773

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Food Habits and Trophic Relationships of a Community of Fishes on the Outer Continental Shelf

George R. Sedberry

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U.S. DEPARTMENT OF COMMERCE
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U.S. DEPARTMENT OF COMMERCE
Malcolm Baldrige, Secretary
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John V. Byrne, Administrator
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William G. Gordon, Assistant Administrator for Fisheries

CONTENTS

Figures

Tables

Food Habits and Trophic Relationships of a Community of Fishes on the Outer Continental Shelf[1]

GEORGE R. SEDBERRY[2]

ABSTRACT

The demersal fish community of the Outer Continental Shelf in the Middle Atlantic Bight consists of resident species (*Lophius americanus, Citharichthys arctifrons, Paralichthys oblongus*), seasonal species with boreal affinities (*Raja erinacea, Urophycis chuss, Merluccius bilinearis, Macrozoarces americanus*), and seasonal species with warm-temperate affinities (*Urophycis regia, Stenotomus chrysops*). Although most dominant demersal fishes of the Outer Continental Shelf feed primarily on dense, stable macrobenthic invertebrate communities, some feed on fishes, cephalopods, and planktonic invertebrates. In addition to seasonal changes in prey species preference, food habits change considerably with fish size. Most predator species share many prey species. Overlap in diet among predators varies seasonally, with overlap relationships changing as species and size-class composition of the predators changes. Intraspecific diet overlap between size classes is low, but higher interspecific overlap occurs between species of similar size. Dietary overlap is lowest in the spring, when planktonic and nektonic organisms are consumed by most size classes of dominant predators. Although many important prey species are consumed by several predators, some are selectively consumed by only a few predators, so that there is never complete dietary overlap between two species.

INTRODUCTION

Studies of the food habits of fishes are essential to a complete understanding of the functional role of fishes in aquatic ecosystems. Research in this field has resulted in an abundance of papers dealing with the food habits of individual species, but fewer studies have related food habits to community structure, including patterns of competition, resource partitioning, or prey selectivity. Some experimental and field studies have focused on resource partitioning, including food subdivision in closely related species (McEachran et al. 1976; Werner and Hall 1976; Chao and Musick 1977; Ross 1977; Langton and Bowman 1980). Fewer studies have dealt with the feeding ecology of entire marine fish communities (Tyler 1972; Gatz 1979). Study of diet overlap is essential to understanding competitive coexistence and species diversity (Pyke et al. 1977) and hence community structure.

The continental shelf areas of the Middle Atlantic Bight have been a focus of benthic biological research in recent years (Boesch 1972; Pratt 1973; Steimle and Stone 1973; Pearce et al. 1976), and distribution and abundance of fishes have also been examined (Tyler 1971; Musick 1974; McEachran and Musick 1975; Clark and Brown 1977; Musick and Mercer 1977; Musick et al. 1979). The fish fauna on the continental shelf of the Middle Atlantic Bight consists of a highly migratory component of boreal and warm-temperate species and a small resident component (Tyler 1971; Musick et al. 1979). Stomach contents of some of the dominant species on the Middle Atlantic Outer Continental Shelf have been reported in faunal and taxonomic works and in life history studies (Bigelow and Welsh 1925; Nichols and Breder 1927; Olsen and Merriman 1946; Bigelow and Schroeder 1953; Fitz and Daiber 1963; Richards et al. 1963; Barans 1969), and some food habits studies have been done (Jensen and Fritz 1960; Sikora et al. 1972; Vinogradov 1972; McEachran et al. 1976; Langton and Bowman 1980, 1981).

The purposes of this report are to describe the food habits of dominant demersal fishes on the Middle Atlantic Outer Continental Shelf, to describe diet overlap patterns, and to relate these patterns to predator size and seasonality and to seasonal prey abundance.

METHODS

Two areas were selected for intensive fish sampling: Area B (approximately 735 km^2) off Atlantic City, N.J.; and Area E (approximately 540 km^2) off Delaware Bay (Fig. 1). These areas were chosen for the great habitat variety of their complex topography. The bottom of both areas is characterized by a series of ridges, swales, scarps, and flats which support different benthic invertebrate assemblages (Boesch 1978), and an attempt was made to sample each bottom type. Both study areas were divided into 11 strata, based mainly on depth data taken from U.S. Geological Survey charts and also on available data on the distribution of bottom sediments and previous sampling of macrobenthos.

Sampling for fishes consisted of tows of 15-min duration (at about 6.5 km/h) with a lined, semiballoon otter trawl having a 13.7 m (45 ft) headrope and the following stretch-mesh dimensions: 4.45 cm in the wings, 3.81 cm in the body, 3.96 cm in the cod end, and 1.27 cm in the cod end liner. Six stations, three day and three night, were randomly selected in each stratum for each cruise. Samples were collected seasonally on four cruises, utilizing the RV *Cape Henlopen* (fall 1976, spring and summer 1977) and the RV *James M. Gilliss* (winter 1977).

All fishes captured were identified, measured to the nearest millimeter, and weighed. Standard length (SL) was taken on all dominant species with the exception of *Raja erinacea* (disc width = DW) and *Macrozoarces americanus* (total length = TL). Each fish was dissected and its stomach excised if not conspicuously empty.

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On large catches of some dominant species, random subsamples (at least 30 specimens) were dissected. Each stomach was labeled, individually wrapped in cheesecloth, and fixed in 10% seawater Formalin.

After proper fixation, stomachs were soaked in water and transferred to either 40% isopropanol or 70% ethanol. For analysis, each stomach was cut open and its contents sorted by taxon and counted. Fragments such as crustacean parts, polychaete setae, or fish bones were counted as one animal, unless abundance could be estimated by counting pairs of eyes (crustaceans), otoliths (fishes), or other parts.

Volume displacement of food items was measured by using either a graduated cylinder (Windell 1971) or a calibrated vial and buret (McEachran et al. 1976). Displacement of small species was estimated by using a 0.1 cm^2 grid (Windell 1971).

Since methods of food habits analysis are variously biased (Hynes 1950; Pinkas et al. 1971; Windell 1971), the relative contribution of different food items to the total diet was determined using three methods: 1) The number of stomachs in which a food item occurred was expressed as a percentage of the total number of stomachs of a series containing food (percent frequency of occurrence); 2) the number of individuals of each type of food was expressed as a percentage of the total number of food items from all stomachs for a series (percent numerical abundance); 3) the volume displacement of food items was expressed as a percentage of the total volume of food from all stomachs examined of a series (percent volume displacement).

From these three measurements an index of relative importance, IRI (Pinkas et al. 1971), was calculated for each prey species and each higher taxon as follows:

$$IRI = (N + V)\,F$$

where: IRI = index of relative importance,
N = numerical percentage,
V = volumetric percentage, and
F = frequency of occurrence percentage.

This index has been useful in evaluating the relative importance of different food items found in fish stomachs (Pinkas et al. 1971; McEachran et al. 1976; Sedberry and Musick 1978). The IRI was used in the present study to describe the food habits of each species and to determine seasonal and predator size differences in the relative importance of food items.

Overlap in diet among dominant predators was measured using cluster analysis. Stomachs of predators were treated as collections and were subjected to normal cluster analysis on the basis of prey similarity, using percent standardized numerical abundance (Clifford and Stephenson 1975), because sample sizes were unequal. Flexible sorting (Lance and Williams 1967; Clifford and Stephenson 1975), with $\beta = -0.25$, was used, based on resemblance measured by the Bray-Curtis similarity index (Bray and Curtis 1957), expressed as follows:

$$S_{jk} = 1 - \frac{\sum_i |X_{ji} - X_{ki}|}{\sum_i (X_{ji} + X_{ki})}$$

where S_{jk} is the similarity in diet between the predator species j and k; X_{ji} is the abundance of the ith prey species for predator j; and X_{ki} is the abundance of the ith prey species for predator k.

RESULTS

Food Habits Analysis

Over 12,500 individual fish were dissected in the field for stomach analysis. A total of 6,087 stomachs representing the nine dominant species was examined in the laboratory. Initially, only seven species were to be examined: *Raja erinacea* Mitchill, *Lophius americanus* Valenciennes, *Urophycis chuss* (Walbaum), *Merluccius bilinearis* (Mitchill), *Stenotomus chrysops* (Linnaeus), *Citharichthys arctifrons* Goode, and *Paralichthys oblongus* (Mitchill). *Urophycis regia* (Walbaum) and *Marcrozoarces americanus* (Schneider) were added to this list because they were dominant species in the catches in summer 1977 (Table 1).

Raja erinacea.—The little skate was abundant in the study area at all times of the year (see Table 1), feeding mainly on amphipods, decapods, cumaceans, and polychaetes (Fig. 2, Table 2). Pelecypods, fishes, and isopods were also consumed. The relative importance of these major taxa of food remained fairly constant seasonally, although juvenile fishes were somewhat more important and cumaceans less important in fall samples. Juvenile fishes were also important in the diet of *R. erinacea* in the summer. Although the relative importance of the major taxa was nearly constant seasonally, the species composition of these taxa in the diet changed somewhat seasonally (Table 2).

The food habits of *Raja erinacea* varied greatly with size (Fig. 3). Smaller skates fed more on amphipods and cumaceans, whereas larger skates fed more on decapods and polychaetes. The smallest skates (1–100 mm DW) fed on numerous small food items (Fig. 4), and fed on these in increasing numbers up to 200 mm DW. At about 200 mm DW, *R. erinacea* showed the most pronounced change in food habits and feeding strategies, switching to fewer, larger food items (primarily decapods).

Lophius americanus.—The goosefish, though not as abundant as many other fishes on the outer shelf, was common and composed a considerable portion of the biomass of fishes in the study areas because of its large size (Table 1). Goosefish fed mainly on fishes and to a lesser extent on benthic invertebrates during all seasons (Fig. 5, Table 3). Decapods and cephalopods were less important as food, and polychaetes, amphipods, asteroids, and chaetognaths were only occasionally found in stomachs. Fishes were the most important food for all sizes of *L. americanus* (Fig. 6), although larger fish were eaten by larger *L. americanus* (Fig. 7).

Urophycis chuss.—Although red hake were abundant during this study, size composition of the population varied seasonally. Juveniles predominated in fall ($\bar{x}$ SL = 49 mm) and summer ($\bar{x}$ SL = 147 mm), but were rare in winter and spring, when larger fish moved into the area ($\bar{x}$ SL = 251 and 238 mm, respectively). This was reflected in the much smaller contribution of this species to the biomass of fishes during the fall and summer (Table 1).

Red hake fed primarily on amphipods, which were important as food at all times of the year, especially in fall. During this season they made up most of the diet (Fig. 8, Table 4). Decapods and polychaetes were also dominant prey taxa, and copepods were important in fall and winter. Chaetognaths, absent from the diet in fall and winter, were commonly consumed during the spring and summer. Much seasonal variation was observed in the diet at the species level within these higher taxa (Table 4), particularly within the Amphipoda.

Small red hake ate amphipods (mainly planktonic hyperiids) and copepods (Fig. 9), whereas decapods and polychaetes were important dietary items for larger *U. chuss*. Chaetognaths were ingested by all size classes. Red hake fed on increasing numbers of increasingly larger prey items up to a length of about 300-350 mm SL (Fig. 10), where the feeding strategy of *U. chuss* changed, with fewer prey items of much larger size being consumed.

Urophycis regia.—Spotted hake were common in the study area in fall but were more abundant in summer. They were rare in the colder months, and only two were captured in winter.

Decapod crustaceans were the most important food for spotted hake based on seasons for which adequate data were available (Fig. 11, Table 5). Fishes and amphipods were next in importance in fall and summer, and the relative importance of these and other taxa of food was similar during these seasons. The relative importance of these taxa was different in spring samples, but this may reflect the small sample size.

Spotted hake fed on increasing numbers of decapods with increasing size of the fish (Fig. 12). Numbers of fishes consumed by *U. regia* decreased in relative abundance; however, the percent volume increased, indicating that larger *U. regia* fed on larger fishes. Amphipods decreased numerically in larger fish, and cephalopods, while remaining constant in relative abundance, became volumetrically important in the largest *U. regia*. Spotted hake demonstrated a distinct change in feeding strategy at about 250 mm SL (Fig. 13). The size of individual prey items increased by an order of magnitude, and fewer were consumed.

Merluccius bilinearis.—Silver hake were abundant in the study area at all times of the year but less so in spring. Juvenile fish (<100 mm SL) dominated the catches in fall and summer. Food habits of this species varied greatly with season (Fig. 14, Table 6). Amphipods were the primary food in fall, winter, and summer. Fishes were second in importance in winter and summer and were relatively unimportant in fall and spring. Cephalopods replaced fishes as the second most important prey in spring and were also quite important in fall. Decapods were third in importance in winter and summer, whereas copepods and amphipods were third in fall and spring, respectively. Chaetognaths were absent in the diet in fall, were infrequent in winter, but were the most important prey taxon in spring. They were also consumed in summer.

The food habits of *M. bilinearis* changed with size (Fig. 15). Amphipods were relatively numerous in all size classes except the largest, but they steadily decreased in relative volume in larger fish. Fishes and cephalopods were numerically dominant in larger fishes and made up the bulk of food in larger silver hakes. Decapods had the highest IRI in small and medium-sized fish (101–200 mm SL) and chaetognaths were important for medium-sized fish.

Silver hake fed on small food items up to a fish length of about 350 mm SL (Fig. 16). Average prey size increased at 351-400 mm SL, and continued a sharp increase in size up to the largest fish sampled. Average number of prey per stomach fluctuated, but reached a maximum at fish lengths of 251-300 mm SL.

Macrozoarces americanus.—The ocean pout varied greatly in its relative abundance, but at times made up a significant portion of the catch (Table 1). Abundances were low in fall (23 individuals), winter (46 individuals), and spring (84 individuals). In summer, however, juvenile ocean pout were common (397 individuals).

Ocean pout fed mainly on amphipods and decapods (Fig. 17, Table 7), which made up a large proportion of the diet at all seasons of the year except fall when all stomachs were empty. Polychaetes were important in the diet in winter and spring but were rarely consumed in summer. Cumaceans and pelecypods were eaten in small amounts during most seasons, and echinoids were important in winter.

Smaller ocean pout consumed more amphipods than decapods, and amphipods made up a large volume of the food eaten (Fig. 18). Larger ocean pout fed more heavily on decapods, which made up the greatest volume of food for larger fish. Although the total volume of food consumed did increase regularly from small to large fish, the mean volume of each prey item fluctuated, as did the number of prey consumed (Fig. 19).

Of the 23 ocean pout captured on the fall cruise, none had food in their stomachs. Olsen and Merriman (1946) also noted a high percentage (36–75%) of empty stomachs among their fall samples. They suggested that this may indicate a tendency to stop feeding either during spawning or movement into rocky winter habitats.

Stenotomus chrysops.—Scup were abundant in the study area in the fall, with only a few individuals taken on other cruises (Table 1). Food habits analysis was limited to fall samples.

Scup fed mainly on amphipods and polychaetes, and polychaetes made up the largest volume of food (Fig. 20, Table 8). Decapods, copepods, gastropods, and cumaceans were of lesser importance. Numerous other taxa were infrequently consumed (Table 8).

The food habits of scup changed with increasing fish size (Fig. 21). Amphipods decreased in relative abundance in larger fish, and gammarideans replaced hyperideans in the diet of larger scup. Polychaetes, especially the larger species (e.g., *C. infundibuliformis*), increased in abundance and became the most important food in the largest fish. Copepods were mainly consumed by small scup, and decapods were slightly important for all size classes. The smallest scup ate large numbers of small prey, mainly amphipods and copepods (Fig. 22), but scup of 101–150 mm SL fed on fewer but larger items. Mean volume per prey item remained relatively constant for fish larger than 150 mm SL, and larger scup again fed on increasing numbers of food items, thus increasing the total volume of food consumed.

Citharichthys arctifrons.—The Gulf Stream flounder was abundant at all times of the year, especially summer (Table 1). Amphipods and polychaetes were the most important prey taxa consumed by this species during all seasons; however, polychaetes exceeded amphipods in relative importance in the spring and were second during other seasons (Fig. 23, Table 9). Several other groups were consumed seasonally. Larvaceans and cumaceans were important in the diet in spring. Fishes were very important in summer, and copepods and ostracods were of minor importance in the fall.

Amphipods had the highest IRI in all size classes of *C. arctifrons* (Fig. 24). Polychaetes increased in importance in the diet of larger fish, and made up the greatest volume of prey in the largest size class. Copepods were important for smaller fish, whereas larger fish consumed more cumaceans. Small fishes were consumed by intermediate sized *C. arctifrons*.

Gulf Stream flounder demonstrated a more gradual change in feeding habits with size (Fig. 25). Average stomach volume, the mean prey number per stomach, and mean volume per prey item increased almost linearly with increasing fish length. In Gulf Stream flounder there was no sudden decrease in the number of prey per stomach with a corresponding large increase in average prey size. Small food items (i.e., amphipods) remain the most important food for all size classes of *C. arctifrons*.

***Paralichthys oblongus*.**—Fourspot flounder were common in the study area on all cruises (Table 1). Decapods were the most important prey at all times of the year (Fig. 26, Table 10). Amphipods were very important in winter and spring, but fishes apparently replaced amphipods in the diet in fall and summer. This seasonal shift from amphipods to fishes reflected the seasonal abundance of small fishes in the study area and also seasonal differences in the size composition of the predator population. Fourspot flounder captured in winter and spring were slightly smaller ($\bar{x}$ SL = 196 and 180 mm, respectively) than those taken in fall and summer ($\bar{x}$ SL = 214 and 221 mm, respectively) and fed more on smaller prey items such as amphipods. Cephalopods were frequently consumed in the fall.

Amphipods were the most abundant food for smaller fourspot flounder, although decapods contributed most to the volume of food for all size classes (Fig. 27). Amphipods steadily decreased in relative abundance in larger fishes, when decapods became the most abundant food. Fishes, polychaetes, and cephalopods contributed more to the diet of larger *P. oblongus*.

Mean prey number per stomach remained relatively constant for all size classes of *P. oblongus* (Fig. 28). However, as larger fish switched to larger prey items, mean total volume of stomach contents increased.

Overlap in Diet

Overlap in diet varied seasonally with changes in species and size composition of the predator community (Fig. 29). *Merluccius bilinearis* and *U. chuss* showed the greatest similarity in diet in fall (Fig. 29A), when smaller individuals ($\bar{x}$ SL = 127 and 51 mm, respectively) dominated in the study area and fed mainly on small planktonic crustaceans such as *Parathemisto gaudichaudi* and *Centropages typicus*. *Stenotomus chrysops* also fed heavily on these two species and was classified with this group. *Raja erinacea* and *C. arctifrons*, both of which fed heavily on *Unciola irrorata*, *Byblis serrata*, and *Ampelisca vadorum*, were grouped together. *Paralichthys oblongus* and *U. regia* were more similar to each other in their diets than to other fishes in fall. Decapods and fish were the two most important food taxa for these species in fall, and amphipods were also important for both species. *Lophius americanus*, being primarily piscivorous, had little similarity in diet to other species but was classified with *P. oblongus* and *U. regia* which also ate fish.

In winter, predator groups changed for several reasons (Fig. 29B). First, *S. chrysops* was absent from the study area, and *M. americanus* became common and was included in the classification. Also larger *U. chuss* ($\bar{x}$ SL = 250 mm) and *M. bilinearis* ($\bar{x}$ SL = 282 mm) were present. *Unciola irrorata* and *Erichthonius rubricornis* were the most abundant food items for *P. oblongus*, *M. americanus*, *R. erinacea*, *C. arctifrons*, and *U. chuss*, and all of these species formed a group with high similarity. The one *U. regia* captured had eaten fish and was classified with *L. americanus*. *Merluccius bilinearis*, which fed mainly on hyperiids, copepods, *Dichelopandalus leptocerus*, and chaetognaths, differed in its diet from all other species. However, since *M. bilinearis* consumed fish, it was joined to this latter group at a lower level of similarity. The larger *M. bilinearis* present in the winter fed on different prey than smaller *M. bilinearis* and cooccurring larger *U. chuss*. Although *M. bilinearis* and *U. chuss* had similar diets in fall as juveniles, their adult diets were quite dissimilar in winter, when large *U. chuss* ate more benthic prey and *M. bilinearis* continued to feed on planktonic species. Also in winter, *P. oblongus* fed on more amphipods than decapods and fishes, and was grouped with other amphipod feeders.

In spring (Fig. 29C), as in winter, the corophiid amphipods *U. irrorata* and *E. rubricornis* were the most important food for several predators, and the classification was similar to winter, although similarity values between predators were lower. *Paralichthys oblongus* and *R. erinacea* fed heavily on *U. irrorata*, *E. rubricornis*, and *B. serrata* and showed the highest similarity of any predator pair. *Urophycis chuss*, *C. arctifrons*, and *M. americanus* also fed heavily on *U. irrorata* and *E. rubricornis*. They were included in this group, although they also fed heavily on other species. *Lophius americanus*, *U. regia*, and *M. bilinearis*, though somewhat dissimilar in diet, were more dissimilar to other predators and formed a separate group because all three species consumed fishes.

In summer, *C. arctifrons* and *M. americanus* displayed the greatest similarity in diet, when *C. arctifrons* again fed heavily on amphipods and *E. rubricornis* and *U. irrorata* were the most abundant species consumed by both predators (Fig. 29D). *Raja erinacea* and *U. chuss* again fed heavily on both these species during summer and were included in this group, but *R. erinacea* also fed heavily on ampeliscid amphipods, whereas *U. chuss* consumed many *Sagitta elegans* and *P. gaudichaudi*. *Parathemisto gaudichaudi* and *D. leptocerus* were the most abundant species consumed by *M. bilinearis* and *U. regia*, both of which also fed on fishes. *Paralichthys oblongus* switched to a fish and decapod diet in summer and was classified with *L. americanus* since both fed heavily on fish, primarily *M. bilinearis*. *Dichelopandalus leptocerus* was consumed by both species, so they were joined to *M. bilinearis* and *U. regia*.

A classification of predators from all seasons indicated two major groups of similar feeders (Fig. 30). One group (Group I, Fig. 30) fed mainly on benthic amphipods, primarily *U. irrorata*, *E. rubricornis*, *B. serrata*, and *A. vadorum*, and brachyuran decapods (primarily *C. irroratus*). A second major group (Group II, Fig. 30) fed mainly on hyperiids, copepods, fishes, and caridean decapods (primarily *D. leptocerus*). While some fishes consistently fed similarly during all seasons (e.g., *R. erinacea*), several predators belonged to both groups, switching at various seasons. Thus *U. chuss* fed mainly on hyperiids and copepods in the fall at which time it was classified in Group II; during other seasons red hake were included in Group I. *Urophycis regia* also fed differently in the fall from other seasons and was classified in Group I in the fall. *Paralichthys oblongus* fed preferentially on small fish in summer and fall, the period of their greatest abundance, but fed more on amphipods in winter and spring.

Although the food habits of some species appeared to change seasonally, this phenomenon may be attributed to seasonal changes in size-class composition of the predators in the study area. The food habits of most predators changed dramatically with size. Thus, diet overlap between species could be greater than that between different-sized fishes of the same species. To resolve such differences, each size class within a species was treated as an entity in the normal classification for each season (Figs. 31–34).

In fall, four major groups appeared in the classification (Fig. 31). The first (Group I, Fig. 31) was composed of small-to-medium skates, medium spotted hake, large fourspot flounder, small red hake, and medium-to-large scup. These fishes fed mainly on corophiid and ampeliscid amphipods and caridean decapods. Group II consisted mainly of piscivores, such as *L. americanus* and large *M. bilinearis*, and other fishes which had prey in common. Group III consisted of large fishes having *C. irroratus* as their most abundant food item. Finally, Group IV consisted of small *U. chuss* and *S. chrysops* and small-to-medium *M. bilinearis*, all of which fed heavily on hyperiid amphipods while consuming copepods and caridean decapods as well.

Small *R. erinacea* overlapped incompletely with other amphipod consumers, especially medium *U. chuss*, small *U. regia*, and large *P. oblongus* (Group I, Fig. 31). Medium-to-large *R. erinacea* also showed a very high similarity in diet to these three species (Group III, Fig. 31), but their prey (mainly *C. irroratus*) were quite different at this size. Thus, interspecific diet overlap, rather than intraspecific, was greater for these species. Small *S. chrysops* were very similar in diet to small *U. chuss* and *M. bilinearis* (Group IV), but were different from larger *S. chrysops*, which shared food items with medium *U. chuss* and *C. arctifrons*. Other examples of higher interspecific vs. intraspecific diet overlap were also evident (Fig. 31).

In winter, three major groups of similar feeders were classified (Fig. 32). Group I was composed of those fishes (Subgroup I-A) such as *L. americanus* and large *M. bilinearis* which fed largely on fishes (primarily *U. chuss*) and a few carideans (*D. leptocerus*); and those fishes (Subgroup I-B) which fed on hyperiids and carideans as well as fishes. As in fall, small *M. bilinearis* and *U. chuss* had similar diets and constituted a group (Group II) with high similarity. Group III (Fig. 32) was comprised of five species in several size classes; all fed primarily on corophiid amphipods (*U. irrorata* and *E. rubricornis*). Two subgroups were present: Subgroup III-A was comprised of small *P. oblongus*, *R. erinacea*, *C. arctifrons*, and large *M. americanus*, all of which had *E. rubricornis* as the most abundant food item. Subgroup III-B consisted of larger *P. oblongus*, *U. chuss*, *C. arctifrons*, *R. erinacea*, and small-to-medium *M. americanus*. With the exception of the largest *H. oblonga*, all size-classes of these species fed primarily on *U. irrorata* (the second most important food for large *H. oblonga*). *Erichthonius rubricornis* was the second most abundant food for most of these entities. Further subgroups (1 and 2) were distinguished by a secondary preference for other amphipods or alternatively for decapods. A multispecies group of large fishes which fed mainly on *C. irroratus* was absent in winter.

In winter, as in fall, different size classes within a species of predator were classified in different groups. Small *R. erinacea* fed mainly on *E. rubricornis* and overlapped with *M. americanus*, small *P. oblongus*, and small *C. arctifrons*. Medium *R. erinacea* fed mainly on *U. irrorata*, *E. rubricornis*, *D. sculpta*, and *B. serrata*, overlapping with large *U. chuss*, *M. americanus*, and again with larger *P. oblongus*. The largest class of skates also fed heavily on *U. irrorata*. Again, as in the fall, small *U. chuss* overlapped in diet most closely with small *M. bilinearis*. However, larger *U. chuss* fed more on gammarideans and decapods and were classified with similar feeders (Subgroup III-B). Large and medium *M. bilinearis* fed on fishes and were grouped with other piscivores, but small individuals fed on items similar to those taken by small *U. chuss*. All *M. americanus* fed primarily on gammarideans and were included in Group III. Small *C. arctifrons* and *H. oblonga* were similar in diet (Subgroup III-A), and larger individuals of these species were grouped with other gammaridean feeders (Subgroup III-B).

In spring (Fig. 33), the classification of predator entities resulted in several small groups, each characterized by high intragroup diet similarity. These groups were in turn joined together at lower levels of similarity. An additional large multispecies group consisted of several loosely joined entities (Group I). This group consisted mainly of piscivores such as *L. americanus*, large *U. chuss*, and small *U. regia*. These last two species also ate *C. irroratus*, in addition to fishes, and were joined with other decapod consumers (*M. americanus*, large *U. regia*, and large *H. oblonga*). The largest sizes of *M. bilinearis* consumed cephalopods (*I. illecebrosus*) and fishes (C. *arctifrons*) and were included in this rather dissimilar group.

The smaller, more similar groupings present in spring (e.g., Group II) were monospecific in many cases, indicating more specialization in the diet within each species, and less interspecific overlap in food in the spring. Thus, small and medium *M. bilinearis* (Group II) consumed predominantly *S. elegans* and were grouped together. Larvaceans were the most abundant prey for all sizes of *C. arctifrons*, and all sizes of this predator clustered together. Most size-classes of *M. americanus* clustered with small *R. erinacea*. Both species fed mainly on *E. rubricornis* and *U. irrorata*. All sizes of *U. chuss* (except the two largest individuals) were included in a single group of high similarity in spring. In fall and winter, small *U. chuss* fed quite differently from large ones and were classified separately with smaller individuals of other species, such as *C. arctifrons*, *S. chrysops*, and *M. bilinearis*. In spring, however, all *U. chuss* except the two largest individuals (451 and 500 mm SL) formed a distinct group. This group of *U. chuss* was joined with another group consisting of larger *P. oblongus* and *R. erinacea*, for which *U. irrorata* was the most abundant prey but which also fed heavily on decapods.

In summer (Fig. 34) interspecific overlap in diet again increased. A rather large group (Group I, Fig. 34) included the many species which consumed fishes during the summer and those species that fed primarily on planktonic invertebrates. Small *U. chuss* and *M. bilinearis* fed similarly, as in fall and winter, and were grouped together (Subgroup I-A, Fig. 34). They had consumed primarily *S. elegans*, *P. gaudichaudi*, and some gammarideans. A single small goosefish which had consumed chaetognaths (*S. elegans*) was included. The remainder of Group I consisted of those entities which had eaten fishes. Group II consisted of fishes for which *C. irroratus* was the most abundant food, followed by amphipods, other decapods, and fishes. This group consisted of large predators of decapods, such as *M. americanus*, *R. erinacea*, *P. oblongus*, and *U. regia*.

Group III consisted of amphipod eaters. *Erichthonius rubricornis* and *U. irrorata* were the two most abundant prey for all fishes in Subgroup III-A, and these two amphipods were also abundant in the diets of other Group III fishes. Other amphipods were also taken by Group III fishes.

In summer, as in most other seasons, different sizes of most predator species were included in different feeding groups. Thus, small *R. erinacea* clustered with other amphipod feeders, and large skates were included with larger individuals of other species which fed on decapods (primarily brachyurans such as *C. irroratus*). Large *U. regia* and *P. oblongus* fed on brachyuran decapods, whereas smaller individuals of both species fed more on fishes and caridean decapods. As in all other seasons except spring, small *M. bilinearis* and *U. chuss* were grouped together. However, larger *M. bilinearis* (151–400 mm SL) were included in a single assemblage which fed more on carideans and fishes. *Urophycis chuss* was associated with three separate groups. The smallest (1–100 mm SL) red hake fed on *S. elegans* and *P. gaudichaudi* and were associated with Group I-A. Intermediate-sized fish (101–300 mm SL) fed on gammarideans (*U. irrorata* and *E. rubricornis*), decapods, and *S. elegans*, and belonged to Group III. Large red hake (>300 mm SL) fed primarily on fishes (*C. arctifrons*) and *C. irroratus*. *Macrozoarces americanus* was associated with two groups: Small ocean pout fed mainly on amphipods (*E. rubricornis*, *U. irrorata*, and *A. vadorum*), and larger fish fed mainly on *C. irroratus*. *Lophius americanus* was primarily piscivorous and all sizes were included in Group I. *Citharichthys arctifrons* fed mainly on corophiid amphipods, and all sizes were included in Group III.

DISCUSSION

Comparison of present results with previous studies indicates that although fishes select a certain type of prey, depending on their size and habitat, the prey species consumed is dependent upon prey availability and prey community structure. Generally, the important higher prey taxa, e.g., polychaetes, amphipods, decapods, etc., are important in the diet of shelf fishes throughout their range, but the species consumed reflect availability of these prey items. *Raja erinacea* fed mainly on amphipods and decapods in the waters around Long Island (Smith 1950; Richards et al. 1963), a finding duplicated by the present study. The amphipod *Leptocheirus pinguis* was the most abundant species in the diet in Long Island waters, and Smith (1950) reported that this amphipod was a dominant species in the benthos. Although locally common in muddier habitats on the outer shelf, *L. pinguis* is seldom abundant in the present study area (Boesch 1978) and was not abundant in the diet of the little skate. McEachran et al. (1976) found no significant differences in the higher taxonomic composition of the diet of *R. erinacea* from four areas, including the Middle Atlantic Bight, Georges Bank, the Gulf of Maine, and the Nova Scotian shelf. However, species composition of the most important prey changed from north to south, probably reflecting changes in the benthic fauna. Previous reports of stomach contents of the other dominant species from other localities show similar results (Hildebrand and Schroeder 1927; Olsen and Merriman 1946; Bigelow and Schroeder 1953; Jensen and Fritz 1960; Richards 1963; Barans 1969; Sikora et al. 1972; Vinogradov 1972; Langton and Bowman 1980, 1981).

Diversity and Seasonality of Prey Availability

The diets of several outer shelf fishes were quite diverse. *Raja erinacea* fed on at least 107 species, *U. chuss* fed on about 130 species, *S. chrysops* fed on 106 species, and *C. arctifrons* fed on about 70 prey species. Other predators were more specialized in diet, such as *U. regia* (45 species of prey), *M. bilinearis* (51 species), *M. americanus* (39 species), and *P. oblongus* (34 species). *Lophius americanus* was the most specialized predator, feeding on only 24 prey species, mostly fishes.

