	40.0	0.50	1
Black seabass	6-21	17	13.5	11.8	0.12	12
Bluefish	11-20	62	9.1	3.2	0.03	11
Bluefish	21-36	19	12.2	10.5	0.11	10
Brown bullhead	21-35	5	13.2	20.0	0.20	16
Oyster toadfish	4-13	15	2.6	6.7	0.07	7
Oyster toadfish	18-28	15	12.4	13.3	0.13	4
Smooth dogfish	39-56	12	90.7	83.3	1.33	2
Striped burrfish	23&25	2	83.2	50.0	1.00	5
Summer flounder	6-24	25	0.3	4.0	0.08	13
Summer founder	26-65	13	13.6	7.7	0.08	17
Tautog	6-16	18	LT.1	5.6	0.06	15
Tautog	20-32	7	7.3	28.6	0.29	9
White perch	14-26	54	3.3	5.6	0.06	6
Weakfish	11-17	22	0.9	4.5	0.05	14
Winter flounder	12-21	41	0.5	9.8	0.15	3
Winter flounder	22-33	45	0.2	4.4	0.04	8

Family Xanthidea - Total

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
American eel	11-61	10	3.0	20.0	0.40
Atlantic silversides	3-13	85	5.2	2.4	0.07
Black seabass	6-21	17	26.0	64.7	1.29
Fourspine stickleack	2-6	76	0.1	1.3	0.01
Northern pipefish	9-21	21	0.4	4.8	0.05
Northern searobin	8-18	4	3.8	25.0	0.75
Oyster toadfish	4-13	15	36.9	33.3	0.60
Oyster toadfish	18-28	15	10.0	26.7	0.73
Spot	3-10	48	0.1	2.1	0.02
Spotted hake	5-19	16	5.6	6.3	0.06
Striped burrfish	23&25	2	10.0	100.0	3.00
Summer flounder	6-24	25	5.2	16.0	0.36
Summer flounder	26-65	13	0.5	23.1	0.23
Tautog	6-16	18	21.3	33.3	0.33
Tautog	20-32	7	67.1	100.0	2.78
White perch	14-26	54	3.8	3.7	0.06
Weakfish	5-10	27	0.9	3.7	0.07
Winter flounder	12-21	41	0.2	2.4	0.05
Winter flounder	22-33	45	4.4	20.0	1.13

Neopanope texanna

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
American eel	11-61	10	2.0	10.0	0.20	8
Black seabass	6-21	17	7.8	47.1	0.71	4
Northern pipefish	9-21	21	0.4	4.8	0.05	7
Northern searobin	8-18	4	0.8	25.0	0.25	12
Oyster toadfish	4-13	15	3.2	13.3	0.13	5
Oyster toadfish	18-28	15	9.1	13.3	0.60	1
Spotted hake	5-19	16	5.6	6.3	0.06	13
Striped burrfish	23&25	2	5.5	50.0	1.50	6
Summer flounder	6-24	25	1.9	8.0	0.16	9
Summer founder	26-65	13	0.5	15.4	0.15	11
Tautog	20-32	7	28.1	57.1	2.57	3
White perch	14-26	54	1.4	1.94	0.02	10
Winter flounder	22-33	45	1.2	13.3	0.51	2

Rhithropanopeus harrisii

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
American eel	11-61	10	0.8	10.0	0.10	9
Black seabass	6-21	17	7.9	17.6	0.24	8
Oyster toadfish	4-13	15	28.5	13.3	0.33	1
Oyster toadfish	18-28	15	0.5	6.7	0.07	5
Striped burrfish	23&25	2	3.3	50.0	1.00	4
Summer flounder	6-24	25	3.2	12.0	0.20	7
Summer founder	26-65	13	LT.1	7.7	0.08	10
Tautog	20-32	7	11.2	28.6	1.43	3
White perch	14-26	54	2.4	1.9	0.04	6
Winter flounder	29-37	45	2.4	4.4	0.36	2

Eurypanopeus depressus

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Black seabass	6-21	17	0.9	5.9	0.06	3
Striped searobin	4-7	3	3.0	33.3	0.67	2
Winter flounder	22-33	45	0.2	6.7	0.18	1

Phylum Chordata
Class Ascidiacea
Family Molgulidae

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
Winter flounder	22-33	45	0.2	4.4	0.04

Class Osteichthyes (bony fishes)
eggs

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Atlantic silversides	3-13	85	31.0	12.9	3.86	1
Banded killifish	3-10	18	1.1	5.5	0.06	3
Bay anchovy	5-11	101	0.5	8.9	0.15	5
Bluefish	6-10	16	0.7	6.3	6.19	8
Fourspine stickleback	2-6	76	3.5	1.3	0.04	7
Grey snapper	4&5	2	24.6	50.0	0.50	12
Mummichog	3-11	34	3.4	2.9	0.32	6
Oyster toadfish	18-28	15	LT.1	13.3	0.47	10
Spot	3-10	48	LT.1	2.0	0.02	11
Striped killifish	4-13	13	31.6	15.4	0.54	9
White perch	7-12	18	14.0	22.2	60.9	2
White perch	14-26	54	1.0	7.4	12.1	4

Class Osteichthyes - Total except eggs

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
American eel	11-61	10	0.3	10.0	0.10
Atlantic needlefish	5-16	15	50.0	40.0	1.47
Atlantic needlefish	24-58	5	83.3	60.0	0.80
Black seabass	6-21	17	7.1	17.6	0.29
Bluefish	6-10	16	26.3	37.5	0.63
Bluefish	11-20	62	81.8	72.6	1.23
Bluefish	21-36	19	85.5	84.2	1.21
Brown bullhead	21-35	5	60.1	80.0	2.20
Crevalle jack	4-13	9	53.3	33.3	0.89
Inshore lizzardfish	10-14	2	100.	100.0	1.00
Mummichog	3-11	34	50.4	2.9	0.03
Northern sennet	10-17	7	94.9	71.4	0.71
Oyster toadfish	4-13	15	0.7	13.3	0.13
Oyster toadfish	18-28	15	55.6	26.7	0.60
Red hake	8-20	3	54.5	33.3	0.33
Redfin pickerel	26	1	100.0	100.0	1.00
Scup	14	1	22.5	100.0	1.00
Silver perch	3-12	26	14.5	15.4	0.19
Smooth dogfish	39-56	12	2.5	16.7	0.17
Spot	11-19	44	LT.1	2.3	0.02
Spotted hake	5-19	16	5.7	25.0	0.25
Striped bass	43-58	11	93.9	81.8	4.18
Summer flounder	6-24	25	32.6	36.0	0.60
Summer flounder	26-65	13	74.3	69.2	1.69
Tautog	6-16	18	LT.1	5.6	0.05
Tidewater silversides	4-9	37	8.3	5.4	0.24
White perch	7-12	18	10.5	16.0	0.16
White perch	14-26	54	1.7	5.6	0.06
White perch	29-37	7	4.2	14.3	0.14
Weakfish	5-10	27	26.1	14.8	0.15
Weakfish	11-17	22	60.6	59.1	1.04
Weakfish	32-62	2	99.3	100.0	2.50
Windowpane	15-34	4	17.4	25.0	1.00
Winter flounder	22-33	45	2.3	8.9	0.11

Family Atherinidae (silversides)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Atlantic needlefish	5-16	15	0.8	6.6	1.07*	2
Atlantic needlefish	24-58	5	71.9	20.0	0.20	4
Bluefish	6-10	16	6.7	6.3	0.06	7
Bluefish	11-20	62	10.1	9.7	0.11	3
Northern Sennet	10-17	7	44.1	28.6	0.29	1
Striped bass	43-58	11	2.6	9.1	0.09	8
Summer flounder	6-24	25	1.9	4.0	0.04	6
Summer flounder	26-65	13	3.4	7.7	0.15	5

* larvae

Genus Anchoa (anchovies)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Bluefish	11-20	62	7.9	11.3	0.24	2
Bluefish	21-36	19	3.6	5.3	0.05	5
Brown bullhead	21-35	5	60.1	40.0	1.80	4
Crevalle jack	4-13	9	44.1	11.1	0.66	1
Summer flounder	6-24	25	8.1	4.0	0.04	7
Summer flounder	26-65	13	6.5	15.3	0.08	6
Weakfish	11-17	22	25.9	9.7	0.18	3

Apeltes quadracus (fourspine stickleback)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Atlantic Needlefish	5-16	15	26.0	6.7	0.13	2
Bluefish	11-20	62	1.1	3.2	0.06	4
Oyster toadfish	18-28	15	0.8	6.7	0.07	1
Spotted hake	8-20	16	3.8	12.5	0.13	6
Summer flounder	6-24	25	4.5	12.0	0.20	5
Summer flounder	26-65	13	1.7	15.4	0.38	3
White perch	14-26	54	0.7	1.9	0.02	7

Ammodytes americanus (American sandlance)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Striped bass	43-58	11	30.0	54.5	2.18	1
Windowpane	15-34	4	11.9	25.0	0.25	2

Brevoortia tyrannus (Atlantic mendhaden)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Bluefish	11-20	62	5.4	4.8	0.05	1
Bluefish	21-36	19	30.1	5.3	0.05	2
Red hake	8-20	3	54.5	33.3	0.33	3

Family Bothidae (left handed flatfish)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
Striped bass	43-58	11	3.8	9.1	0.18

Bairdiella chrysura (silver perch)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
Summer flounder	26-65	13	8.9	7.7	0.23

Cynoscion regalis (weakfish)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Bluefish	11-20	62	1.8	1.6	0.02	1
Smooth dogfish	39-56	12	2.1	8.3	0.08	2
Striped bass	43-58	11	18.1	9.1	0.18	3

Leiostomus xanthurus (spot)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Bluefish	11-20	62	3.1	1.6	0.02	2
Oyster toadfish	18-28	15	54.4	13.3	0.47	1

Genus Fundulus (killifish)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Bluefish	11-20	62	23.7	9.7	0.19	3
Bluefish	21-36	19	22.2	15.8	0.26	4
Mummichog	3-11	34	50.4*	2.9	0.03	2
Tidewater silverside	4-9	37	8.3**	2.7	0.21	1
White perch	7-12	18	10.5	5.6	0.06	5
White perch	29-37	7	4.2	14.3	0.14	6

* One occurrence in largest speciman
** Larvae only

Gobiosoma bosci (Naked goby)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
Black seabass	6-21	17	5.2	5.9	0.18	2
Bluefish	11-20	62	1.7	1.6	0.05	3
White perch	14-26	54	0.7	1.9	0.02	4
Winter flounder	22-33	45	2.0	8.9	0.09	1

Genus Prionotus (searobins)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
Summer flounder	26-65	13	43.4	15.4	0.15

Pseudopleuronectes americanus (winter flounder)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
Summer flounder	26-65	13	8.4	7.7	0.15

Strongylura marina (Atlantic needlefish)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish
Atlantic needlefish	5-16	15	7.7	13.3	0.13

Syngnathus fuscus (northern pipefish)

Consumer Species	Size Range	Sample Size	% Volume	% Occurrence	Ind/fish	P.I. Rank
American eel	11-61	10	0.3	10.0	0.10	1
Summer flounder	26-65	13	1.0	7.7	0.08	2

APPENDIX II

Stomach analyses data for fish species collected in Little Egg Harbor

Alewife, *Alosa pseudoharengus*

Diet Item	% Volume			% Occurrence			Individuals/fish		
Sample size	6	5	11						
Size Range	6-13	27-34	Total	6-13cm	27-34	Total	6-13	27-34	Total
Plant detritus	0.2	1.1	0.8	33.3	20.0	27.0	2.0*	22.0*	10.9*
Algae		1.5	1.0		40.0	18.2		29.0*	13.2*
Class Insecta-all forms	0.2		LT.1	33.3		18.2	0.33		0.18
Fam. Chironimidae, larvae	0.1		LT.1	16.7		9.1	0.17		0.09
Adult forms	0.1		LT.1	16.7		9.1	0.17		0.09
Subclass Ostracoda		LT.1	LT.1		20.0	9.1		1.4	0.64
Subclass Copepoda, Order Calanoida	LT.1	65.5	44.6	16.7	100.0	54.5	0.83	2077.8	519.7
Order Mysidacea, *Neomysis americana*	99.5	5.2	35.3	50.0	20.0	36.4	13.67	2.5	8.5
Infraorder Caridea, larval forms	LT.1		LT.1	16.7		9.1	0.17		0.09
Genus Palaemonetes-Total		21.5	14.6		40.0	18.2		0.60	0.27
Palaemonetes vulgaris		20.7	14.1		20.0	9.1		0.40	0.18
Genus Palaemonetes unclassified		0.8	0.5		20.0	9.1		0.20	0.09
Crangon septemspinosa		5.2	3.5		20.0	9.1		0.20	0.09
Infraorder Brachyura, larvae	0.2		LT.1	16.7		9.1	0.83		0.45

