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Feeding of Most Abundant Fish Species in Flemish Cap in Summer 1993

by

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Abstract

The stomach contents of 4320 fishes comprising 14 species were collected from Flemish Cap Bank (NW Newfoundland) at depths ranging from 130 to 730 m, during summer 1993.

The general feeding intensity was high in all species. Three main feeding patterns were evident: the genus *Sebastes* consume primarily pelagic species, although they also feed on preys which migrate vertically such as shrimps, Euphausids and mysids. The benthic group is made up of American plaice (*Hippoglossoides platessoides*), witch flounder (*Glyptocephalus cygnoglossus*), arctic eelpout (*Lycodes reticulatus*), wolffishes (*Anarhichas lupus* and *Anarhichas minor*) and thorny skate (*Raja radiata*). Lastly, the group of benthopelagic fish remains, longfin hake (*Urophycis chesteri*), cod (*Gadus morhua*), grenadiers (*Nezumia bairdi* and *Macrourus berglax*) and Greenland halibut (*Reinhardtius hippoglossoides*). Pelagic and benthopelagic preys are an important food resource for all fish considered, the abundance of Hyperids, *P. borealis* and *Sebastes* sp. in summer makes them an important food resource in the diet of fish in Flemish Cap.

Introduction

The effort of the Spanish fleet in Flemish Cap Bank increased after the establishment of the 200-Mile Fishing Zone Boundary by Canada. With the aim of studying the fishing resources of this bank, in 1988 a series of research cruises began, and these have since been financed by the European Union. The study of stomach contents of some of the fish species of commercial interest has continued since the first survey (Vazquez *et al.*, 1989; Paz *et al.*, 1989; 1993).

Previously, diverse monospecific studies had been carried out in Flemish Cap on cod feeding in winter (Lilly, 1979; 1983; 1985, 1987; De Cárdenas *et al.*, 1993), redfish (Gavaris and Legge, 1981; Saborido-Rey, 1993) or of a few species together, cod, redfish and American plaice (Konstantinov *et al.*, 1985), cod and beaked redfish (Albikovskaya *et al.*, 1988; Albikovskaya and Gerasimova, 1993). Some of these studies have placed special emphasis on the effects of predator-prey relationships between cod and redfish (Lilly 1985; Lilly and Evans, 1986). But an investigation had never been conducted which permitted the establishment of the interspecific relationships among the main

fish species in this area, and so, in the survey of summer 1993, the number of species sampled was amplified with the aim of obtaining a wider vision of the trophic flow in Flemish Cap.

The aim of this paper is a preliminary description of the food habits of dominant fishes in Flemish Cap, taking predator length into account.

Material and Methods

Fish stomachs representing 14 fish species were obtained and analyzed on board, during a bottom trawl survey carried out at the beginning of summer 1993 in Flemish Cap Bank. The survey was carried out according to NAFO methodological specifications (Doubleday, 1981) for a random stratified survey. Fishing was based on daytime trawling, between 6,30 and 23,30, with hauls of 30 minutes duration. Samples were collected at depths ranging from 132 to 730 m. with an average of 330 m.

These 14 species were selected because they presented the greatest biomass abundance and/or number according to estimates from previous surveys (Vazquez, 1993). In each haul a maximum of 10 stomachs were analyzed by 10 cm predator length groups for the priority species, while for the remaining species only 10 specimens were analyzed, chosen at random. Fish whose stomachs were everted or contained prey ingested in the fishing gear were discarded (the number of everted stomachs in *Urophycis chesteri*, *Sebastes* sp., *Macrourus berglax* and *Nezumia bairdi* was high). Specimens which presented total or partial regurgitation were taken into account to estimate the emptiness indices. Owing to the fact that an empty stomach or one with little food can be confused with one totally or partially regurgitated, special attention was paid to the size and colour of the gall bladder, according to the criteria of A.P. Robb (Anon., 1991).

From each predator, data was collected of total length rounded down to the cm. (anal length for family Macrouridae), sex and stage of sexual maturity. From each stomach content, volume was quantified in cc. through the use of a trophometer (Olaso, 1990), as was the percentage with respect to this volume, state of digestion and number of each prey. In the case that the prey was a fish, size in mm. was noted, and where this was not possible owing to the degree of digestion, the otolith was measured. Prey were identified to species for fish, decapod crustaceans and cephalopods whenever their state of digestion made this possible. The rest of the prey were identified to upper taxonomic levels.