Although many species of prey were consumed by the fish community, only a few species predominated in the diet of each predator. Most species important in the diet of any one predator were also important for other predators as well. These species include the amphipods *Ampelisca vadorum*, *Byblis serrata*, *Erichthonius rubricornis*, and *Unciola irrorata*. Other important prey species were *Cancer irroratus*, *Crangon septemspinosa*, *Dichelopandalus leptocerus*, and *Diastylis bispinosa*.

Predation can be an important factor controlling the structure of benthic communities (Virnstein 1977, 1979; Peterson 1979). Selective predation on prolific prey species keeps the population levels of these species low, allowing more species to coexist in the same habitat (Dayton and Hessler 1972). The heavy predation mortality exerted through selective predation by demersal shelf fishes on ampeliscid and, especially, corophiid amphipods may keep populations of these prolific species from completely dominating the benthic community, thus contributing to the high diversity (Boesch et al. 1977; Boesch 1978) in macrobenthic communities on the outer shelf.

In addition to those prey species that were important for many predators, some prey species were important to only a few predators. These included such species as *Ensis directus* (preyed on mainly by *R. erinacea*), *Clymenura* sp. A (prey for *C. arctifrons*), *Chone infundibuliformis* (prey for *S. chrysops* and *C. arctifrons*), *Ampelisca agassizi* (preyed on mainly by *S. chrysops*), fishes (fed on by *L. americanus* and seasonally important for *U. regia*, *H. oblonga*, and *M. bilinearis*), and cephalopods (important for *U. regia*, *M. bilinearis*, and *H. oblonga*).

Many prey species, mostly planktonic invertebrates, were only seasonally important in the diet of some predators. These included the copepods *Centropages typicus* and *Paracalanus* spp., hyperiid amphipods, decapod larvae, chaetognaths, larvaceans, and juvenile fishes. Seasonally important benthic invertebrates included *Diastylis sculpta*, *Cirolana polita*, *Trichophoxus epistomus*, *Monoculodes edwardsi*, *Dichelopandalus leptocerus*, and *Crangon septemspinosa*. However, most benthic food items were equally important in the diet of the predators during all seasons, reflecting the temporal persistence (Boesch 1978) of populations of macrobenthos on the shelf. The seasonal importance of planktonic prey in the diet is related to two factors. The first is the size class composition of the predators. Smaller red and silver hake present in the fall and summer consumed more copepods and hyperiids. Secondly, seasonal importance of pelagic food items is related to abundance of these taxa in the nearbottom plankton community. Chaetognaths were probably concentrated near the bottom in winter and spring, when they were important food for many demersal fishes. Larval stages of decapods were also seasonally important; this is related to the seasonal abundance of these stages in the plankton (Grant 1977).

Seasonal prey switching (Murdoch et al. 1975; Love and Ebeling 1978) was evident for some predators. For example, *S. elegans* was rare in the diet of large silver hake present in the study area in winter. In spring, however, *S. elegans* was the most abundant prey species consumed by silver hake. This probably represents an opportunistic switching in silver hake as chaetognaths become abundant in the nearbottom plankton. This switching was independent of predator size, i.e., larger silver hake present in winter and spring switched from a diet dominated by amphipods in the winter to a diet dominated by chaetognaths in the spring. Other predators switched seasonally between benthic and planktonic prey. *Urophycis chuss* demonstrated a similar switching to chaetognaths, and *C. arctifrons* switched to planktonic larvaceans in the spring. Love and Ebeling (1978) noted that fishes they studied switched to a more planktonic diet in winter and spring, when plankton volumes were high in their study area or when other food may have been relatively scarce. There were similar increases in plankton in spring in the Middle Atlantic Bight. Increased feeding on *S. elegans* in spring is related to an appearance of boreal zooplankton, which were abundant following the severe winter of 1977 (Grant 1979, 1980[3]). As concluded by Love and Ebeling (1978), seasonal switching in prey selectivity, in this case to different prey types—i.e., benthic to pelagic—probably reflects an increased relative abundance or availability of these prey species. Since benthic populations remain relatively constant (Boesch et al. 1977; Boesch 1978), this is probably due to an increase in nearbottom zooplankton, especially chaetognaths and larvaceans. Increased importance

[3]G. C. Grant, Acting Assistant Director, Virginia Institute of Marine Science, Gloucester Pt., VA 23062, pers. commun. 20 April 1980.

of decapod larvae in the diet of many fishes (*R. erinacea*, *U. chuss*, *M. bilinearis*, *M. americanus*) in the summer may also reflect this phenomenon.

Predator Size and Feeding Strategy

The food habits of dominant shelf fishes changed considerably with size, as noted in other fishes (Tyler 1972; Ross 1978; Werner 1979). For most predators this change was a switch to different, larger, prey taxa. Many predators (*R. erinacea*, *U. chuss*, *U. regia*, and *M. bilinearis*) fed on increasing numbers of similarly sized, small food items, up to a certain length. At this point, there was a rapid increase in mean prey size for larger predators, with a concomitant decrease in the number of prey consumed. Total volume of food increased with increasing fish length. Ross (1978) noted a similar progression in food habits with increasing size and suggested this strategy should maximize energy intake at the onset of reproduction, a time of increased energy demand.

Schoener (1971) predicted, from optimal foraging models, that food size should decrease with decreasing predator size, and should do so asymptotically. Numerous examples demonstrate the trend of his prediction, but evidence for an asymptote has been sparse, and one study indicated it did not occur (Schoener 1971). Most shelf fishes studied (Figs. 4, 7, 10, 13, 16, 25, 28) demonstrate this phenomenon, but there are exceptions. *Macrozoarces americanus* (Fig. 19) fed heavily on small food items throughout the size-range examined, with larger fish retaining small prey in the diet, while broadening their feeding to include larger prey items. *Stenotomus chrysops* underwent a marked change in prey-size preference between 100 and 150 mm standard length (Fig. 22), but then prey size remained relatively constant. There is no asymptote at the lower end of the length range for *S. chrysops*.

Larger predators should take a greater size range of food, and food diversity (i.e., number of prey types or species) should be greater in large animals, unless available small prey are sufficiently more diverse (Schoener 1971). In those predators for which benthic prey dominated (all except *L. americanus* and *M. bilinearis*), such a relationship is evident for prey types. Although amphipods, the dominant prey for smaller predators, decrease in abundance, they remain relatively common in the diet of large fish even as other larger prey items are added. However, large prey items include the much less diverse decapods and larger polychaetes. The high diversity of available small prey (amphipods, isopods, cumaceans) result in smaller fishes having a more diverse diet at the species level.

Overlap in Diet

Most predator species were selective on the macrobenthos, particularly on corophiid and ampeliscid amphipods and decapods. These crustaceans were important food for these predators, resulting in considerable overlap in diet.

Cluster analysis of predator species and size-classes based on prey similarity indicates that intraspecific and interspecific diet-overlap relationships change considerably with season and with fish size. Although there was considerable interspecific overlap in diet, there is evidence for intraspecific food-resource partitioning. Small fishes overlapped in diet intraspecifically as well as with small fishes of other species. The larger fishes of these species also exhibited interspecific dietary overlap, but fed quite differently from the juveniles. These differences in diet overlap with size were correlated with changes in feeding strategy with increased fish length. For example, in fall (Fig. 31), all *R. erinacea* ranging between 51 and 250 mm DW fed similarly and were grouped together within a larger group of similar feeders. However, skates larger than 250 mm DW fed differently and were grouped together with other large decapod feeders. *Raja erinacea* demonstrated a marked change in food habits at 250 mm DW (Fig. 4) where this shift in food-overlap relationships occurred. The other species that grouped with *R. erinacea* also demonstrated a parallel change in feeding strategy with increased size. Thus, although intraspecific changes in diet with increased size may prevent intraspecific overlap in diet, considerable interspecific overlap occurred. Although intraspecific and interspecific diet-overlap relationships changed seasonally, it is apparent that intraspecific differences in feeding are as important as interspecific differences in structuring the predator community.

Several reasons may account for the considerable amount of interspecific overlap in diet exhibited by shelf fishes. Optimal foraging theory predicts that as food becomes scarce, predators will take a wide variety of food and similar predators occupying the same habitat will converge in diet (Pyke et al. 1977). Alternatively, some authors have hypothesized that as food density lowers, coexisting predators will specialize on different prey and food overlap will decrease. Considerable food overlap would only be expected if food were abundant (Jones 1978). Some field studies support this latter hypothesis, although this may be due to a lack of measurement of actual resource availability. Thus, Keast (1965) and Zaret and Rand (1971) found that fishes specialized in diet and that interspecific overlap was at a minimum during the food-impoverished season. Maximum food overlap occurred when food levels were high [see also Ross (1977) and Townsend and Hildrew (1979)]. Tyler (1972) reported little overlap in the diets of northern marine demersal fishes and concluded that food limitation led to specialization and food-resource partitioning. The present results indicate that shelf fishes are selective in their feeding, but that considerable interspecific overlap occurs in diet. The question remains whether this overlap is due to a food shortage (Pianka 1976; Pyke et al. 1977) or a food abundance (Zaret and Rand 1971; Ross 1977; Jones 1978). Boesch et al. (1977) and Boesch (1978) reported that density and abundance of macrobenthos on the outer shelf were generally high and persistent year-round. Walsh et al. (1978) reported an increase in plankton productivity in the early spring and suggested most of this productivity was transferred to the bottom. This could lead to a superabundance of food near and on the bottom in the spring. It is noteworthy that food overlap among shelf fishes was lowest in spring, and that some of this was due to normally benthic predators (e.g., *U. chuss* and *C. arctifrons*) switching to planktonic prey. It appears that minimal overlap in diet of shelf fishes in the present study is associated with a superabundance of prey in the spring, supporting the hypothesis of optimal foraging (Pianka 1976; Pyke et al. 1977).

The question also remains to be answered as to whether there is competition for food among shelf fishes. Although there was much interspecific diet overlap among shelf fishes, overlap need not necessarily lead to competition unless resources are in short supply (Pianka 1976). Extensive niche overlap may actually be correlated with reduced competition (Pianka 1974, 1976; Jones 1978). Most shelf fishes exhibited extensive overlap in habitat and food, but it is not known if these resources are in short supply. Predator exclusion experiments on the outer shelf indicate that the macrobenthic community is, in part, predator controlled (Boesch 1978) and that populations of certain species, including those important as prey to fishes (e.g., corophiid amphipods), may be kept below carrying capacity by fish predation. Whether this predation pressure keeps potential prey in short supply is unknown.

Seasonal intrusions of abundant predators could also result in food resource limitation and competition. Tyler (1972) reported that seasonally abundant species did not, as a group, feed on a unique set of prey species. In the present study *S. chrysops*, a seasonal species, was similar in diet to *U. chuss* and *M. bilinearis*. Ocean pout were only abundant seasonally (in summer), but fed on common prey species shared with other predators. Apparently seasonal intrusions of abundant predators do not affect food availability on the Middle Atlantic Shelf.

Overlap in diet between closely related species is generally lower than that for unrelated species, suggesting food resource partitioning among closely related species. Thus the congeners *U. chuss* and *U. regia* show a low similarity in prey species and prey size (Fig. 29). Seasonally, the bothids *Citharichthys arctifrons* and *Hippoglossina oblonga* were also quite dissimilar in diet. Still, no predator monopolized any trophic resource. This apparent food resource partitioning among closely related species may be due, not to present limited food resources, but to environmental factors and predator community structure during the evolutionary history of these species.

Although predators demonstrated considerable diet overlap, each predator had a diverse diet and fed selectively on some prey items that were not as important in the diets of other predators. Perhaps each predator has a food refuge in these prey species if competition for food becomes intense. Due to overexploitation by fishing vessels, populations of fishes on the outer shelf may be below carrying capacity (Edwards 1976; Clark and Brown 1977; Edwards and Bowman 1979), allowing several dominant species to coexist on similar food resources. At higher population levels, food resources may become a limiting factor and the high level of diet overlap could lead to competition. With reduced fishing pressure due to extended jurisdiction by the United States, fish populations on the outer shelf may increase, and food competition may become intense.

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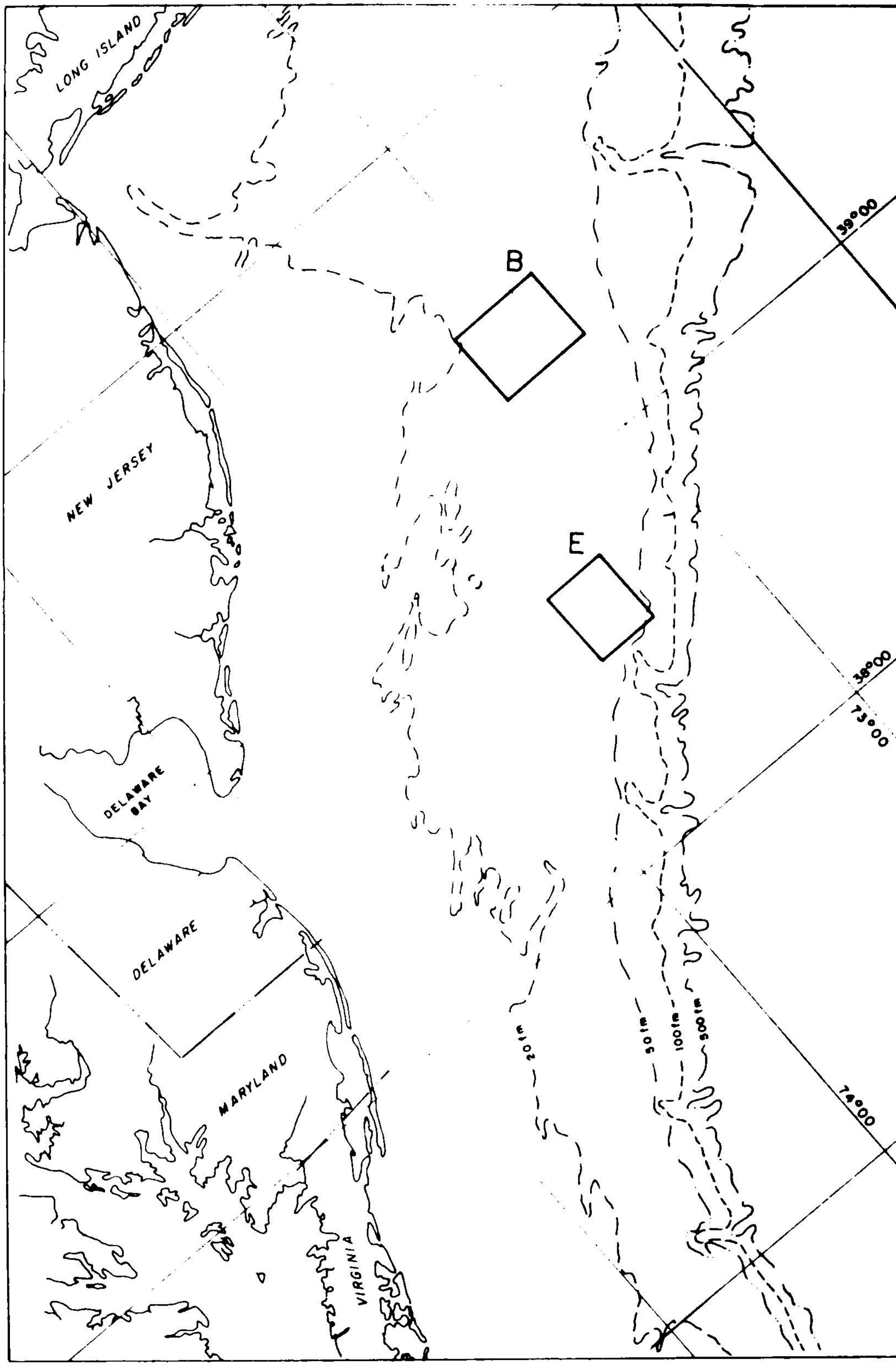


Figure 1.—Location of sample areas B and E.

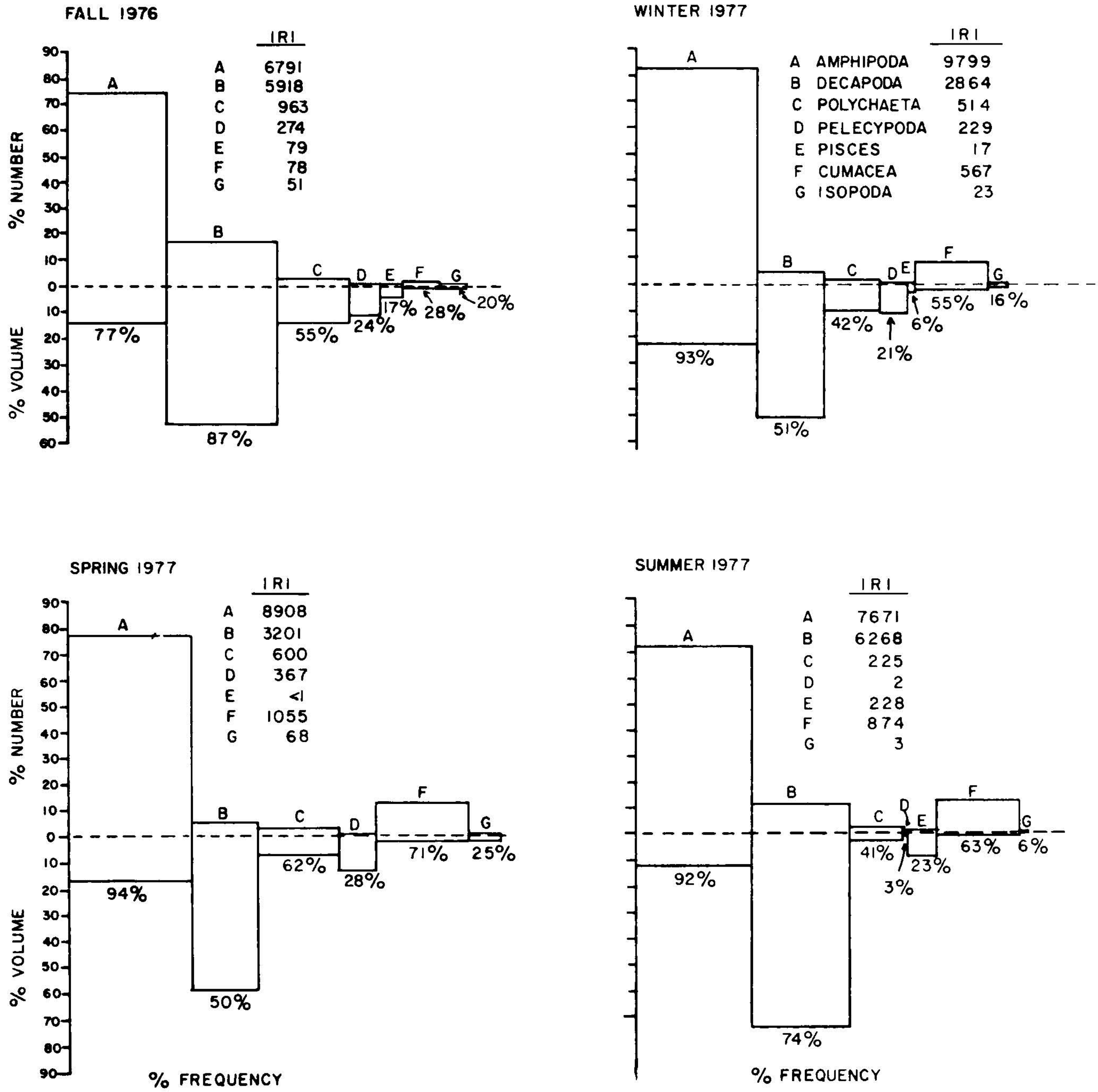
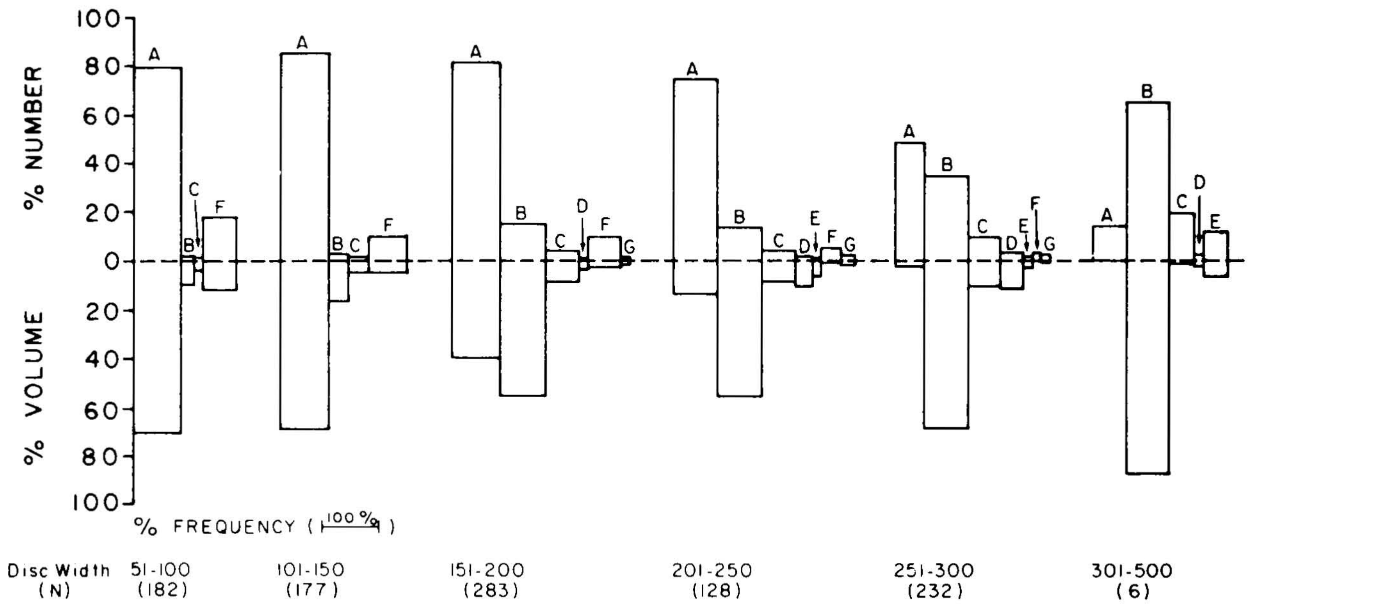


Figure 2.—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food in the diet of *Raja erinacea*, by seasonal cruise.



IRI

	51-100	101-150	151-200	201-250	251-300	301-500	
A)	14861	15376	11850	7993	3147	960	AMPHIPODA
B)	284	849	3379	5997	9423	12662	DECAPODA
C)	54	259	564	921	1223	550	POLYCHAETA
D)	0	1	59	377	686	72	PELECYPODA
E)	7	16	13	121	70	915	PISCES
F)	2082	1173	943	227	48	0	CUMACEA
G)	1	25	24	84	72	0	ISOPODA

Figure 3.—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food for size intervals (mm) of *Raja erinacea*.

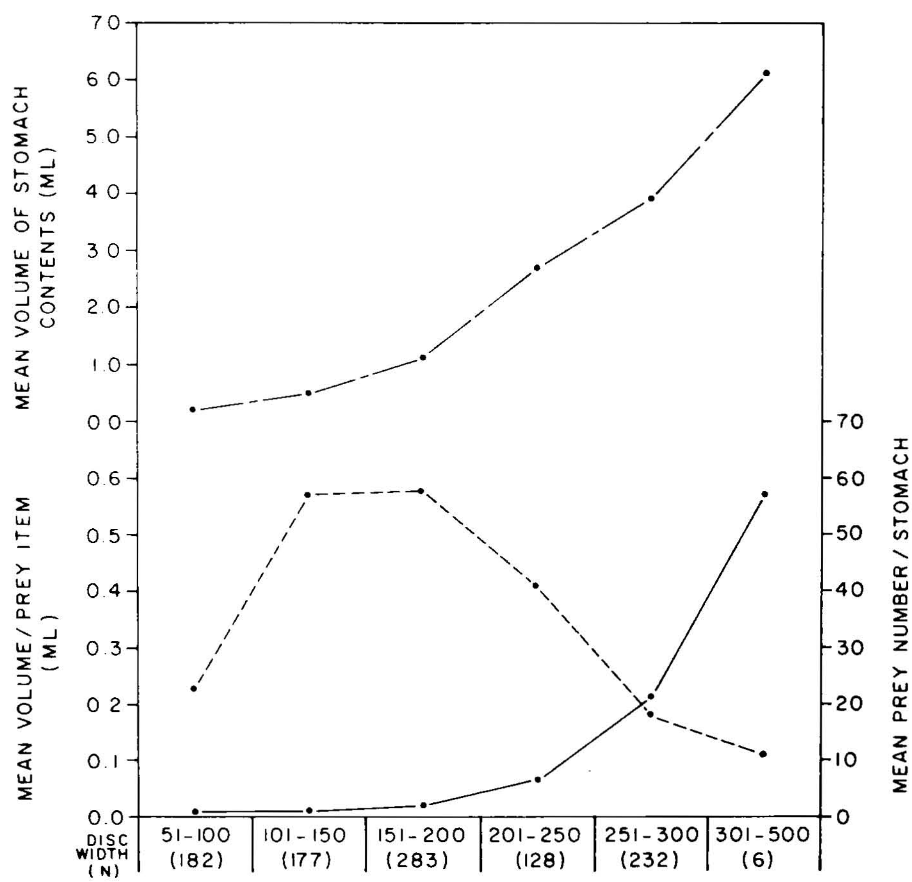


Figure 4.—Relationship between size of *Raja erinacea* and volume of food consumed (broken line), mean prey volume (solid line), and prey number per stomach (dashed line).

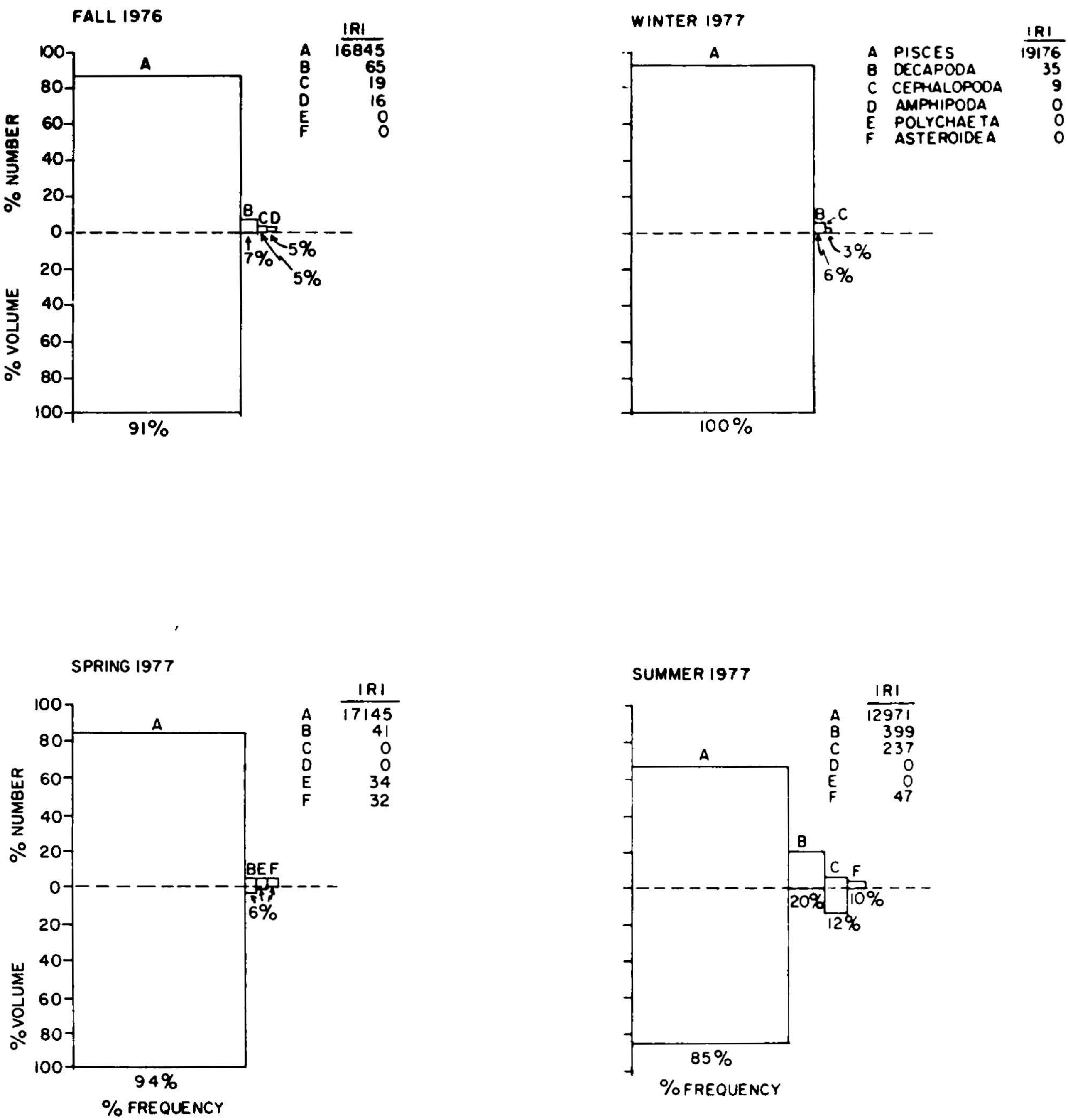
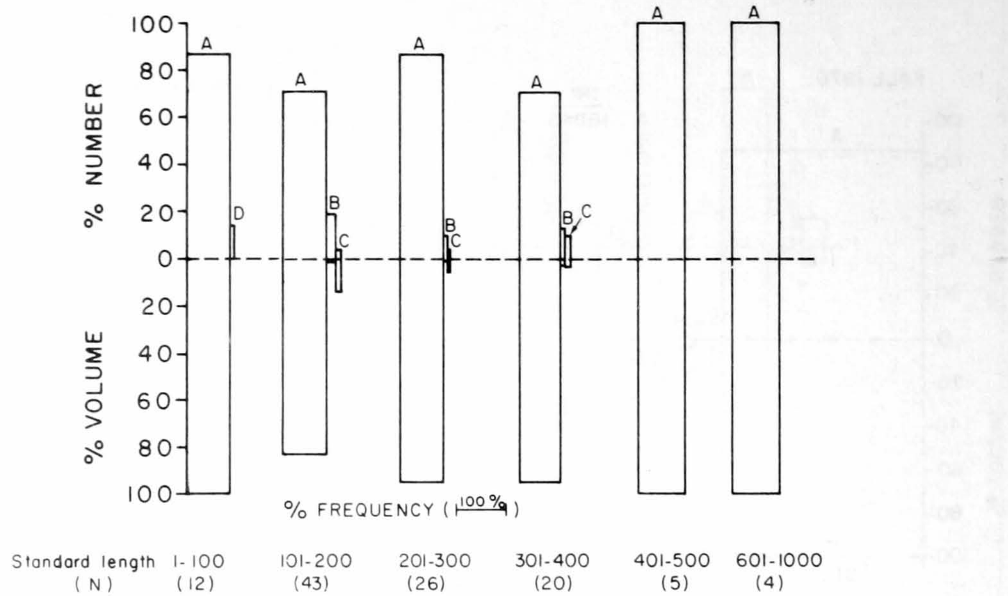


Figure 5.—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food in the diet of *Lophius americanus*, by seasonal cruise.



IRI

	1-100	101-200	201-300	301-400	401-500	601-1000	
A)	17080	14394	16763	14122	20000	20000	PISCES
B)	0	373	118	145	0	0	DECAPODA
C)	0	125	31	188	0	0	CEPHALOPODA
D)	114	0	0	0	0	0	CHAETOGNATHA

Figure 6.—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food and size intervals (mm) of *Lophius americanus*.