*ml x 10^{-4}/fish

American eel, Anquilla rostrata
Size Range (cm), 11-61
Sample Size, 10

Stomach Contents	% Volume	% Occurrence	Ind/fish
plant detritus	0.4	30.0	201.0*
Algae	0.1	10.0	50.0*
Phylum Nemertea	LT.1	10.0	0.1
Class Gastropoda, *Mitrella lunata*	LT.1	10.0	0.1
Class Pelecypoda, *Mya arenaria*	1.0	10.0	0.1
Order Isopoda, Total	0.1	10.0	0.5
Genus Idotea	LT.1	10.0	0.3
Genus Erichsonella	0.1	10.0	0.2
Suborder Gammaridea, Total	0.1	20.0	0.7
Genus Ampelisca	LT.1	10.0	0.2
Fam. Gammaridae, *Gammarus mucronatus*	0.1	10.0	0.4
Unclassified	LT.1	10.0	0.1
Infraorder Brachyura, Total	93.9	50.0	0.9
Callinectes sapidus	90.9	40.0	0.5
Family Xanthidea, Total	3.0	20.0	0.4
Neopanope texanna	2.0	10.0	0.2
Rhithropanopeus harrisii	0.8	10.0	0.2
Unclassified	0.2	10.0	0.1
Class Osteichthyes, *Syngnathus fuscus*	0.3	10.0	0.1

*ml x 10^{-4}/fish

American sandlance, Ammodytes americanus
Size range (cm), 9-12
Sample size,

Stomach Contents	% Volume	% Occurrence	Ind/fish
Subclass Copepoda, Order Calanoid	100.	100.	523.75

Atlantic menhaden, Brevoortia tyrannus

Diet Item	% Occurrence				Individuals/fish			
Sample size	19	15	8	42	19	15	8	42
Size Range (cm)	4-8	11-16	25-28	Total	4-8	11-16	25-28	Total
Sediment	21.1	40.0	37.5	31.0				
Plant detritus	-	26.7	12.5	11.9				
Algae	68.4	100.	87.5	83.3				
Class Turbellaria	21.1	-	-	9.5	0.42	-	-	0.19
Class Gastropoda larvae	5.3	-	-	2.4	0.11	-	-	0.05
Class Polychaeta (excluding larvae)	5.3	6.7	-	4.8	1.42	0.07	-	0.66
Family Spionidae	5.3	-	-	2.4	1.42	-	-	0.64
Unclassified	-	6.7	-	2.4	-	0.07	-	0.02
Class Polychaeta, larvae	15.8	6.7	-	9.5	0.58	0.07	-	0.29
Order Cladocera	26.3	-	-	11.9	9.60	-	-	4.36
Subclass Copepoda, Total	68.4	33.3	75.0	54.8	39.6	28.4	98.75	46.86
Order Calanoida	63.2	20.0	37.5	42.9	19.4	28.3	67.5	31.73
Order Harpacticoidia	21.1	20.0	12.5	19.0	19.4	0.13	0.13	8.83
Unclassified	5.3	-	25.0	7.1	0.8	-	31.12	6.30
Subclass Cirripedia, larvae	15.8	-	-	7.1	0.21	-	-	0.09
Infraorder Brachyura, larvae	5.3	-	-	2.4	1.68	-	-	0.76

Atlantic needlefish, *Strongylura marina*

Diet Item	% Volume			% Occurrence			Individuals/fish		
Sample size	15	5	20						
Size Range (cm)	5-16	24-58	Total	5-16	24-58	Total	5-16	24-58	Total
Class Polychaeta, Total	3.2		0.6	20.0		15.0	0.2		0.15
Genus Nereis	1.2		0.3	6.7		5.0	0.07		0.05
unclassified	2.0		0.3	13.3		10.0	0.13		0.10
Class Insecta, adult forms	41.7	11.8	17.8	46.7	60.0	50.0	5.00	8.00	5.25
Order Cladocera	LT.1		LT.1	6.7		5.0	0.67		0.05
Subclass Copepoda, Order Harpacticoidia	LT.1		LT.1	6.7		5.0	1.67		1.25
Infraorder Caridea, larvae	0.1		LT.1	6.7		5.0	2.60		0.45
Crangon septemspinosa		4.9	3.9		40.0	10.0		0.60	0.15
Infraorder Brachyura, larvae	4.9			20.0		15.0	46.9		35.2
Class Osteichthyes, Total	50.0	83.3	76.6	40.0	60.0	45.0	1.47	0.80	1.30
Family Atherinidae	0.8	71.9	57.6	6.7	20.0	10.0	1.07	0.20	0.85
Apeltes quadracus	26.0		5.2	6.7		5.0	2.13		0.10
Strongylura marina	7.7		1.5	13.3		10.0	0.13		0.10
unclassified	15.5	11.4	12.3	13.3	40.0	20.0	0.13	0.60	0.25

Atlantic Silversides, *Menida menida*
Size Range (cm), 3-13
Sample size, 85

Diet Item	% Volume	% Occurrence	Ind/fish
Plant detritus	1.2	10.6	6.0*
Algae	LT.1	7.1	0.3*
Class Hydrozoa	0.5	2.4	2.40*
Class Nematoda	LT.1	1.2	0.01
Class Gastropoda, adult forms	LT.1	1.2	0.01
Class Gastropoda, larval forms	LT.1	2.4	0.56
Class Polychaeta, Total	8.0	3.5	0.20
Genus Nereis	8.0	2.4	0.19
Unclassified	LT.1	1.2	0.01
Class Insecta	1.1	14.1	0.74
Order Cladocera	LT.1	3.5	1.96
Subclass Ostracoda	LT.1	1.2	0.01
Subclass Copepoda, Total	9.2	42.4	101.81
Order Calanoida	9.2	40.0	101.73
Order Harpacticoida	LT.1	7.1	0.08
Subclass Cirripedia, larval forms	LT.1	1.2	0.01
Order Isopoda, *Edotea triloba*	LT.1	1.2	0.01
Suborder Gammaridea, Total	14.4	14.1	4.33
Genus Ampelisca, Total	10.1	8.2	4.15
Ampelisca abdita	10.0	5.9	4.13
Ampelisca vadorum	LT.1	1.2	0.01
Unclassified	0.1	1.2	0.01
Family Gammaridae, Total	0.1	2.4	0.02
Gammarus mucronatus	LT.1	1.2	0.01
Unclassified	0.1	1.2	0.01
Family Photidae	2.2	1.2	0.04
Orchestia platensis	0.5	1.2	0.05
Unclassified	1.5	7.1	0.07
Order Mysidacea, Total	13.7	28.2	2.14
Neomysis americana	13.4	22.4	2.07
Unclassified	0.3	4.7	0.07
Infraorder Caridea, larval forms	0.1	5.9	0.42
Genus Palaemonetes	LT.1	1.2	0.04
Crangon septemspinosa	12.0	3.5	0.08
Infraorder Brachyura, larval forms	3.1	11.8	5.09
Infraorder Brachyura, Fam. Xanthidea	5.2	2.4	0.07
Class Osteichthyes, eggs	31.0	12.9	3.86

*ml x 10^{-4}/fish

Banded Killifish, *Fundulus diaphanus*
Size range (cm) 3-10
Sample size 18

Diet Item	% Volume	% Occurrence	Ind/fish
Sediment	7.8	55.6	6.8*
Plant detritus	6.7	16.7	6.0*
Algae	15.7	38.9	13.6*
Class Nematoda	LT.1	5.6	0.11
Class Polychaeta	10.1	33.3	0.33
Class Insecta, Fam. Chironomidae, larvae	2.2	16.7	1.06
Subclass Copepoda	0.2	11.1	0.61
Order Cumacea	3.1	38.9	0.83
Order Isopoda, *Cyathura polita*	10.5	16.7	0.44
Suborder Gammaridea, Total	41.3	50.0	5.67
Family Gammaridae	4.3	22.2	0.44
Fam. Photidae, *Leprocheirus plumulosus*	16.1	22.2	1.72
Unclassified	20.9	44.2	3.51
Class Osteichthyes, eggs	1.1	5.5	0.06

*ml x 10^{-4}/fish

Bay Anchovy, *Anchoa mitchilli*
Size range (cm), 5-11
Sample size, 101

Diet Item	% Volume	% Occurrence	Ind/fish
Sediment	0.2	5.0	0.2*
Plant detritus	0.2	4.0	0.2*
Class Turbellaria	1.0	41.6	2.38
Class Nematoda	LT.1	2.0	0.02
Class Polychaeta, total excluding larvae	1.0	13.9	0.76
Genus Nereis	0.4	4.0	0.05
Family Spionidae	0.2	5.9	0.24
Unclassified	0.4	4.0	0.47
Class Polychaeta, larval forms	1.0	5.0	0.21
Class Insecta, all forms	0.3	6.9	0.10
larval forms, Fam. Chironimidae	0.2	6.9	0.09
Adult forms	0.1	1.0	0.01
Order Cladocera	2.2	7.9	35.35
Subclass Ostacoda	0.2	30.7	0.98
Subclass Copepoda, Total	53.6	87.1	148.16
Order Calanoida	52.6	77.2	143.83
Order Harpacticoida	0.6	42.6	3.38
Order Cyclopoda	LT.1	2.0	0.02
Unclassified	0.4	3.0	0.93
Subclass Cirripedia, larval forms	LT.1	10.9	0.22
Order Cumacea	LT.1	2.0	0.03
Orders Isopoda and Tanaidacea, Total	LT.1	2.0	0.02
Leptochelia savignyi	LT.1	1.0	0.01
Unclassified	LT.1	1.0	0.01
Suborder Gammaridea, Total	4.1	11.9	0.33
Genus Ampelisca, Total	3.2	4.0	0.25
Ampelisca abdita	0.3	1.0	0.01
unclassified	2.9	1.0	0.24
Family Corophiidae	0.3	4.0	0.04
Fam. Photidae, *Leptocheirus plumulosus*	0.5	2.0	0.02
Unclassified	0.1	2.0	0.02
Order Mysidacea, Total	31.8	22.8	1.38
Neomysis americana	31.5	19.8	1.24
unclassified	0.3	4.0	0.14
Infraorder Caridea, larval forms	0.2	7.9	0.15
Crangon septemspinosa	LT.1	1.0	0.01
Infraorder Brachyura, larval forms	1.2	20.8	1.78
Class Osteichthyes, eggs	0.5	8.9	0.15

*ml x 10^{-4}/fish

Black seabass, _Centropristis striata_
Size range (cm), 6-21
Sample size, 17

Diet Item	% Volume	% Occurrence	Ind/fish
Plant detritus	LT.1	5.9	1.8*
Class Pelecypoda	3.9	5.9	0.18
Class Polycaeta	LT.1	11.8	0.12
Order Isopoda, Total	3.0	35.3	1.12
Genus Idotea	2.9	29.4	1.06
Genus Erichsonella	LT.1	5.9	0.06
Suborder Gammaridea, Total	0.6	47.1	2.12
Genus Ampelisca, Total	LT.1	17.7	0.24
Ampelisca abdita	LT.1	11.8	0.18
Ampelisca vadorum	LT.1	5.9	0.06
Family Ampithoidae, Total	LT.1	11.8	0.12
Cymadusa compta	LT.1	5.9	0.06
unclassified	LT.1	5.9	0.06
Fam. Aoridae, _Microdeutopus gryllotalpa_	LT.1	5.9	0.06
Family Gammaridae, Total	0.4	23.5	1.06
Elasmopus leavis	0.2	23.5	0.65
unclassified	0.2	5.9	0.41
Family Lysianassidae	LT.1	11.8	0.12
Unclassified	0.1	5.9	0.52
Order Mysidacea, _Neomysis americana_	0.5	11.8	0.35
Genus Palaemonetes, Total	16.2	23.5	0.59
Palaemonetes vulgaris	3.5	11.8	0.18
Unclassified	12.7	11.8	0.41
Crangon septemspinosa	11.6	52.9	0.94
Genus Pagurus	1.7	5.9	0.06
Infraorder Brachyura, Total	55.2	70.6	1.53
Ovalipes ocellatus	15.7	5.9	0.12
Callinectes sapidus	13.5	11.8	0.12
Family Xanthidea, Total	26.0	64.7	1.29
Neopanope texanna	7.8	47.1	0.71
Rhitropanopeous harrisii	7.9	17.6	0.24
Eurypanopeus depressus	0.9	5.9	0.06
Unclassified	9.4	17.6	0.28
Class Osteichthyes, Total	7.1	17.6	0.28

*1 x 10^{-4}/fish

Blueback herring, _Alosa aestivalis_
Size range (cm), 7-15
Sample size, 13

Diet Item	% Volume	% Occurrence	Ind/fish
Plant detritus	0.2	15.4	0.7*
Algae	LT.1	7.7	0.4*
Class Hydrozoa	LT.1	7.7	0.38*
Class Turbellaria	LT.1	7.7	0.08
Class Polychaeta	LT.1	7.7	0.46
Class Insecta, Fam. Chironimidae, larvae	0.4	7.7	0.23
Subclass Ostracoda	LT.1	15.4	0.77
Subclass Copepoda, Total	48.5	100.	972.6
Order Calanoida	48.2	100.	962.9
Order Harpacticoida	0.4	46.2	9.7
Suborder Gammaridea, Fam. Photidae, _Leptocheirus plumulosus_	9.7	15.4	2.92
Order Mysidacea, Total	11.4	30.8	2.08
Neomysis americana	8.0	23.1	1.23
Unclassified	3.4	15.4	0.85
Infraorder Caridea, larval forms	17.5	23.1	38.62

*ml x 10^{-4}/fish

BLUEFISH, Pomatomus saltatrix

Diet Item / Sample Size / Size Range (cm)	% Volume				% Occurrence				Ind/Fish			
Sample Size	16	62	19	97	16	62	19	97	16	62	19	97
Size Range (cm)	6-10	11-20	21-36	Total	6-10	11-20	21-36	Total	6-10	11-20	21-36	Total
Sediment		LT.1		LT.1		1.6		1.0		0.08*		0.05
Plant detritus	LT.1	0.6	0.6	0.6	6.3	17.7	15.8	15.5	0.3*	60.9*	158.9*	70.2*
Class Turbellaria		LT.1		Lt.1		1.6		1.0		0.16		0.10
Class Polychaeta, Total	28.6	LT.1		0.5	25.0	3.2		6.2	0.5	0.03		0.10
Genus Nephtys	11.2			0.2	6.3			1.0	0.13			0.02
Genus Nereis	17.4	LT.1		0.3	18.8	3.2		5.2	0.38	0.03		0.08
Class Insecta, adult forms	0.2			LT.1	6.3			1.0	0.06			0.01
Subclass Copepoda, Order Calanoidia	0.2	LT.1		LT.1	18.8	1.6		4.1	9.0	0.02		1.49
Subclass Cirripedia, adult forms		LT.1		LT.1		1.6		1.0		0.02		0.01
Suborder Gammaridea, Gammarus mucronatus	0.4			LT.1	6.3			1.0	0.06			0.01
Order Mysidacea, Total	0.1	2.8	LT.1	1.5	6.3	12.9	5.3	10.3	0.13	15.9	0.05	10.16
Neomysis americana	0.1	2.1	LT.1	1.1	6.3	9.7	5.3	8.2	0.13	10.3	0.05	6.64
Mysidopsis bigelowi		0.7		0.4		3.2		2.1		5.52		3.53
Infraorder Caridea, larva	3.6			LT.1	18.8			3.1	16.75			2.76
Genus Palaemonetes, Total	33.5	0.1		0.7	18.8	4.8		6.2	3.38	0.06		0.60
Palaemonetes vulgaris	24.5	0.1		0.5	12.5	3.2		4.1	3.25	0.03		0.56
Palaemonetes pugio	8.9			0.2	6.3			1.0	0.13			0.02
Unclassified		LT.1		LT.1		1.6		1.0		0.03		0.02

BLUEFISH - (Cont.)