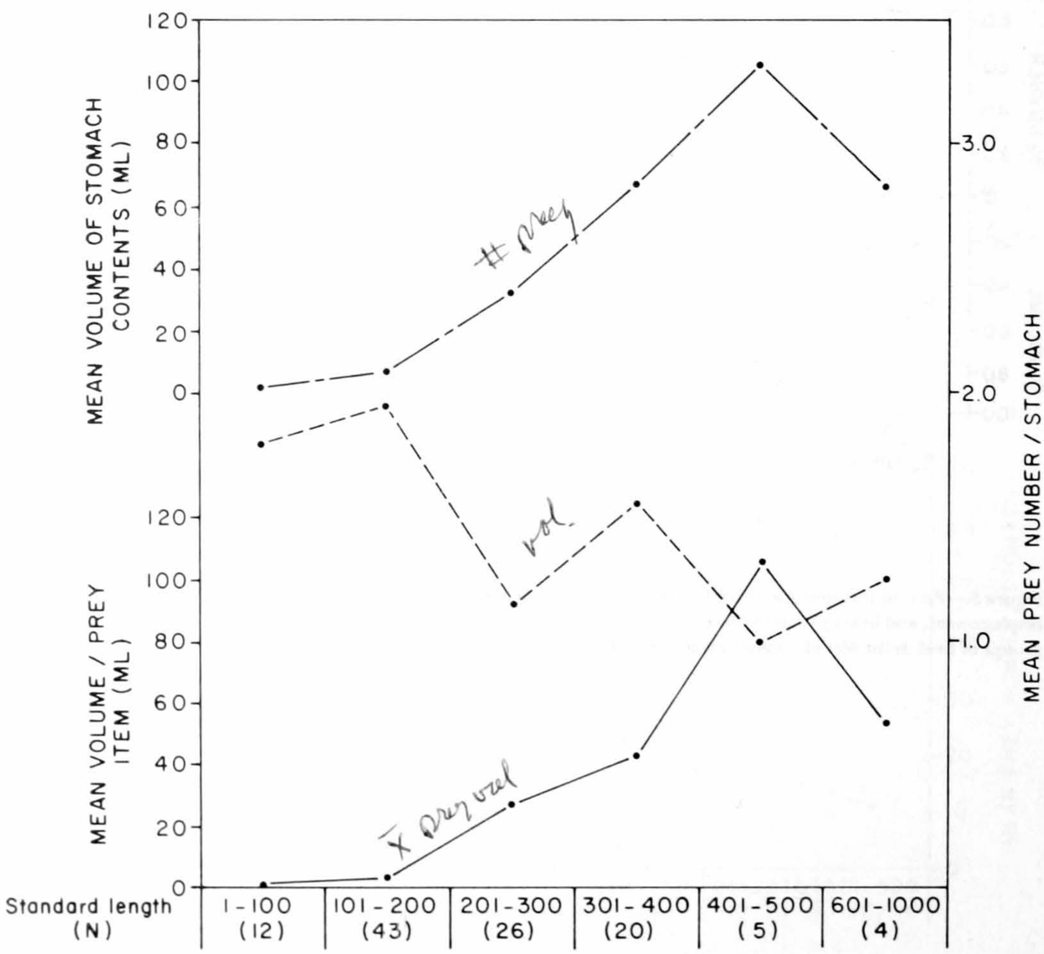


Figure 7.—Relationship between size of *Lophius americanus* and volume of food consumed (broken line), mean prey volume (solid line), and prey number per stomach (dashed line).

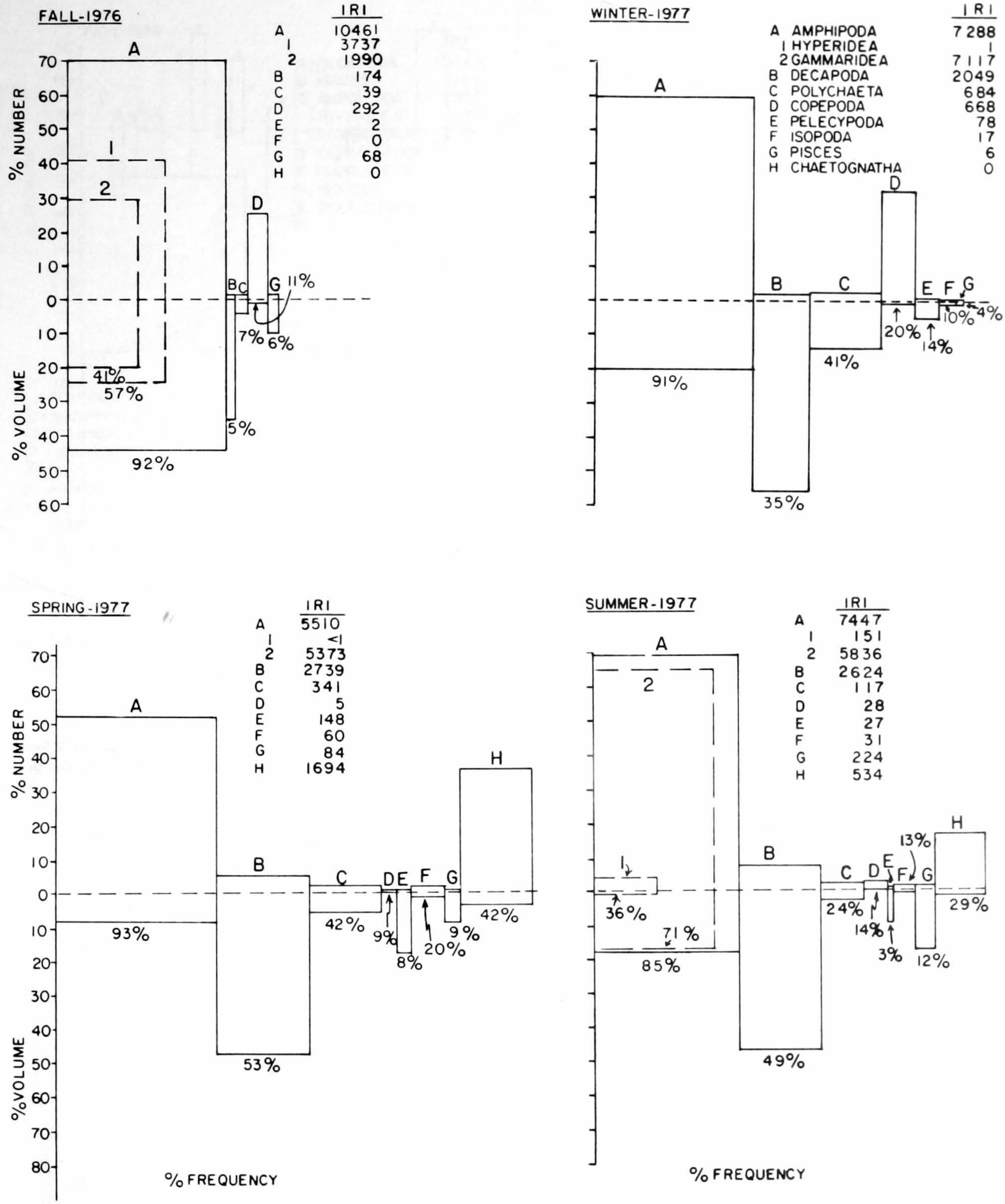
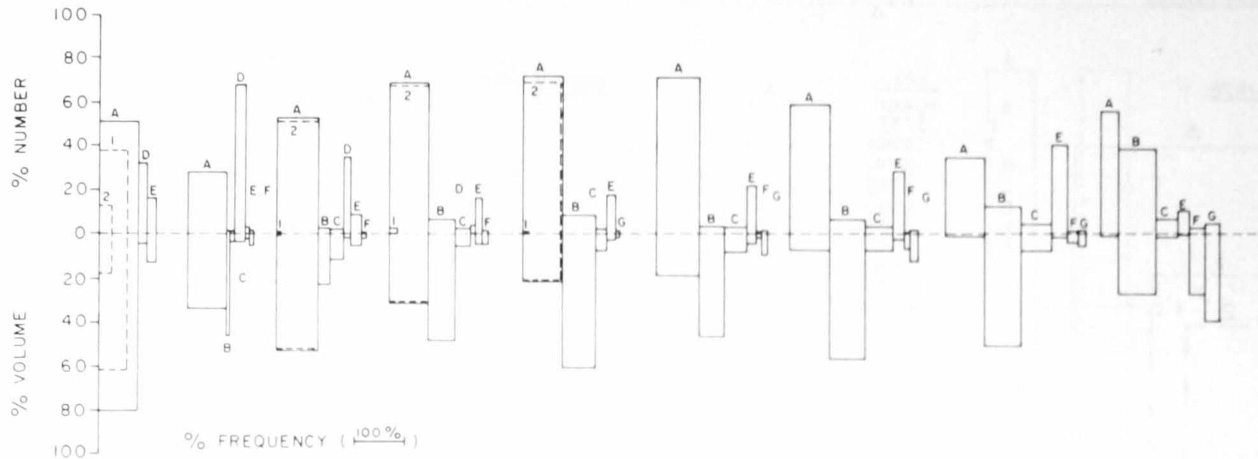


Figure 8.—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food in the diet of *Urophycis chuss*, by seasonal cruise.

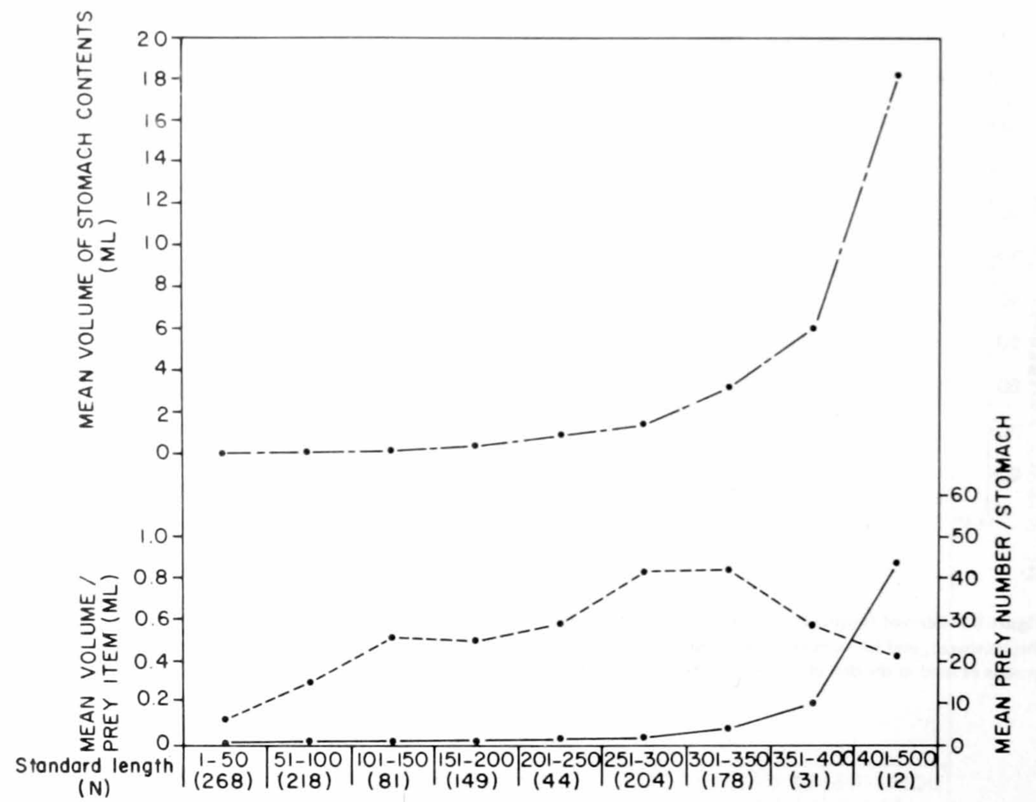


IRI

STANDARD LENGTH (N)	1-50 (268)	51-100 (218)	101-150 (81)	151-200 (149)	201-250 (44)	251-300 (204)	301-350 (178)	351-400 (31)	401-500 (12)	
A)	11409	5703	9967	9248	8460	8480	5871	3210	2329	AMPHIPODA
1)	6466	1	7	47	23	1	1	0	0	HYPERIDEA
2)	879	5514	9567	8856	8017	8224	5736	3189	2176	GAMMARIDEA
B)	1	151	643	3383	5209	2962	4982	5134	3824	DECAPODA
C)	7	52	374	287	240	598	706	818	432	POLYCHAETA
D)	748	1766	488	25	1	2	1	3	0	COPEPODA
E)	628	68	381	341	400	533	743	1491	263	CHAETOGNATHA
F)	1	38	23	92	2	22	80	128	1006	PISCES
G)	0	1	2	3	20	142	312	83	1462	PELECYPODA

Figure 9.—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food for size intervals (mm) of *Urophycis chuss*.

Figure 10.—Relationship between size of *Urophycis chuss* and volume of food consumed (broken line), mean prey volume (solid line), and prey number per stomach (dashed line).



Urophycis regia

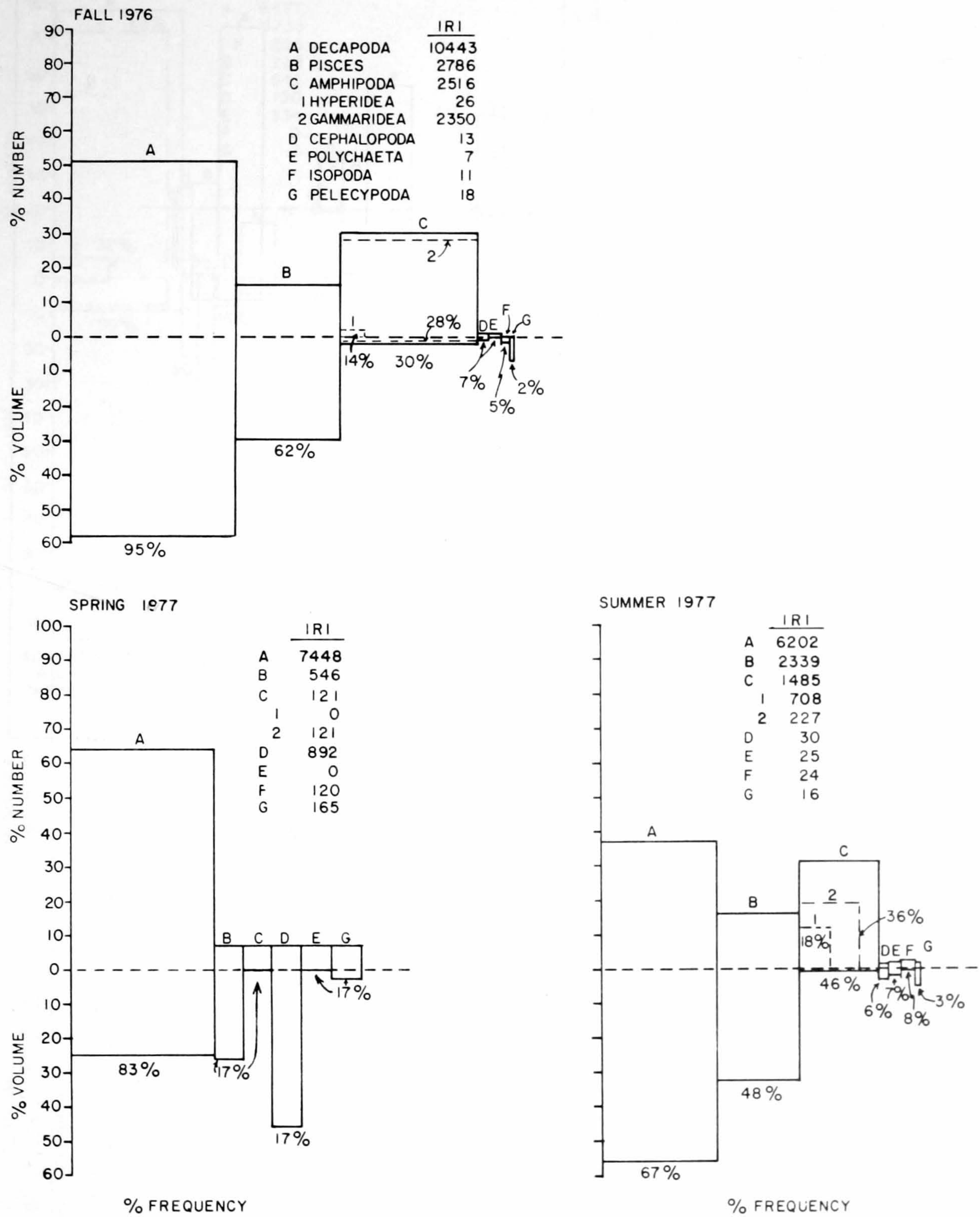
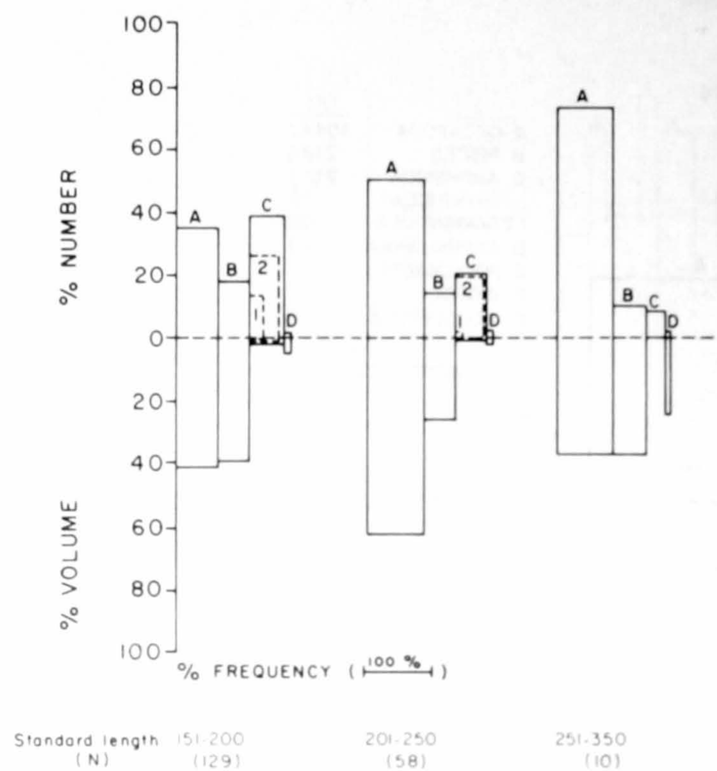


Figure 11.—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food in the diet of *Urophycis regia*, by seasonal cruise.



IRI

	151-200	201-250	251-350	
A)	4921	9896	9927	DECAPODA
B)	2901	1945	2355	PISCES
C)	2250	1078	252	AMPHIPODA
1)	292	12	21	HYPERIDEA
2)	1215	925	190	GAMMARIDEA
D)	40	25	278	CEPHALOPODA

Figure 12.—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food for size intervals (mm) of *Urophycis regia*.

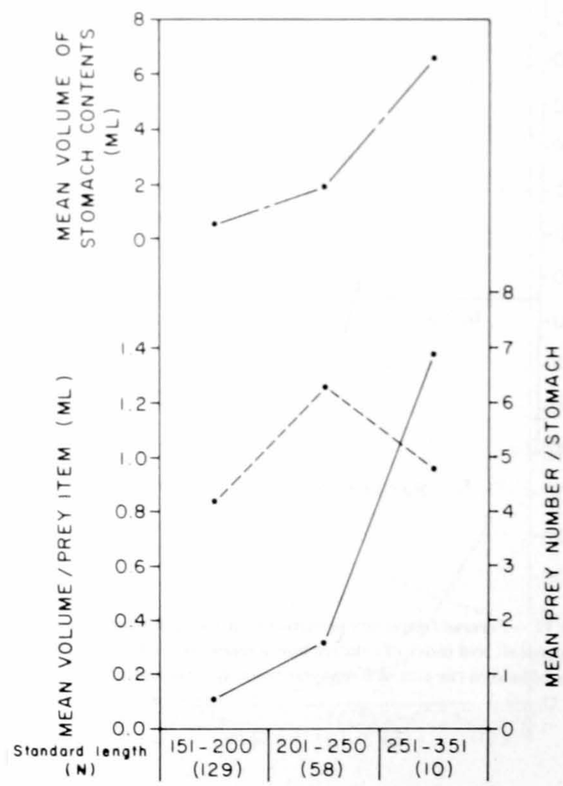


Figure 13.—Relationship between size of *Urophycis regia* and volume of food consumed (broken line), mean prey volume (solid line), and prey number per stomach (dashed line).

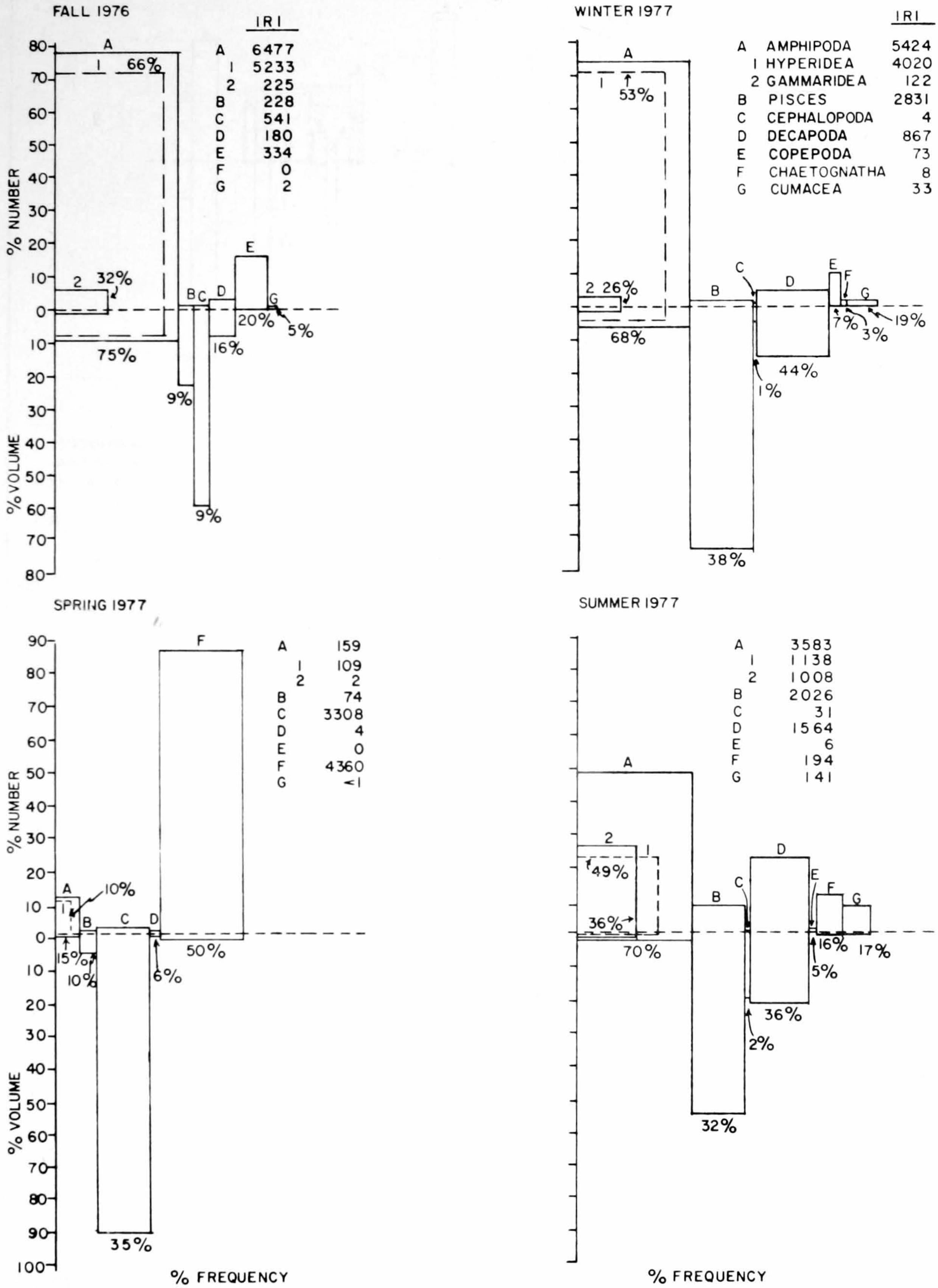
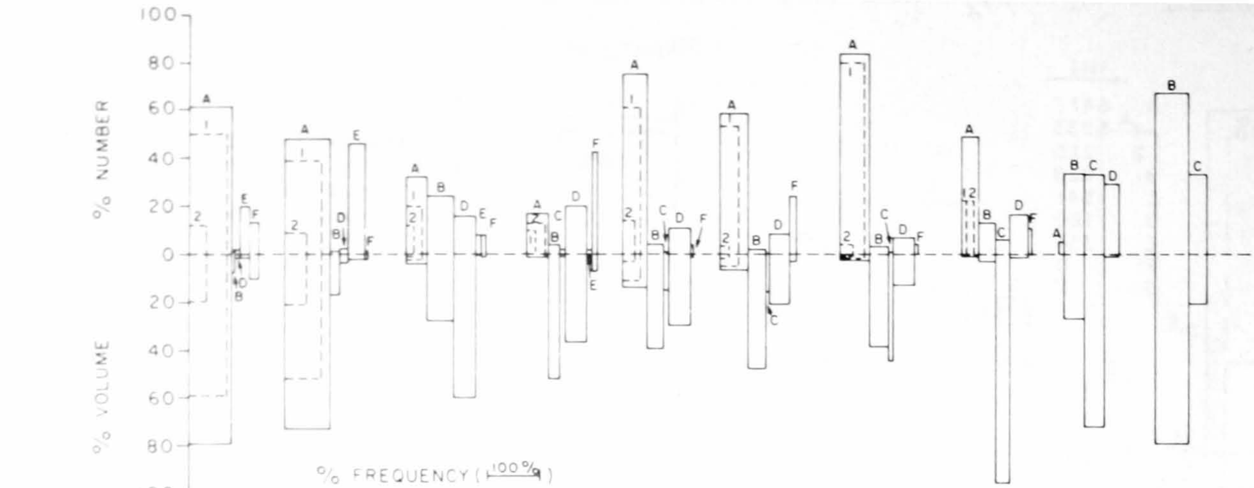


Figure 14.—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food in the diet of *Merluccius bilinearis*, by seasonal cruise.

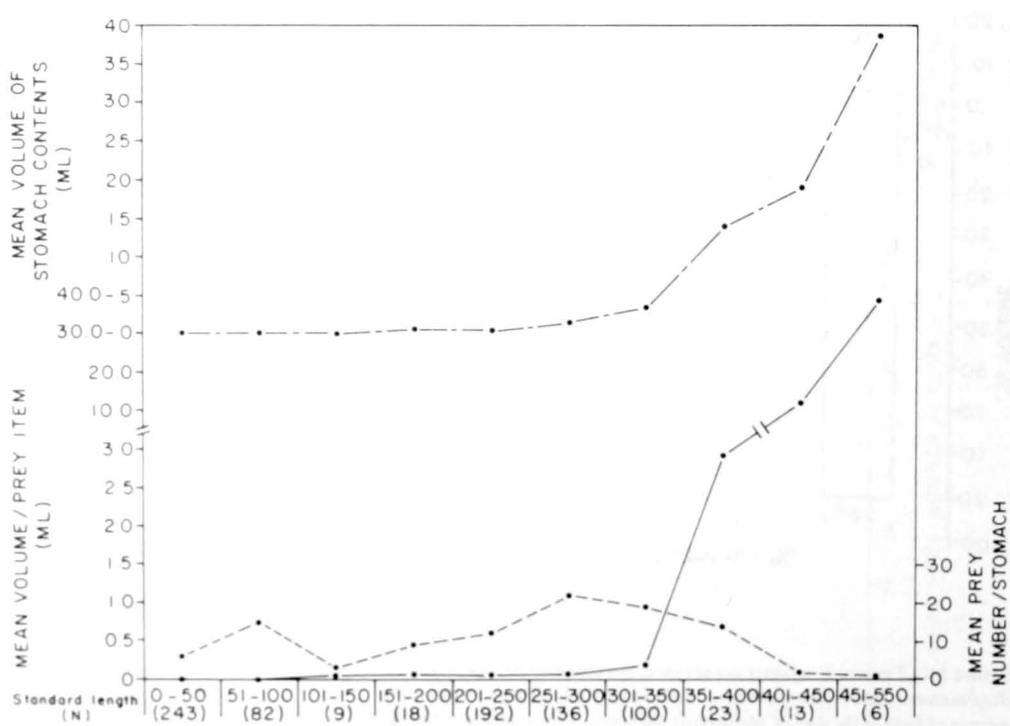


IRI

STANDARD LENGTH (N)	1-50 (243)	51-100 (82)	101-150 (9)	151-200 (18)	201-250 (192)	251-300 (136)	301-350 (100)	351-400 (23)	401-450 (13)	451-550 (6)	
A)	12822	11321	1588	801	4631	3783	5008	1699	37	0	AMPHIPODA
1)	8526	6696	·741	106	2564	2507	4007	236	0	0	HYPERIDEA
2)	1128	1346	300	515	429	156	105	567	37	0	GAMMARADEA
B)	43	341	2867	1869	1386	1715	1737	542	2782	9685	PISCES
C)	0	0	0	9	95	81	538	3079	4067	1825	CEPHALOPODA
D)	23	98	3365	2535	1840	1265	963	678	900	0	DECAPODA
E)	411	1571	89	3	4	1	1	0	0	0	COPEPODA
F)	490	14	97	285	15	384	12	51	0	0	CHAETOGNATHA

Figure 15.—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food for size intervals (mm) of *Merluccius bilinearis*.

Figure 16.—Relationship between size of *Merluccius bilinearis* and volume of food consumed (broken line), mean prey volume (solid line), and prey number per stomach (dashed line).



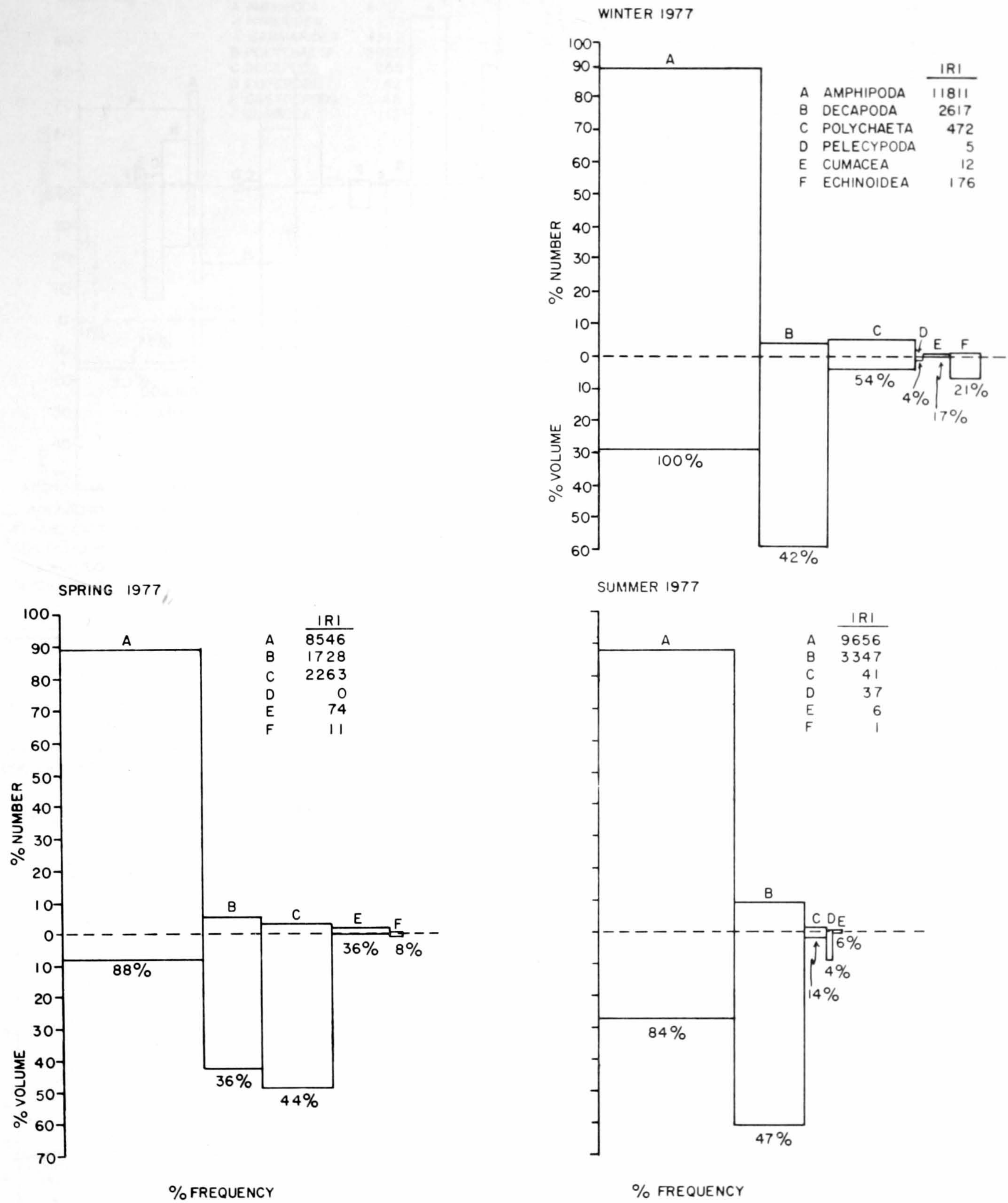
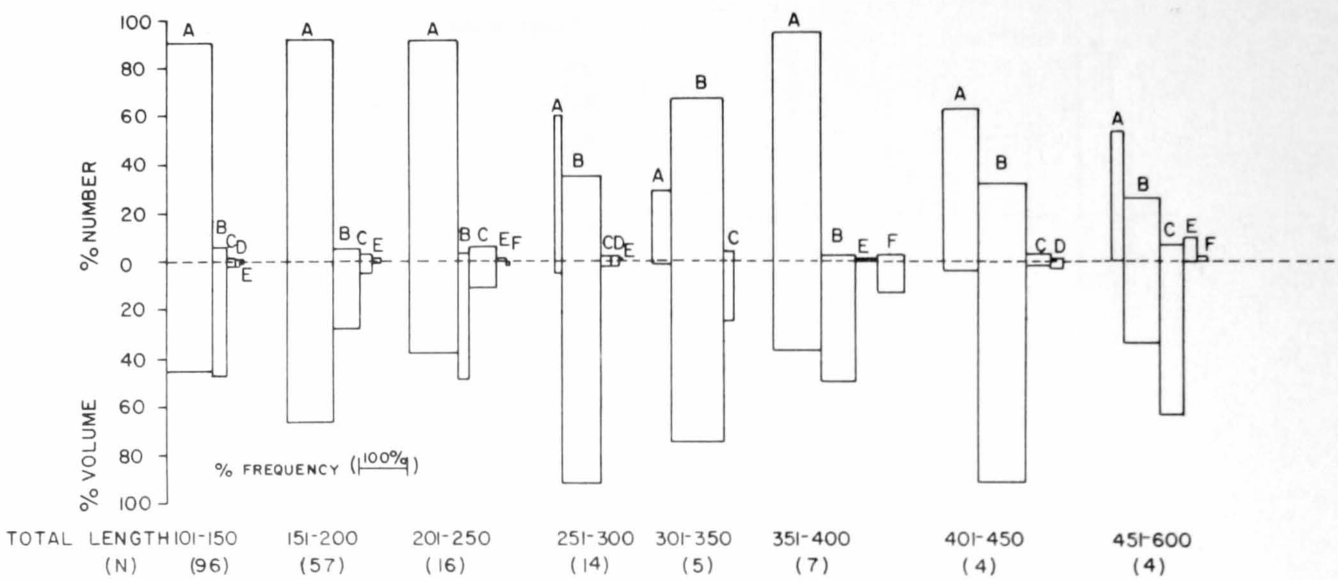


Figure 17.—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food in the diet of *Macrozoarces americanus*, by seasonal cruise.

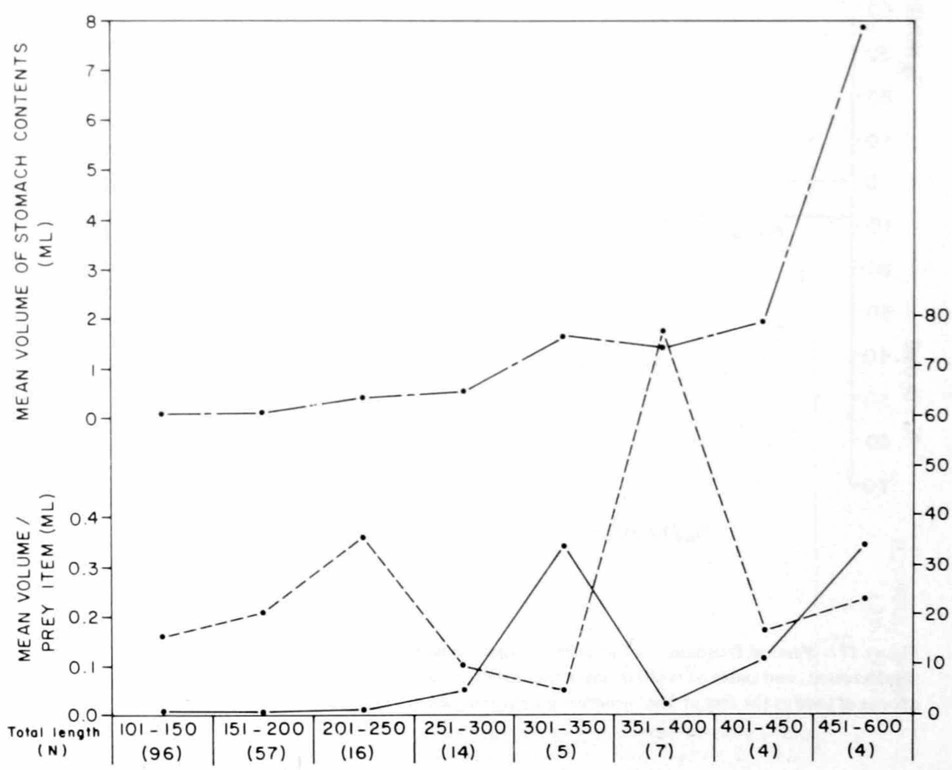


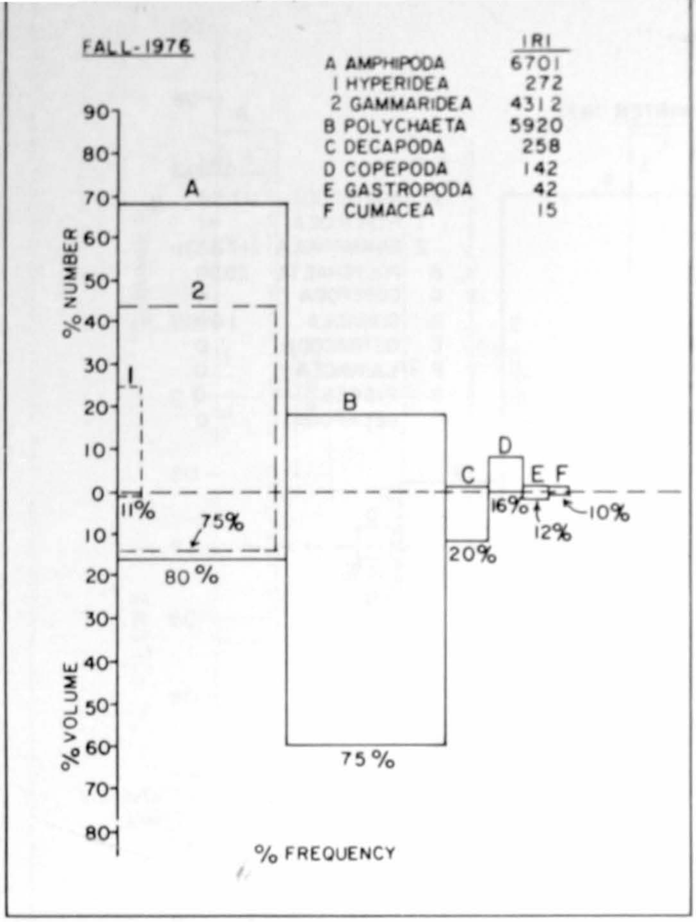
IRI

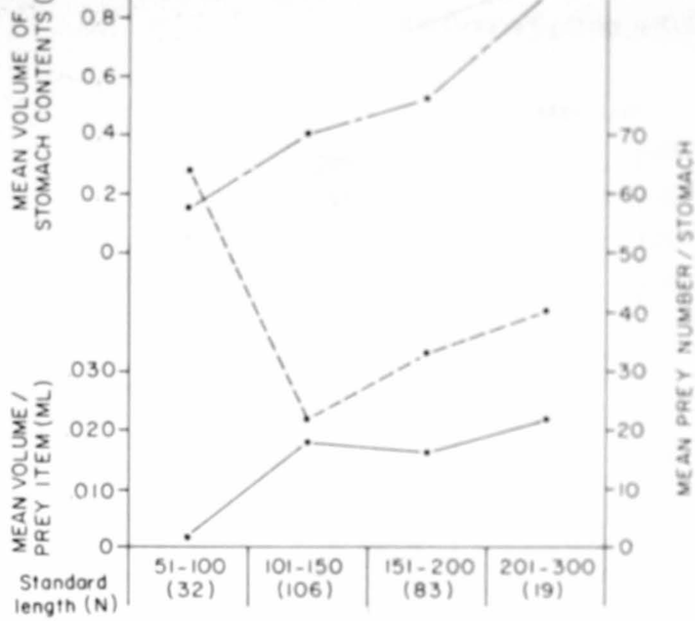
	101-150	151-200	201-250	251-300	301-350	351-400	401-450	451-600	
A)	12894	14706	12496	915	1186	13177	5027	1359	AMPHIPODA
B)	1675	1759	1291	10016	14151	3730	12439	4496	DECAPODA
C)	62	173	929	83	0	6	225	3536	POLYCHAETA
D)	8	0	0	55	577	0	102	0	PELECYPODA
E)	11	10	13	5	0	44	0	245	CUMACEA
F)	5	0	11	0	0	833	0	55	ECHINOIDEA

Figure 18.—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food for size intervals (mm) of *Macrozoarces americanus*.

Figure 19.—Relationship between size of *Macrozoarces americanus* and volume of food consumed (broken line), mean prey volume (solid line), and prey number per stomach (dashed line).







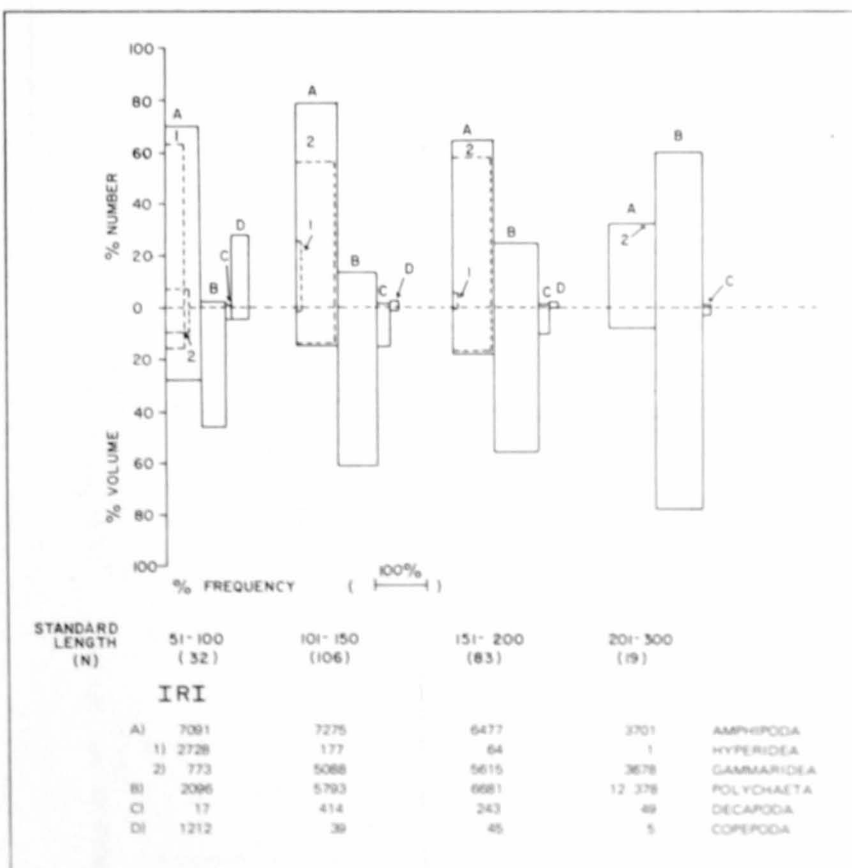


Figure 20 (upper left).—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food in the diet of *Stenotomus chrysops* in the fall.

Figure 21 (lower left).—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food for size intervals (mm) of *Stenotomus chrysops*.

Figure 22 (upper right).—Relationship between size of *Stenotomus chrysops* and volume of food consumed (broken line), mean prey volume (solid line), and prey number per stomach (dashed line).

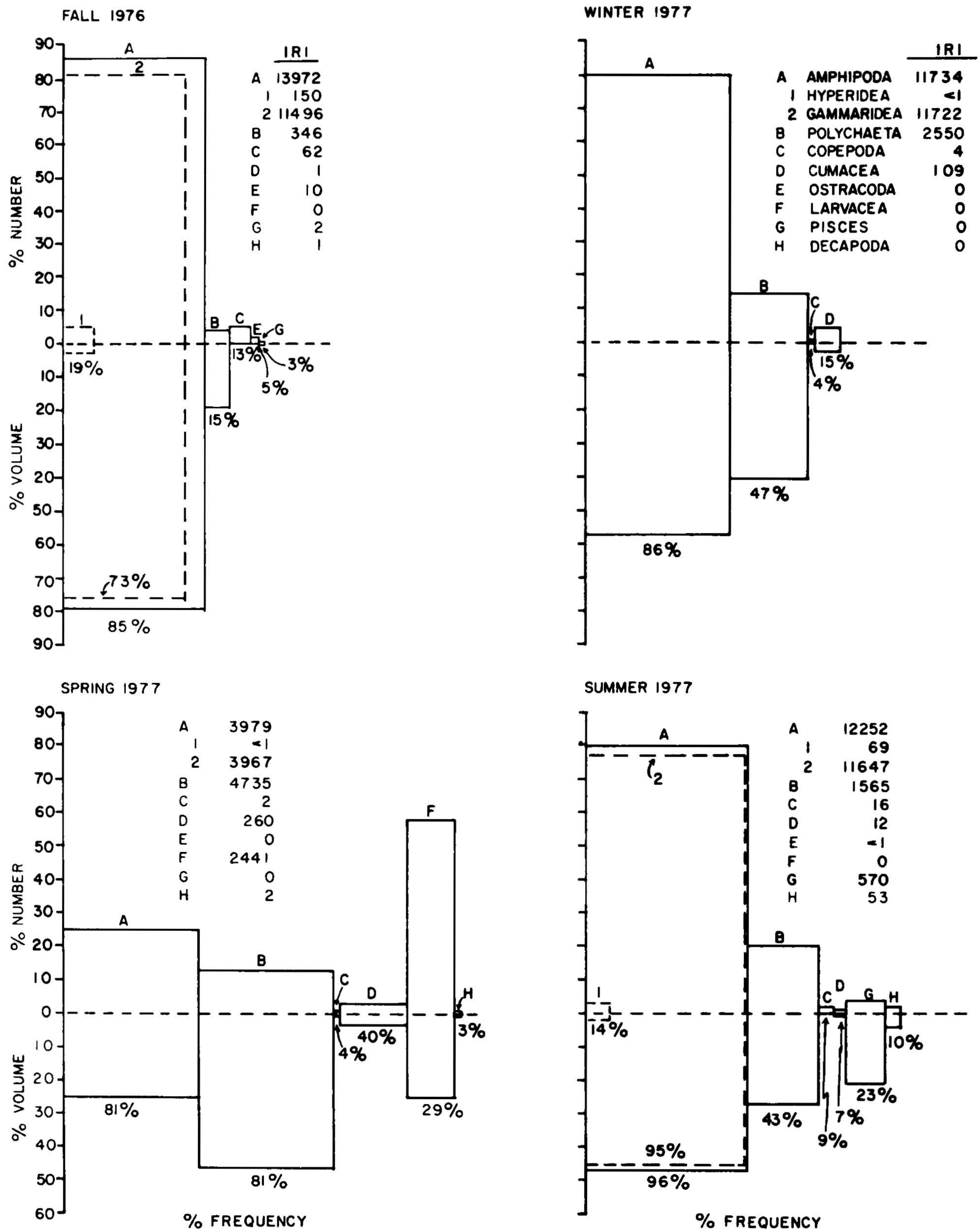
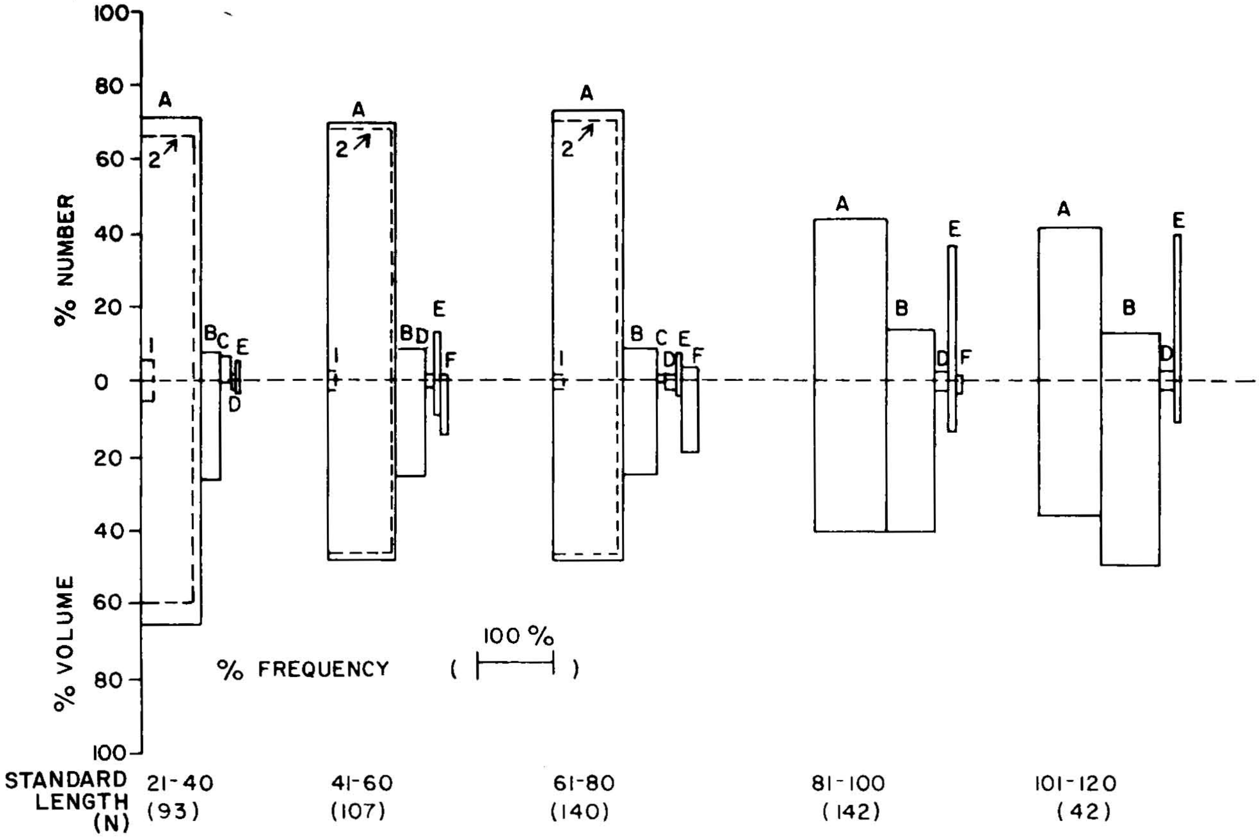


Figure 23.—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food in the diet of *Citharichthys arctifrons*, by seasonal cruise.



IRI

	21-40	41-60	61-80	81-100	101-120	
A)	10521	10544	11512	7983	6739	AMPHIPODA
1)	154	49	60	1	1	HYPERIDEA
2)	8727	9979	10965	7952	6707	GAMMARIDEA
B)	811	1279	1528	3570	4896	POLYCHAETA
C)	87	6	19	3	1	COPEPODA
D)	23	28	61	101	100	CUMACEA
E)	40	88	27	426	240	LARVACEA
F)	1	187	571	21	6	PISCES

Figure 24.—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food for size intervals (mm) of *Citharichthys arctifrons*.

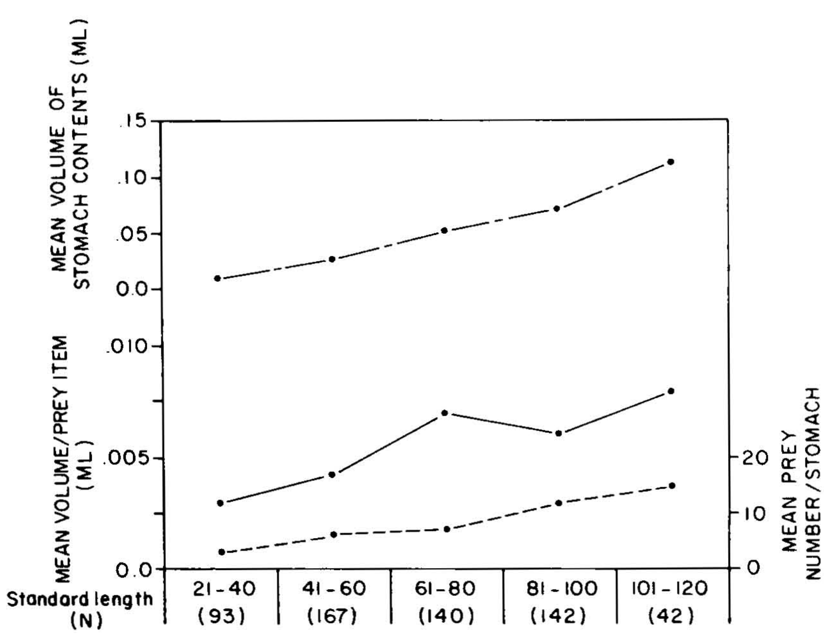


Figure 25.—Relationship between size of *Citharichthys arctifrons* and volume of food consumed (broken line), mean prey volume (solid line), and prey number per stomach (dashed line).

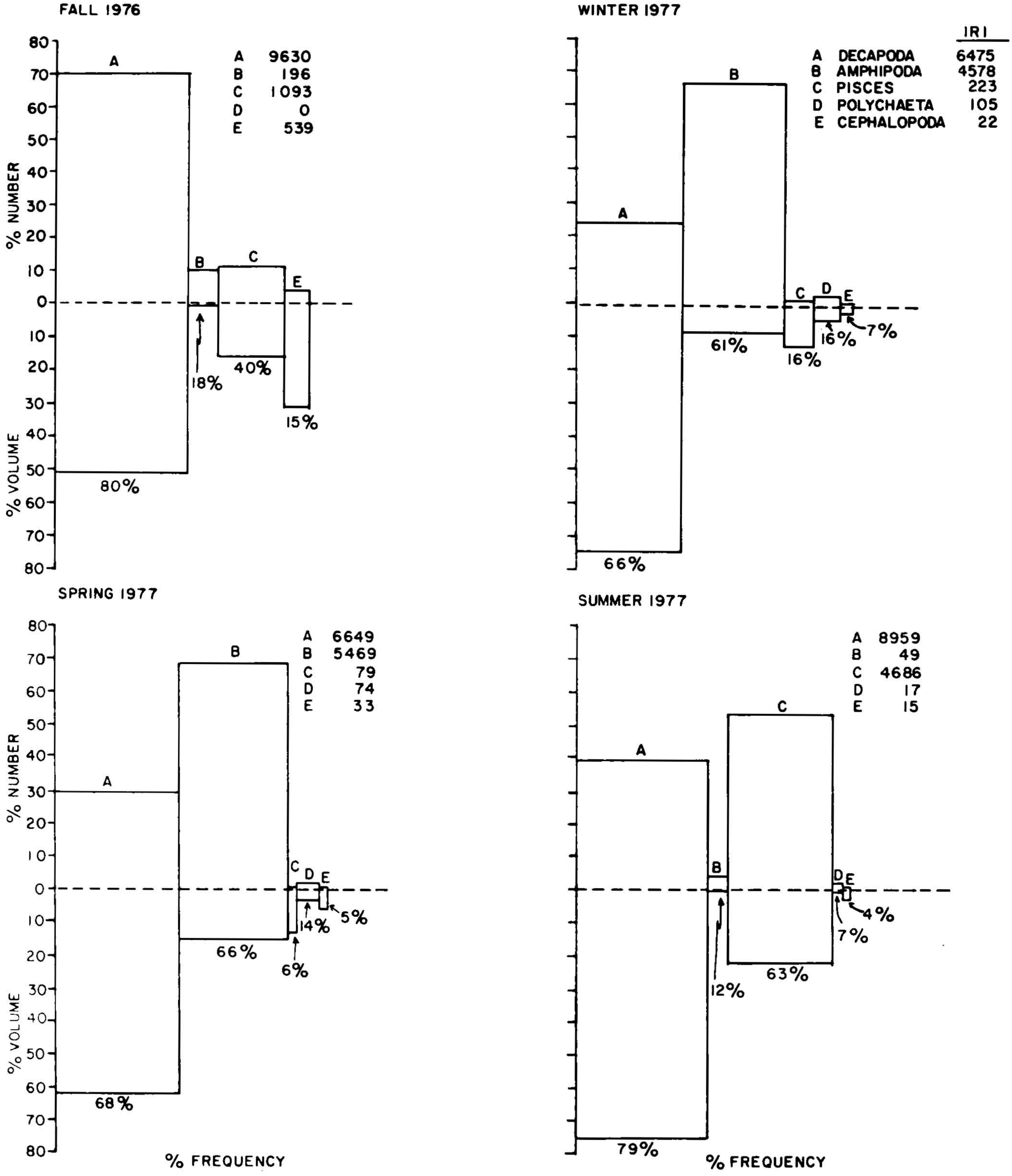
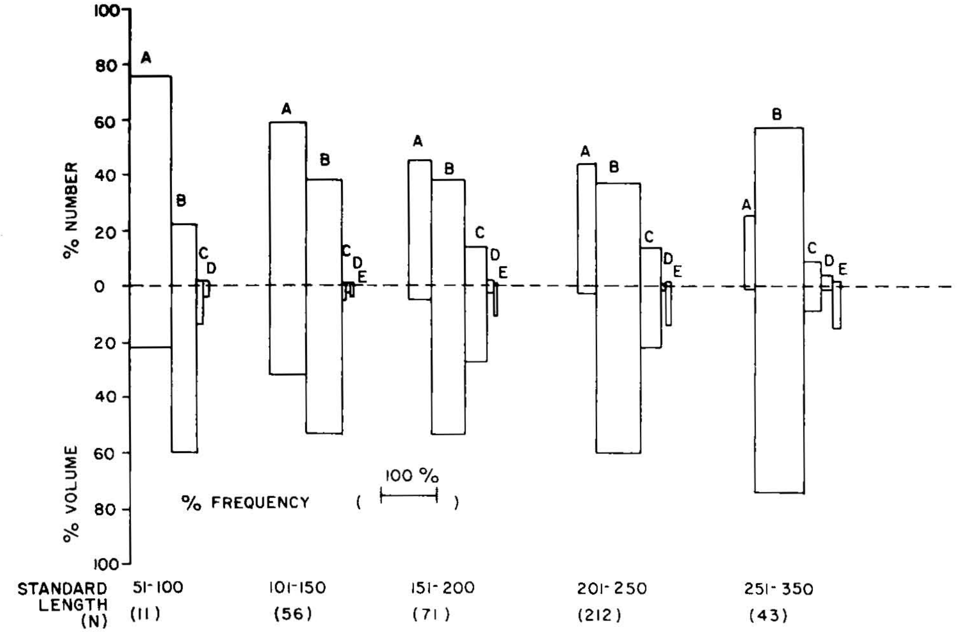


Figure 26.—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food in the diet of *Paralichthys oblongus*, by seasonal cruise.



	IRI					
A)	7046	6055	1891	1704	487	AMPHIPODA
B)	3729	5669	5512	7740	11 919	DECAPODA
C)	141	21	1624	1222	492	PISCES
D)	59	18	39	16	106	POLYCHAETA
E)	0	8	51	184	238	CEPHALOPODA

Figure 27.—Percent frequency occurrence, percent number, percent volume displacement, and index of relative importance (IRI) of higher taxonomic groups of food for size intervals (mm) of *Paralichthys oblongus*.

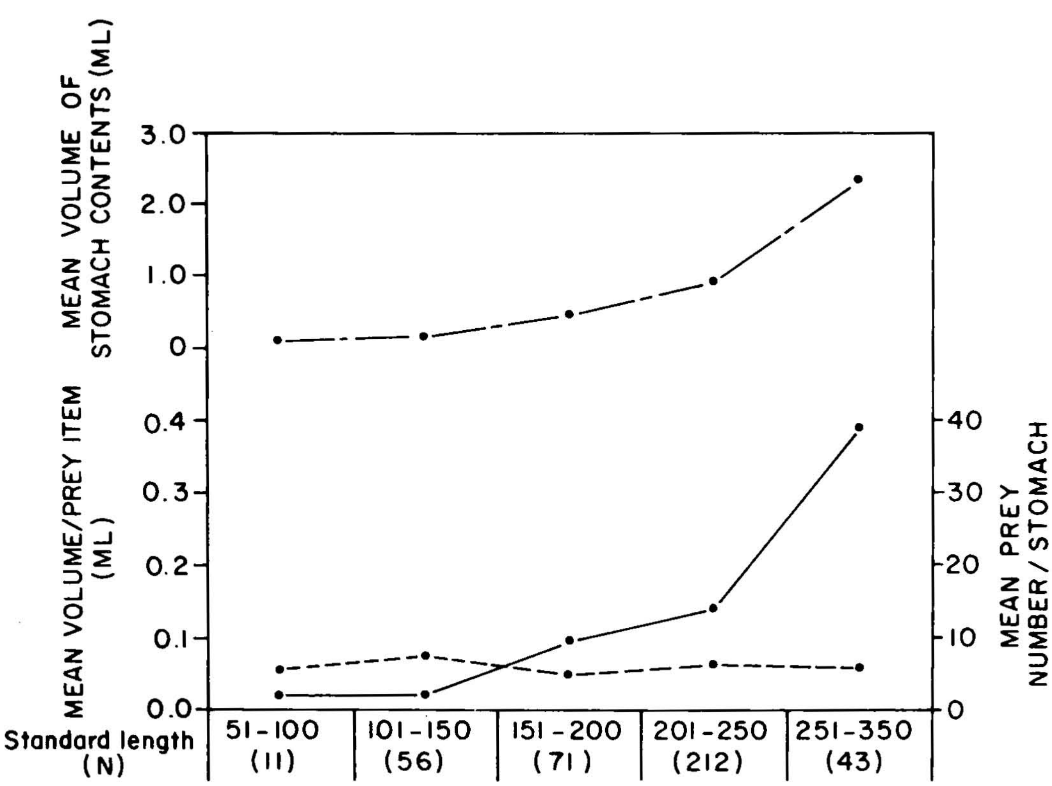


Figure 28.—Relationship between size of *Paralichthys oblongus* and volume of food consumed (broken line), mean prey volume (solid line), and prey number per stomach (dashed line).

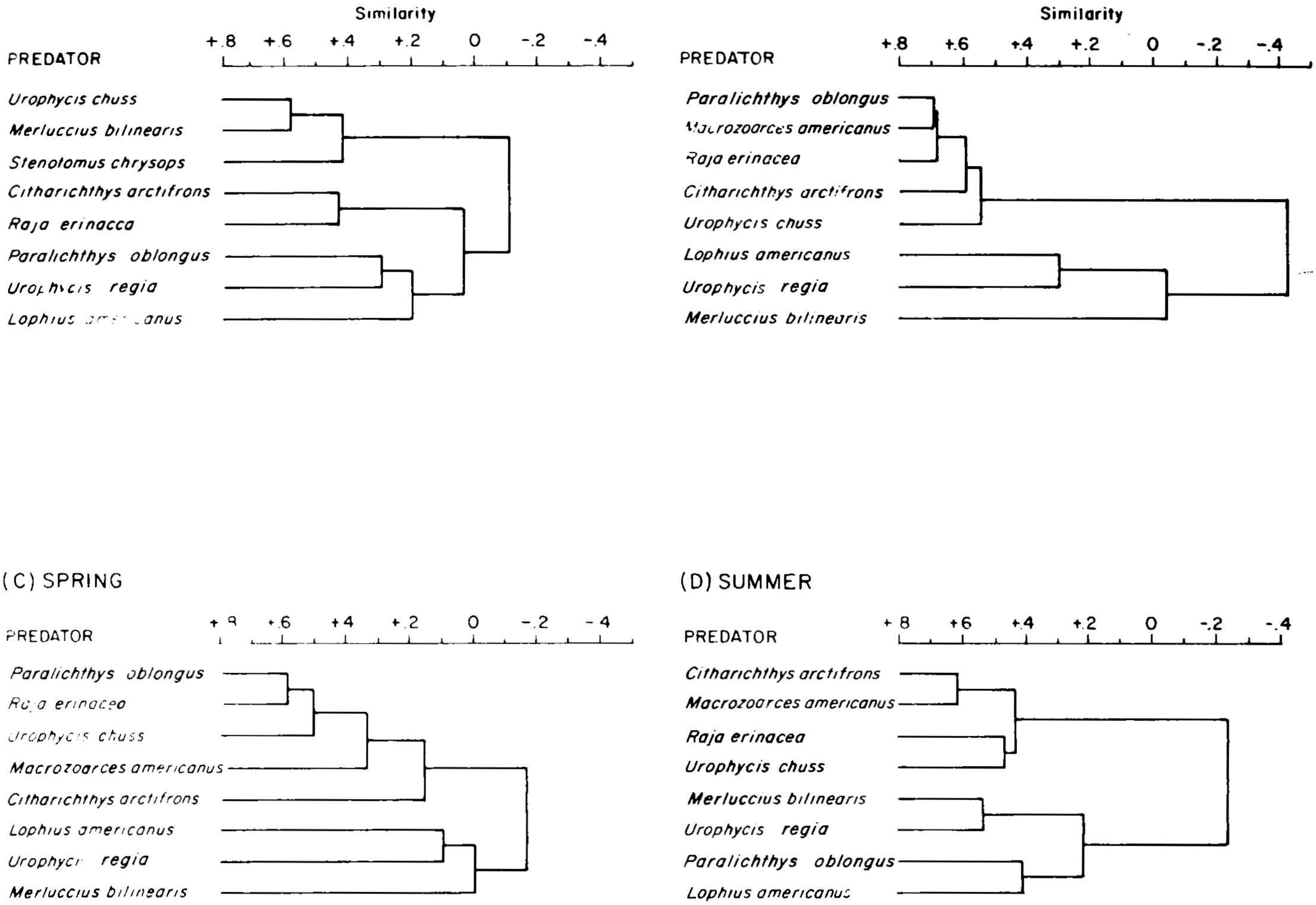


Figure 29.—Dendrograms depicting diet similarity (Bray-Curtis similarity index) among dominant predators, within each season.