	% Volume				% Occurrence				Ind/Fish			
	16 6-10	62 11-20	19 21-36	97 Total	16 6-10	62 11-20	19 21-36	97 Total	16 6-10	62 11-20	19 21-36	97 Total
<u>Crangon septemspinosa</u>	6.0	5.5	1.8	3.9	18.8	22.6	31.6	23.7	0.31	0.52	0.47	0.47
Infraorder Brachyura, larvae	0.4			LT.1	25.0			4.1	4.06			0.67
Infraorder Brachyura, <u>Callinectes sapidus</u>		9.1	12.2	10.3		3.2	10.5	4.1		0.03	0.11	0.04
Class Osteichthyes, eggs	0.7			LT.1	6.3			1.0	6.19			0.20
Class Osteichthyes, adult forms	26.3	81.8	85.5	82.3	37.5	72.6	84.2	69.1	0.63	1.23	1.21	1.12
Family Atherinidae	6.7	10.1		5.6	6.3	9.7		7.2	0.06	0.11		0.08
Genus Anchoa		7.9	3.6	5.9		11.3	5.3			0.24	0.05	0.16
<u>Apeletes quadracus</u>		1.1		0.6		3.2		2.1		0.06		0.04
<u>Brevoortia tyrannus</u>		5.4	30.1	16.1		4.8	5.3	4.1	0.05	0.05		0.04
<u>Cynoscion regalis</u>		1.8		1.0		1.6		1.0		0.02		0.01
<u>Leiostomus xanthurus</u>		3.1		1.6		1.6		1.0		0.02		0.01
Genus Fundulus		23.7	22.2	22.6		9.7	15.8	9.3		0.19	0.26	0.18
<u>Gobiosoma bosci</u>		1.7		0.9		1.6		1.0		0.05		0.03
Unclassified	19.6	27.0	29.9	28.0	31.3	38.7	63.2	42.3	0.56	0.48	0.89	0.58

* ml x 10^{-4}/fish

Brown bulkhead, Ictalurus nebulosus
Size Range (cm), 20-35
Sample Size, 5

Diet Item	% Volume	% Occurrence	Ind/fish
Sediment	0.9	40.0	158.0*
Plant detritus	0.1	80.0	23.0*
Phylum Nemertea	0.1	20.0	0.20
Phylum Bryozoa	LT.1	20.0	14.0*
Class Gastropoda, Fam. Nassariidae	0.1	20.0	0.2
Class Pelecypoda	0.5	20.0	0.2
Class Polychaeta, Total	16.0	40.0	25.8
Genus Nereis	0.5	20.0	0.2
Family Spionidae	7.1	40.0	20.2
Family Capitellidae	0.1	20.0	0.4
Unclassified	8.3	20.0	5.0
Class Insecta, larval forms, Fam. Chironimidae	0.2	60.0	0.8
Subclass Copepoda, Order Harpacticoida	LT.1	20.0	0.2
Order Isopoda, Total	2.3	80.0	5.6
Cyathura polita	1.7	80.0	3.0
Genus Cirolana	LT.1	20.0	0.2
Edotea triloba	0.1	40.0	2.2
Family Oniscidae	0.5	10.0	0.1
Suborder Gammaridea, Total	3.4	80.0	15.4
Fam. Aoridae, Microdentopus gryllotalpa	LT.1	20.0	0.4
Fam. Photidae, Leptocheirus plumulosus	3.3	40.0	14.2
Unclassified	0.1	40.0	0.8
Order Mysidacea, Neomysis americana	LT.1	20.0	0.2
Infraorder Brachyura, Total	13.4	80.0	1.0
Callinectes sapidus	13.2	20.0	0.2
unclassified	0.2	60.0	0.8
Class Osteichthyes, Total	60.1	80.0	2.2
Genus Anchoa	60.1	40.0	1.8
Unclassified	LT.1	40.0	0.4

*ml x 10^{-4}/fish

Crevalle jack, *Caranx hippos*
Size Range (cm), 4-13
Sample Size, 9

Diet Item	% Volume	% Occurrence	Ind/fish
Sediment	LT.1	22.2	1.1*
Order Mysidacea, Total	30.4	77.8	31.0
Neomysis americana	30.3	77.8	30.8
Mysidopsis bigelowi	LT.1	22.2	0.2
Crangon septemspinosa	16.2	33.3	0.4
Class Osteichthyes, Total	53.3	33.3	0.9
Genus Anchoa	44.1	11.1	0.7
Unclassified	9.2	22.2	0.2

*ml x 10^{-4}/fish

Cunner, *Tautogolabrus adspersus*
Size range (cm), 3-5
Sample size, 4

Diet Item	% Volume	% Occurrence	Ind/fish
Plant detritus	2.3	25.0	1.3*
Phylum Porifera	2.3	25.0	1.3*
Class Nematoda	0.2	25.0	0.25
Class Polychaeta	2.3	25.0	0.25
Subclass Copepoda, Total	0.5	75.0	1.0
Order Calanoida	0.4	50.0	0.75
Order Harpacticoida	0.1	25.0	0.25
Order Isopoda, *Edotea triloba*	12.6	50.0	3.25
Suborder Gammaridea, Total	70.5	50.0	5.75
Genus Ampelisca, *A. Abdita*	30.6	25.0	1.50
Fam. Gammaridae, *Elasmopus leavis*	34.9	50.0	2.00
Unclassified	5.0	25.0	2.25
Infraorder Brachyura, larval forms	2.4	25.0	0.75
Unclassified material	6.9	-	-

*ml x 10^{-4}/fish

Fourspine stickleback, _Apeltes quadracus_
Size range (cm), 2-6
Sample size, 76

Diet Item	% Volume	% Occurrence	Ind/fish
Sediment	0.6	3.9	0.3*
Plant detritus	0.5	5.3	0.2*
Algae	0.5	7.9	0.2*
Class Turbellaria	0.1	7.9	0.18
Class Nemotoda	2.4	10.5	0.59
Class Gastropoda, Total	0.3	2.6	0.12
Genus Bittium	0.2	1.3	0.01
Genus Crepidula	LT.1	1.3	0.11
Class Pelecypoda, Family Mytilidae	3.0	1.3	0.08
Class Polychaeta, larval forms	LT.1	1.3	0.01
Class Polychaeta, total excluding larvae	6.7	10.5	0.18
Family Phyllodocidae	2.3	1.3	0.01
Family Syllidae	0.1	1.3	0.01
Family Spionidae	0.1	3.9	0.08
Unclassified	4.2	6.6	0.08
Class Oligochaeta	0.3	2.6	0.34
Order Acari	LT.1	1.3	0.01
Class Insecta, larval forms, Fam. Chironimidae	0.3	3.9	0.07
Subclass Ostracoda	LT.1	3.9	0.07
Subclass Copepoda, Total	14.9	73.7	19.87
Order Calanoida	12.4	50.0	14.37
Order Harpacticoida	2.0	42.1	4.47
Unclassified	0.5	10.5	1.03
Order Isopoda, Total	6.1	3.9	0.04
Genus Idotea	6.0	2.6	0.03
Edotea triloba	LT.1	1.3	0.01
Suborder Gammaridea, Total	34.2	29.0	1.11
Genus Ampelisca, _A. vadorum_	3.5	1.3	0.09
Family Ampithoidae, _Cymadusa compta_	6.0	3.9	0.16
Fam. Aoridae, _Microdeutopus gryllotalpa_	3.2	2.6	0.20
Family Corophiidae	1.8	2.6	0.04
Family Gammaridae, Total	0.9	2.6	0.03
Elasmopus laevis	0.6	1.3	0.01
Unclassified	0.3	1.3	0.01
Fam. Photidae, _Leptocheirus plumulosus_	0.4	1.3	0.01

Fourspine stickleback, _Apeltes quadracus_ (Con't)

Diet Item	% Volume	% Occurrence	Ind/fish
Suborder Caprellidae	LT.1	2.6	0.03
Order Mysidacea, Total	26.0	13.2	0.26
Neomysis americana	25.5	11.8	0.25
Unclassified	0.5	1.3	0.01
Infraorder Caridea, larval forms	LT.1	1.3	0.01
Infraorder Brachyura, Family Xanthidea	0.1	1.3	0.01
Class Osteichthyes, eggs	3.5	1.3	0.04

*ml x 10^{-4}/fish

Golden shiner, _Notemigonus crysoleucas_
Size range (cm), 15-18
Sample size, 3

Diet Item	% Volume	% Occurrence	Ind/fish
Plant detritus	1.0	33.3	1.7*
Algae	1.0	33.3	1.7*
Class Polychaeta	22.5	33.3	0.33
Subclass Copepoda, Total	20.1	33.3	108.0
Order Calanoida	19.6	33.3	104.33
Order Harpacticoida	0.4	33.3	3.67
Unclassified Material	55.4	-	-

*ml x 10^{-4}/fish

Grey Snapper, *Lutjanus griseus*
Size range (cm), 4 and 5
Sample size, 2

Diet Item	% Volume	% Occurrence	Ind/fish
Class Pelecypoda	2.4	50.0	0.5
Class Polychaeta, Fam. Maldanidae	23.7	50.0	0.5
Subclass Copepoda, Order Calanoida	1.9	50.0	0.5
Order Isopoda, Genus, Idotea	19.0	50.0	0.5
Class Osteichtyes, eggs	24.6	50.0	0.5
Unclassified Material	28.4	-	-

Hogchoker, *Trinectes maculatus*
Size range (cm), 2 - 17
Sample size, 7

Diet Item	% Volume	% Occurrence	Ind/fish
Sediment	2.1	42.9	7.1*
Plant detritus	0.6	28.3	2.1*
Class Polychaeta, Total	48.4	57.1	0.57
Genus Nereis	5.4	14.3	0.14
Unclassified	43.0	42.9	0.43
Class Insecta, larval forms, Fam. Chironimidae	6.1	42.9	1.57
Subclass Copepoda, Order Harpacticoida	LT.1	14.3	0.29
Suborder Gammaridea, Total	0.9	28.6	0.29
Fam. Photidae, *Leptocheirus plumulosus*	0.7	14.3	0.14
Unclassified	0.2	14.3	0.14
Unclassified Material	41.9	-	-

*ml x 10^{-4}/fish

Inshore lizzardfish, <u>Synodus foetens</u>
Size range (cm), 10 and 14
Sample size, 2

Diet Item	% Volume	% Occurrence	Ind/fish
Class Osteichthyes, unclassified	100.	100.	1.00

Lined seahorse, *Hippocampus erectus*
Size range (cm), 8-12
Sample size, 3

Diet Item	% Volume	% Occurrence	Ind/fish
Class Pelecypoda, Fam. Mytilidae	1.3	33.3	0.33
Class Polychaeta	4.0	33.3	0.33
Suborder Gammaridea, Total	71.2	100.	16.67
Genus Ampelisca, *A. abdita*	13.2	33.3	3.33
Fam. Ampithoidae, *Cymadusa compta*	56.7	66.7	13.00
Family Corophiidae	1.2	33.3	0.33
Order Mysidacea, *Neomysis americana*	9.0	33.3	0.33
Crangon septemspinosa	13.2	33.3	0.33
Infraorder Brachyura, larval forms	1.3	33.3	0.33