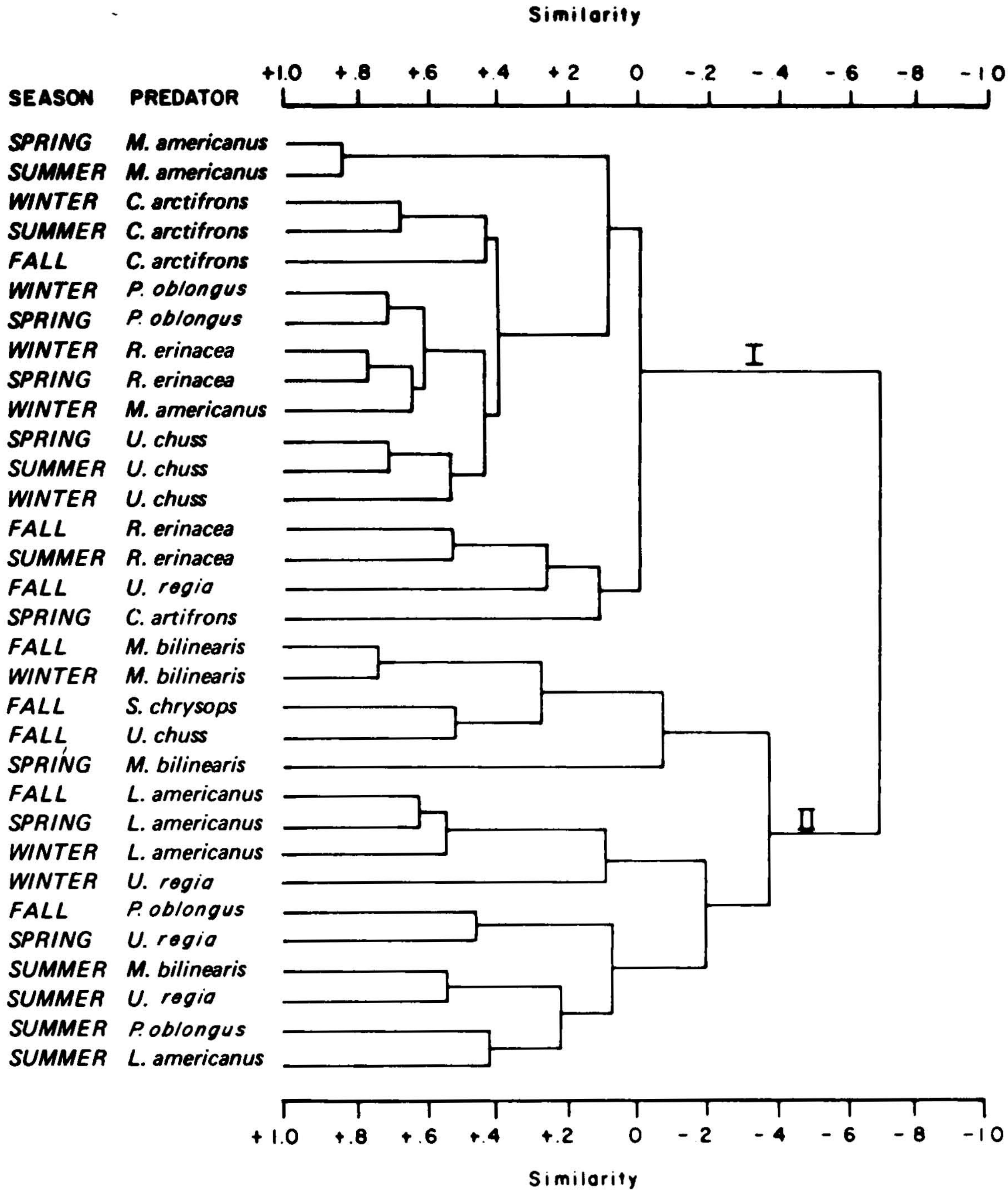


Figure 30.—Dendrogram depicting diet similarity (Bray-Curtis similarity index) among predators, by season. Roman numerals indicate groups referred to in the text.

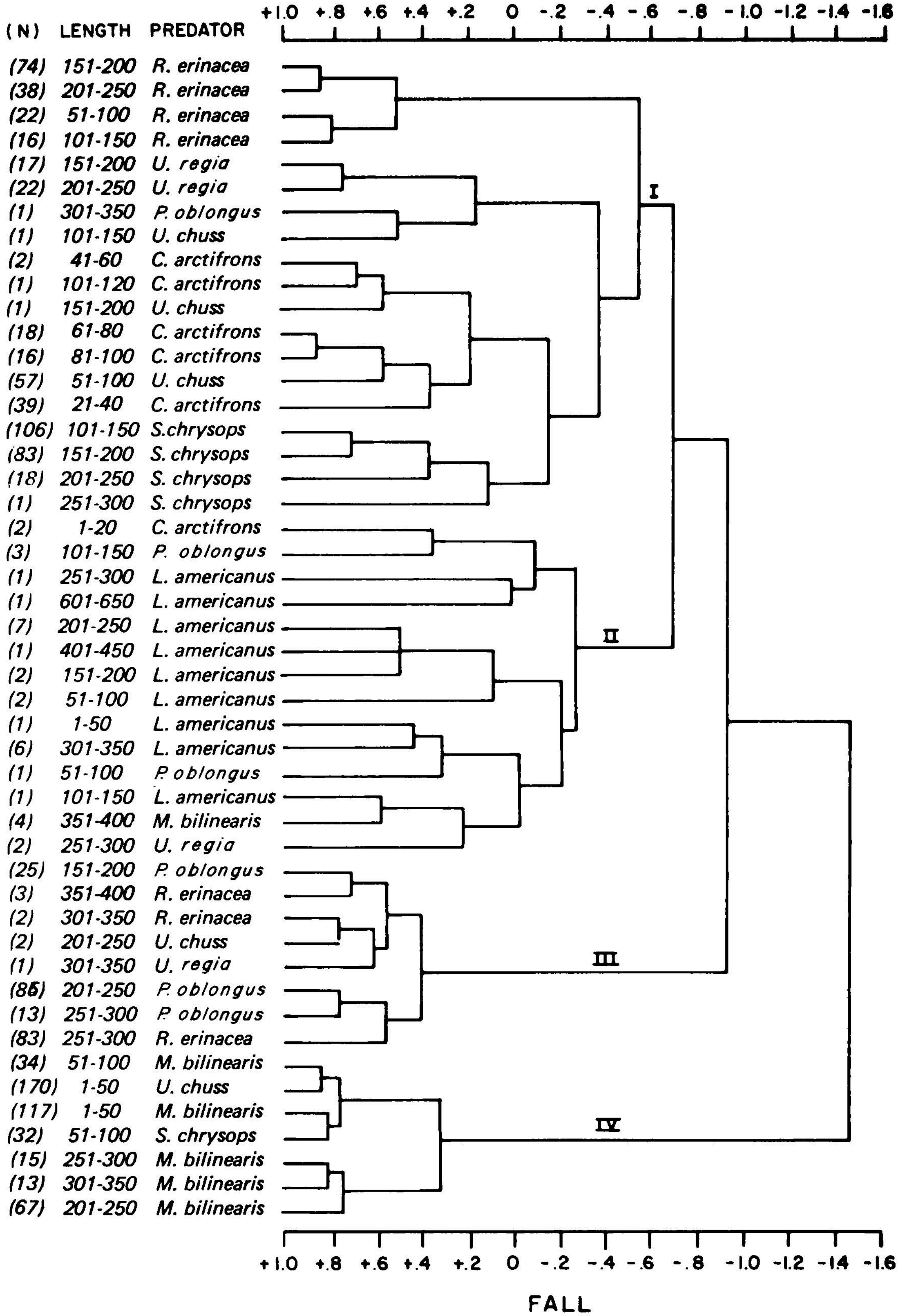


Figure 31.—Dendrogram depicting diet similarity (Bray-Curtis similarity index) among size groups of predators in the fall. Roman numerals indicate groups referred to in the text.

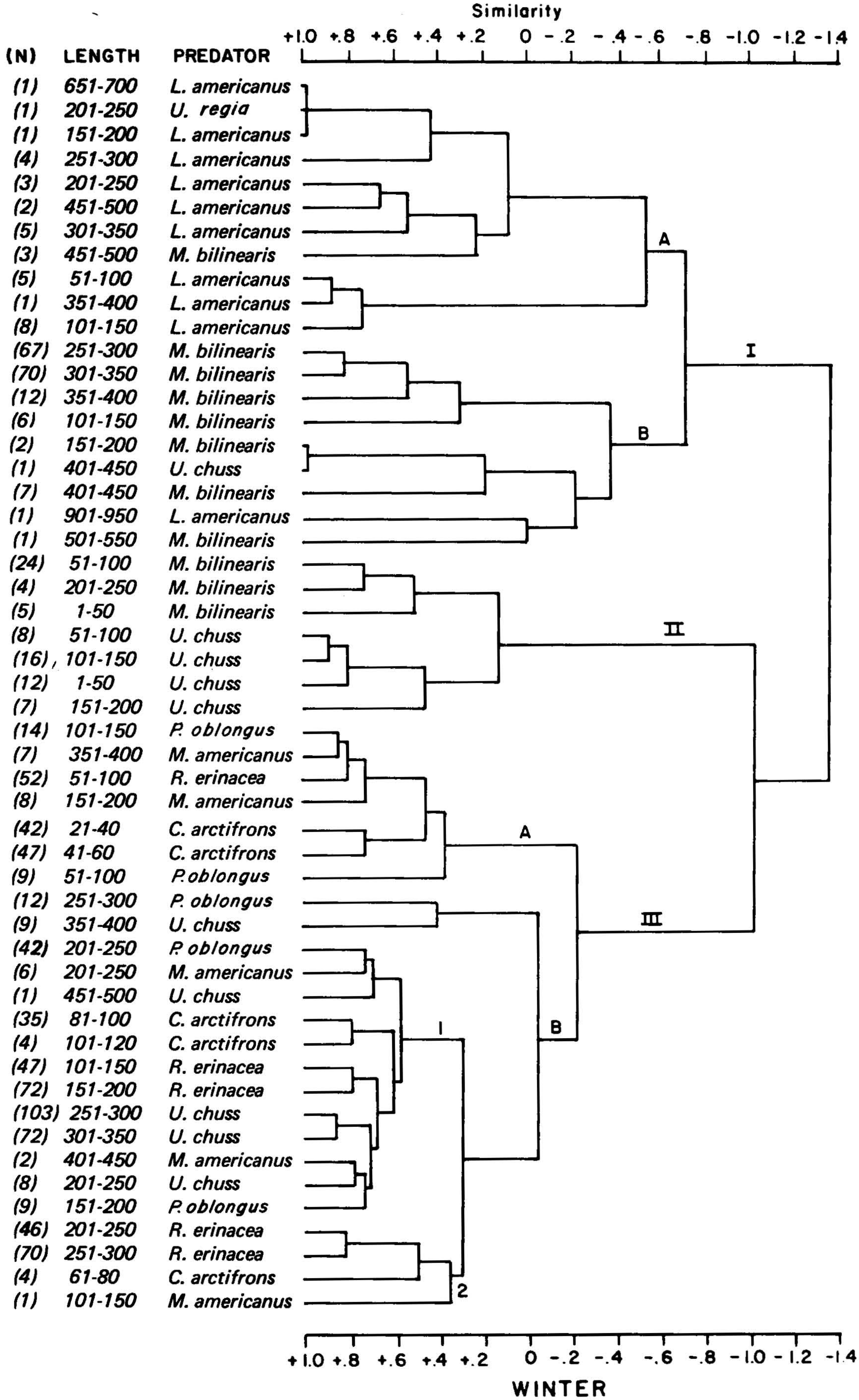


Figure 32.—Dendrogram depicting diet similarity (Bray-Curtis similarity index) among size groups of predators in winter. Roman numerals, letters and arabic numbers indicate groups and subgroups referred to in the text.

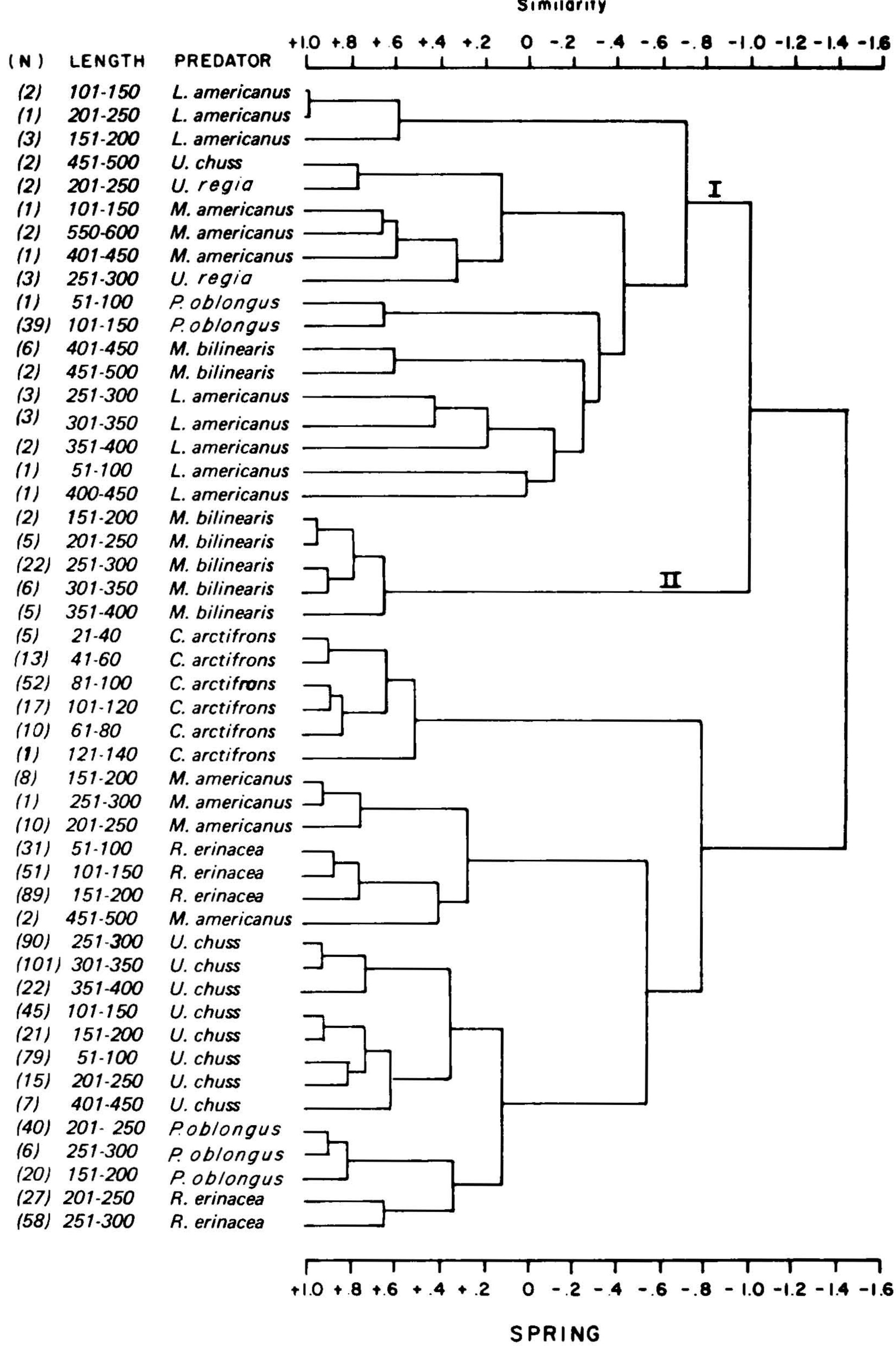


Figure 33.—Dendrogram depicting diet similarity (Bray-Curtis similarity index) among size groups of predators in spring. Roman numerals indicate groups referred to in the text.

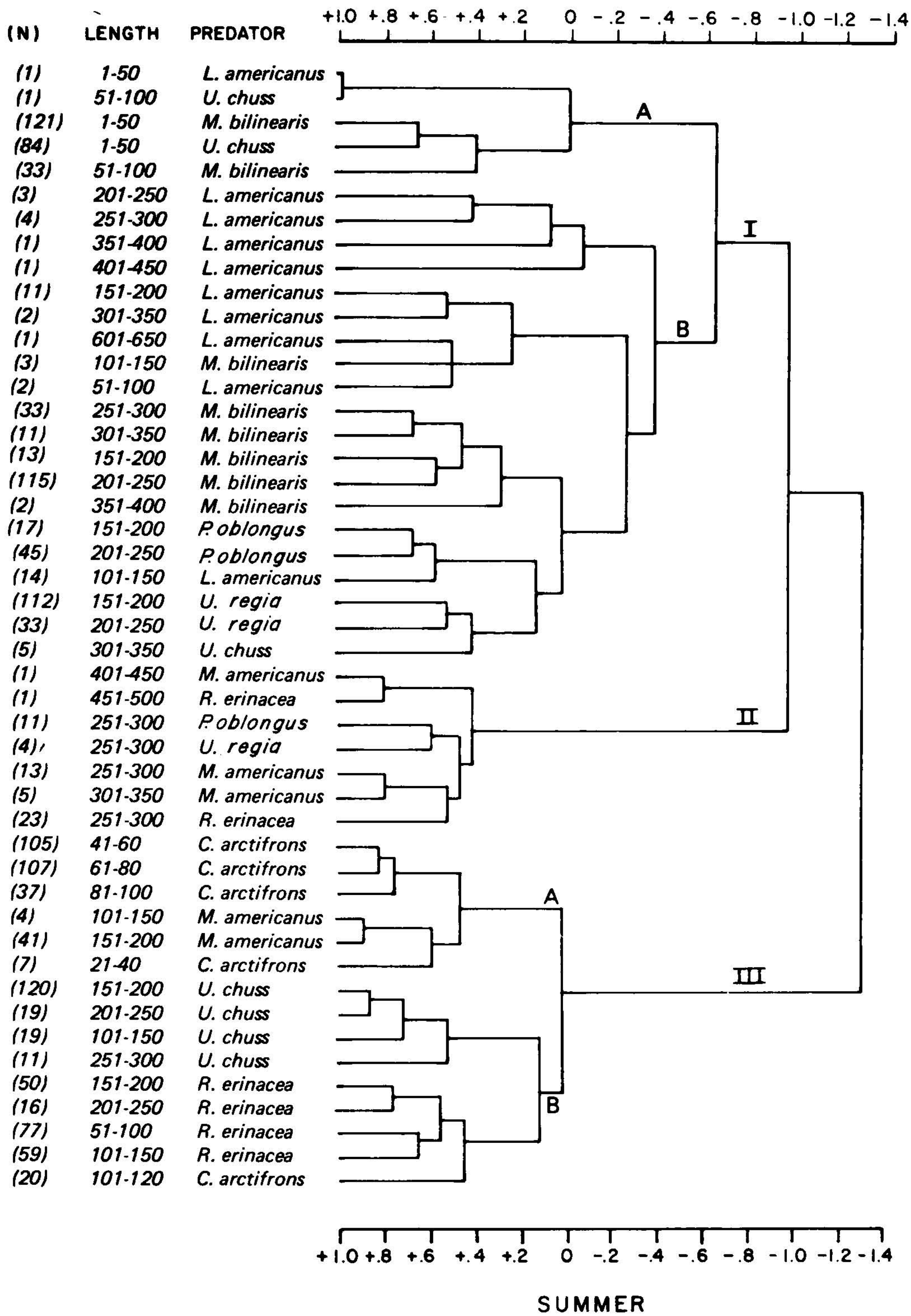


Figure 34.—Dendrogram depicting diet similarity (Bray-Curtis similarity index) among size groups of predators in summer. Roman numerals and letters indicate groups and subgroups referred to in the text.

Table 1.--Fishes selected for food habits analysis, and percentage of the total catch by number (N) and weight (W) comprised by each species, for each cruise.

Species	Fall 1976		Winter 1977		Spring 1977		Summer 1977	
	N	W	N	W	N	W	N	W
Rajidae								
Raja erinacea	6.7	21.2	13.4	14.7	24.2	28.6	5.2	15.6
Lophiidae								
Lophius americanus	1.5	18.3	2.8	11.5	3.3	12.7	1.2	10.5
Gadidae								
Urophycis chuss	25.0	0.3	39.8	33.4	36.6	33.6	17.3	15.4
Urophycis regia	1.2	1.4	0.1	0.1	0.6	0.9	7.2	12.0
Merluccius bilinearis	16.7	5.1	22.8	25.3	10.2	14.1	27.0	32.1
Zoarcidae								
Macrozoarces americanus	0.5	0.4	1.8	0.9	5.3	3.8	8.2	2.7
Sparidae								
Stenotomus chrysops	26.7	25.9	0.1	0.1	0.4	0.2	0.0	0.0
Bothidae								
Citharichthys arctifrons	11.7	0.1	7.9	0.1	7.1	0.3	26.9	1.8
Paralichthys oblongus	5.2	7.1	5.0	2.8	9.2	4.2	1.9	5.3
TOTAL	95.2	79.8	93.7	88.9	96.9	98.4	94.9	95.4

Table 2.--Percent frequency occurrence (F), percent number (N), percent volume (V) and index of relative importance (IRI) of food items in Raja erinacea stomachs, by cruise.

Taxon / Food Item	Fall 1976				Winter 1977				Spring 1977				Summer 1977			
	F	N	V	IRI	F	N	V	IRI	F	N	V	IRI	F	N	V	IRI
Cnidaria																
Hydrozoa																
Eudendrium spp.	-	-	-	-	.35	.01	.00	<1	-	-	-	-	-	-	-	-
Anthozoa																
Unidentified	-	-	-	-	-	-	-	-	1.13	.03	.36	<1	-	-	-	-
Annelida																
Polychaeta																
Aphrodita hastata	3.67	.12	1.63	6	2.08	.07	1.90	4	1.13	.03	.52	1	-	-	-	-
Harmothoe extenuata	.41	.01	.25	<1	.70	.03	.03	<1	10.94	.38	.22	7	7.05	.30	.13	3
Sthenelais limicola	3.67	.17	.17	1	7.29	.48	1.28	13	17.36	.67	1.89	44	4.41	.15	.26	2
Phyllodocidae	-	-	-	-	-	-	-	-	.35	.01	.01	<1	.88	.03	.02	<1
Nereidae	.41	.01	.00	<1	-	-	-	-	-	-	-	-	-	-	-	-
Nereis	.41	.01	.00	<1	-	-	-	-	.38	.01	.00	<1	4.41	.18	.20	2
N. grayi	.41	.01	.00	<1	-	-	-	-	-	-	-	-	-	-	-	-
Nephtyidae	-	-	-	-	-	-	-	-	1.13	.03	.15	<1	-	-	-	-
Aglaophamus circinata	4.10	.11	.86	4	1.73	.04	.72	1	.75	.02	.03	<1	1.32	.04	.08	<1
Nephtys	-	-	-	-	-	-	-	-	.75	.02	.23	<1	-	-	-	-
N. bucera	-	-	-	-	-	-	-	-	.38	.01	.04	<1	-	-	-	-
N. incisa	.41	.01	.83	<1	-	-	-	-	-	-	-	-	-	-	-	-
Glycera spp.	2.86	.08	.24	1	2.78	.06	.10	<1	.75	.02	.05	<1	.88	.03	.08	<1
G. dibranchiata	6.53	.20	.81	7	-	-	-	-	12.08	.31	1.30	19	3.08	.09	.56	2
Godiada norvegica	.41	.03	.69	<1	11.46	.31	2.29	30	-	-	-	-	-	-	-	-
G. brunnea	-	-	-	-	.35	.01	.26	<1	-	-	-	-	-	-	-	-
Scalibregma inflatum	.41	.01	.01	<1	.69	.02	.01	<1	6.42	.14	.25	3	3.96	.11	.14	1
Ophelia denticulata	1.22	.03	.23	<1	.69	.02	.04	<1	.38	.01	.08	<1	-	-	-	-
Ophelina spp.	4.08	.75	.51	5	.35	.01	.02	<1	.75	.04	.04	<1	8.81	.76	.61	12
Maldanidae	.81	.02	.02	<1	1.04	.03	.13	<1	.38	.01	.01	<1	5.73	.16	.22	2
Clymenella torquata	.41	.01	.02	<1	.35	.01	.02	<1	.38	.01	.01	<1	.88	.03	.04	<1
Euclymene collaris	.41	.01	.02	<1	-	-	-	-	-	-	-	-	-	-	-	-
Clymenura sp. A	8.57	.24	.58	7	8.67	.22	.96	10	10.19	.23	.67	9	1.32	.04	.05	<1
Spionidae	.41	.01	.03	<1	-	-	-	-	.75	.02	.02	<1	.44	.01	.00	<1
Spiophanes bombyx	-	-	-	-	-	-	-	-	-	-	-	-	.44	.01	.00	<1
Onuphis pallidula	-	-	-	-	-	-	-	-	.38	.01	.01	<1	-	-	-	-
Marphysa spp.	-	-	-	-	-	-	-	-	.75	.02	.01	<1	.44	.01	.03	<1
Lumbrineris fragilis	2.45	.07	.76	2	1.39	.03	.22	<1	1.51	.03	.12	<1	.44	.01	.07	<1
Ampharete arctica	1.22	.03	.02	<1	7.98	.23	.37	5	3.77	.10	.15	1	1.32	.04	.01	<1
Pherusa affinis	2.04	.11	.56	1	2.08	.08	.28	1	1.51	.08	.42	1	-	-	-	-
Sabellidae	1.22	.06	.94	1	-	-	-	-	-	-	-	-	.88	.03	.39	<1
Chone infundibuliformis	4.90	.20	.77	5	3.47	.08	.16	1	3.02	.07	.18	1	.44	.01	.00	<1
Filograma implexa	.41	.01	.50	<1	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified	29.80	.97	3.83	143	14.93	.37	1.26	24	20.38	.47	.60	22	10.13	.31	.30	6
Total Polychaeta	54.69	3.32	14.28	963	42.31	2.08	10.07	515	61.51	2.73	7.03	600	40.53	2.34	3.20	225
Mollusca																
Scaphopoda																
Unidentified	.41	.01	.00	<1	-	-	-	-	-	-	-	-	-	-	-	-
Gastropoda																
Unidentified	.41	.01	.08	<1	.35	.01	.00	<1	-	-	-	-	-	-	-	-
Pelecypoda																
Ensis directus	10.61	.29	3.10	36	20.48	.51	10.30	221	27.17	.63	12.61	360	3.08	.10	.62	2
Unidentified	13.47	.37	7.61	108	.69	.02	.19	<1	.38	.01	.00	<1	-	-	-	-
Total Pelecypoda	24.08	.67	10.71	274	20.83	.52	10.49	229	27.55	.64	12.62	365	3.08	.10	.62	2
Cephalopoda																
Loligo pealei	.41	.01	1.25	1	-	-	-	-	-	-	-	-	-	-	-	-
Rossia tenera	.82	.02	.01	<1	-	-	-	-	.38	.01	.00	<1	.44	.01	.20	<1
Octopus vulgaris	-	-	-	-	-	-	-	-	-	-	-	-	.88	.03	.08	<1
Unidentified	-	-	-	-	-	-	-	-	.38	.01	.00	<1	-	-	-	-
Total Cephalopoda	1.22	.03	1.26	2	-	-	-	-	.75	.02	.00	<1	1.32	.04	.28	<1
Total Mollusca	25.71	.72	12.06	329	21.18	.53	10.49	233	28.30	.66	12.62	376	4.41	.14	.90	5

Table 2.--Continued.

Taxon / Food Item	Fall 1976				Winter 1977				Spring 1977				Summer 1977			
	F	N	V	IRI	F	N	V	IRI	F	N	V	IRI	F	N	V	IRI
Crustacea																
Copepoda																
Calanus finmarchicus	-	-	-	-	-	-	-	-	1.51	.04	.00	<1	3.08	.10	.00	<1
Paracalanus spp.	-	-	-	-	1.39	.08	.00	<1	-	-	-	-	-	-	-	-
Centropages typicus	-	-	-	-	1.73	.05	.00	<1	-	-	-	-	.44	.01	.00	<1
Candacia armata	-	-	-	-	-	-	-	-	-	-	-	-	13.22	.47	.01	6
Metridia lucens	-	-	-	-	.35	.01	.00	<1	1.51	.03	.00	<1	.44	.01	.00	<1
Caligus spp.	-	-	-	-	-	-	-	-	-	-	-	-	.44	.01	.00	<1
Unidentified	.41	.01	.00	<1	.69	.02	.00	<1	.75	.02	.00	<1	-	-	-	-
Total Copepoda	.41	.01	.00	<1	3.82	.16	.00	1	3.40	.09	.00	<1	15.42	.60	.01	7
Stomatopoda																
Unidentified	-	-	-	-	-	-	-	-	-	-	-	-	1.32	.04	.05	<1
Mysidacea																
Heteromysis formosa	.41	.01	.00	<1	.69	.02	.00	<1	.75	.02	.01	<1	.88	.03	.01	<1
Erythrops erythropthalma	-	-	-	-	-	-	-	-	.75	.02	.00	<1	.88	.03	.00	<1
Total Mysidacea	.41	.01	.00	<1	.69	.02	.00	<1	1.50	.03	.02	<1	1.76	.05	.01	<1
Cumacea																
Eudorella spp.	-	-	-	-	.35	.01	.00	<1	2.26	.05	.00	<1	.44	.01	.00	<1
E. hispida	-	-	-	-	.69	.02	.00	<1	1.13	.03	.00	<1	-	-	-	-
Diastylis spp.	2.45	.17	.02	<1	3.13	.26	.02	1	.38	.01	.00	<1	.44	.01	.00	<1
D. sculpta	.41	.01	.00	<1	33.68	4.26	.53	161	60.75	8.65	1.21	594	42.73	6.97	.60	323
D. bispinosa	22.04	1.84	.36	49	35.76	4.10	1.00	182	42.26	4.29	.56	205	48.46	5.39	.71	296
D. polita	-	-	-	-	-	-	-	-	.38	.01	.00	<1	-	-	-	-
Nannastacidae	-	-	-	-	.35	.01	.00	<1	-	-	-	-	-	-	-	-
Petalosarsia declivis	-	-	-	-	1.39	.05	.00	<1	1.51	.07	.00	<1	2.64	.08	.00	<1
Unidentified	6.53	.32	.04	2	2.43	.06	.01	<1	-	-	-	-	.44	.01	.00	<1
Total Cumacea	28.16	2.34	.43	78	54.86	8.77	1.56	567	70.94	13.09	1.77	1055	6[illegible].44	12.47	1.31	874
Isopoda																
Chirodotea spp.	.41	.01	.00	<1	.35	.01	.00	<1	.38	.02	.00	<1	.44	.03	.00	<1
C. tuftsi	2.04	.07	.01	<1	.35	.01	.00	<1	1.38	.01	.00	<1	.88	.04	.01	<1
C. arenicola	-	-	-	-	-	-	-	-	1.51	.07	.02	<1	.44	.01	.00	<1
Edotea triloba	.41	.01	.00	<1	2.43	.05	.01	<1	12.83	.54	.09	8	.88	.04	.01	<1
Cirolana spp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. polita	18.78	1.10	1.27	44	13.19	.36	.93	17	11.32	.59	1.38	22	3.08	.10	.22	1
Janira alta	-	-	-	-	-	-	-	-	.38	.01	.00	<1	.44	.01	.00	<1
Unidentified	.41	.01	.00	<1	.69	.02	.02	<1	-	-	-	-	-	-	-	-
Total Isopoda	20.40	1.20	1.28	51	15.97	.44	.97	23	24.91	1.24	1.51	68	6.17	.21	.24	3
Amphipoda																
Ampelisca spp.	4.08	.32	.02	1	1.39	.05	.01	<1	.75	.02	.00	1	.44	.01	.00	<1
A. vadorum	38.78	9.46	1.74	436	22.92	1.20	.34	34	22.26	.94	.26	34	42.29	9.31	1.53	458
A. macrocephala	.41	.02	.01	<1	.69	.02	.01	<1	.38	.01	.00	<1	-	-	-	-
A. agassizi	2.86	.10	.03	<1	1.73	.04	.01	<1	3.40	.13	.01	<1	5.73	.19	.03	1
Byblis serrata	62.45	49.82	9.32	3694	57.64	9.43	2.64	696	67.55	11.26	3.04	966	69.16	19.49	4.06	1629
Leptocheirus pinguis	8.57	.67	.33	9	18.05	2.05	1.17	58	14.34	.85	.45	19	8.81	.37	.16	5
Argissa hamatipes	-	-	-	-	4.17	.16	.02	1	.75	.02	.00	<1	2.20	.06	.00	<1
Corophium spp.	.41	.01	.00	<1	.35	.01	.00	<1	-	-	-	-	-	-	-	-
Erichthonius rubricornis	26.53	1.84	.18	53	66.67	17.64	1.89	1302	74.34	28.30	3.69	2379	71.37	14.98	1.14	1152
Unciola spp.	-	-	-	-	-	-	-	-	-	-	-	-	.44	.01	.00	1
U. irrorata	51.43	8.06	1.50	491	87.15	50.65	15.86	5797	87.92	33.91	9.28	3798	77.09	15.51	3.24	1446
Pseudunicola obliquua	-	-	-	-	-	-	-	-	.38	.01	.00	<1	-	-	-	-
Siphonoectes smithianus	.41	.01	.00	<1	-	-	-	-	-	-	-	-	1.76	.08	.01	<1
Melita dentata	.41	.01	.00	<1	1.39	.04	.02	<1	.38	.02	.02	<1	.44	.01	.00	<1
Casco bigelowi	1.22	.03	.03	<1	.69	.02	.01	<1	2.64	.06	.02	<1	3.96	.14	.08	1
Jerbarnia sp. A	-	-	-	-	.35	.01	.00	<1	1.13	.10	101	<1	-	-	-	-
Protohaustorius wigleyi	1.63	.05	.01	<1	3.47	.10	.02	<1	1.89	.12	.01	<1	2.64	.08	.00	<1
Photis spp.	-	-	-	-	.35	.01	.00	<1	-	-	-	-	.88	.03	.00	<1
Photis dentata	-	-	-	-	-	-	-	-	.38	.01	.00	<1	.44	.01	.00	<1
Protomedia fasciata	-	-	-	-	-	-	-	-	3.02	.09	.01	<1	-	-	-	-
Hippomedan serratus	4.49	.15	.06	<1	2.78	.06	.06	<1	3.02	.08	.09	<1	1.32	.04	.01	<1
Anonyx sarsi	1.22	.03	.02	<1	.35	.01	.02	<1	2.64	.06	.17	1	-	-	-	-
A. lilljeborgi	.41	.01	.00	<1	.35	.01	.01	<1	-	-	-	-	-	-	-	-
Oedicerotidae	.41	.01	.00	<1	-	-	-	-	-	-	-	-	-	-	-	-
Monoculodes spp.	.41	.01	.00	<1	-	-	-	-	-	-	-	-	-	-	-	-
Monoculodes edwardsi	2.04	.08	.01	<1	4.17	.29	.07	1	1.13	.03	.00	<1	54.63	9.08	1.19	561

Table 2.—Continued.