Mummichog, *Fundulus heteroclitus*
Size range (cm), 3-11
Sample size, 34

Diet Item	% Volume	% Occurrence	Ind/fish
Sediment	0.7	14.7	1.9*
Plant detritus	0.6	14.7	1.5*
Algae	1.4	44.1	3.7*
Class Hydrozoa	0.1	8.8	0.3*
Class Nematoda	LT.1	14.7	0.21
Class Polychaeta, Total	3.3	14.7	0.18
Family Phyllodocidae	LT.1	2.9	0.03
Unclassified	3.3	11.8	0.15
Class Insecta, All Forms	2.1	32.4	2.00
Larval forms	2.0	29.4	1.94
Family Chironimidae	2.0	26.5	1.88
Unclassified	LT.1	2.9	0.06
Adult forms	0.1	5.9	0.06
Subclass Copepoda, Total	LT.1	17.6	0.29
Order Calanoida	LT.1	5.9	0.09
Order Harpacticoida	LT.1	14.7	0.21
Order Isopoda, *Edotea triloba*	0.6	2.9	0.03
Suborder Gammaridea, Total	13.9	44.1	1.15
Family Ampithoidae, *Cymadusa compta*	1.6	5.9	0.06
Fam. Aoridae, *Microdeutopus gryllotalpa*	0.6	2.9	0.29
Family Corophiidae	1.1	2.9	0.09
Family Gammaridae, Total	7.1	14.7	0.47
Gammarus mucronatus	6.9	11.8	0.44
Unclassified	0.2	2.9	0.03
Family Photidae, *Leptocheirus plumulosus*	0.3	2.9	0.03
Unclassified	3.2	17.6	0.21
Genus Palaemonetes, *P. pugio*	5.6	2.9	0.03
Crangon septemspinosa	11.2	2.9	0.03
Class Osteichthyes, Genus Fundulus	50.4	2.9	0.03
Class Osteichthyes, eggs	3.4	2.9	0.32
Unclassified Material	6.7	-	-

*ml x 10^{-4}/fish

Naked goby, *Gobiosoma bosci*
Size range (cm), 3-5
Sample size, 8

Diet Item	% Volume	% Occurence	% Ind/fish
Seidment	1.9	25.0	1.1*
Plant detritus	1.1	12.5	0.6*
Class Turbellaria	1.9	25.0	0.38
Class Polychaeta, Total	52.4	25.0	0.50
Family Phyllodocidae	30.6	25.0	0.38
Family Capitellidae	21.8	12.5	0.13
Order Isopoda, *Edotea triloba*	0.3	12.5	0.13
Suborder Gammaridea, Total	40.0	50.0	1.88
Genus Ampelisca, *A. abdita*	15.1	37.5	1.25
Family Gammaridae, Total	24.9	25.0	0.63
Gammarus mucronatus	2.2	12.5	0.13
Elasmopus laevis	22.7	12.5	0.50
Order Mysidacea, Total	2.4	25.0	0.38
Mysidopsis bigelowi	2.2	12.5	0.25
Unclassified	0.2	12.5	0.25

*ml x 10^{-4}/fish

Northern kingfish, _Menticirrhus saxatilis_
Size range (cm), 15 and 19
Sample size, 2

Diet Item	% Volume	% Occurrence	Ind/fish
Plant detritus	0.2	50.0	5.0*
Class Polychaeta, Total	20.6	50.0	2.0
Family Capitellidae	9.9	50.0	1.0
Glycera americana	9.9	50.0	0.5
Unclassified	0.8	50.0	0.5
Crangon septemspinosa	79.2	100.	3.0

*ml x 10^{-4}/fish

Northern pipefish, *Syngnathus fuscus*
Size range (cm), 9-21
Sample size, 21

Diet Item	% Volume	% Occurrence	Ind/fish
Sediment	LT.1	4.8	0.2*
Algae	0.2	4.8	0.8*
Class Turbellaria	0.9	23.8	1.95
Class Nematoda	LT.1	9.5	0.14
Subclass Copepoda, Total	2.1	42.9	18.9
Order Clanoida	1.4	33.3	10.57
Order Harpacticoida	LT.1	19.0	0.43
Unclassified	0.7	4.8	7.90
Order Isopoda, Total	0.5	14.3	0.29
Genus Idotea	0.3	9.5	0.19
Genus Erichsonella	0.1	4.8	0.05
Unclassified	0.1	4.8	0.05
Suborder Gammaridea, Total	35.0	47.6	2.19
Genus Ampelisca, Total	2.4	14.3	0.38
Ampelisca abodita	2.2	9.5	0.33
Unclassified	0.2	4.8	0.05
Family Ampithoidae, *Cymadusa compta*	31.8	9.5	0.86
Family Corophiidae	LT.1	9.5	0.10
Family Gammaridae	LT.1	4.8	0.10
Family Stenothoidae	0.5	4.8	0.67
Suborder Caprellidae	1.4	9.5	0.33
Order Mysidacea, *Neomysis americana*	58.6	47.6	2.95
Infraorder Caridea, larval forms	LT.1	4.8	0.05
Infraorder Brachyura, Fam. Xanthidea	0.4	4.8	0.05
Infraorder Brachyura, larval forms	0.4	14.3	0.76

*ml x 10^{-4}/fish

Northern puffer, *Sphoeroides maculatus*
Size range (cm), 2-11
Sample size, 3

Diet Item	% Volume	% Occurrence	Ind/fish
Plant detritus	2.8	66.7	25.0*
Class Hydrozoa	0.4	66.7	3.33*
Class Turbellaria	LT.1	33.3	0.33
Class Gastropoda, Genus Crepidula	55.4	66.7	8.0
Class Gastropoda, larval forms	LT.1	33.3	3.0
Class Polychaeta	18.4	33.3	0.67
Order Cladocera	LT.1	33.3	0.33
Subclass Ostracoda	LT.1	66.7	2.33
Subclass Copepoda, Order Calanoida	LT.1	33.3	0.67
Order Isopoda, Total	18.4	66.7	1.33
Genus Idotea	LT.1	33.3	0.33
Genus Erichsonella	18.4	33.3	1.00
Suborder Gammaridea, Total	2.5	66.7	2.33
Genus Ampelisca, *A. vadorum*	1.8	33.3	1.00
Family Corophiidae	LT.1	33.3	0.67
Family Stenothoiidae	LT.1	33.3	0.33
Unclassified	0.7	33.3	0.33

*ml x 10^{-4}/fish

Northern searobin, Prionotus carolinus
Size range (cm), 8-18
Sample size, 4

Diet Item	% Volume	% Occurrence	Ind/fish
Plant detritus	0.3	50.0	12.5*
Suborder Gammaridea, Total	7.6	50.0	6.50
Genus Ampelisca, A. abdita	LT.1	25.0	0.25
Fam. Ampithoidae, Cymadusa compta	6.7	50.0	4.50
Fam. Gammaridae, Elasmopus leavis	0.4	25.0	1.50
Monoculodes edwardsi	0.5	25.0	0.25
Genus Palaemonetes, P. vulgaris	7.9	25.0	0.25
Crangon septemspinosa	80.4	100.	9.75
Infraorder Brachyura, unclassified adult forms	3.8	25.0	0.75
Infraorder Brachyura, larval forms	LT.1	25.0	0.25

*ml x 10^{-4}/fish

Northern sennet, *Sphyraena borealis*
Size range (cm), 10-17
Sample size, 7

Diet Item	% Volume	% Occurrence	Ind/fish
Order Mysidacea, *Neomysis americana*	5.1	14.3	2.57
Class Osteichthyes, Total	94.9	71.4	0.71
Family Atherinidae	44.1	28.6	0.29
Unclassified	50.8	42.9	0.42

Oyster toadfish, *Opsanus tau*

Diet Item	% Volume			% Occurrence			Ind/fish		
Sample Size	15	15	30	15	15	30	15	15	30
Size Range (cm)	4-13	18-28	Total	4-13	18-28	Total	4-13	18-28	Total
Plant detritus	2.2	11.7	11.3	26.7	33.3	30.0	28.3*	3579.3*	1803.8*
Class Nematoda	2.0	0.7	0.7	60.0	53.3	56.7	2.0	4.73	3.37
Class Gastopoda, Total		4.2	4.0		33.3	16.7		0.6	0.30
Genus Bittium		LT.1	LT.1		6.7	3.3		0.07	0.03
Genus Crepidula		LT.1	LT.1		6.7	3.3		0.07	0.03
Mitrella lunata		LT.1	LT.1		6.7	3.3		0.07	0.03
Family Nassariidae		3.3	3.1		13.3	6.7		0.13	0.07
Haminoea solitaria		0.8	0.8		13.3	6.7		0.27	0.13
Class Pelecypoda, *Ensis directus*		0.4	0.4		6.7	3.3		0.07	0.03
Class Polychaeta, Total	23.0		0 9	33.3		16.7	0.60		0.30
Genus Nereis	20.1		0.8	26.7		13.3	0.47		0.23
Unclassified	2.9		0.1						
Subclass Copepoda, Order Harpacticoidia	LT.1		LT.1	6.7		3.3	0.80		0.40
Orders Tanaidacea and Isopoda, Total	19.9	2.9	3.6	46.7	33.3	40.0	0.87	2.53	1.70
Cyathura polita	6.1		0.2	20.0		10.0	0.33		0.17
Genus Idotea	13.8	2.4	2.9	26.7	33.3	30.0	0.53	1.93	1.23
Genus Erichsonella		0.4	0.4		20.0	10.0		0.60	0.30
Suborder Gammaridea, Total	0.7	0.5	0.5	13.3	33.3	23.3	0.27	1.53	0.90
Family Ampithoidae, *Cymadusa compta*	0.4	0.2	0.2	6.7	6.7	6.7	0.13	1.20	0.67
Unclassified	0.3	0.3	0.3	6.7	26.7	16.7	0.13	0.33	0.23
Genus Palaemonetes, Total		1.0	1.0		20.0	10.0		0.20	0.10
Palaemonetes vulgaris		0.4	0.4		6.7	3.3		0.07	0.03
Palaemonetes pugio		0.5	0.5		6.7	3.3		0.07	0.03
Unclassified		0.1	0.1		6.7	3.3		0.07	0.03
Crangon septemspinosa	10.4		0.4	20.0		10.0	0.27		0.13
Infraorder Brachyura, Total	39.5	22.4	23.1	40.0	33.3	36.7	0.67	0.87	0.76
Callinectes sapidus	2.6	12.4	12.0	6.7	13.3	10.0	0.07	0.13	0.10
Family Xanthidea, Total	36.9	10.0	11.1	33.3	26.7	30.0	0.60	0.73	0.67

Oyster toadfish, *Opsanus tau* (continued)

Diet Item	% Volume			% Occurrence			Ind/fish		
Sample Size	15	15	30	15	15	30	15	15	30
Size Range (cm)	4-13	18-28	Total	4-13	18-28	Total	4-13	18-28	Total
Neopanope texanna	3.2	9.1	8.9	13.3	13.3	13.3	0.13	0.60	0.37
Rhithropanopeus harrisii	28.5	0.5	1.6	13.3	6.7	10.0	0.33	0.07	0.20
Unclassified	5.2	0.4	0.6	6.7	6.7	6.7	0.13	0.07	0.10
Class Osteichthyes - eggs	LT.1		LT.1	13.3		6.7	0.47		0.23
Class Osteichthyes, Total except eggs	0.7	55.6	53.4	13.3	26.7	20.0	0.13	0.60	0.37
Apeletes quadracus		0.8	0.7		6.7	3.3		0.07	0.03
Leiostomus xanthurus		54.4	52.2	-	13.3	6.7		0.47	0.23
Unclassified	0.7	0.4	0.5	13.3	6.7	10.0	0.13	0.07	0.10

*ml x 10^{-4}/fish

Permit, *Trachinotus falcatus*
Size range (cm), 8
Sample size, 1

Diet Item	% Volume	% Occurrence	Ind/fish
Class Gastropoda, Total	100.	100.	16.0
Genus Crepidula	99.0	100.	15.0
Mitrella lunata	1.0	100.	1.0

Pinfish, *Lagodon rhomboides*
Size range (cm), 6-11
sample size, 3

Diet Item	% Volume	% Occurrence	Ind/fish
Suborder Gammaridea, Total	6.5	100.	2.33
Genus Ampelisca, Total	0.4	66.7	1.00
Apelisca abdita	0.4	33.3	0.67
Unclassified	LT.1	33.3	0.33
Family Corophiidae	5.5	33.3	1.00
Family Gammaridae	0.6	33.3	0.33
Genus Palaemonetes, *P. vulgaris*	60.3	33.3	1.33
Crangon septemspinosa	33.3	66.7	1.33

Planehead filefish, <u>Monacanthus hispidus</u>
Size range (cm), 5 and 13
sample size, 2

Diet Item	% Volume	% Occurrence	Ind/fish
Algae	39.7	50.0	500.0*
Class Hydrozoa	19.8	50.0	250.0*
Class Pelecypoda	9.9	50.0	0.5
Suborder Gammaridea, Total	20.5	100.	10.50
Fam. Aoridae, *Microdeutopus gryllotalpa*	0.3	50.0	0.5
Fam Corophiidae	20.2	100.	10.00
Suborder Caprellidae	0.1	50.0	0.50
Unclassified Material	10.1	-	-

Pumpkinseed, *Lepomis gibbosus*
Size range (cm), 9 and 10
sample size, 2

Diet Item	% Volume	% Occurrence	Ind/fish
Sediment	0.4	100.	5.0*
Plant detritus	0.2	50.	2.5*
Class Polychaeta, Total	79.6	100.	8.0
Genus Nereis	50.3	50.	1.0
Hypaniola grayi	21.0	50.	6.5
Unclassified	8.3	50.	0.5
Class Oligochaeta	0.4	50.	0.5
Class Insecta, larval forms, Fam. Chironimidae	1.3	50.	1.00
Suborder Gammaridea, Total	15.9	50.	21.0
Family Gammaridae	8.4	50.	6.0
Fam. Photidae, *Leptocheirus plumulosus*	7.5	50.	15.0