Taxon / Food Item	Fall 1976 F	Fall 1976 N	Fall 1976 V	Fall 1976 IRI	Winter 1977 F	Winter 1977 N	Winter 1977 V	Winter 1977 IRI	Spring 1977 F	Spring 1977 N	Spring 1977 V	Spring 1977 IRI	Summer 1977 F	Summer 1977 N	Summer 1977 V	Summer 1977 IRI
Synchelidium americanum	.82	.02	.00	<1	-	-	-	-	.38	.01	.00	<1	-	-	-	-
Phoxocephalus holbolli	.41	.01	.00	<1	1.04	.02	.00	<1	2.64	.06	.01	<1	4.85	.20	.02	1
Trichophoxus epistomus	21.63	2.20	.32	55	4.86	.12	.02	1	7.92	.23	.05	2	6.17	.19	.03	1
Harpinia propinqua	1.22	.03	.00	<1	-	-	-	-	.38	.01	.00	<1	.44	.01	.00	<1
Stenopleustis inermis	.82	.02	.00	<1	2.78	.06	.00	<1	6.79	.25	.01	2	11.01	.38	.00	4
Hyperiidae	1.63	.05	.01	<1	-	-	-	-	-	-	-	-	-	-	-	-
Parathemisto gaudichaudi	6.12	.20	.02	1	1.39	.03	.00	<1	.75	.02	.00	<1	29.07	1.54	.12	46
Caprellidae	-	-	-	-	.35	.01	.00	<1	-	-	-	-	-	-	-	-
Aeginina longicornis	.82	.02	.00	<1	15.63	.67	.31	15	16.98	.75	.21	16	7.05	.30	.07	3
Unidentified	16.33	.94	.24	19	2.43	.07	.03	<1	3.02	.13	.01	<1	.88	.03	.00	<1
Total Amphipoda	77.14	74.20	13.83	6791	93.06	82.79	22.52	9800	93.96	77.45	17.35	8908	91.63	72.02	11.70	7671
Euphausiacea																
Euphausiidae	-	-	-	-	-	-	-	-	-	-	-	-	.44	.01	.00	<1
Decapoda																
Leptochela bermudensis	1.22	.03	.02	<1	-	-	-	-	-	-	-	-	1.32	.05	.02	<1
Dichelopandalus leptocerus	6.94	.28	1.78	14	1.73	.05	.24	1	4.53	.10	.02	1	18.06	.74	1.43	39
Crangonidae	.82	.02	.00	<1	-	-	-	-	-	-	-	-	.44	.01	.00	<1
Crangon septemspinosa	28.98	1.27	2.09	97	12.15	.82	.54	17	7.17	.21	.28	4	44.05	3.06	1.77	213
Munida iris	-	-	-	-	.35	.01	.04	<1	-	-	-	-	-	-	-	-
Axius serrata	.82	.02	.36	<1	-	-	-	-	-	-	-	-	-	-	-	-
Pagurus spp.	.41	.01	.01	<1	.69	.02	.06	<1	-	-	-	-	1.32	.04	.01	<1
P. arcuatus	.41	.01	.03	<1	-	-	-	-	.38	.01	.10	<1	-	-	-	-
P. acadianus	-	-	-	-	1.39	.03	.14	<1	.38	.01	.02	<1	.44	.01	.03	<1
Albunea spp. megalopae	-	-	-	-	-	-	-	-	-	-	-	-	.44	.01	.00	<1
Calappidae spp. megalopae	-	-	-	-	-	-	-	-	-	-	-	-	.88	.03	.00	<1
Callinectes spp. zoea	-	-	-	-	-	-	-	-	-	-	-	-	.44	.01	.00	<1
Cancer spp.	8.16	.59	.36	8	2.08	.05	.09	<1	.38	.02	.01	<1	-	-	-	-
C. borealis	11.02	.50	1.31	20	3.13	.10	.58	2	3.02	.11	1.49	5	3.96	.20	5.88	24
C. irroratus	72.65	13.29	45.57	4284	42.71	3.86	49.77	2290	43.77	4.12	57.28	2688	53.30	7.05	64.30	3803
Unidentified	11.43	1.05	1.68	31	1.04	.02	.07	<1	-	-	-	-	.44	.01	.00	<1
Total Decapoda	83.08	17.18	53.21	5918	50.69	4.95	51.54	2864	50.19	4.57	59.21	3201	74.01	11.24	73.46	6268
Unidentified Crustacea	9.80	.36	.84	12	3.13	.09	.05	1	1.51	.03	.00	<1	1.32	.04	.01	<1
Total Crustacea	99.59	95.30	69.59	16421	100.00	97.22	76.63	17386	100.00	96.52	79.85	17636	100.00	96.69	86.79	18348
Nemertea																
Phascolion strombi	-	-	-	-	.35	.01	.00	<1	-	-	-	-	-	-	-	-
Ectoprocta																
Unidentified	-	-	-	-	.35	.01	.00	<1	-	-	-	-	-	-	-	-
Echinodermata																
Echinoidea																
Echinarachnius parma	.82	.02	.00	<1	.35	.01	.01	<1	-	-	-	-	-	-	-	-
Asteroidea																
Unidentified	.41	.01	.00	<1	-	-	-	-	-	-	-	-	-	-	-	-
Total Echinodermata	1.22	.03	.01	<1	.35	.01	.01	<1	-	-	-	-	-	-	-	-
Chaetognatha																
Sagitta elegans	-	-	-	-	-	-	-	-	.75	.02	.00	<1	-	-	-	-
Chordata																
Pisces																
Teleostei	11.02	.36	1.65	22	2.78	.06	1.57	5	.75	.02	.01	<1	10.57	.31	1.02	14
Urophycis chuss	4.08	.18	.43	3	1.39	.03	.84	1	-	-	-	-	2.20	.06	7.12	16
Merluccius bilinearis	.41	.01	.08	<1	.35	.01	.21	<1	-	-	-	-	1.32	.08	.20	<1
Lepophidium cervinum	.41	.02	1.83	1	.69	.02	.13	<1	.38	.02	.12	<1	-	-	-	-
Liparis inquilinus	-	-	-	-	-	-	-	-	.38	.01	.00	<1	.88	.02	.03	<1
Ammodytes spp.	-	-	-	-	.69	.02	.04	<1	.38	.01	.02	<1	-	-	-	-
Citharichthys arctifrons	1.22	.05	.08	<1	-	-	-	-	-	-	-	-	3.52	.16	.25	1
Limanda ferruginea	-	-	-	-	-	-	-	-	-	-	-	-	4.85	.19	.49	1
Total Pisces	16.73	.62	4.08	79	5.90	.13	2.80	17	1.89	.05	.15	<1	22.91	.83	9.12	221
Total number of stomachs examined		249				296				272				233		
Examined stomachs with food		243				288				265				227		

Table 3.--Percent frequency occurrence (F), percent number (N), percent volume (V) and index of relative importance (IRI) of food items in *Lophius americanus* stomachs, by cruise.

Taxon / Food Item	Fall 1976				Winter 1977				Spring 1977				Summer 1977			
	F	N	V	IRI	F	N	V	IRI	F	N	V	IRI	F	N	V	IRI
Annelida																
Polychaeta																
Aphrodita hastata	-	-	-	-	-	-	-	-	6.25	5.00	.41	34	-	-	-	-
Mollusca																
Cephalopoda																
Loligo pealeii	4.54	3.45	.69	19	-	-	-	-	-	-	-	-	7.32	3.33	11.47	108
Rossia tenera	-	-	-	-	3.23	2.63	.19	9	-	-	-	-	2.44	1.11	.02	3
unidentified	-	-	-	-	-	-	-	-	-	-	-	-	2.44	1.11	2.39	9
Total Cephalopoda	4.54	3.45	.69	19	3.23	2.63	.19	9	-	-	-	-	12.20	5.56	13.89	237
Crustacea																
Amphipoda																
Byblis serrata	4.54	3.45	.00	16	-	-	-	-	-	-	-	-	-	-	-	-
Decapoda																
Dichelopandalus leptocerus	9.09	6.90	.22	65	6.45	5.26	.16	35	-	-	-	-	17.07	16.67	.36	291
Crangon septemspinosa	-	-	-	-	-	-	-	-	-	-	-	-	2.44	1.11	.02	3
Cancer borealis	-	-	-	-	-	-	-	-	6.25	5.00	1.63	41	-	-	-	-
C. irroratus	-	-	-	-	-	-	-	-	-	-	-	-	4.88	2.22	.05	11
Total Decapoda	9.09	6.90	.22	65	6.45	5.26	.16	35	6.25	5.00	1.63	41	19.51	20.00	.43	399
Echinodermata																
Asteroidea																
Asterias vulgaris	-	-	-	-	-	-	-	-	6.25	5.00	.08	32	7.32	3.33	.28	26
Astropecten americanus	-	-	-	-	-	-	-	-	-	-	-	-	2.44	1.11	.12	3
Total Asteroidea	-	-	-	-	-	-	-	-	6.25	5.00	.08	32	9.76	4.44	.40	47
Chaetognatha																
Sagitta elegans	-	-	-	-	-	-	-	-	-	-	-	-	2.44	3.33	.00	8
Chordata																
Pisces																
Squalus acanthias	-	-	-	-	6.45	5.26	.97	40	-	-	-	-	-	-	-	-
Raja spp.	-	-	-	-	3.23	2.63	.23	9	-	-	-	-	-	-	-	-
Teleostei	27.27	20.69	10.69	856	35.48	28.95	40.20	2454	25.00	20.00	12.96	824	29.27	15.55	25.46	1200
Lophius americanus	-	-	-	-	-	-	-	-	6.25	5.00	.24	33	-	-	-	-
Urophycis chuss	27.27	24.14	6.20	827	48.39	50.00	54.75	5068	43.75	35.00	33.21	2984	24.39	11.11	25.36	890
U. regius	-	-	-	-	-	-	-	-	-	-	-	-	2.44	1.11	8.37	23
Merluccius bilinearis	4.54	3.45	.24	17	-	-	-	-	6.25	5.00	26.89	199	7.32	18.89	.65	143
Lepophidium cervinum	13.64	10.34	8.33	255	3.23	2.63	2.03	15	6.25	5.00	1.63	41	12.19	5.55	5.68	137
Liparis inquilinus	-	-	-	-	-	-	-	-	-	-	-	-	4.88	2.22	.02	11
Stenotomus chrysops	9.09	10.34	70.76	737	-	-	-	-	6.25	5.00	4.89	62	-	-	-	-
Scombridae	-	-	-	-	-	-	-	-	6.25	5.00	17.93	143	-	-	-	-
Citharichthys arctifrons	4.54	13.79	.19	64	-	-	-	-	6.25	5.00	.12	32	17.07	10.00	4.20	242
Pseudopleuronectes americanus	-	-	-	-	-	-	-	-	-	-	-	-	2.44	1.11	13.15	35
Limanda ferruginea	-	-	-	-	-	-	-	-	-	-	-	-	2.44	1.11	2.39	9
Total Pisces	90.91	86.21	99.08	16845	100.00	92.11	99.65	19176	93.75	85.00	97.88	17145	85.35	66.67	85.28	12971
Total number of stomachs examined		37				40				18				45		
Examined stomachs with food:		22				31				16				41		

Table 4.--Percent frequency occurrence (F), percent number (N), percent volume (V) and index of relative importance (IRI) of food items in *Urophycis chuss* stomachs, by cruise.

Taxon	Fall 1976				Winter 1977				Spring 1977				Summer 1977			
Food Item	F	N	V	IRI	F	N	V	IRI	F	N	V	IRI	F	V	N	IRI
Plant																
Sargassum spp.	-	-	-	-	-	-	-	-	-	-	-	-	.38	.02	.01	<1
Poacea	-	-	-	-	.32	.01	.16	<1	-	-	-	-	-	-	-	-
Cnidaria																
Hydrozoa																
Unidentified	-	-	-	-	-	-	-	-	1.04	.03	.00	<1	-	-	-	-
Anthozoa																
Unidentified	-	-	-	-	.32	.01	.05	<1	.26	.01	.00	<1	-	-	-	-
Rhynchocoela																
Anopla																
Carinomella lactea	-	-	-	-	.32	.01	.08	<1	-	-	-	-	-	-	-	-
Annelida																
Polychaeta																
Aphrodita hastata	-	-	-	-	2.22	.07	2.55	6	8.33	.27	3.84	34	-	-	-	-
Harmothoe spp.	-	-	-	-	.32	.01	.07	<1	-	-	-	-	-	-	-	-
H. extenuata	-	-	-	-	3.49	.14	.11	1	3.13	.11	.05	<1	1.53	.08	.04	<1
Sthenalais limicola	-	-	-	-	1.90	.06	.27	1	4.17	.14	.12	1	2.30	.11	.28	1
Phyllodoce spp.	-	-	-	-	.32	.01	.02	<1	.26	.01	.00	<1	-	-	-	-
P. mucosa	-	-	-	-	.32	.01	.00	<1	-	-	-	-	-	-	-	-
Syllis spp.	-	-	-	-	-	-	-	-	.52	.02	.00	<1	-	-	-	-
Nereis spp.	-	-	-	-	-	-	-	-	.52	.02	.00	<1	-	-	-	-
N. grayi	-	-	-	-	-	-	-	-	.26	.01	.01	<1	-	-	-	-
Nephtyidae	-	-	-	-	-	-	-	-	-	-	-	-	1.53	.08	.08	<1
Aglaophamus circinata	-	-	-	-	-	-	-	-	1.82	.05	.03	<1	-	-	-	-
Glycera dibranchiata	-	-	-	-	-	-	-	-	.52	.02	.01	<1	-	-	-	-
Goniada spp.	-	-	-	-	-	-	-	-	.26	.01	.00	<1	-	-	-	-
G. brunnea	-	-	-	-	.32	.01	.04	<1	-	-	-	-	-	-	-	-
Scalibregma inflatum	-	-	-	-	-	-	-	-	.26	.01	.01	<1	-	-	-	-
Ophelina spp.	-	-	-	-	-	-	-	-	-	-	-	-	1.53	.08	.05	<1
Maldanidae	-	-	-	-	-	-	-	-	1.04	.03	.02	<1	1.91	.12	.07	<1
Euclymene collaris	-	-	-	-	-	-	-	-	.26	.01	.00	<1	-	-	-	-
Clymenura sp. A	.43	.08	.73	<1	7.30	.24	.74	7	5.47	.18	.18	2	4.20	.23	.35	2
Praxillura longissima	-	-	-	-	-	-	-	-	.26	.01	.02	<1	-	-	-	-
Spionidae	-	-	-	-	.32	.01	.00	<1	.26	.01	.00	<1	-	-	-	-
Spiophanes bombyx	-	-	-	-	-	-	-	-	.26	.01	.00	<1	-	-	-	-
Onuphis pallidula	-	-	-	-	-	-	-	-	2.34	.11	.05	<1	-	-	-	-
Marphysa spp.	-	-	-	-	1.27	.04	.50	1	-	-	-	-	.38	.02	.22	<1
M. sanguinea	-	-	-	-	1.27	.05	1.06	1	-	-	-	-	-	-	-	-
M. bellii	-	-	-	-	.63	.02	.04	<1	-	-	-	-	-	-	-	-
Lumbrineris spp.	.43	.08	.00	<1	-	-	-	-	-	-	-	-	-	-	-	-
L. fragilis	-	-	-	-	6.35	.23	2.81	19	3.65	.13	.22	1	1.91	.09	.66	1
L. cruzensis	-	-	-	-	.63	.03	.02	<1	-	-	-	-	.38	.02	.01	<1
L. impatiens	-	-	-	-	-	-	-	-	-	-	-	-	.76	.04	.01	<1
L. albidentata	-	-	-	-	.32	.01	.03	<1	.26	.01	.00	<1	-	-	-	-
Lumbrinerides spp.	-	-	-	-	.32	.01	.02	<1	-	-	-	-	-	-	-	-
Arabella iricolor	-	-	-	-	.32	.07	1.10	<1	.52	.05	.13	<1	-	-	-	-
Driloneris longa	-	-	-	-	-	-	-	-	.26	.02	.02	<1	-	-	-	-
D. magna	-	-	-	-	.63	.02	.19	<1	-	-	-	-	.38	.02	.04	<1
Cirratulidae	-	-	-	-	.32	.01	.01	<1	1.82	.05	.10	<1	.38	.02	.07	<1
Tharyx spp.	-	-	-	-	.32	.01	.04	<1	-	-	-	-	-	-	-	-
T. acuta	-	-	-	-	1.59	.06	.22	<1	-	-	-	-	-	-	-	-
Ampharete arctica	-	-	-	-	8.25	.57	.94	12	1.30	.05	.03	<1	-	-	-	-
Terebellidae spp.	-	-	-	-	-	-	-	-	.26	.01	.03	<1	-	-	-	-
Nicolea venustula	-	-	-	-	.32	.01	.02	<1	-	-	-	-	-	-	-	-
Terebellides stroemi	-	-	-	-	.32	.01	.04	<1	-	-	-	-	-	-	-	-
Pherusa affinis	-	-	-	-	.95	.03	.13	<1	2.86	.10	.31	1	1.15	.10	.27	<1
Chone infundibuliformis	-	-	-	-	4.13	.23	.25	2	5.21	.19	.33	3	1.91	.10	.30	1
Unidentified	6.44	1.18	3.28	29	17.78	.68	2.68	60	16.67	.57	.44	17	8.78	.48	.73	11
Total Polychaeta	7.30	1.34	4.01	39	41.27	2.68	13.90	684	41.93	2.17	5.96	341	24.43	1.58	3.20	117
Mollusca																
Gastropoda																
Lunatia heros	-	-	-	-	-	-	-	-	.26	.01	1.99	1	-	-	-	-
Mitrella spp.	-	-	-	-	.95	.03	.01	<1	.26	.01	.00	<1	-	-	-	-
Pyramidellidae	-	-	-	-	.95	.03	.01	<1	-	-	-	-	-	-	-	-
Odostomia spp.	-	-	-	-	.32	.01	.00	<1	-	-	-	-	-	-	-	-
Unidentified	-	-	-	-	.63	.02	.00	<1	-	-	-	-	-	-	-	-
Total Gastropoda	-	-	-	-	2.54	.09	.02	<1	.52	.02	2.00	1	-	-	-	-

Table 4.—Continued.

Taxon / Food Item	Fall 1976 F	N	V	IRI	Winter 1977 F	N	V	IRI	Spring 1977 F	N	V	IRI	Summer 1977 F	N	V	IRI
Pelecypoda																
Placopecten magellanicus	-	-	-	-	1.90	.07	2.88	6	3.65	.15	16.83	62	1.15	.06	8.97	10
Astarte spp.	-	-	-	-	.32	.01	.00	<1	.26	.01	.00	1	-	-	-	-
A. undata	-	-	-	-	.159	.05	.16	<1	.26	.01	.00	1	-	-	-	-
Cyclocardia borealis	-	-	-	-	.95	.04	.13	<1	.26	.01	.00	1	.76	.04	.00	<1
Ensis directus	-	-	-	-	6.98	.29	.50	5	3.13	.09	.23	1	.38	.02	.75	<1
Unidentified	.86	.16	2.48	2	4.76	.21	1.21	7	1.04	.03	.95	1	.38	.02	.26	<1
Total Pelecypoda	.86	.16	2.48	2	13.97	.67	4.88	78	8.07	.29	18.02	148	2.67	.13	9.97	27
Cephalopoda																
Rossia spp.	-	-	-	-	-	-	-	-	1.56	.05	.01	<1	-	-	-	—
Illex illecebrosus	-	-	-	-	-	-	-	-	1.82	.05	4.70	9	-	-	-	-
Unidentified	-	-	-	-	.32	.01	.04	<1	1.30	.04	.45	1	-	-	-	-
Total Cephalopoda	-	-	-	-	.32	.01	.04	<1	4.43	.15	5.16	23	-	-	-	-
Unidentified Mollusca	.43	.08	.07	<1	.63	.02	.01	<1	-	-	-	-	-	-	-	-
Total Mollusca	1.29	.24	2.55	4	16.82	.80	4.94	97	12.50	.45	25.17	324	2.67	.13	9.97	27
Arthropoda																
Ostracoda																
Unidentified	-	-	-	-	-	-	-	-	.26	.01	.00	<1	-	-	-	-
Copepoda																
Calanus finmarchicus	-	-	-	-	-	-	-	-	4.43	.19	.00	1	1.53	.08	.00	<1
Rhincalanus nasutus	-	-	-	-	.32	.01	.00	<1	-	-	-	-	-	-	-	-
Nannocalanus minor	.43	.24	.00	<1	-	-	-	-	-	-	-	-	-	-	-	-
Paracalanus spp.	-	-	-	-	10.48	15.67	.27	167	3.65	.16	.00	1	.76	.08	.00	<1
Pseudocalanus spp.	.43	.08	.00	<1	.32	.03	.00	<1	-	-	-	-	-	-	-	-
Temora longicornis	-	-	-	-	2.54	.18	.00	<1	.26	.02	.00	<1	.38	.02	.00	<1
Centropages typicus	9.01	24.49	.88	229	9.21	.73	.01	7	.78	.05	.00	1	2.29	.56	.02	1
Candacia armata	-	-	-	-	-	-	-	-	-	-	-	-	4.20	.27	.01	1
Metridia lucens	.43	.08	.00	<1	-	-	-	-	-	-	-	-	4.58	.81	.01	4
Euchaeta marina	-	-	-	-	-	-	-	-	-	-	-	-	.38	.02	.00	<1
Harpacticoida	-	-	-	-	-	-	-	-	.26	.01	.00	<1	-	-	-	-
Microsetella norvegica	-	-	-	-	.63	.02	.00	<1	-	-	-	-	-	-	-	-
Caligus spp.	-	-	-	-	-	-	-	-	.26	.01	.00	<1	-	-	-	-
Unidentified	1.72	.39	.00	1	10.48	15.65	.28	167	1.56	.05	.00	<1	1.91	.11	.00	<1
Total Copepoda	11.16	25.28	.88	292	20.32	32.30	.57	668	9.38	.50	.00	5	14.12	1.94	.05	28
Stomatopoda																
Unidentified (larvae)	-	-	-	-	-	-	-	-	.26	.01	.00	<1	.38	.02	.00	<1
Mysidacea																
Heteromysis formosa	-	-	-	-	.63	.02	.01	<1	.52	.02	.00	<1	1.14	.06	.02	<1
Cumacea																
Eudorella spp.	-	-	-	-	-	-	-	-	.78	.02	.00	<1	-	-	-	-
E. hispida	-	-	-	-	1.27	.06	.01	<1	2.34	.08	.00	<1	-	-	-	-
Petalosarsia declivis	-	-	-	-	-	-	-	-	6.25	.73	.02	5	-	-	-	-
Diastylis spp.	-	-	-	-	.95	.03	.00	<1	1.56	.07	.00	<1	-	-	-	-
D. scupta	-	-	-	-	2.22	.09	.01	<1	10.94	.67	.04	8	2.67	.17	.02	1
D. bispinosa	-	-	-	-	4.44	.20	.05	1	13.28	.66	.04	9	12.60	1.52	.37	24
Unidentified	.43	.08	.07	<1	1.27	.08	.01	<1	1.04	.03	.00	<1	-	-	-	-
Total Cumacea	.43	.08	.07	<1	9.52	.47	.09	5	28.13	2.25	.10	66	13.36	1.69	.40	28
Tanaidacea																
Tanaissus lilljeborgi	-	-	-	-	.32	.01	.00	<1	.26	.01	.00	<1	-	-	-	-
Isopoda																
Chiridotea spp.	-	-	-	-	.32	.02	.00	<1	.52	.02	.00	<1	-	-	-	-
C. tuftsi	-	-	-	-	.63	.02	.01	<1	.26	.01	.00	<1	-	-	-	-
C. arenicola	-	-	-	-	.32	.01	.00	<1	.26	.01	.00	<1	-	-	-	-
Edotea triloba	-	-	-	-	.32	.02	.00	<1	1.30	.05	.00	<1	2.29	.13	.04	<1
Ptilanthura tricarina	-	-	-	-	.63	.02	.00	<1	.26	.01	.00	<1	1.53	.31	.04	1
Cirolana spp.	-	-	-	-	.32	.01	.01	<1	.26	.01	.00	<1	-	-	-	-
C. polita	-	-	-	-	6.67	.37	1.11	10	16.67	1.33	1.51	47	10.31	.67	1.11	18
Janira alta	-	-	-	-	.32	.01	.00	<1	.52	.02	.00	<1	.38	.02	.00	<1
Unidentified	-	-	-	-	.95	.04	.09	<1	.52	.02	.00	<1	-	-	-	-
Total Isopoda	-	-	-	-	9.52	.53	1.24	17	20.05	1.46	1.52	60	13.36	1.13	1.19	31
Amphipoda																
Ampelisca spp.	.86	.16	.00	<1	2.22	.16	.02	<1	-	-	-	-	-	-	-	-
A. vadorum	3.43	.71	.58	4	16.82	1.39	.29	28	9.11	.39	.04	4	10.69	1.08	.31	15
A. macrocephala	-	-	-	-	-	-	-	-	-	-	-	-	.38	.02	.00	<1

Table 4.—Continued.

Taxon / Food Item	Fall 1976 F	N	V	IRI	Winter 1977 F	N	V	IRI	Spring 1977 F	N	V	IRI	Summer 1977 F	N	V	IRI
A. agassizi	.43	.08	.07	<1	5.08	1.88	.30	11	4.69	.44	.02	2	5.73	.77	.13	[illegible]
Byblis serrata	7.30	2.84	2.85	42	10.79	.41	.14	6	15.63	.97	.10	17	20.61	2.50	.87	69
Ampithoidae	-	-	-	-	-	-	-	-	.26	.01	.00	<1	-	-	-	-
Aoridae	-	-	-	-	-	-	-	-	.26	.01	.01	<1	-	-	-	-
Leptocheirus pinguis	.43	.08	.22	<1	6.67	.29	.36	4	4.43	.14	.05	1	1.91	.13	.13	[illegible]
Argissa hamatipes	-	-	-	-	2.86	.14	.04	1	1.30	.04	.00	<1	-	-	-	-
Erichthonius rubricornis	14.16	5.45	1.82	103	70.48	16.69	3.82	1446	67.97	13.58	.97	988	45.[illegible]	16.11	2.08	[illegible]
Unciola spp.	.86	.24	.07	<1	-	-	-	-	-	-	-	-	-	-	-	-
U. irrorata	27.90	16.74	12.48	815	77.78	33.93	13.56	3694	85.16	31.18	5.28	3105	46.[illegible]	39.58	12.85	[illegible]
U. serrata (?)	.43	.08	.07	<1	-	-	-	-	-	-	-	-	-	-	-	-
Pseudunciola obliquua	-	-	-	-	-	-	-	-	.26	.01	.00	<1	-	-	-	-
Siphonoecetes smithianus	1.29	.24	.00	<1	.95	.03	.00	<1	.26	.01	.00	<1	.76	.04	.00	<1
Rhachotropis oculata	.43	.08	.07	<1	-	-	-	-	-	-	-	-	-	-	-	-
Gammaridae	-	-	-	-	.95	.04	.01	<1	-	-	-	-	-	-	-	-
Melita dentata	.86	.16	.15	<1	13.33	.82	.62	19	9.38	.45	.08	5	2.67	.13	.06	1
Maera danae	-	-	-	-	.95	.03	.02	<1	.26	.02	.01	<1	-	-	-	-
Casco bigelowi	-	-	-	-	-	-	-	-	1.56	.05	.02	<1	2.29	.13	.12	[illegible]
Jerbarnia sp. A	-	-	-	-	.63	.05	.01	<1	-	-	-	-	.38	.02	.00	<1
Protohaustorius wigleyi	-	-	-	-	-	-	-	-	.26	.01	.00	<1	-	-	-	-
Photis spp.	-	-	-	-	.32	.01	.00	<1	.78	.02	.00	<1	-	-	-	-
P. dentata	-	-	-	-	2.86	.23	.02	1	4.43	.18	.01	1	1.14	.06	.00	[illegible]
P. macrocoxa	-	-	-	-	-	-	-	-	.52	.02	.00	<1	.38	.02	.00	[illegible]
Lysianassidae	-	-	-	-	-	-	-	-	.26	.01	.00	<1	-	-	-	-
Orchomenella pinguis	-	-	-	-	-	-	-	-	.52	.02	.00	<1	-	-	-	-
Hippomedon serratus	-	-	-	-	.95	.03	.02	<1	11.20	.45	.16	7	2.29	.13	.04	[illegible]
Anonyx lilljeborgi	-	-	-	-	.32	.02	.02	<1	-	-	-	-	.38	.02	.01	[illegible]
A. sarsi	-	-	-	-	-	-	-	-	1.30	.05	.06	<1	.76	.04	.01	[illegible]
Monoculodes edwardsi	.43	.08	.00	<1	2.86	.14	.04	1	2.34	.07	.01	<1	22.14	2.77	.61	[illegible]
Phoxocephalus holbolli	-	-	-	-	6.03	.28	.05	2	22.14	1.72	.11	40	9.92	.67	.05	[illegible]
Trichophoxus epistomus	1.29	.24	.07	<1	15.87	1.24	.30	24	8.07	.35	.04	3	9.54	.69	.17	[illegible]
Harpinia propinqua	-	-	-	-	2.54	.10	.02	<1	.52	.02	.00	<1	.38	.02	.00	[illegible]
Stenopleustes gracilis	-	-	-	-	.32	.01	.00	<1	1.30	.07	.00	<1	.38	.02	.00	<1
S. inermis	-	-	-	-	-	-	-	-	1.30	.04	.00	<1	1.14	.06	.00	[illegible]
Dulichia porrecta	-	-	-	-	.95	.03	.00	<1	-	-	-	-	-	-	-	
Stenothoidae	-	-	-	-	-	-	-	-	.78	.02	.00	<1	-	-	-	-
Hyperiidae	19.74	6.24	3.36	189	.95	.03	.01	<1	.26	.01	.00	<1	-	-	-	-
Parathemisto gaudichaudi	46.78	34.44	20.95	2591	.32	.01	.00	<1	.26	.01	.00	<1	35.88	[illegible]	.48	[illegible]
Aeginina longicornis	1.29	.32	.29	1	8.25	.51	.21	6	20.83	1.23	.22	30	4.58	[illegible]	.11	[illegible]
Unidentified	6.44	1.50	1.17	17	22.54	.92	.62	35	4.17	.16	.00	1	1.91	.17	[illegible]	[illegible]
Total Amphipoda	91.85	69.67	44.23	10461	91.11	59.46	20.53	7288	93.49	51.73	7.21	5510	88.11	[illegible]	[illegible]	[illegible]
Euphausiacea																
Euphausiidae	-	-	-	-	.32	.01	.01	<1	-	-	-	-	-	-	-	-
Decapoda																
Eualus pusiolus	-	-	-	-	-	-	-	-	.26	.01	.00	<1	.38	[illegible]	[illegible]	[illegible]
Dichelopandalus leptocerus	.43	.08	1.31	1	2.86	.30	5.26	16	4.17	.16	.83	4	24.05	[illegible]	[illegible]	[illegible]
Carngon septemspinosa	2.15	.55	4.31	10	4.76	.20	.68	4	8.07	.32	.33	5	8.78	[illegible]	[illegible]	[illegible]
Axius serrata	-	-	-	-	1.27	.04	.92	1	.52	.02	.03	<1	-	-	-	-
Munida iris	-	-	-	-	5.40	.28	1.88	12	1.04	.04	.13	<1	.38	[illegible]	[illegible]	[illegible]
Pagurus spp.	-	-	-	-	.63	.03	.38	<1	.52	.02	.03	<1	[illegible]	[illegible]	[illegible]	[illegible]
P. acadianus	-	-	-	-	.63	.02	.24	<1	1.30	.04	.86	1	-	-	-	
P. arcuatus	-	-	-	-	.63	.02	.16	<1	-	-	-	-	-	-	-	
Calappidae megalopae	-	-	-	-	-	-	-	-	-	-	-	-	[illegible]	[illegible]	[illegible]	
Cancer spp.	-	-	-	-	1.59	.05	.56	1	.52	.02	.01	<1	[illegible]	[illegible]	[illegible]	[illegible]
C. borealis	-	-	-	-	8.25	.48	14.91	127	7.29	.44	5.99	47	[illegible]	[illegible]	[illegible]	
C. irroratus	.86	.55	29.42	26	21.59	1.47	28.54	648	43.75	3.45	38.84	1850	[illegible]	[illegible]	[illegible]	[illegible]
Unidentified	1.72	.32	.29	1	3.49	.16	2.65	10	.26	.01	.00	<1	[illegible]	[illegible]	[illegible]	[illegible]
Total Decapoda	4.72	1.50	35.33	174	34.60	3.05	56.18	2049	53.13	4.51	47.06	2731	[illegible]	[illegible]	[illegible]	[illegible]
Unidentified Crustacea	2.15	.39	2.41	6	4.76	.16	.32	2	1.04	.04	.01	<1	[illegible]	[illegible]	[illegible]	[illegible]
Total Crustacea	95.71	96.92	82.92	17212	96.82	96.01	78.95	16940	98.70	60.52	55.91	11491	[illegible]	[illegible]	[illegible]	[illegible]
Insecta																
Unidentified	-	-	-	-	-	-	-	-	.26	.01	.00	<1	-	-	-	-
Nemertea																
Phascolion strombi	-	-	-	-	-	-	-	-	.26	.01	.00	<1	-	-	-	
Ectoprocta																
Unidentified	-	-	-	-	.95	.03	.01	<1	1.30	.04	.00	<1	[illegible]	[illegible]	[illegible]	[illegible]

Table 4.--Continued.