*ml x 10^{-4}/fish

Rainwater killifish, *Lucania parva*
Size range (cm), 3-4
sample size, 9

Diet Item	% Volume	% Occurrence	Ind/fish
Algae	3.5	22.2	0.7*
Class Turbellaria	3.1	22.2	0.22
Class Polychaeta, genus Nereis	11.8	11.1	0.11
Class Insecta, larval forms, Fam. Chironimidae	4.2	22.2	0.89
Subclass Copepoda, Total	5.0	44.4	2.67
Order Calanoida	3.9	22.2	1.78
Order Harpacticoida	1.1	22.2	0.89
Suborder Gammaridea, *Gammarus mucronatus*	61.8	66.7	2.89
Order Mysidacea	10.6	11.1	0.11

*ml x 10^{-4}/fish

Red Hake, *Urophycis chuss*

Size range (cm), 8 -20

Sample size, 3

	% Volume	% Occurrence	Ind/fish
Class Nematoda	0.2	33.3	2.00
Suborder Gammeridea, *Cymadusa Compta*	5.5	33.3	0.67
Crangon septemspinosa	39.9	66.7	5.33
Class Osteichthyes, *Brevoortia tyrannus*	54.5	33.3	0.33

Redfin pickerel, _Esox americanus_
Size range (cm), 26
sample size, 1

Diet Item	% Volume	% Occurrence	Ind/fish
Class Osteichthyes	100.	100.	1.0

Scup, _Stenotomus chrysops_
Size range (cm), 14
Sample size, 1

Diet Item	% Volume	% Occurrence	Ind/fish
Class Pelecypoda, Fam. Veneridae	0.1	100.	2.0
Class Polychaeta, Total	37.6	100.	4.0
Family Maldanidae	37.5	100.	3.0
Family Terebellidae	LT.1	100.	1.0
Order Isopoda, _Cyathura polita_	2.3	100.	1.0
Suborder Gammaridea, Genus Ampelisca	1.0	100.	1.0
Order Mysidacea, _Neomysis americana_	7.5	100.	5.0
Class Osteichthyes	22.5	100.	1.0
Unclassified Material	29.0	-	-

Sheepshead minnon, *Cyprinodon variegatus*
Size range (cm), 3-5
Sample size, 29

Diet Item	% Occurrence
Sediment	20.7
Plant detritus	34.5
Algae	96.6
Class Hydrozoa	13.8
Class Insecta, larval forms, Fam. Chironimidae	3.4
Subclass Copepoda, Total	27.6
Order Calanoida	10.3
Order Harpacticoida	13.8

Silver perch, *Bairdiella chrysura*
Size range (cm), 3-12
Sample size, 26

Diet Item	% Volume	% Occurrence	Ind/fish
Class Gastropoda, Genus Bittium	LT.1	3.8	0.04
Class Polychaeta, Genus Nereis	0.3	3.8	0.04
Subclass Copepoda, Total	LT.1	11.5	1.38
Order Calanoida	LT.1	11.5	1.35
Order Harpacticoida	LT.1	3.8	0.04
Order Isopoda, Genus Idotea	0.1	3.8	0.04
Suborder Gammaridea, Total	1.9	34.6	1.23
Genus Ampelisca, Total	0.2	15.4	0.69
Ampelisca abdita	LT.1	7.7	0.62
Ampelisca vadorum	0.1	7.7	0.08
Family Ampithoidae, Total	1.7	19.2	0.34
Cymadusa compta	0.5	15.4	0.19
Unclassified	1.2	3.8	0.15
Family Corophiidae	LT.1	11.5	0.08
Family Gammaridae, *Gammarus mucronatus*	LT.1	3.8	0.04
Family Stenothoidae	LT.1	3.8	0.04
Order Mysidacea, Total	20.4	57.7	14.04
Neomysis americana	18.3	42.3	11.81
Mysidopsis bigelowi	2.1	23.1	2.23
Genus Palaemonetes, Total	16.8	19.2	0.42
Palaemonetes vulgaris	12.3	11.5	0.19
Palaemonetes pugio	3.4	3.9	0.08
Unclassified	1.1	3.9	0.15
Crangon septemspinosa	43.6	53.9	1.73
Class Osteichthyes	14.5	15.4	0.19

Smooth dogfish, *Mustelus canis*
Size range (cm), 39-56
Sample size, 12

Diet Item	% Volume	% Occurrence	Ind/fish
Class Pelecypoda	0.1	8.3	0.08
Class Polychaeta	LT.1	8.3	0.08
Genus Palaemonetes, *P. vulgaris*	0.6	25.0	0.58
Crangon septemspinosa	0.4	25.0	0.50
Infraorder Brachyura, *Callinectes sapidus*	90.7	83.3	1.33
Class Osteichthyes, Total	2.5	16.7	0.17
Cynoscion regalis	2.1	8.3	0.08
Unclassified	0.4	8.3	0.08
Unclassified material	5.7	-	-

Spot, Leiostomus Xanthurus

Diet Item	% Volume			% Occurrence			Ind/fish		
Sample Size	48	44	92	48	44	92	48	44	92
Size Range (cm)	3-10	11-19	Total	3-10	11-19	Total	3-10	11-19	Total
Sediment	1.1	0.8	0.86	10.4	9.1	9.7	1.1*	3.4*	2.20*
Plant detritus	0.1	0.4	0.36	2.1	34.1	17.4	0.1*	1.8*	0.92*
Algae		LT.1	LT.1		2.3	1.1		0.1*	0.05*
Class Hydrozoa	0.2	0.1	0.1	4.2	11.4	7.6	0.21*	0.57*	0.38*
Class Turbellaria	0.3	0.1	0.2	10.4	11.4	10.9	0.21	0.32	0.26
Class Gastropoda, unclassified		LT.1	LT.1		2.3	1.1		0.07	0.03
Class Gastropoda, larval forms	LT.1	LT.1	LT.1	2.1	2.3	2.2	0.02	1.25	0.61
Class Pelecypoda, larval forms		LT.1	LT.1		2.3	1.1		0.59	0.28
Class Pelecypoda, Adults Forms									
Total	2.4	5.7	5.0	10.4	6.8	8.7	0.31	1.68	0.97
Family Mytilidae		LT.1	LT.1		2.3	1.1		0.02	0.01
Family Veneridae	1.7	2.9	2.7	4.2	2.3	3.3	0.15	1.59	0.84
Siphons		2.7	2.1		2.3	1.1		0.05	0.02
Unclassified	0.7	0.1	0.2	6.3	2.3	4.3	0.15	0.02	0.10
Class Polychaeta, larvae	LT.1		LT.1	2.1		1.1	0.02		0.01
Class Polychaeta, Adult Forms									
Total	6.4	29.4	24.3	29.2	31.8	30.4	1.10	6.32	3.60
Family Phyllodocidae	0.2	0.7	0.6	6.3	6.8	6.5	0.15	0.16	0.15
Family Syllidae		LT.1	LT.1		2.3	1.1		0.02	0.01
Genus Nephthys		2.7	2.1		2.3	1.1		0.02	0.01
Genus Nereis	0.3	3.7	2.9	2.1	6.8	4.3	0.06	0.07	0.07
Family Spionidae		6.9	5.4		4.5	2.2		4.84	2.32
Hypaniola grayi	4.6	5.8	5.5	4.2	4.5	4.3	0.60	0.75	0.67
Unclassified	1.3	9.6	7.8	16.7	18.2	17.4	0.29	0.45	0.37
Class Oligochaeta		4.2	3.3		6.8	3.3		3.09	1.48
Class Insecta, larvae Total	LT.1	0.9	0.7	2.1	18.2	9.8	0.02	0.50	0.25
Family Chironomidae, larvae	LT.1	0.5	0.4	2.1	13.6	7.6	0.02	0.32	0.16
Unclassified larvae		0.4	0.3		4.5	2.2		0.18	0.09
Order Cladocera	LT.1		LT.1	2.1		1.1	0.02		0.01
Subclass Ostracoda	LT.1	LT.1	LT.1	4.2	9.1	6.5	0.35	0.27	0.32

Spot, *Leiostomus Xanthurus* (continued)

Diet Item	% Volume			% Occurrence			Ind/fish		
Sample Size	48	44	92	48	44	92	48	44	92
Size Range (cm)	3-10	11-19	Total	3-10	11-19	Total	3-10	11-19	Total
Subclass Copepoda, Total	33.5	11.2	16.1	91.7	70.5	81.5	170.3	204.1	186.5
Order Calanoida	0.4	0.9	0.8	4.2	29.5	16.3	1.42	11.68	6.33
Order Harpacticoida	13.7	10.3	11.0	35.4	59.1	46.7	88.17	191.45	137.6
Order Cyclopoda		LT.1	LT.1		2.3	1.1		0.05	0.02
Unclassified	19.4	LT.1	4.3	56.3	2.3	30.4	80.71	0.92	42.6
Order Cumacea	2.9	0.1	0.7	12.5	4.5	8.7	0.50	0.09	0.30
Orders Tanaidacea and Isopoda									
Total	1.1	2.1	1.9	12.5	15.9	14.1	0.17	1.77	0.93
Tanais cavolini		1.1	0.9		9.1	4.3		1.64	0.78
Cyathura polita	0.5	1.0	0.9	8.3	9.1	8.7	0.10	0.11	0.11
Edotea triloba	0.2	LT.1	LT.1	2.1	2.3	2.2	0.02	0.02	0.02
Genus Erichsonella	0.4		LT.1	2.1		1.1	0.04		0.02
Suborder Gammaridea, Total	49.5	14.7	22.3	68.8	59.1	64.1	16.06	28.27	21.9
Genus Ampelisca Total	32.5	13.2	17.4	33.3	36.4	34.8	10.94	26.14	18.2
Ampelisca abdita	4.1	8.9	7.9	4.2	15.9	9.8	2.85	22.1	12.0
Unclassified	28.4	4.3	9.5	29.2	20.5	25.0	8.09	4.04	6.2
Fam. Aoridae, *Microdeutopus gryllotalpa*	0.4	0.2	0.2	4.2	4.5	4.3	0.10	0.05	0.08
Family Corophiidae	LT.1	0.6	0.5	2.1	18.2	9.8	0.02	0.89	0.43
Family Gammaridae, Total	1.0	0.2	0.4	4.2	9.1	6.5	0.25	0.52	0.38
Elasmopus laevis		0.2	0.2		6.8	3.3		0.50	0.24
Unclassified	1.0	LT.1	0.2	4.2	2.3	3.3	0.25	0.02	0.14
Family Photidae, *Leptocheirus plumulosus*	0.2	0.2	0.2	2.1	6.8	4.3	0.15	0.30	0.22
Unclassified	15.4	0.3	3.6	39.6	20.5	30.4	4.60	0.37	2.59
Order Mysidacea, Total	0.1	8.9	6.9	2.1	20.5	10.9	0.02	3.27	1.58
Neomysis americana		6.1	4.8		15.9	7.6		2.61	1.25
Mysidopsis bigelowi		2.7	2.1		2.3	1.1		0.57	0.27
Unclassified	0.1	LT.1	LT.1	2.1	2.3	2.2	0.02	0.09	0.06
Infraorder Caridea, larvae		LT.1	LT.1		2.3	1.1		0.02	0.01

Spot, Leiostomus Xanthurus (continued)

Diet Item	% Volume			% Occurrence			Ind/fish		
Sample Size	48	44	92	48	44	92	48	44	92
Size Range (cm)	3-10	11-19	Total	3-10	11-19	Total	3-10	11-19	Total
Crangon septemspinosa		2.2	1.7		2.3	1.1		0.02	0.01
Infraorder Brachyura, Total	0.1	5.4	4.3	2.1	2.3	2.2	0.02	0.02	0.02
Family Xanthidea unclassified	0.1			2.1		1.1	0.02		0.01
Unclassified		5.4	4.3		2.3	1.1		0.02	0.01
Class Osteichthyes, eggs	LT.1		LT.1	2.1		1.1	0.02		0.01
Class Osteichthyes, except eggs		LT.1	LT.1		2.3	1.1		0.02	0.01

*ml x 10^{-4}/fish

Spotted Hake, *Urophycis regius*
Size range (cm), 5-19
Sample size, 16

Diet Item	% Volume	% Occurence	Ind/fish
Plant detritus	1.9	12.5	31.6*
Class Nematoda	LT.1	18.8	0.38
Subclass Ostracoda	LT.1	6.3	0.13
Subclass Copepoda, Order Calanoida	0.1	25.0	3.75
Orders Tanaidacea and Isopoda	0.5	18.8	0.19
Suborder Gammaridea, Total	1.3	31.3	0.69
Genus Ampelisca, Total	0.7	12.5	0.31
Ampelisca vadorum	0.5	6.3	0.13
Unclassified	0.2	6.3	0.18
Fam. Ampithoidae, *Cymadusa compta*	0.6	18.8	0.31
Fam. Hyalidae	LT.1	6.3	0.06
Order Mysidacea, *Neomysis americana*	10.6	31.3	3.63
Genus Palaemonetes, Total	33.8	12.5	0.44
Palaemonetes vulgaris	18.8	12.5	0.38
Palaemonetes pugio	15.0	6.3	0.06
Crangon septemspinosa	47.7	50.0	1.63
Infraorder Brachyura, Fam. Xanthidea	5.6	6.3	0.06
Class Osteichthyes, Total	5.7	25.0	0.25
Apeltes quadracus	3.8	12.5	0.13
Unclassified	1.9	12.5	0.13

$*ml \times 10^{-4}/fish$

Striped burrfish, *Chilomycterus schoepfi*
Size range (cm), 23 and 25
Sample size, 2

Diet Item	% Volume	% Occurrence	Ind/fish
Plant detritus	1.3	100.0	585.0*
Class Gastropoda, Fam. Nassariidae	1.7	50.0	0.50
Class Pelecypoda, Fam. Mytilidae	1.1	50.0	0.50
Order Isopoda, Genus Idotea	0.6	50.0	1.00
Suborder Gammaridea, Fam. Ampithoidae	LT.1	50.0	0.50
Genus Pagurus	2.2	50.0	1.00
Infraorder Brachyura, Total	93.1	100.0	4.00
Callinectes sapidus	83.2	50.0	1.00
Family Xanthidea, Total	10.0	100.0	3.00
Neopanope texanna	5.5	50.0	1.50
Rhithropanopeus harrisii	3.3	50.0	1.00
Unclassified	1.2	50.0	1.50

*ml$\times 10^{-4}$/fish

Striped bass, *Morone saxatilis*
Size range (cm), 43-58
Sample size, 11

Diet Item	% Volume	% Occurrence	Ind/fish
Sediment	LT.1	9.1	90.9*
Class Pelecypoda, Fam. Mytilidae	0.3	9.1	0.09
Class Polychaeta	0.1	9.1	0.09
Crangon septemspinosa	5.9	36.4	3.27
Class Osteichthyes, Total	93.9	81.8	4.18
Family Atherinidae	2.6	9.1	0.09
Ammodytes americanus	30.0	54.5	2.18
Family Bothidae	3.8	9.1	0.18
Cynoscion regalis	18.1	9.1	0.18
Unclassified	39.4	45.5	1.55

*ml x 10^{-4}/fish

Striped Killifish, *Fundulus majalis*
Size range (cm), 4-13
Sample size, 13

Diet Item	% Volume	% Occurrence	Ind/fish
Sediment	9.4	46.2	12.0*
Plant detritus	0.6	15.4	0.8*
Class Hydrozoa	0.3	7.7	0.38*
Class Turbellaria	0.3	10.8	0.22
Class Nematoda	0.1	30.8	1.69
Class Polychaeta, Total except larvae	10.8	38.5	2.38
Hypaniola grayi	0.1	7.7	0.23
Unclassified	10.7	30.8	2.15
Class Polychaeta, larval forms	0.3	7.7	0.08
Class Insecta, Fam. Chironimidae, larvae	4.0	15.4	0.15
Class Copepoda, Order Harpacticoida	0.4	15.4	4.38
Orders Tanaidacea and Isopoda, Total	16.8	30.8	1.54
Tanais cavolini	0.4	7.7	0.08
Genus Idotea	14.6	15.4	1.38
Edotea triloba	1.8	7.7	0.08
Suborder Gammaridea, Total	11.8	38.5	1.23
Fam. Ampithoidae, *Cymadusa compta*	6.1	15.4	0.85
Fam. Aoridae, *Microdeutopus gryllotalpa*	4.3	7.7	0.15
Fam. Corophiidae	0.8	7.8	0.08
Fam. Gammaridae, *Elasmopus laevis*	0.8	7.7	0.15
Suborder Caprellidae	0.3	7.7	0.08
Class Osteichhyes, eggs	31.6	15.4	0.54
Unclassified material	13.0	-	-

*$ml \times 10^{-4}$/fish

Striped Mullet, _Mugil cephalus_
Size range (cm), 11-16
Sample size, 4

Diet item	% Occurence
Sediment	100
Algae	100

Striped searobin, *Prionotus evolans*
Size range (cm), 4-7
Sample size, 3

Diet Item	% Volume	% Occurrence	Ind/fish
Sediment	1.4	33.3	1.7*
Class Turbellaria	4.5	33.3	3.67
Class Copepoda, Order Calanoida	0.4	33.3	1.0
Suborder Gammaridea, Total	11.7	66.7	3.00
Genus Ampelisca, *A. abdita*	5.7	33.3	1.33
Family Aoridae	5.7	33.3	1.33
Family Stenothoidae	0.3	33.3	0.33
Order Mysidacae, Total	76.3	100.0	6.33
Neomysis ameicana	42.2	66.7	3.00
Mysidopsis bigelowi	34.2	33.3	3.33
Crangon septemspinosa	5.7	33.3	0.33
Infraorder Brachyura, Fam. Xanthidae, *Eurypanopeus depressus*	3.0	33.3	0.67

*$ml \times 10^{-4}$/fish

Summer flounder, *Paralichrhys dentatus*

Diet Item	% Volume			% Occurrence			Ind/fish		
Sample Size	25	13	38	25	13	38	25	13	38
Size Range (cm)	6-24	26-65	Total	6-24	26-65	Total	6-24	26-65	Total
Plant detritus	0.2	1.1	0.9	24.0	38.5	28.9	9.8	770.0*	92.6*
Class Nematoda	LT.1		LT.1	4.0		2.6	0.04		0.03
Phylum Bryozoa	LT.1		LT.1	4.0		2.6	0.20*		0.13*
Suborder Gammaridea, Total	0.5	LT.1	LT.1	32.0	7.7	23.7	1.08	0.08	0.74
Genus Ampelisca, *Ampelisca abdita*	LT.1		LT.1	8.0		5.3	0.08		0.05
Family Anpithoidae, *Cymadusa compta*	0.1		LT.1	4.0		2.6	0.04		0.03
Family chorophiidae	LT.1	LT.1	LT.1	4.0	7.7	5.3	0.12	0.08	0.11
Family Gammaridae	LT.1		LT.1	4.0		2.6	0.08		0.05
Fam. Photidae, *Leptocheirus plumulosus*	0.4		LT.1	12.0		7.9	0.76		0.50
Order Mysidacea, Total	14.2	0.4	2.3	52.0	23.1	42.1	41.68	1.69	28.00
Neomysis americana	12.8	0.4	2.2	44.0	23.1	36.8	36.28	1.69	24.44
Mysidopsis bigelowi	1.4		0.1	12.0		7.9	5.36		3.53
Unclassified	LT.1		LT.1	4.0		2.6	0.04		0.03
Penaeus sp.	2.5		0.4	4.0		2.6	0.04		0.03
Genus Palaemonetes, Total	16.5	1.4	3.5	12.0	7.7	10.5	0.28	0.54	0.37
Palaemonetes vulgaris	10.0	1.4	2.6	8.0	7.7	7.9	0.20	0.54	0.32
Palaemonetes pugio	5.5		0.8	4.0		2.6	0.04		0.03
Unclassified	1.0		0.1	4.0		2.6	0.04		0.03
Crangon septemspinosa	27.6	6.9	9.8	40.0	53.9	44.7	2.56	3.92	3.03
Genus Pagurus		0.1	0.1		7.7	2.6		0.08	0.03
Infraorder Brachyura, Total	5.5	14.2	13.0	20.0	30.8	23.7	0.44	0.31	0.39
Callinectes sapidus	0.3	13.6	11.8	4.0	7.7	5.3	0.08	0.08	0.08
Family Xanthidea, Total	5.2	0.5	1.2	16.0	23.1	18.4	0.36	0.23	0.32
Neopanope texanna	1.9	0.5	0.7	8.0	15.4	10.5	0.16	0.15	0.16
Rhithropanopeus harrisii	3.2	LT.1	0.5	12.0	7.7	10.5	0.20	0.08	0.16
Class Osteichthyes, Total	32.6	74.3	68.5	36.0	69.2	47.4	0.60	1.69	0.97
Family Atherinidae	1.9	3.4	3.2	4.0	7.7	5.3	0.04	0.15	0.08
Genus Anchoa	8.1	6.5	6.7	4.0	15.3	7.9	0.04	0.08	0.05

Summer flounder, Paralichthys dentatus (continued)

Diet Item	% Volume			% Occurrence			Ind/fish		
Sample Size	25	13	38	25	13	38	25	13	38
Size Range (cm)	6-24	26-65	Total	6-24	26-65	Total	6-24	26-65	Total
Apeletes quadracus	4.5	1.7	2.1	12.0	15.4	13.2	0.20	0.38	0.26
Bairdiella chrysura		8.9	7.7		7.7	2.6		0.23	0.08
Genus Prionotus		43.4	37.4		15.4	5.3		0.15	0.05
Pseudopleuronectes americanus		8.4	7.2		7.7	2.6		0.15	0.05
Syngnathus fuscus		1.0	0.9		7.7	2.6		0.08	0.03
Unclassified	18.1	2.0	3.3	24.0	23.1	23.7	0.32	0.46	0.37

*ml x 10^{-4}/fish

Tautog, *Tautoga onitis*

Diet Item	% Volume			% Occurrence			Ind/fish		
Sample Size	18	7	25	18	7	25	18	7	25
Size Range (cm)	6-16	20-32	Total	6-16	20-32	Total	6-16	20-32	Total
Sediment	LT.1	0.1	0.1	5.6	14.3	8.0	1.5*	19.2*	6.5*
Plant detritus	LT.1	2.3	1.8	16.7	85.7	36.0	0.8*	306.4*	86.4*
Class Nematoda	0.9	LT.1	0.2	55.6	42.9	52.0	13.89	4.71	11.32
Phylum Bryozoa		2.1	1.6		28.6	8.0		285.71*	80.0*
Class Gastropoda, Total		0.7	0.5		42.9	12.0		5.43	1.52
Genus Bittium		0.1	LT.1		28.6	8.0		1.57	0.44
Genus Crepidula		0.6	0.5		42.9	12.0		3.86	1.08
Class Pelecypoda, Total		0.5	0.4		14.3	4.0		0.29	0.08
Solemya velum		0.5	0.4		14.3	4.0		0.14	0.04
Unclassified		LT.1	LT.1		14.3	4.0		0.14	0.04
Class Polychaeta, Total	3.6	1.2	1.7	11.1	42.9	20.0	0.17	0.57	0.28
Genus Nereis		LT.1	LT.1		14.3	4.0		0.14	0.04
Genus Lumbrineris		1.0	0.8		14.3	4.0		0.29	0.08
Unclassified	3.6	0.2	0.9	11.1	14.3	12.0	0.17	0.14	0.16
Subclass Copepoda, Total	LT.1		LT.1	11.1		8.0	0.17		0.12
Order Calanoida	LT.1		LT.1	11.1		8.0	0.11		0.08
Order Harpacticoida	LT.1		LT.1	5.6		4.0	0.06		0.04
Subclass Cirripedia, Adult forms	0.6		0.1	5.6		4.0	0.11		0.08
Orders Tanaidacea and Isopoda	63.3	1.7	15.5	55.6	42.9	52.0	3.56	1.0	2.84
Genus Idotea	47.2	1.0	11.4	33.3	14.3	28.0	2.17	0.42	1.68
Genus Erichsonnella	15.7	0.6	4.0	33.3	28.6	32.0	1.22	0.42	1.00
Unclassified	0.4	LT.1	0.1	11.1	14.3	12.0	0.17	0.14	0.16
Suborder Gammaridea, Total	7.8	LT.1	1.8	72.2	42.9	64.0	7.83	0.57	5.80
Genus Ampelisca, *A. abdita*	LT.1		LT.1	5.6		4.0	0.11		0.08
Fam. Ampithoidae, *Cymadusa compta*	6.2	LT.1	1.4	22.2	14.3	20.0	3.67	0.14	2.68
Fam. Aoridae, Total	LT.1	LT.1	LT.1	5.6	14.3	8.0	0.17	0.14	0.16
Microdeutopus gryllotalpa	LT.1		LT.1	5.6		4.0	0.17		0.12
Unclassified		LT.1	LT.1		14.3	4.0		0.14	0.04
Family Corophiidae	1.1		0.2	27.8		20.0	2.0		1.44

Tautog, Tautoga onitis (continued)

Diet Item	% Volume			% Occurrence			Ind/fish		
Sample Size	18	7	25	18	7	25	18	7	25
Size Range (cm)	6-16	20-32	Total	6-16	20-32	Total	6-16	20-32	Total
Family Gammaridae, Total	0.04	LT.1	LT.1	11.1	14.3	12.0	1.0	0.29	0.80
Elasmopus laevis	LT.1	LT.1	LT.1	5.6	14.3	8.0	0.22	0.29	0.24
Maeea danae	0.4		LT.1	5.6		4.0	0.77		0.56
Unclassified	0.1		LT.1	11.1		8.0	0.88		0.64
Crangon septemspinosa	3.7	LT.1	0.9	11.1	28.6	16.0	0.11	0.29	0.16
Infraorder Brachyura, Total	23.1	87.1	72.7	44.4	100.	60.0	1.39	7.86	3.20
Ovalipes ocellatus		12.6	9.8		14.3	4.0		0.43	0.12
Callinectes sapidus	LT.1	7.3	5.7	5.6	28.6	12.0	0.06	0.29	0.12
Family Xanthidea, Total	21.3	67.1	56.9	33.3	100.	52.0	1.28	7.14	2.92
Neopanope texanna		28.1	21.8		57.1	16.0		2.57	0.72
Rhithropanopeus harrisii		11.2	8.7		28.6	8.0		1.43	0.40
Unclassified	21.3	27.8	26.4	33.3	42.9	36.0	1.28	3.14	1.80
Unclassified				5.6		4.0	0.06		0.04
Class Osteichthyes unclassified	LT.1		LT.1	5.6		4.0	0.06		0.04