Taxon Food Item	Fall 1976 F	N	V	IRI	Winter 1977 F	N	V	IRI	Spring 1977 F	N	V	IRI	Summer 1977 F	N	V	IRI
Echinodermata																
Asteroidea																
Asterias vulgaris	-	-	-	-	.32	.01	.04	<1	-	-	-	-	-	-	-	-
Echinoidea																
Echinarachnius parma	.43	.08	.58	<1	4.13	.13	.12	1	-	-	-	-	-	-	-	-
Holothuroidea																
Stereoderma unisemita	-	-	-	-	-	-	-	-	.26	.01	.02	<1	-	-	-	-
Havelockia scabra	-	-	-	-	.95	.03	.65	1	-	-	-	-	-	-	-	-
Total Echinodermata	.43	.08	.58	1	5.08	.18	.81	5	.26	.01	.02	<1	-	-	-	-
Chaetognatha																
Sagitta elegans	-	-	-	-	-		-	-	42.19	36.44	3.71	1696	29.39	16.13	2.03	534
Chordata																
Larvacea																
Unidentified	-	-	-	-	-	-		-	-	-	-	-	.38	.13	.01	<1
Pisces																
Raja erinacea	-	-	-		-	-	-	-	.26	.01	.16	1	-	-	-	-
Teleostei	1.29	.24	.88	1	1.22	.05	.28	1	3.39	.11	5.87	20	6.11	.31	1.01	8
Urophycis chuss	.86	.16	1.46	1	.63	.02	.31	1	2.34	.07	1.60	4	1.91	.10	.57	1
Merluccius bilinearis	-	-	-	-	.63	.02	[illegible]	1	.26	.01	.01	1	.76	.15	.90	1
Lepophidium cervinum	.43	.08	.23	[illegible]	1.27	.15	.61	1	.78	.03	.20	<1	.38	.02	.07	<1
Liparis inquilinus	-	-	-		-	-	-	-	[illegible]	.02	.00	<1	-	-	-	-
Ammodytes spp.	-	-	-	-	.32	.02	.01	1	.52	.02	.02	<1	-	-	-	-
Citharichthys arctifrons	[illegible]	[illegible]	6.86	[illegible]	.32	.01	.38	1	1.82	.05	1.35	3	3.05	.31	15.54	48
Total Pisces	6.01	1.42	9.43	68	[illegible]	[illegible]	[illegible]	6	8.85	.31	9.22	84	11.83	.88	18.09	224
Aves (unidentified feathers)	-	-	-	-	-			-	.26	.01	.00	1	-	-	-	-
Total number of stomachs examined:		29				[illegible]				415				284		
Examined stomachs with food:		[illegible]				[illegible]				384				262		

Table 5.--Percent frequency occurrence (F), percent number (N), percent volume (V) and index of relative importance (IRI) of food items in *Urophycis regia* stomachs, by cruise.

Taxon	Fall 1976				Winter 1977				Spring 1977				Summer 1977			
Food Item	F	N	V	IRI	F	N	V	IRI	F	N	V	IRI	F	N	V	IRI
Annelida																
Polychaeta																
Harmothoe extenuata	-	-	-	-	-	-	-	-	-	-	-	-	.67	.17	.03	<1
Sthenelais limicola	-	-	-	-	-	-	-	-	-	-	-	-	.67	.17	.19	<1
Nephtyidae	2.38	.28	.07	1	-	-	-	-	-	-	-	-	-	-	-	-
Aglaophamus circinata	2.38	.28	.07	1	-	-	-	-	-	-	-	-	-	-	-	-
Onuphis pallidula	-	-	-	-	-	-	-	-	-	-	-	-	2.01	.51	.06	1
Eunicidae	-	-	-	-	-	-	-	-	-	-	-	-	1.34	.34	1.50	2
Unidentified	2.38	.28	.00	1	-	-	-	-	-	-	-	-	2.68	.68	.07	2
Total Polychaeta	7.14	.85	.14	7	-	-	-	-	-	-	-	-	6.71	1.88	1.85	25
Mollusca																
Pelecypoda																
Placopecten magellanicus	2.38	.28	7.15	18	-	-	-	-	16.67	7.14	2.73	164	2.01	.51	5.39	12
Ensis directus	-	-	-	-	-	-	-	-	-	-	-	-	.67	.17	.03	<1
Unidentified	-	-	-	-	-	-	-	-	-	-	-	-	2.68	.68	5.42	16
Total Pelecypoda	2.38	.28	7.15	18	-	-	-	-	16.67	7.14	2.73	165	-	-	-	-
Cephalopoda																
Illex illecebrosus	-	-	-	-	-	-	-	-	16.67	7.14	46.36	892	-	-	-	-
Rossia tenera	7.14	.85	.95	13	-	-	-	-	-	-	-	-	5.37	1.37	3.30	25
Unidentified	-	-	-	-	-	-	-	-	-	-	-	-	.67	.17	.06	<1
Total Cephalopoda	7.14	.85	.95	13	-	-	-	-	16.67	7.14	46.36	892	6.04	1.54	3.36	30
Total Mollusca	9.52	1.14	8.11	88	-	-	-	-	33.33	14.29	49.09	2112	8.05	2.22	8.78	89
Crustacea																
Copepoda																
Calanus finmarchicus	-	-	-	-	-	-	-	-	-	-	-	-	1.34	.34	.00	<1
Centropages typicus	2.38	.57	.00	1	-	-	-	-	-	-	-	-	-	-	-	-
Candacia armata	2.38	.28	.00	1	-	-	-	-	-	-	-	-	.67	.17	.00	<1
Unidentified	-	-	-	-	-	-	-	-	-	-	-	-	2.01	.68	.00	1
Total Copepoda	2.38	.85	.00	2	-	-	-	-	-	-	-	-	4.03	1.20	.00	5
Stomatopoda																
Unidentified	-	-	-	-	-	-	-	-	-	-	-	-	.67	.17	.03	<1
Cumecea																
Eudorella spp.	-	-	-	-	-	-	-	-	-	-	-	-	1.34	.34	.00	<1
Isopoda																
Cirolana polita	4.76	.57	1.67	11	-	-	-	-	16.67	7.14	.05	120	7.38	2.39	.46	21
Janira alta	-	-	-	-	-	-	-	-	-	-	-	-	.67	.17	.01	<1
Total Isopoda	4.76	.57	1.67	11	-	-	-	-	16.67	7.14	.05	120	8.05	2.56	.47	24
Amphipoda																
Ampelisca spp.	-	-	-	-	-	-	-	-	-	-	-	-	.67	.17	.00	<1

Table 5.--Continued.

Taxon Food Item	Fall 1976 F	Fall 1976 N	Fall 1976 V	Fall 1976 IRI	Winter 1977 F	Winter 1977 N	Winter 1977 V	Winter 1977 IRI	Spring 1977 F	Spring 1977 N	Spring 1977 V	Spring 1977 IRI	Summer 1977 F	Summer 1977 N	Summer 1977 V	Summer 1977 IRI
A. vadorum	2.38	1.42	.12	4	-	-	-	-	-	-	-	-	4.03	1.20	.03	5
A. agassizi	4.76	.85	.07	4	-	-	-	-	-	-	-	-	3.36	1.37	.01	5
Bybis serrata	14.29	1.70	.00	24	-	-	-	-	-	-	-	-	.67	.17	.00	<1
Leptocheirus pinguis	2.38	.28	.24	1	-	-	-	-	-	-	-	-	-	-	-	-
Erichthonius rubricornis	14.29	1.99	.02	29	-	-	-	-	--	-	-	-	4.03	1.37	.01	6
Unciola irrorata	59.52	20.45	1.50	1307	-	-	-	-	-	-	-	-	14.76	9.74	.26	148
Rhachotropis oculata	2.38	.57	.00	1	-	-	-	-	-	-	-	-	-	-	-	-
Melita dentata	-	-	-	-	-	-	-	-	-	-	-	-	.67	.17	.02	<1
Protohaustorius wigleyi	-	-	-	-	-	-	-	-	-	-	-	-	1.34	.34	.00	<1
Hippomedan serratus	-	-	-	-	-	-	-	-	16.67	7.14	.14	121	1.34	.34	.01	<1
Anonyx sarsi	2.38	.28	.12	1	-	-	-	-	-	-	-	-	1.34	.34	.00	<1
Monoculodes edwardsi	-	-	-	-	-	-	-	-	-	-	-	-	2.68	.85	.01	2
Phoxocephalus holbolli	-	-	-	-	-	-	-	-	-	-	-	-	2.01	.51	.00	1
Trichophoxus epistomus	2.38	.28	.00	1	-	-	-	-	-	-	-	-	8.05	2.56	.06	21
Parathemisto gaudichaudi	14.29	1.70	.10	26	-	-	-	-	-	-	-	-	18.12	12.31	.22	227
Aeginina longicornis	2.38	.28	.02	1	-	-	-	-	-	-	-	-	-	-	-	-
Total Amphipoda	78.57	29.83	2.19	2516	-	-	-	-	16.67	7.14	.14	121	46.31	31.45	.62	1485
Euphausiacea																
Thysanoessa inermis	-	-	-	-	-	-	-	-	-	-	-	-	.67	.17	.00	<1
Decapoda																
Dichelopandalus leptocerus	19.05	5.40	12.57	342	-	-	-	-	-	-	-	-	44.67	27.01	14.05	1846
Crangon septemspinosa	85.71	32.10	25.54	4940	-	-	-	-	16.67	14.29	.55	247	3.36	1.03	.23	4
Munida iris	9.52	1.42	.33	17	-	-	-	-	-	-	-	-	2.68	.68	1.63	6
Cancer spp.	2.38	.57	.12	2	-	-	-	-	-	-	-	-	-	-	-	-
C. borealis	7.14	3.41	5.96	67	-	-	-	-	16.67	14.29	4.91	320	1.34	.34	.13	1
C. irroratus	26.19	8.24	13.71	575	-	-	-	-	83.33	35.71	19.63	4612	24.16	7.52	39.56	1137
Unidentified	2.38	.28	.00	1	-	-	-	-	-	-	-	-	.67	.17	.06	<1
Total Decapoda	95.24	51.42	58.23	10443	-	-	-	-	83.33	64.29	25.09	7448	67.11	36.75	55.66	6202
Unidentified Crustacea	-	-	-	-	-	-	-	-	-	-	-	-	.67	.17	.01	<1
Total Crustacea	95.24	82.67	62.09	13787	-	-	-	-	83.33	78.57	25.28	8654	86.58	72.82	56.79	11222
Sipuncula																
Phascolion strombi	-	-	-	-	-	-	-	-	-	-	-	-	.67	.17	.00	1
Chaetognatha																
Sagitta elegans	-	-	-	-	-	-	-	-	-	-	-	-	.67	6.32	.06	4
Chordata																
Pisces																
Teleostei	2.38	.28	.02	1	100	100	100	20000	16.67	7.14	25.63	546	22.15	5.64	4.21	218
Etrumeus teres	-	-	-	-	-	-	-	-	-	-	-	-	.67	.17	5.01	3
Urophycis chuss	7.14	.85	3.93	34	-	-	-	-	-	-	-	-	3.36	.85	9.68	35
Merluccius bilinearis	2.38	.28	1.91	5	-	-	-	-	-	-	-	-	6.04	4.27	5.33	58
Lepophidium cervinum	14.29	1.99	5.72	110	-	-	-	-	-	-	-	-	.67	.17	.06	<1
Liparis inquilinus	-	-	-	-	-	-	-	-	-	-	-	-	.67	.17	.06	<1
Citharichthys arctifrons	50.00	11.93	18.07	1500	-	-	-	-	-	-	-	-	16.11	5.30	7.85	212
Total Pisces	61.90	15.34	29.66	2786	100	100	100	20000	16.67	7.14	.26	546	47.65	16.58	32.51	2339
Number of stomachs examined:		45				2				7				180		
Examined stomachs with food:		42				1				6				149		

Table 6.--Percent frequency occurrence (F), percent number (N), percent volume (V) and index of relative importance (IRI) of food items in Merluccius bilinearis stomachs, by cruise.

Taxon / Food Item	Fall 1976 F	Fall 1976 N	Fall 1976 V	Fall 1976 IRI	Winter 1977 F	Winter 1977 N	Winter 1977 V	Winter 1977 IRI	Spring 1977 F	Spring 1977 N	Spring 1977 V	Spring 1977 IRI	Summer 1977 F	Summer 1977 N	Summer 1977 V	Summer 1977 IRI
Cnidaria																
Hydrozoa																
Unidentified	-	-	-	-	.50	.02	.00	<1	-	-	-	-	-	-	-	-
Annelida																
Polychaeta																
Harmothoe extenuata	-	-	-	-	-	-	-	-	-	-	-	-	.30	.05	.02	<1
Nereis spp.	-	-	-	-	-	-	-	-	-	-	-	-	.60	.11	.08	<1
Nephtyidae	-	-	-	-	-	-	-	-	-	-	-	-	.30	.05	.02	<1
Aglaophamus circinata	-	-	-	-	.50	.05	.00	<1	-	-	-	-	-	-	-	-
Ophelina spp.	-	-	-	-	-	-	-	-	-	-	-	-	.30	.05	.00	<1
Clymenella torquata	-	-	-	-	-	-	-	-	-	-	-	-	.30	.05	.04	<1
Unidentified	-	-	-	-	-	-	-	-	-	-	-	-	.30	.05	.04	<1
Total Polychaeta	-	-	-	-	.50	.05	.00	<1	-	-	-	-	2.11	.38	.21	1
Mollusca																
Cephalopoda																
Loliginidae	3.28	.31	29.45	98	.50	.02	3.40	2	-	-	-	-	-	-	-	-
Loligo pealei	3.69	.40	28.21	106	-	-	-	-	2.08	.10	8.46	18	.30	.05	16.10	5
Rossia spp.	-	-	-	-	-	-	-	-	2.08	.20	.01	<1	-	-	-	-
R. tenera	.82	.06	.40	<1	.50	.02	.15	<1	4.17	.30	.41	3	.90	.16	3.78	4
Illex illecebrosus	-	-	-	-	-	-	-	-	25.00	1.40	80.72	2053	-	-	-	-
Unidentified	1.64	.12	.99	2	-	-	-	-	2.08	.10	1.69	4	.30	.05	.12	<1
Total Cephalopoda	9.02	.89	59.06	541	1.00	.05	3.55	4	35.42	2.10	91.29	3308	1.51	.27	20.01	31
Arthropoda																
Copepoda																
Calanus finmarchicus	-	-	-	-	1.00	.05	.00	<1	-	-	-	-	.90	.33	.01	<1
Paracalanus spp.	-	-	-	-	5.97	9.01	.02	54	-	-	-	-	-	-	-	-
Rhincalanus nasutus	2.05	.22	.00	<1	-	-	-	-	-	-	-	-	-	-	-	-
Nannocalanus minor	2.46	.34	.00	1	-	-	-	-	-	-	-	-	-	-	-	-
Centropages typicus	18.03	14.90	.02	269	1.49	.68	.00	1	-	-	-	-	.30	.05	.00	<1
Candacia armata	-	-	-	-	-	-	-	-	-	-	-	-	2.41	.44	.00	1
Metridia lucens	.82	.12	.00	<1	-	-	-	-	-	-	-	-	.60	.11	.00	<1
Caligus spp.	-	-	-	-	-	-	-	-	-	-	-	-	.30	.05	.00	<1
Unidentified	4.10	.71	.00	3	1.00	.05	.00	<1	-	-	-	-	.60	.11	.00	<1
Total Copepoda	20.49	16.29	.02	334	7.46	9.78	.02	73	-	-	-	-	5.12	1.10	.02	6
Cumacea																
Eudorella spp.	-	-	-	-	-	-	-	-	-	-	-	-	.90	.22	.01	<1
E. emarginata	-	-	-	-	-	-	-	-	-	-	-	-	.30	.05	.00	<1
E. hispida	-	-	-	-	1.00	.05	.00	<1	-	-	-	-	.60	.27	.01	<1
Diastylis spp.	-	-	-	-	1.99	.22	.01	<1	-	-	-	-	-	-	-	-
D. sculpta	-	-	-	-	14.43	1.28	.07	19	2.08	.10	.00	<1	3.01	.66	.01	2
D. bispinosa	2.46	.28	.03	1	1.00	.07	.00	<1	-	-	-	-	12.65	6.43	.32	85
Unidentified	2.05	.19	.01	<1	.50	.02	.00	<1	-	-	-	-	.60	.11	.00	<1
Total Cumacea	4.51	.46	.04	2	18.91	1.65	.08	33	2.08	.10	.00	<1	17.47	7.75	.34	141
Isopoda																
Unidentified	.41	.03	.00	<1	-	-	-	-	-	-	-	-	-	-	-	-
Cirolana polita	.41	.03	.04	<1	-	-	-	-	-	-	-	-	-	-	-	-
Total Isopoda	.82	.06	.04	1	-	-	-	-	-	-	-	-	-	-	-	-
Amphipoda																
Ampelisca spp.	.82	.06	.00	<1	-	-	-	-	-	-	-	-	-	-	-	-
A. vadorum	19.67	2.34	.32	52	2.49	.15	.70	2	-	-	-	-	4.52	1.59	.11	8
A. macrocephala	.41	.03	.01	<1	.50	.02	.00	<1	-	-	-	-	-	-	-	-
A. agassizi	1.64	.22	.02	<1	.50	.02	.00	<1	-	-	-	-	5.42	2.75	.14	16
Byblis serrata	12.70	3.21	.44	46	1.49	.10	.01	<1	2.08	.10	.00	<1	20.48	14.90	1.23	330
Argissa hamatipes	-	-	-	-	4.48	.34	.02	2	-	-	-	-	-	-	-	-
Erichthonius rubricornis	.82	.06	.00	<1	-	-	-	-	-	-	-	-	4.82	1.21	.02	6
Unciola irrorata	.41	.06	.00	<1	4.48	.36	.05	2	-	-	-	-	1.81	.33	.02	1
Haustoriidae	-	-	-	-	-	-	-	-	-	-	-	-	.30	.05	.00	<1
Photis dentata	-	-	-	-	-	-	-	-	-	-	-	-	.30	.22	.00	<1
Orchomenella minuta	-	-	-	-	-	-	-	-	-	-	-	-	.30	.05	.00	<1
O. pinguis	-	-	-	-	-	-	-	-	-	-	-	-	.30	.05	.00	<1
Hippomedon serratus	-	-	-	-	7.46	1.09	.24	10	2.08	.30	.01	1	.06	.11	.04	<1
Anonyx sarsi	-	-	-	-	1.49	.61	.30	1	-	-	-	-	-	-	-	-
Monoculodes spp.	-	-	-	-	.50	.02	.00	<1	-	-	-	-	-	-	-	-
M. edwardsi	-	-	-	-	4.98	.31	.02	2	-	-	-	-	5.72	1.59	.04	9
Harpinia propinqua	.41	.03	.00	<1	-	-	-	-	-	-	-	-	-	-	-	-

Table 6.--Continued.

Taxon Food Item	Fall 1976				Winter 1977				Spring 1977				Summer 1977			
	F	N	V	IRI	F	N	V	IRI	F	N	V	IRI	F	N	V	IRI
Phoxocephalus holbolli	-	-	-	-	-	-	-	-	-	-	-	-	1.81	.93	.02	2
Trichophoxus epistomus	-	-	-	-	-	-	-	-	-	-	-	-	5.12	2.31	.08	12
Stenopleustes inermis	-	-	-	-	-	-	-	-	-	-	-	-	.30	.05	.00	<1
Hyperiidae	9.84	2.09	.42	23	1.99	.73	.10	2	-	-	-	-	-	-	-	-
Parathemisto gaudichaudi	61.89	69.42	7.87	4784	52.24	70.43	4.27	3902	10.42	10.42	.06	109	49.10	22.43	.75	1138
Aeginina longicornis	-	-	-	-	.50	.02	.00	<1	-	-	-	-	-	-	-	-
Unidentified	2.05	.19	.03	<1	2.99	.19	.03	1	-	-	-	-	-	-	-	-
Total Amphipoda	74.59	77.72	9.12	6477	67.66	74.40	5.76	5424	14.58	10.82	.07	159	70.18	48.60	2.46	3583
Euphausiacea																
Euphausiidae	-	-	-	-	.50	1.84	.91	1	-	-	-	-	-	-	-	-
Thysanoessa raschii	.41	.06	.00	<1	.50	2.35	1.06	2	-	-	-	-	-	-	-	-
T. inermis	-	-	-	-	-	-	-	-	-	-	-	-	.30	.05	.01	<1
Total Euphausiacea	.41	.06	.00	<1	1.00	4.19	1.97	6	-	-	-	-	.30	.05	.01	<1
Decapoda																
Dichelopandalus leptocerus	5.74	1.54	7.81	54	23.88	2.88	11.66	347	6.25	.50	.17	4	28.92	18.14	19.10	1077
Crangonidae	-	-	-	-	1.49	.10	.03	<1	-	-	-	-	.30	.05	.00	<1
Crangon septemspinosa	2.87	.28	.30	2	25.87	1.94	2.74	121	-	-	-	-	13.25	4.12	2.35	86
Calappidae spp. megalopae	-	-	-	-	-	-	-	-	-	-	-	-	.30	.05	.00	<1
Callinectes spp. megalopae	-	-	-	-	-	-	-	-	-	-	-	-	.30	.05	.00	<1
Geryon quinquedens megalopae	-	-	-	-	-	-	-	-	-	-	-	-	.30	.05	.00	<1
Cancer spp. zoea & megalopae	5.74	1.30	.00	7	-	-	-	-	-	-	-	-	.30	.05	.00	<1
Cancer irroratus	-	-	-	-	.50	.02	.33	<1	-	-	-	-	-	-	-	-
Unidentified	2.46	.22	.08	1	1.00	.05	.05	<1	-	-	-	-	-	-	-	-
Total Decapoda	15.57	3.33	8.20	180	43.78	4.99	14.81	867	6.25	.50	.17	4	35.54	22.54	21.46	1564
Unidentified Crustacea	2.87	.31	.06	1	3.48	.17	.05	1	-	-	-	-	-	-	-	-
Total Crustacea	78.69	98.24	17.48	9106	87.06	95.18	22.69	10762	18.75	11.42	.24	219	85.84	80.04	24.29	8956
Echinodermata																
Asteroidea																
Asterias vulgaris	-	-	-	-	.50	.02	.14	<1	2.08	.10	.05	<1	-	-	-	-
Astropecten americanus	.41	.03	.06	<1	-	-	-	-	-	-	-	-	-	-	-	-
Total Asteroidea	.41	.03	.06	<1	.50	.02	.14	<1	2.08	.10	.05	<1	-	-	-	-
Echinoidea																
Echinarachnius parma	-	-	-	-	1.99	.10	.77	2	4.17	.20	.34	2	-	-	-	-
Total Echinodermata	.41	.03	.06	<1	2.49	.12	.90	3	6.25	.30	.39	4	-	-	-	-
Chaetognatha																
Sagitta elegans	-	-	-	-	2.99	2.40	.15	8	50.00	85.57	1.62	4360	16.27	11.60	.33	194
Chordata																
Pisces																
Teleostei	2.05	.15	2.61	6	19.40	.94	13.03	271	4.17	.20	.11	1	13.55	2.64	10.42	177
Clupeidae	-	-	-	-	1.49	.07	14.29	21	-	-	-	-	-	-	-	-
Etrumeus teres	.82	.06	19.10	16	1.00	.05	30.82	31	-	-	-	-	.30	.05	2.21	1
Urophycis chuss	3.28	.25	.77	3	1.99	.15	5.56	11	-	-	-	-	3.92	.77	22.86	93
Merluccius bilinearis	1.23	.09	.51	1	10.45	.53	8.69	96	-	-	-	-	12.05	3.19	4.92	98
Ammodytes spp.	-	-	-	-	3.98	.44	.30	3	-	-	-	-	1.80	.55	11.64	22
Peprilus triacanthus	-	-	-	-	-	-	-	-	2.08	.20	4.23	9	-	-	-	-
Citharichthys arctifrons	2.46	.28	.41	2	-	-	-	-	4.17	.20	2.12	10	2.41	.49	3.12	9
Total Pisces	9.43	.83	23.40	229	37.81	2.18	72.71	2831	10.42	.60	6.46	74	31.23	7.70	55.17	2026
Total number of stomachs examined:		272				282				109				385		
Examined stomachs with food:		244				201				48				332		

Table 7.--Percent frequency occurrence (F), percent number (N), percent volume (V) and index of relative importance (IRI) of food items in *Macrozoarces americanus* stomachs, by cruise.

Taxon / Food Item	Fall 1976 F	Fall 1976 N	Fall 1976 V	Fall 1976 IRI	Winter 1977 F	Winter 1977 N	Winter 1977 V	Winter 1977 IRI	Spring 1977 F	Spring 1977 N	Spring 1977 V	Spring 1977 IRI	Summer 1977 F	Summer 1977 N	Summer 1977 V	Summer 1977 IRI
Annelida																
Polychaeta																
Aphrodita hastata	-	-	-	-	-	-	-	-	4.00	.33	47.44	191	-	-	-	-
Harmothoe extenuata	-	-	-	-	25.00	1.11	1.57	67	28.00	1.11	.33	40	4.55	.31	.85	5
Pholoe minuta	-	-	-	-	-	-	-	-	-	-	-	-	.65	.04	.08	<1
Scalibregma inflatum	-	-	-	-	-	-	-	-	4.00	.11	.05	1	-	-	-	-
Maldanidae	-	-	-	-	4.17	.11	.27	2	-	-	-	-	.65	.04	.04	<1
Clymenura sp. A	-	-	-	-	-	-	-	-	4.00	.11	.02	1	.65	.04	.04	<1
Lumbrineris fragilis	-	-	-	-	4.17	.11	.05	1	-	-	-	-	-	-	-	-
Ampharete arctica	-	-	-	-	16.67	1.22	1.41	44	-	-	-	-	-	-	-	-
Flabelligeridae sp. A	-	-	-	-	-	-	-	-	4.00	.22	.19	2	-	-	-	-
Brada spp.	-	-	-	-	4.17	1.11	.27	6	-	-	-	-	-	-	-	-
Euchone spp.	-	-	-	-	8.33	.88	.22	9	-	-	-	-	-	-	-	-
Chone infundibuliformis	-	-	-	-	-	-	-	-	12.00	1.11	.40	18	3.25	.52	.19	2
Unidentified	-	-	-	-	8.33	.22	.16	3	-	-	-	-	4.55	.31	.58	4
Total Polychaeta	-	-	-	-	54.17	4.76	3.95	472	44.00	2.99	48.43	2263	13.64	1.27	1.78	41
Mollusca																
Pelecypoda																
Placopecten magellanicus	-	-	-	-	-	-	-	-	-	-	-	-	2.60	.22	8.57	23
Cyclocardia borealis	-	-	-	-	-	-	-	-	-	-	-	-	.65	.22	.19	<1
Ensis directus	-	-	-	-	4.17	.11	1.08	5	-	-	-	-	1.30	.13	.23	<1
Total Pelecypoda	-	-	-	-	4.17	.11	1.08	5	-	-	-	-	3.90	.57	8.99	37
Crustacea																
Copepoda																
Candacia armata	-	-	-	-	-	-	-	-	-	-	-	-	.65	.04	.00	<1
Cumacea																
Eudorella hispida	-	-	-	-	-	-	-	-	4.00	.11	.00	1	-	-	-	-
Diastylis sculpta	-	-	-	-	12.50	.44	.00	6	32.00	1.33	.07	45	3.25	.26	.08	1
D. bispinosa	-	-	-	-	4.17	.22	.05	1	12.00	.55	.00	7	3.25	.39	.15	2
Total Cumacea	-	-	-	-	16.67	.66	.05	12	36.00	1.99	.07	74	6.49	.65	.23	6
Isopoda																
Janira alta	-	-	-	-	-	-	-	-	-	-	-	-	.65	.04	.00	<1
Amphipoda																
Ampelisca spp.	-	-	-	-	-	-	-	-	-	-	-	-	.65	.26	.12	<1
A. vadorum	-	-	-	-	4.17	.11	.00	1	16.00	1.22	.14	22	11.69	2.40	1.08	4
A. agassizi	-	-	-	-	-	-	-	-	4.00	.88	.12	4	-	-	-	-
Byblis serrata	-	-	-	-	4.17	.11	.05	1	4.00	.11	.00	<1	1.95	.13	.04	<1
Leptocheirus pinguis	-	-	-	-	-	-	-	-	4.00	.11	.12	1	.65	.04	.04	<1
Erichthonius rubricornis	-	-	-	-	70.83	43.69	6.11	3528	84.00	71.90	5.79	6526	72.08	63.74	13.20	5546
Unciola irrorata	-	-	-	-	100.00	44.91	22.84	6775	72.00	13.50	1.85	1105	63.64	21.25	12.54	2150
Melita dentata	-	-	-	-	-	-	-	-	8.00	.22	.00	2	-	-	-	-
Photis dentata	-	-	-	-	-	-	-	-	8.00	.44	.02	4	.65	.04	.00	<1
Monoculodes edwardsi	-	-	-	-	-	-	-	-	-	-	-	-	.65	.04	.00	<1
Phoxocephalus holbolli	-	-	-	-	4.17	.11	.00	1	4.00	.11	.00	1	.65	.04	.00	<1
Stenopleustes inermis	-	-	-	-	-	-	-	-	8.00	.33	.00	3	-	-	-	-
Parathemisto gaudichaudi	-	-	-	-	-	-	-	-	-	-	-	-	1.30	.09	.00	<1
Aeginina longicornis	-	-	-	-	4.17	.11	.05	1	8.00	.22	.02	2	2.60	.17	.04	<1
Total Amphipoda	-	-	-	-	100.00	89.05	29.06	11811	88.00	89.05	8.06	8546	83.77	88.22	27.06	9656
Decapoda																
Crangon septemspinosa	-	-	-	-	-	-	-	-	-	-	-	-	.65	.04	.39	<1
Calappidae spp. megalopae	-	-	-	-	-	-	-	-	-	-	-	-	.65	.04	.00	<1
Cancer spp.	-	-	-	-	-	-	-	-	-	-	-	--	.65	.04	.12	<1
C. borealis	-	-	-	-	4.17	.11	1.08	5	4.00	.33	1.07	6	4.55	.31	6.10	29
C. irroratus	-	-	-	-	41.67	3.98	57.63	2567	36.00	5.20	41.39	1677	44.16	8.64	54.92	2806
Total Decapoda	-	-	-	-	41.67	4.09	58.71	2617	36.00	5.53	42.46	1728	47.40	9.08	61.52	3347
Total Crustacea	-	-	-	-	100.00	93.81	87.93	18163	100.00	96.57	50.59	14716	96.10	98.04	88.81	17957
Echinodermata																
Echinoidea																
Echinarachnius parma	-	-	-	-	20.83	1.33	7.14	176	8.00	.33	.95	10	1.30	.09	.23	<1
Ophiuroidea																
Amphioplus macilentus	-	-	-	-	-	-	-	-	4.00	.11	.02	1	-	-	-	-
Total Echinodermata	-	-	-	-	20.83	1.33	7.14	176	8.00	.44	.97	11	-	-	-	-
Chordata																
Pisces																
Teleostei	-	-	-	-	-	-	-	-	-	-	-	-	.65	.04	.19	<1
Number of stomachs examined:		7				27				31				359		
Examined stomachs with food:		0				24				25				154		

Table 8.--Percent frequency occurrence (F), percent number (N), percent volume (V) and index of relative importance (IRI) of food items in *Stenotomus chrysops* from fall samples.