*ml x 10^{-4}/fish

Threespine stickleback, Gasterosteus aculeatus
Size range (cm) 5-7
Sample size, 6

Diet Item	% Volume	% Occurrence	Ind/fish
Algae	2.0	16.7	0.9*
Class Copepoda, Total	12.3	83.3	11.50
Order Calanoida	12.0	66.7	11.00
Order Harpacticoida	0.2	16.7	0.33
Unclassified	0.1	16.7	0.17
Suborder Gammaridea, Total	25.1	33.3	0.33
Family Gammaridae	21.1	16.7	0.17
Unclassified	4.0	16.7	0.17
Order Mysidacea, Neomysis americana	56.5	66.7	1.17

*ml x 10^{-4}/fish

Tidewater silversides, *Menidia beryllina*
Size range (cm), 4-9
Sample size, 37

Diet Item	% Volume	% Occurrence	Ind/fish
Sediment	LT.1	2.7	0.02*
Algae	1.4	24.3	0.50*
Class Turbellaria	0.3	10.8	0.22
Class Gastropoda, larval forms	LT.1	2.7	0.14
Class Insecta, Total	6.8	18.9	0.51
Fam. Chironimidae, larvae	0.6	8.1	0.11
Adult forms	6.3	13.5	0.41
Order Cladocera	0.5	8.1	1.89
Subclass Ostracoda	0.3	5.4	0.30
Subclass Copepeda	70.7	81.1	73.16
Order Calanoida	13.6	37.8	15.5
Order Harpacticoida	1.0	24.3	2.24
Unclassified	56.1	21.6	55.42
Subclass Cirripedia, larval forms	LT.1	2.7	0.05
Order Cumacea	0.1	5.4	0.05
Order Isopoda, *Cyathura polita*	0.3	2.7	0.03
Suborder Gammaridea, Total	11.2	16.2	0.62
Family Gammaridae	1.4	2.7	0.03
Fam. Photidae, *Leptocheirus plumulosus*	3.4	5.4	0.08
Unclassified	6.4	13.5	0.51
Class Osteichthyes, Genus Fundulus (larvae)	8.3	2.7	0.21

*ml$\times 10^{-4}$/fish

WEAKFISH, Cynoscion regalis

Diet Item / Sample Size / Size Range	% Volume 27 5-10	22 11-17	2 32-62	51 Total	% Occurrence 27 5-10	22 11-17	2 32-62	51 Total	Ind/Fish 27 5-10	22 11-17	2 32-62	51 Total
Plant detritus		LT.1		LT.1		9.1		3.9		1.6*		0.69
Class Polychaeta, Total	1.8	LT.1	LT.1	LT.1	3.7	4.5	50.0	5.9	0.04	0.05	0.50	0.06
Genus Nereis		LT.1		LT.1		4.5		2.0		0.05		0.02
Unclassified	1.8		LT.1	LT.1	3.7		50.0	3.9	0.04		0.50	0.04
Suborder Gammaridea, Total	6.6	0.1		0.4	59.3	18.2		39.2	5.37	0.55		3.08
Genus Ampelisca, Total	6.2	0.1		0.4	44.4	13.6		29.4	5.11	0.50		2.90
Ampelisca abdita	4.8	LT.1		0.3	33.3	4.5		19.6	4.20	0.09		2.25
Ampelisca vadorum	LT.1			LT.1	3.7			2.0	0.04			0.02
Unclassified	1.4	0.1		0.1	7.4	9.1		7.8	0.85	0.41		0.63
Fam. Ampithoidae, Cymadusa compta	LT.1			LT.1	3.7			2.0	0.04			0.02
Fam. Aoridae, Microdeutopus gryllotalpa	LT.1			LT.1	3.7			2.0	0.04			0.02
Fam. Corophiidae	LT.1			LT.1	3.7			2.0	0.04			0.02
Fam. Gammaridae, Elasmopus laevis	0.3			LT.1	7.4			3.9	0.07			0.04
Family Stenothoidae	LT.1			LT.1	3.7			2.0	0.07			0.04
Unclassified	0.1	LT.1		LT.1	3.7	4.5		3.9	0.04	0.04		0.04
Order Mysidacea, Total	43.4	23.1		8.2	81.5	72.7		74.5	18.52	37.86		26.14
Neomysis americana	41.4	23.1		8.1	77.8	72.7		72.5	17.59	37.86		25.65
Mysidopsis bigelowi	1.9			0.1	7.4			3.9	0.85			0.45
Unclassified	0.1			LT.1	3.7			2.0	0.07			0.04
Genus Palaemonetes, P. pugio	1.7			LT.1	3.7			2.0	0.07			0.04

WEAKFISH - (Cont.)

	% Volume				% Occurrence				Ind/Fish			
	27 5-10	22 11-17	2 32-62	51 Total	27 5-10	22 11-17	2 32-62	51 Total	27 5-10	22 11-17	2 32-62	51 Tota
<u>Crangon</u> <u>septemspinosa</u>	19.2	13.6	0.7	5.0	25.9	36.4	50.0	31.4	0.33	1.23	0.50	0.7
Infraorder Brachyura,												
Total	0.9	0.9		0.3	3.7	4.5		3.9	0.07	0.05		0.0
<u>Callinectes</u> <u>sapidus</u>		0.9		0.2		4.5		2.0		0.05		0.0
Family Xanthidea	0.9			LT.1	3.7			2.0	0.07			0.0
Class Osteichthyes,												
Total	26.1	60.6	99.3	85.4	14.8	59.1	100.0	37.3	0.15	1.04	2.50	0.6
Genus Anchoa		25.7		6.6		9.1		7.8		0.18		0.0
Unclassified	26.1	34.9	99.3	78.8	14.8	50.0	100.0	33.3	0.15	0.86	2.50	0.5

* ml x 10^{-4}/fish

WHITE PERCH, Morone americana

Diet Item / Sample Size / Size Range	% Volume 18 7-12	% Volume 54 14-26	% Volume 7 29-37	% Volume 79 Total	% Occurrence 18 7-12	% Occurrence 54 14-26	% Occurrence 7 29-37	% Occurrence 79 Total	Ind/Fish 18 7-12	Ind/Fish 54 14-26	Ind/Fish 7 29-37	Ind/Fish 79 Tota
Sediment		LT.1		LT.1		1.9		1.3		0.10*		0.0
Plant detritus	LT.1	1.1		0.7	5.6	31.5		22.8	0.30*	59.4*		40.6
Class Hydrozoa		LT.1		LT.1		1.9		1.3		0.09*		0.0
Class Nematoda		LT.1		LT.1		1.9		1.3		0.02		0.0
Class Pelecypoda, Total		0.4		0.2		3.7		2.5		0.07		0.0
Siphons		LT.1		LT.1		1.9		1.3		0.02		0.0
Unclassified		0.3		0.2		1.9		1.3		0.06		0.0
Class Polychaeta, Total	7.7	3.7	1.8	3.4	38.9	31.5	28.6	32.9	0.39	0.76	0.29	0.6
Genus Glycera		1.2		0.8		1.9		1.3		0.02		0.0
Genus Nereis		0.3	1.8	0.7		3.7	28.6	6.3		0.04	0.29	0.0
Family Spionidae		LT.1		LT.1		1.9		1.3		0.04		0.0
Hypaniola grayi		LT.1		LT.1		1.9		1.3		0.06		0.0
Unclassified	7.7	2.2		1.9	38.9	22.2	28.6	24.1	0.39	0.61	0.29	0.5
Class Insecta, Total	2.1	1.1	LT.1	0.8	27.8	33.3	14.3	30.4	2.11	3.24	0.71	2.7
Larval Forms, Total	2.1	1.1	LT.1	0.8	27.8	31.5	14.3	29.1	2.11	3.11	0.71	2.6
Fam. Chironimidae	2.1	1.0	LT.1	0.8	27.8	27.8	14.3	26.6	2.11	3.09	0.71	2.6
Unclassified		0.1		LT.1		1.9		1.3		0.02		0.0
Adult forms		LT.1		LT.1		3.7		2.5		0.11		0.0
Subclass Copepoda, Order Calanoida	0.2	5.5		3.5	11.1	14.8		12.7	5.72	170.0		117.5

WHITE PERCH - (Cont.)

	% Volume				% Occurrence				Ind/Fish			
	18 7-12	54 14-26	7 29-37	79 Total	18 7-12	54 14-26	7 29-37	79 Total	18 7-12	54 14-26	7 29-37	79 Total
Subclass Cirrepedia, adult		0.2		0.1		1.9		1.3		0.02		0.01
Orders Tanaidacea and Isopoda		0.3		0.2		9.3		6.3		0.17		0.11
Tanais cavolini		LT.1		LT.1		1.9		1.3		0.02		0.01
Cyathura polita		0.3		0.2		9.3		6.3		0.15		0.10
Suborder Gammaridea, Total	53.3	11.2	0.2	10.4	50.0	38.9	42.9	41.8	27.06	9.20	0.57	12.5
Fam Ampithoidae, *Cymadusa compta*		0.5		0.3		3.7		2.5		0.22		0.15
Fam. Corophiidae	15.7	0.1		1.1	11.1	7.4		7.6	11.06	0.44		2.82
Fam. Gammaridae, Total	2.1	6.6	0.1	4.3	16.7	18.5	28.6	19.0	0.22	3.19	0.43	2.27
Gammarus mucronatus		0.2	0.1	0.1		5.6	28.6	6.3		0.44	0.43	0.34
Elasmopus laevis		LT.1		LT.1		1.9		1.3		0.06		0.04
Unclassified	2.1	6.4		4.2	16.7	16.7		15.2	0.22	2.69		1.89
Family Photidae, Total	35.4	3.9		4.7	38.9	27.8		27.8	15.72	5.31		7.22
Leptocheirus plumulosus	35.4	3.9		4.7	38.9	25.9		26.6	15.72	5.30		7.20
Unclassified		LT.1		4.7		1.9		1.3		0.02		0.01
Monoculodes edwardsi	LT.1			LT.1	5.6			1.3	0.06			0.01
Orchestia platensis		LT.1		LT.1		1.9		1.3		0.04		0.03
Order Mysidacea, Total	10.5	43.8	20.0	34.3	72.2	63.0	57.1	64.6	8.67	44.31	73.71	38.80
Neomysis americana	10.5	43.8	20.0	34.3	66.7	63.0	57.1	63.3	8.61	44.31	73.71	38.78
Unclassified	LT.1			LT.1	5.6			1.3	0.06			0.01
Infraorder Caridea, larvae		LT.1		LT.1		3.7		2.5		0.06		0.04

WHITE PERCH - (Cont.)

	% Volume				% Occurrence				Ind/Fish			
	18 7-12	54 14-26	7 29-37	79 Total	18 7-12	54 14-26	7 29-37	79 Total	18 7-12	54 14-26	7 29-37	79 Tota
Genus Palaemonetes,												
Total		5.5	1.4	3.9		3.7	14.3	12.6		0.69	0.29	0.4
<u>Palaemonetes</u> <u>vulgaris</u>		4.8		3.0		3.7		2.5		0.63		0.4
<u>Palaemonetes</u> <u>pugio</u>			1.4	0.4			14.3	10.1			0.29	0.0
Unclassified		0.7		0.5		1.9		1.3		0.06		0.0
<u>Crangon</u> <u>septemspinosa</u>	1.7	17.4	62.0	30.2	5.6	11.1	71.4	15.2	0.06	0.67	4.57	0.8
Infraorder Brachyura,												
Total except larvae		7.1		4.5		9.3		6.3		0.11		0.0
<u>Callinectes</u> <u>sapidus</u>		3.3		2.1		5.6		3.8		0.06		0.0
Family Xanthidea, Total		3.8		2.4		3.7		2.5		0.06		0.0
<u>Neopanope</u> <u>texanna</u>		1.4		0.9		1.9		1.3		0.02		0.0
<u>Rhithropanopeus</u> <u>harrisii</u>		2.4		1.5		1.9		1.3		0.04		0.0
Infraorder Brachyura larval forms		LT.1		LT.1		1.9		1.3		0.19		0.1
Class Osteichthys,												
Total except eggs	10.5	1.7	4.2	3.0	16.7	5.6	14.3	8.9	0.16	0.06	0.14	0.0
<u>Apeletes</u> <u>quadracus</u>		0.7		0.4		1.9		1.3		0.02		0.0
Genus Fundulus	10.5		4.2	2.0	5.6		14.3	2.5	0.06		0.14	0.0
<u>Gobiosoma</u> <u>bosci</u>		0.7		0.4		1.9		1.3		0.02		0.0
Unclassified	LT.1	0.3		0.2	11.1	1.9		3.8	0.11	0.02		0.0
Class Osteichthys, eggs	14.0	1.0		1.5	22.2	7.4		10.1	60.9	12.1		22.1

* ml x 10^{-4}/fish

White mullet, *Mugil curema*
Size range (cm), 3-14
Sample size, 11

Diet item	% Occurrence
Sediment	90.9
Plant detritus	63.7
Algae	54.5

Windowpane, _Scophthalmus aquosus_
Size range (cm), 15-34
Sample size, 4

Diet Item	% Volume	% Occurrence	Ind/fish
Plant detritus	LT.1	50.0	2.5*
Order Actiniaria	LT.1	25.0	0.25
Suborder Gammaridea, _Cymadusa compta_	LT.1	25.0	0.25
Order Mysidacea, _Neomysis americana_	10.2	50.0	90.5
Genus Palaemonetes	7.5	25.0	1.75
Palaemonetes vulgaris	5.9	25.0	1.50
Unclassified	1.6	25.0	0.25
Crangon septemspinosa	56.2	50.0	8.00
Class Osteichthyes, Total	17.4	25.0	1.00
Ammodytes americanus	11.9	25.0	0.25
Unclassified	5.5	25.0	0.75

*$ml \times 10^{-4}$/fish

WINTER FLOUNDER, Pseudopluronectes americanus

* ml x 10 $^{-4}$/fish

Diet Item / Sample Size / Size Range (cm)	% Volume 56 3-11	% Volume 41 12-21	% Volume 45 22-33	% Volume 142 Total	% Occurrence 56 3-11	% Occurrence 41 12-21	% Occurrence 45 22-33	% Occurrence 142 Total	Ind/Fish 56 3-11	Ind/Fish 41 12-21	Ind/Fish 45 22-33	Ind/Fish 142 Total
Sediment	0.4	LT.1	0.4	0.3	25.0	9.8	15.6	17.6	1.8*	2.4*	64.6*	21.9*
Plant detritus	0.5	0.4	1.2	1.1	25.0	29.3	57.8	36.6	2.2*	19.4*	223.9*	77.4*
Class Hydrozoa	LT.1	0.5	0.4	0.4	1.8	7.3	8.9	5.6	0.36*	24.63*	81.33*	33.0*
Class Tubellaria	LT.1	LT.1		LT.1	19.6	2.4		8.5	0.38	0.02		0.16
Phylum Nemertea		1.5	12.2	9.8		2.4	4.4	2.1		0.02	0.04	0.02
Class Nematoda	LT.1	LT.1	LT.1	LT.1	21.4	17.1	6.7	15.5	41.1	2.15	0.40	17.0
Phylum Bryozoa	2.1			LT.1	1.8			0.7	8.93*			3.5*
Class Gastropoda, Total		0.3	LT.1	LT.1		4.9	8.9	4.2		0.12	0.16	0.08
Genus Bittium		0.1	LT.1	LT.1		2.4	4.4	2.1		0.02	0.09	0.04
Genus Crepidula		LT.1	LT.1	LT.1		2.4	2.2	1.4		0.07	0.04	0.04
Mitrella lunata			LT.1	LT.1			2.2	0.7			0.02	0.01
Haminoea solitaria		0.1		LT.1		2.4		0.7		0.02		0.01
Class Pelecypoda, Total	0.2	22.7	13.8	15.3	7.1	34.1	53.3	29.6	0.14	3.9	6.27	3.17
Laevicardium mortoni			LT.1	LT.1			2.2	0.7			0.02	0.01
Family Tellinidae			LT.1	LT.1			2.2	0.7			0.02	0.01
Tagelus divisus		LT.1		LT.1		2.4		0.7		0.02		0.01
Ensis directus		0.2		LT.1		2.4		0.7		0.02		0.01
Lyonsia hyalina			1.2	0.9			2.2	0.7			0.16	0.05
Siphons	0.02	22.5	12.4	14.1	7.1	29.3	51.1	27.5	0.14	3.85	6.02	3.08
Unclassified			0.2	0.1			2.2	0.7			0.04	0.01

WINTER FLOUNDER - (Cont.)

	% Volume				% Occurrence				Ind/Fish			
	56 3-11	41 12-21	45 22-33	142 Total	56 3-11	41 12-21	45 22-33	142 Total	56 3-11	41 12-21	45 22-33	142 Total
Class Polychaeta,												
Total except larvae	61.2	41.4	33.1	35.3	83.9	65.9	77.8	76.8	6.98	9.50	9.20	8.42
Family Phyllodocidae	4.1		LT.1	0.1	21.4		6.7	10.6	0.68		0.16	0.32
Family Aphroditidae	LT.1	1.2		0.2	1.8	2.4		1.4	0.02	0.02		0.01
Family Polynoidae		LT.1	0.1	LT.1		2.4	2.2	1.4		0.10	0.02	0.04
Genus Stenelais			0.3	0.2			2.2	0.7			0.02	0.01
Genus Glycera	0.3	5.2	8.3	7.5	3.6	7.3	11.1	7.7	0.04	0.12	0.42	0.18
Family Goniadidae	11.0	LT.1		0.3	14.3	4.9	7.0		0.21	0.05		0.10
Genus Nephtys		0.7		0.1		4.8		1.4		0.05		0.01
Genus Nereis	3.5	12.4	LT.1	2.5	7.1	24.4	4.4	11.3	0.23	1.27	0.04	0.47
Family Spionidae	4.6	2.1	1.1	1.4	25.0	17.0	11.1	18.3	1.98	1.71	2.82	2.17
Family Capitellidae	11.5	12.6	LT.1	2.7	12.5	9.8	2.2	8.4	1.61	5.32	0.04	2.18
Family Maldanidae	13.1	2.2	0.5	1.1	5.4	4.9	8.9	6.3	0.09	0.37	0.16	0.19
Family Terebellidae	2.6	3.6	16.5	13.6	3.6	9.8	48.9	19.7	0.04	0.32	4.0	1.37
Genus Aricidea			LT.1	LT.1			2.2	0.7			0.07	0.02
Genus Lumbrineris	2.6		LT.1	LT.1	5.4		2.2	2.8	0.07		0.02	0.04
Arabella iricolor			1.1	0.8			4.4	1.4			0.07	0.02
Sabella microphthalma		0.3		LT.1		7.3		2.1		0.07		0.02
Genus Scoloplos	LT.1	LT.1	0.2	0.2	1.8	2.4	2.2	2.1	0.02	0.02	0.77	0.26
Hypaniola grayi	1.5		0.1	0.1	14.3		4.4	7.0	0.70		0.11	0.06
Unclassified	6.4	1.1	4.9	4.5	30.4	7.3	22.2	21.1	1.93	0.10	0.47	0.93
Class Polychaeta, larval forms	LT.1			LT.1	1.8			0.7	0.02			0.01
Class Oligochaeta	LT.1			LT.1	1.8			0.7	0.02			0.01
Class Merostomata, _Limulus polyphemus_		LT.1		LT.1		2.4		0.7		0.07		0.02

WINTER FLOUNDER - (Cont.)

	% Volume				% Occurrence				Ind/Fish			
	56 3-11	41 12-21	45 22-33	142 Total	56 3-11	41 12-21	45 22-33	142 Total	56 3-11	41 12-21	45 22-33	142 Total
Subclass Ostracoda	0.2		LT.1	LT.1	10.7		2.2	4.9	0.13		0.20	0.11
Subclass Copepoda,												
Total	LT.1			LT.1	28.6			11.3	1.50			0.59
Order Calanoida	LT.1			LT.1	7.1			2.8	0.07			0.03
Order Harpacticoida	LT.1			LT.1	25.0			9.9	1.43			0.56
Subclass Cirripedia,												
Adult forms			LT.1	LT.1			4.4	1.4			0.04	0.01
Order Cumacea	2.1		LT.1	LT.1	30.4		2.2	12.7	1.52		0.02	0.61
Orders Tanaidacea and												
Isopoda	1.0	3.7	1.5	1.9	17.9	26.8	26.7	23.2	0.30	0.51	0.76	0.51
Tanais cavolini	LT.1			LT.1	1.8			0.7	0.02			0.01
Cyathura polita	0.4	0.9	0.9	0.9	7.1	14.6	22.2	14.1	0.11	0.15	0.60	0.27
Genus Idotea		2.7	0.5	0.9		12.2	4.4	4.9		0.36	0.04	0.12
Edotea triloba	0.5		LT.1	LT.1	12.5		4.4	6.3	0.18		0.11	0.11
Suborder Gammaridae,												
Total	19.0	10.2	5.6	6.8	80.4	70.7	64.4	72.5	11.27	8.37	18.16	12.60
Genus Ampelisca	14.6	2.1	4.9	4.6	62.5	41.5	44.4	50.7	8.46	4.05	16.40	9.70
Ampelisca abdita	14.4	0.5	1.7	1.7	58.9	22.0	17.8	35.2	8.34	2.80	10.93	7.56
Ampelisca vadorum	0.1	1.4	1.5	1.4	3.6	19.5	22.2	14.1	0.05	1.20	3.40	1.44
Unclassified	0.1	0.2	1.7	1.5	3.6	2.4	13.3	6.3	0.07	0.05	2.07	0.70
Family Ampithoidae,												
Cymadusa compta	0.5	3.0	0.4	0.9	5.4	7.3	11.1	7.7	0.09	0.93	0.47	0.31
Family Aoridae, Total	0.5	0.5	LT.1	0.1	16.1	9.8	2.2	9.9	0.43	0.80	0.04	0.42
Family Aoridne,												
Microdeutopus												
gryllotalpa	0.1	LT.1	LT.1	LT.1	5.4	7.3	2.2	4.9	0.07	0.12	0.04	0.08

WINTER FLOUNDER - (Cont.)

	% Volume				% Occurrence				Ind/Fish			
	56 3-11	41 12-21	45 22-33	142 Total	56 3-11	41 12-21	45 22-33	142 Total	56 3-11	41 12-21	45 22-33	142 Tota
Fam. Aoridae,												
Unclassified	0.4	0.5		0.1	10.7	2.4		4.9	0.36	0.68		0.3
Family Corophiidae	0.4	LT.1	0.2	0.2	19.6	2.4	17.8	14.1	0.48	0.02	1.02	0.5
Family Gammaridae,												
Total	1.7	1.0	LT.1	0.3	19.6	9.8	13.3	14.7	0.71	1.02	0.13	0.6
Gammarus mucronatus	LT.1			LT.1	1.8			0.7	0.02			0.0
Elasmopus laevis	1.5	0.5	LT.1	0.1	16.1	4.9	4.4	9.2	0.63	0.78	0.04	0.4
Unclassified	0.2	0.5	LT.1	0.1	1.8	4.9	4.4	3.5	0.07	0.24	0.09	0.1
Family Photidae, total	0.6	0.3		LT.1	14.3	7.3		7.7	0.75	0.59		0.4
Leptocheirus plumulosus		0.3		LT.1		4.9		1.4		0.56		0.1
Unclassified	0.6	LT.1		LT.1	14.3	2.4		6.3	0.75	0.02		0.3
Batae catharinensis	LT.1	0.3		LT.1	1.8	2.4		1.4	0.02	0.10		0.0
Paraphoxus spinosus	LT.1			LT.1	1.8			0.7	0.02			0.0
Family Stenothoidae			LT.1	LT.1			2.2	0.7			0.02	0.0
Unclassified	0.7	3.0	0.1	0.7	7.1	9.8	4.4	7.0	0.30	0.85	0.07	0.3
Order Mysidacea,												
Neomysis americana	10.8	10.8	LT.1	2.4	3.6	22.0	6.7	9.9	0.50	5.07	0.07	1.6
Genus Palaemonetes,												
Total		3.5	22.2	18.1		7.3	28.9	11.3		0.07	2.58	0.8
Palaemonetes vulgaris			19.3	15.1			24.4	7.7			2.27	0.7
Palaemonetes pugio		1.2	0.5	0.6		2.4	4.4	2.1		0.02	0.05	0.0
Unclassified		2.3	2.4	2.4		4.9	6.7	3.5		0.05	0.27	0.1
Crangon septemspinosa	2.2	4.7	0.5	1.4	1.8	7.3	6.7	4.9	0.04	0.15	0.07	0.0
Infraorder Brachyura,												
larvae	LT.1			LT.1	1.8			0.7	0.02			0.0

WINTER FLOUNDER - (Cont.)

	% Volume				% Occurrence				Ind/Fish			
	56 3-11	41 12-21	45 22-33	142 Total	56 3-11	41 12-21	45 22-33	142 Total	56 3-11	41 12-21	45 22-33	142 Tota
Infraorder Brachyura,												
Total except larvae		0.8	4.5	3.7		14.6	24.4	12.0		0.22	1.18	0.4
<u>Callinectes</u> <u>sapidus</u>		0.5	0.2	0.2		9.8	4.4	4.2		0.15	0.05	0.0
Family Xanthidea, Total		0.2	4.4	3.5		2.4	20.0	7.0		0.05	1.13	0.3
<u>Neopanope</u> <u>texanna</u>			1.2	0.9			13.3	4.2			0.51	0.1
<u>Rhithropanopeus</u> <u>harrisii</u>			2.4	1.9			4.4	1.4			0.36	0.1
<u>Eurypanopeus</u> <u>depressus</u>			0.2	0.2			6.7	2.1			0.18	0.0
Unclassified		0.1	0.6	0.5		2.4	2.2	1.4		0.05	0.09	0.0
Unclassified		LT.1		LT.1		2.4		0.7		0.02		0.0
Class Ascidiacea, Family												
Molgulidae			0.2	0.1			4.4	1.4			0.05	0.0
Class Osteichthys,												
Total			2.3	1.8			8.9	2.8			0.11	0.0
<u>Gobiosoma</u> <u>bosci</u>			2.0	1.6			8.9				0.09	0.0
Unclassified			0.3	0.2			2.2	0.7			0.02	0.0

* ml x 10^{-4}/fish