Taxon Food Item	F	N	V	IRI
Cnidaria				
Anthozoa				
Unidentified	1.51	.19	.18	1
Nematoda				
Unidentified	.75	.04	.00	<1
Annelida				
Polychaeta				
Aphrodita spp.	.38	.01	.43	<1
A. hastata	.75	.04	.64	1
Harmothoe extenuata	.38	.01	.01	<1
Sthenelais limicola	2.64	.10	.77	2
Phyllodocidae	.38	.01	.01	<1
Paranaitis speciosa	.75	.02	.02	<1
Phyllodoce spp.	1.51	.25	.27	1
P. mucosa	.38	.01	.03	<1
P. groenlandica	12.83	1.19	1.08	29
Eulalia bilineata	.75	.02	.09	<1
Syllis sp.	.38	.01	.01	<1
Nereis grayi	3.02	.12	.14	1
N. zonata	.38	.01	.04	<1
N. riisei	.38	.01	.04	<1
Nephtyidae	.38	.01	.01	<1
Aglaophamus circinata	8.30	.45	3.01	29
Glycera spp.	1.13	.04	.59	1
G. dibranchiata	6.79	.21	4.85	34
G. robusta	.38	.01	.26	<1
Goniada norvegica	.75	.04	.61	<1
Scalibregma inflatum	4.91	.15	1.31	7
Ophelina spp.	4.15	.25	.85	5
Maldanidae	1.51	.07	.19	<1
Clymenella torquata	1.13	.06	.13	<1
Euclymene collaris	6.04	.46	.28	4
Clymenura sp. A	12.83	.76	1.89	34
Aricidea neosuecia	1.89	.07	.04	<1
Spio spp.	.75	.02	.07	<1
Onuphis pallidula	3.77	1.32	2.37	14
Marphysa spp.	2.26	.10	1.61	4
Marphysa bellii	.38	.01	.01	1
Lumbrineridae	.38	.01	.01	<1
Lumbrineris spp.	13.20	.78	.92	21
L. fragilis	3.02	.10	.48	2
L. impatiens	1.13	.04	.03	<1

Table 8.--Continued.

Taxon Food Item	F	N	V	IRI
L. albidentata	2.64	.17	.32	1
Ninoe nigripes	2.26	.08	.61	2
Drilonereis spp.	3.02	.10	.17	1
D. longa	.38	.01	.03	<1
D. magna	3.02	.13	.67	2
Cirratulidae	.75	.07	.09	<1
Tharyx spp.	1.51	.05	.23	<1
T. acutus	7.92	.87	.49	11
Oweniidae	.38	.01	.02	<1
Melinna cristata	1.13	.04	.15	<1
Ampharete arctica	6.41	.32	.52	5
Terebellidae	.75	.02	.30	<1
Pista maculata	.38	.01	.69	<1
Nicolea venustula	15.85	2.43	2.27	74
Terebellides stroemi	3.77	.19	.43	2
Pherusa affinis	2.26	.08	.84	2
P. plumosa	.75	.02	.26	<1
Sabellidae	1.51	.06	1.43	2
Potamilla reniformis	1.89	.06	.20	<1
Chone infundibuliformes	22.64	5.28	13.48	425
Unidentified	37.36	1.65	14.11	589
Total Polychaeta	75.09	18.43	60.41	5920
Mollusca				
Scaphopoda				
Unidentified	.38	.01	.04	<1
Gastropoda				
Mitrella spp.	6.42	1.00	.69	11
Nassarius trivittatus	.38	.01	.00	<1
Pleurobranchaea tarda	6.42	.40	1.35	11
Unidentified	1.51	.05	.10	<1
Total Gastropoda	11.70	1.46	2.14	42
Pelecypoda				
Placopecten magellanicus	.38	.01	.74	<1
Unidentified	.38	.01	.09	<1
Total Pelecypoda	.75	.02	.82	1
Cephalopoda				
Unidentified	.75	.02	.10	<1
Total Mollusca	13.21	1.52	3.10	61
Crustacea				
Copepoda				
Eucalanus spp.	.38	.01	.00	1

Table 8.--Continued.

Taxon Food Item	F	N	V	IRI
Nannocalanus minor	.75	.02	.01	<1
Temora longicornis	.38	.01	.00	<1
Centropages typicus	15.85	8.25	.41	137
Xanthocalanus spp.	.38	.01	.00	<1
Unidentified	.38	.02	.00	<1
Total Copepoda	16.23	8.32	.42	142
Cumacea				
Eudorella hispida	.38	.01	.00	<1
Diastylis spp.	1.89	.14	.17	1
D. sculpta	.38	.01	.01	<1
D. bispinosa	4.91	.31	.34	3
Unidentified	3.40	.20	.24	2
Total Cumacea	10.19	.68	.76	15
Tanaidacea				
Tanaissus lilljeborgi	.38	.01	.00	<1
Isopoda				
Edotea acuta	.38	.01	.04	<1
E. triloba	.38	.02	.04	<1
Ptilanthura tricarina	4.53	.26	.08	2
Cirolana polita	1.51	.05	.25	<1
Total Isopoda	6.79	.34	.42	5
Amphipoda				
Ampeliscidae	.75	.02	.04	<1
Ampelisca spp.	5.66	.44	.21	4
A. vadorum	20.00	1.88	.87	55
A. agassizi	25.28	4.17	1.63	147
Byblis serrata	18.49	1.07	.50	29
Aoridae	.38	.01	.00	<1
Leptocheirus pinguis	3.40	.12	.09	1
Argissa hamatipes	1.51	.05	.02	<1
Corophium spp.	.75	.04	.04	<1
C. crassicorne	.38	.02	.01	<1
Erichthonius spp.	.75	.08	.03	<1
E. rubricornis	61.13	25.81	5.44	1910
Unciola irrorata	44.53	6.48	3.68	452
Siphonoecetes smithianus	3.02	.10	.05	<1
Rachotropis inflata	.38	.01	.01	<1
Gammarus spp.	.38	.01	.01	<1
Melita dentata	1.89	.14	.05	<1
Casco bigelowi	.75	.02	.13	<1
Protohaustorius wigleyi	.38	.01	.00	<1
Photis spp.	.75	.02	.01	<1

Table 8.--Continued.

Taxon Food Item	F	N	V	IRI
P. dentata	1.51	.07	.03	<1
P. macrocoxa	.38	.01	.00	<1
Podoceropsis nitida	.75	.02	.02	<1
Anonyx sarsi	.38	.01	.02	<1
Melphidippidae	.38	.01	.03	<1
Monoculodes spp.	.38	.01	.01	<1
M. edwardsi	.75	.02	.03	<1
Phoxocephalidae	.38	.01	.00	<1
Phoxocephalus holbolli	21.51	1.39	.49	41
Trichophoxus epistomus	4.15	.19	.05	1
Harpinia propinqua	5.28	.39	.41	4
H. truncata	.38	.02	.01	<1
Stenopleustes gracilis	.38	.01	.00	<1
S. inermis	3.40	.13	.01	<1
Hyperiidae	.75	.05	.01	<1
Parathemisto gaudichaudi	9.81	24.72	.94	252
Caprellidae	.38	.01	.02	<1
Aeginina longicornis	7.17	.31	.37	5
Unidentified	11.32	.69	.28	11
Total Amphipoda	79.62	68.63	15.53	6701
Euphausiacea				
Euphausiidae	.38	.01	.00	<1
Decapoda				
Dichelopandalus leptocerus	2.64	.13	3.05	8
Crangon septemspinosa	.75	.02	.35	<1
Axius serrata	.75	.02	.03	<1
Pagurus spp.	.75	.02	1.04	1
Cancer spp.	3.02	.12	.74	3
C. borealis	2.26	.08	.48	1
C. irroratus	10.19	.42	5.53	61
Unidentified	1.89	.06	.57	1
Total Decapoda	20.38	.88	11.79	258
Unidentified Crustacea	7.92	.38	4.70	40
Total Crustacea	86.79	79.27	33.61	9797
Priapulida				
Priapulus caudata	.75	.02	.53	<1
Ectoprocta				
Unidentified	.38	.01	.00	<1
Echinodermata				
Asteroidea				
Asterias vulgaris	.38	.01	.01	<1

Table 8.--Continued.

Taxon Food Item	F	N	V	IRI
Unidentified	.38	.02	.00	<1
Total Asteroidea	.75	.04	.01	<1
Echinoidea				
Echinarachnius parma	4.53	.15	.52	3
Ophiuroidea				
Amphioplus macilentus	1.13	.08	.22	<1
Axiognathus squamata	2.64	.11	.08	<1
Unidentified	.38	.01	.00	<1
Total Ophiuroidea	4.15	.20	.29	2
Total Echinodermata	9.06	.39	.82	11
Chordata				
Ascideacea				
Unidentified	.38	.01	.05	<1
Pisces				
Teleostei	1.51	.05	.74	1
Urophycis chuss	.75	.02	.56	<1
Gobiidae spp. larvae	.38	.04	.00	<1
Total Pisces	2.64	.11	1.30	4
Total number of stomachs examined:		563		
Number of examined stomachs with food:		265		

Table 9.--Percent frequency occurrence (F), percent number (N), percent volume (V) and index of relative importance (IRI) of food items in Citharichthys arctifrons stomachs, by cruise.

Taxon	Fall 1976				Winter 1977				Spring 1977				Summer 1977			
Food Item	F	N	V	IRI	F	N	V	IRI	F	N	V	IRI	F	N	V	IRI
Annelida																
Polychaeta																
Harmothoe extenuata	1.28	.28	.39	1	-	-	-	-	10.68	.76	1.26	22	2.17	.40	1.36	4
Sthenelais limicola	-	-	-	-	2.16	.44	2.93	7	9.71	.71	8.03	85	5.79	1.03	5.96	40
Phyllodoce spp.	-	-	-	-	-	-	-	-	-	-	-	-	.72	.11	.09	<1
Nephytidae	-	-	-	-	-	-	-	-	.97	.05	.19	1	.36	.06	.45	<1
Aglaophamus circinata	-	-	-	-	1.44	.29	2.13	3	10.68	.76	5.13	63	2.89	.46	3.25	11
Opheliidae	-	-	-	-	-	-	-	-	-	-	-	-	.36	.06	.09	<1
Ophelia denticulata	-	-	-	-	-	-	-	-	-	-	-	-	.36	.06	.00	<1
Ophelina spp.	-	-	-	-	-	-	-	-	-	-	-	-	.36	.06	.09	<1
Maldanidae	1.28	.28	.77	1	.72	.15	.27	<1	4.85	.25	1.06	6	2.53	.40	1.08	4
Clymenella torquata	-	-	-	-	-	-	-	-	.97	.05	.00	<1	-	-	-	-
Clymenura sp. A	6.41	1.42	13.51	96	5.75	1.76	10.67	72	21.36	1.58	8.03	205	6.86	1.49	4.25	39
Paraonidae	-	-	-	-	-	-	-	-	1.94	.25	.68	2	-	-	-	-
Spionidae	-	-	-	-	1.44	.29	.00	<1	1.94	.15	.19	1	.36	.06	.90	<1
Spiophanes bombyx	-	-	-	-	-	-	-	-	1.94	.20	.58	2	1.08	.17	.18	<1
Onuphis pallidula	-	-	-	-	1.44	.73	2.40	5	6.79	.76	3.68	30	.72	.11	.18	<1
Lumbrineris spp.	-	-	-	-	.72	.15	.27	<1	.97	.05	.00	<1	.36	.06	.09	<1
L. fragilis	-	-	-	-	-	-	-	-	2.91	.15	1.55	5	.36	.06	.45	<1
L. cruzensis	-	-	-	-	4.32	.88	1.33	10	2.91	.15	.48	2	1.80	.29	.45	1
L. impatiens	-	-	-	-	1.44	.29	.53	1	-	-	-	-	.72	.11	.09	<1
Drilonereis spp.	-	-	-	-	.72	.15	.00	<1	-	-	-	-	.36	.06	.00	<1
Ampharete arctica	-	-	-	-	8.63	2.20	6.13	72	13.59	.76	1.84	35	1.80	.29	1.36	3
Pherusa affinis	-	-	-	-	-	-	-	-	-	-	-	-	.36	.06	.00	<1
Sabellidae	-	-	-	-	.72	.15	.27	<1	-	-	-	-	-	-	-	-
Euchone spp.	-	-	-	-	-	-	-	-	.97	.05	.10	<1	-	-	-	-
Chone infundibuliformis	-	-	-	-	3.60	2.20	2.40	17	38.83	5.65	9.67	595	9.02	2.46	2.17	42
Unidentified	8.97	1.99	3.86	53	22.30	4.84	10.67	346	10.68	.56	3.38	42	13.00	2.29	3.79	79
Total Polychaeta	15.38	3.98	18.53	346	46.76	14.54	40.00	2550	80.58	12.92	45.84	4735	42.96	10.14	26.29	1565
Mollusca																
Gastropoda																
Unidentified	-	-	-	-	.72	.15	.00	<1	-	-	-	-	-	-	-	-
Pelecypoda																
Unidentified	-	-	-	-	-	-	-	-	-	-	-	-	.36	.06	.00	<1
Crustacea																
Ostracoda																
Unidentified	5.13	1.99	.00	10	-	-	-	-	-	-	-	-	.36	.06	.00	<1
Copepoda																
Calanus finmarchicus	-	-	-	-	-	-	-	-	3.88	.36	.10	2	2.17	.57	.09	1
Paracalanus spp.	1.28	.28	.00	<1	.72	.15	.00	<1	-	-	-	-	-	-	-	-
Centropages typicus	2.56	.85	.00	2	2.88	.73	.00	2	-	-	-	-	-	-	-	-
Candacia armata	-	-	-	-	-	-	-	-	-	-	-	-	5.41	.97	.00	5
Metridia lucens	-	-	-	-	-	-	-	-	-	-	-	-	.36	.06	.00	<1
Harpacticoid	2.56	1.14	.00	3	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified	6.41	2.56	.00	16	.72	.15	.00	<1	-	-	-	-	.72	.17	.00	<1
Total Copepoda	12.82	4.83	.00	62	4.32	1.03	.00	4	3.88	.36	.10	2	8.66	1.78	.09	16
Cumacea																
Eudorella spp.	-	-	-	-	-	-	-	-	.97	.05	.00	<1	.36	.06	.00	<1
E. hispida	-	-	-	-	1.44	.29	.00	1	.97	.05	.00	<1	-	-	-	-
Diastylis spp.	-	-	-	-	1.49	.44	.00	1	.97	.05	.00	<1	-	-	-	-
D. sculpta	-	-	-	-	5.04	1.03	1.33	12	16.50	1.22	1.45	44	2.89	.57	.36	3
D. bispinosa	-	-	-	-	3.60	1.03	.53	6	24.27	1.83	1.84	89	2.89	.46	.36	2
Petalosarsia declivis	-	-	-	-	3.60	1.47	.80	8	.97	.05	.00	<1	.36	.06	.00	<1
Unidentified	1.28	.28	.39	1	1.44	.29	.00	1	-	-	-	-	-	-	-	-
Total Cumacea	1.78	.28	.39	1	15.11	4.55	2.67	109	39.81	3.26	3.29	260	6.50	1.15	.72	12
Tanaidacea																
Tanaissus lilljeborgia	1.28	.28	.00	1	-	-	-	-	.97	.05	.00	1	-	-	-	-
Isopoda																
Edotea triloba	-	-	-	-	-	-	-	-	-	-	-	-	1.44	.23	.36	1
Janira alta	-	-	-	-	-	-	-	-	.97	.05	.00	1	2.53	.46	.36	2
Total Isopoda	-	-	-	-	-	-	-	-	.97	.05	.00	1	3.97	.69	.72	6

Table 9.--Continued.

Taxon / Food Item	Fall 1976				Winter 1977				Spring 1977				Summer 1977			
	F	N	V	IRI	F	N	V	IRI	F	N	V	IRI	F	N	V	IRI
Amphipoda																
Ampelisca spp.	2.56	.85	.39	3	1.44	.29	.00	<1	.97	.05	.00	<1	.72	.11	.00	<1
A. macrocephala	-	-	-	-	-	-	-	-	-	-	-	-	.36	.06	.45	<1
A. vadorum	14.10	7.95	3.86	167	12.23	4.70	4.27	110	11.65	.66	.87	18	30.69	8.76	7.05	485
A. agassizi	3.85	1.14	1.16	9	4.32	1.03	1.33	10	2.91	.20	.19	1	1.08	.17	.09	<1
Byblis serrata	32.05	17.90	26.25	1415	7.19	2.94	3.20	44	13.59	1.17	2.32	47	15.88	4.81	6.05	172
Leptocheirus pinguis	-	-	-	-	-	-	-	-	.97	.05	.00	<1	-	-	-	-
Argissa hamatipes	-	-	-	-	-	-	-	-	.97	.05	.19	<1	-	-	-	-
Erichthonius spp.	1.28	.28	.00	<1	-	-	-	-	-	-	-	-	-	-	-	-
E. rubricornis	21.79	7.39	1.93	203	48.20	25.70	18.93	2151	42.72	8.24	8.32	707	61.37	35.22	11.02	2838
Unciola irrorata	58.97	35.79	30.89	3932	56.11	34.95	27.73	3517	58.25	10.58	11.51	1287	63.18	23.42	17.80	2604
Siphonoecetes smithianus	1.28	.28	.39	1	-	-	-	-	-	-	-	-	-	-	-	-
Melita dentata	1.28	.28	.39	1	-	-	-	-	3.88	.20	.10	1	2.89	.57	.54	3
Casco bigelowi	-	-	-	-	1.44	.29	.27	1	.97	.05	.10	<1	.72	.11	.18	<1
Jerbarnia spp.	-	-	-	-	-	-	-	-	.97	.05	.00	<1	-	-	-	-
Photis spp.	-	-	-	-	.72	.15	.00	<1	-	-	-	-	-	-	-	-
P. dentata	1.28	.28	.39	1	4.32	1.17	.53	7	5.82	.46	.19	4	1.44	.29	.09	1
P. macrocoxa	-	-	-	-	1.44	.73	.00	1	1.94	.15	.00	<1	-	-	-	-
Podoceropsis nitida	-	-	-	-	-	-	-	-	-	-	-	-	.36	.06	.09	<1
Orchomonella pinguis	-	-	-	-	-	-	-	-	.97	.05	.10	<1	-	-	-	-
Monoculodes spp.	-	-	-	-	.72	.44	.00	<1	-	-	-	-	-	-	-	--
M. edwardsi	-	-	-	-	.72	.15	.27	<1	-	-	-	-	10.83	2.29	2.08	47
Phoxocephalus holbolli	1.28	.28	.39	1	2.16	.44	.00	1	1.94	.10	.10	<1	2.17	.34	.00	1
Trichophoxus epistomus	6.41	1.70	.39	13	2.16	.44	.00	1	4.85	.25	.39	3	2.17	.34	.09	1
Stenopleustes gracilis	-	-	-	-	-	-	-	-	2.91	.20	.00	1	-	-	-	-
S. inermis	-	-	-	-	8.63	3.08	.00	27	15.53	1.93	.29	35	.72	.11	.00	1
Stenothoidae	1.28	.28	.00	<1	-	-	-	-	-	-	-	-	-	-	-	-
Hyperiidae	8.97	1.99	.77	25	.72	.15	.00	<1	-	-	-	-	-	-	-	-
Parathemisto gaudichaudi	10.26	3.13	1.93	52	-	-	-	-	1.94	.10	.00	<1	14.08	2.92	1.99	69
Aeginina longicornis	-	-	-	-	-	-	-	-	.97	.05	.00	<1	-	-	-	-
Unidentified	29.49	6.82	9.65	486	9.35	3.08	.80	36	1.94	.10	.00	<1	2.89	.46	.00	1
Total Amphipoda	84.62	86.36	78.76	13972	85.61	79.74	57.33	11735	80.58	24.72	24.66	3979	96.03	80.07	47.52	12252
Decapoda																
Leptochela bermudensis	-	-	-	-	-	-	-	-	-	-	-	-	.72	.11	.27	<1
Dichelopandalus leptoceras	-	-	-	-	-	-	-	-	2.91	.15	.48	2	3.97	.63	.90	6
Crangon septemspinosa	-	-	-	-	-	-	-	-	-	-	-	-	2.89	.51	1.72	6
Cancer spp.	-	-	-	-	-	-	-	-	-	-	-	-	.72	.11	.09	<1
C. borealis	-	-	-	-	-	-	-	-	-	-	-	-	.36	.11	.18	<1
C. irroratus	-	-	-	-	-	-	-	-	-	-	-	-	1.44	.23	.45	1
Unidentified	1.28	.28	.39	1	-	-	-	-	-	-	-	-	.36	.06	.09	<1
Total Decapoda	1.28	.28	.39	1	-	-	-	-	2.91	.15	.48	2	9.75	1.78	3.70	53
Unidentified Crustacea	6.41	1.42	1.54	19	-	-	-	-	-	-	-	-	.72	.11	.09	<1
Total Crustacea	93.59	95.45	81.08	16522	86.33	85.32	60.00	12545	86.41	28.59	28.63	4943	97.11	85.62	52.85	13447
Sipuncula																
Phascolion strombi	-	-	-	-	-	-	-	-	.97	.05	.00	<1	-	-	-	-
Echinodermata																
Ophiuroidea																
Axiognathus squamata	-	-	-	-	-	-	-	-	-	-	-	-	.36	.06	.09	<1
Chaetognatha																
Sagitta elegans	-	-	-	-	-	-	-	-	.97	.05	.10	<1	1.44	.23	.00	<1
Chordata																
Larvacea																
Unidentified	-	-	-	-	-	-	-	-	29.13	58.39	25.44	2442	-	-	-	-
Pisces																
Teleostei spp.	2.56	.57	.39	2	-	-	-	-	-	-	-	-	17.33	2.81	12.92	272
Merluccius bilinearis	-	-	-	-	-	-	-	-	-	-	-	-	4.69	.92	7.05	37
Ammodytes spp.	-	-	-	-	-	-	-	-	-	-	-	-	.36	.06	.45	<1
Citharichthys arctifrons	-	-	-	-	-	-	-	-	-	-	-	-	.72	.11	.36	<1
Total Pisces	2.56	.57	.39	2	-	-	-	-	-	-	-	-	23.10	3.89	20.78	570
Total number of stomachs examined:		195				189				110				315		
Examined stomachs with food:		78				139				103				277		

Table 10.--Percent frequency occurrence (F), percent number (N), percent volume (V) and index of relative importance (IRI) of food items in *Paralichthys oblongus* stomachs, by cruise.

Taxon / Food Item	Fall 1976 F	Fall 1976 N	Fall 1976 V	Fall 1976 IRI	Winter 1977 F	Winter 1977 N	Winter 1977 V	Winter 1977 IRI	Spring 1977 F	Spring 1977 N	Spring 1977 V	Spring 1977 IRI	Summer 1977 F	Summer 1977 N	Summer 1977 V	Summer 1977 IRI
Cnidaria																
Hydrozoa																
Eudendrium spp.	.77	.17	.08	<1	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified	-	-	-	-	-	-	-	-	.94	.10	.00	<1	-	-	-	-
Annelida																
Polychaeta																
Harmothoe extenuata	-	-	-	-	1.11	.18	.11	<1	.94	.10	.02	<1	1.33	.29	.04	<1
Sthenelais limicola	-	-	-	-	2.22	.35	.80	3	4.72	.52	.68	6	2.67	.57	.09	2
Maldanidae	-	-	-	-	-	-	-	-	.94	.10	.28	<1	1.33	.29	.04	<1
Clymenura sp. A	-	-	-	-	1.11	.18	.92	1	1.89	.21	.22	1	-	-	-	-
Spionidae	-	-	-	-	1.11	.18	.05	1	-	-	-	-	-	-	-	-
Ampharete arctica	-	-	-	-	1.11	.18	.11	<1	-	-	-	-	-	-	-	-
Chone infundibuliformis	-	-	-	-	5.55	.88	1.95	16	6.60	.93	2.04	20	1.33	.29	.16	1
Unidentified	-	-	-	-	4.44	.70	.14	4	.94	.10	.02	<1	2.67	.57	.17	2
Total Polychaeta	-	-	-	-	15.56	2.65	4.08	105	14.15	1.96	3.26	74	6.67	2.01	.51	17
Mollusca																
Pelecypoda																
Placopecten magellanicus	.77	.17	.01	<1	-	-	-	-	-	-	-	-	-	-	-	-
Cyclocardia borealis	.77	.17	.01	<1	1.11	.18	.11	<1	-	-	-	-	-	-	-	-
Ensis directus	.77	.17	.08	<1	-	-	-	-	.94	.10	.02	<1	-	-	-	-
Unidentified	2.31	.68	.21	2	-	-	-	-	-	-	-	-	-	-	-	-
Total Pelecypoda	4.62	1.19	.31	7	1.11	.18	.11	<1	.94	.10	.02	<1	-	-	-	-
Cephalopoda																
Loliginidae	2.31	.51	9.91	24	-	-	-	-	1.89	.31	4.07	8	1.33	.29	1.31	2
Loligo pealei	3.08	.85	18.49	60	-	-	-	-	-	-	-	-	-	-	-	-
Rossia spp.	3.85	.85	.62	6	5.55	.88	2.11	17	1.89	.21	.09	1	1.33	.29	.00	<1
R. tenera	2.31	.51	1.66	5	1.11	.35	.00	<1	.94	.10	2.22	2	1.33	.29	1.64	3
Unidentified	3.85	1.02	.60	6	-	-	-	-	-	-	-	-	-	-	-	-
Total Cephalopoda	15.38	3.74	31.28	539	6.67	1.23	2.11	22	-	-	-	-	4.00	.86	2.95	15
Unidentified Mollusca	5.38	1.70	.32	11	-	-	-	-	4.72	.62	6.38	33	-	-	-	-
Total Mollusca	22.31	6.62	31.90	859	7.78	1.41	2.23	28	5.66	.73	6.40	40	4.00	.86	2.95	15
Crustacea																
Copepoda																
Centropages typicus	-	-	-	-	1.11	.35	.00	<1	-	-	-	-	-	-	-	-
Candacia armata	-	-	-	-	-	-	-	-	-	-	-	-	2.67	.57	.00	2
Total Copepoda	-	-	-	-	1.11	.35	.00	<1	-	-	-	-	2.67	.57	.00	2
Stomatopoda																
Unidentified	-	-	-	-	-	-	-	-	.94	.10	.09	<1	-	-	-	-
Mysidacea																
Neomysis americana	-	-	-	-	-	-	-	-	.94	.10	.02	<1	-	-	-	-
Cumacea																
Diastylis sculpta	-	-	-	-	-	-	-	-	.94	.10	.00	<1	-	-	-	-

Table 10.--Continued.

Taxon Food Item	Fall 1976 F	Fall 1976 N	Fall 1976 V	Fall 1976 IRI	Winter 1977 F	Winter 1977 N	Winter 1977 V	Winter 1977 IRI	Spring 1977 F	Spring 1977 N	Spring 1977 V	Spring 1977 IRI	Summer 1977 F	Summer 1977 N	Summer 1977 V	Summer 1977 IRI
Amphipoda																
Ampelisca spp.	.77	.17	.00	<1	-	-	-	-	-	-	-	-	-	-	-	-
A. vadorum	.77	.17	.00	<1	-	-	-	-	-	-	-	-	-	-	-	-
A. agassizi	.77	.17	.01	<1	-	-	-	-	.94	.10	.00	<1	-	-	-	-
Byblis serrata	6.15	3.40	.19	22	5.55	2.29	.39	15	18.87	7.48	2.53	189	-	-	-	-
Leptocheirus pinguis	-	-	-	-	-	-	-	-	.94	.10	.09	<1	-	-	-	-
Erichthonius rubricornis	2.31	.68	.01	2	38.89	21.69	1.74	911	24.53	9.24	1.33	259	1.33	.29	.00	<1
Unciola irrorata	10.77	3.23	.19	37	53.33	42.33	5.55	2554	51.89	50.57	11.25	3208	6.67	2.58	.10	18
Trichophoxus epistomus	1.54	.34	.01	1	-	-	-	-	-	-	-	-	-	-	-	-
Hyperiidae	2.31	.68	.01	2	-	-	-	-	-	-	-	-	-	-	-	-
Parathemisto gaudichaudi	2.31	1.02	.02	2	1.11	.70	.02	1	.94	.10	.00	<1	4.00	1.15	.00	5
Unidentified	1.54	.34	.01	1	1.11	.18	.00	<1	-	-	-	-	-	-	-	-
Total Amphipoda	18.46	10.19	.44	196	61.11	67.20	7.71	4578	66.04	67.60	15.21	5469	12.00	4.01	.10	49
Decapoda																
Dichelopandalus leptocerus	7.69	4.75	8.18	99	7.78	1.59	6.72	65	38.68	16.51	14.51	1200	25.33	10.31	3.71	355
Crangonidae	-	-	-	-	-	-	-	-	.94	.10	.02	<1	-	-	-	-
Crangon septemspinosa	11.54	3.56	2.34	68	12.22	3.53	4.89	103	25.47	5.50	6.62	309	22.67	8.60	2.22	245
Scyllarus spp.	-	-	-	-	-	-	-	-	.94	.10	.46	1	-	-	-	-
Munida iris	-	-	-	-	7.78	2.12	4.93	55	.94	.10	.46	1	-	-	-	-
Cancer spp.	10.00	5.09	1.82	69	2.22	.53	.44	2	1.89	.21	.31	1	-	-	-	-
C. borealis	3.85	1.02	.47	6	3.33	1.23	6.54	26	.94	.10	.09	<1	-	-	-	-
C. irroratus	61.54	42.61	31.70	4573	44.44	16.05	49.91	2931	28.30	5.92	39.13	1275	46.67	20.34	68.71	4156
Collodes robustus	-	-	-	-	1.11	.18	.11	<1	-	-	-	-	-	-	-	-
Unidentified	25.38	12.73	6.09	478	-	-	-	-	.94	.10	.09	1	-	-	-	-
Total Decapoda	80.00	69.78	50.60	9630	65.56	25.22	73.54	6475	73.58	28.66	61.70	6649	78.67	39.26	74.63	8959
Unidentified Crustacea	2.31	.68	.35	2	3.33	.53	.76	4	-	-	-	-	-	-	-	-
Total Crustacea	86.92	80.65	51.39	11477	93.33	93.30	82.01	16362	95.28	96.57	77.02	16541	81.33	43.84	74 73	9644
Echinodermata																
Echinoidea																
Echinarachnius parma	6.92	1.53	.34	13	-	-	-	-	-	-	-	-	1.33	.29	.04	<1
Chordata																
Pisces																
Teleostei spp.	22.31	5.26	8.28	302	10.00	1.59	4.54	61	1.89	.21	3.70	7	24.00	8.60	3.35	287
Urophycis chuss	9.23	3.56	6.04	89	1.11	.18	1.84	2	1.89	.21	8.88	17	1.33	.29	.08	<1
Merluccius bilinearis	5.38	1.36	1.37	15	3.33	.53	3.67	14	.94	.10	.56	1	40.00	44.13	18.34	2498
Citharichthys arctifrons	3.85	.85	.60	6	2.22	.35	1.63	4	.94	.10	.19	<1	-	-	-	-
Total Pisces	40.00	11.04	16.29	1093	15.56	2.65	11.68	223	5.66	.62	13.32	79	62.67	53.01	21.77	4686
Total number of stomachs examined		169				101				125				75		
Examined stomachs with food:		130				90				106				75		

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