To evaluate the importance of the stomach content, four indices are used (only stomachs containing food were used for estimation):

- Frequency of occurrence (percentage), FO: $FO= n_s/N_s*100$, where n_s is the number of stomachs with a specific prey, and N_s is the total number of stomachs analyzed.
- Percentage by number, N: $N= n_p/N_p*100$, where n_p is the number of a specific prey, and N_p is the total prey number.
- Percentage by volume, V: $V= v/V_T*100$, where v is the volume of a specific prey, and V_T is the total prey volume.

From these three measurements an index of Relative Importance, IRI (Pinkas *et al.*, 1971) was calculated for each prey taxa. IRI= (N+V)*F

The data were analyzed by length group as percentage of volume, and to establish the minimum number of stomachs for each

length group (minimum sample size), the cumulative number of prey taxa versus the cumulative number of stomachs was used (Modde and Ross, 1983; Arancibia, 1987).

Results and Discussion

A total of 4 320 stomachs were examined, corresponding to 14 fish species which represented 96,6% (Vazquez, 1994 in prep.) of the catch by weight of the total fish caught in the 1993 survey. The characteristics of the stomach sampling of each of the 14 fish species is shown in detail in Table 1.

The percentage of empty stomachs is low for almost all the species, the mean emptiness index being 20%, from a minimum of 4% in *Gadus morhua*, up to a maximum of 53% in *Lycodes reticulatus* (Table 1). These high values of feeding activity are characteristic of summer (Konstantinov *et al*, 1985; Vázquez *et al*, 1989).

In Table 2 the prey species were ordered according to their pelagic, benthopelagic or benthic habitat, and by estimating their importance (IRI) in the stomachs of the 14 fish species, an image was obtained of the greater or lesser relationship which their predators have with the bottom.

Family **Anarhichadidae**

Anarhichas lupus, Atlantic wolffish.

It presents a varied diet, with over thirty prey taxa. It feeds mainly on echinoderms: Ophiuroidea (FO=86%, V=22%) and Asteroidea (FO=9%, V=3%); other components of its diet are fish (FO=13%, V=63%), bivalve molluscs (FO=12%, V=2%) and polychaetes (FO=9%). Its characteristic prey are: brittle stars (IRI=9572), *Sebastes* sp. (IRI=260) and bivalve molluscs (IRI=41).

The presence of sea urchins and sand dollars, brittle stars, hermit crabs, *Pontophilus norvegicus*, bivalve molluscs, polychaetes, etc. in all length groups shows that Atlantic wolffish feed on marine organisms which are closely associated with the bottom. However, as it grows, its ability to feed in the water column increases and the percentage of redfishes and *Pandalus borealis* in its diet rises, while the percentage of echinoderms and polychaetes falls (Table 3 and Fig. 1a). The results of the studies of Templeman (1985) and Nelson and Ross (1992) also indicate that this species feeds primarily on benthic invertebrates, although in the study by Albikovscaya (1983) bivalve molluscs appear to be a dominant component in Flemish Cap.

Anarhichas minor, spotted wolffish.

From the analysis of 121 stomachs, 70% contained food. It presents a less varied diet than that of Atlantic wolffish, echinoderms which were found in 75% of the stomachs, consisted mainly of Ophiuroidea (FO=70%, V=29%) and Asteroidea (FO=25%, V=9%). Natantia (FO=36%, V=28%) and Pisces (FO=10%, V=19%) were also found. The principal preys were brittle stars (IRI=7715), *P. borealis* (IRI=972), *Sebastes* sp. (IRI=195) and sea stars (IRI=277).

As length of the spotted wolffish increases the percentage by volume of the more abundant prey groups does not present large variations, though preys such as Natantia and echinoderms tend to decrease, while fish increase and Ctenophora appear with a significant percentage at lengths over 60 cm. (Table 4, Fig. 1b).

As happens with A. lupus, it feeds on benthic preys and in larger specimens a higher percentage by volume of pelagic preys appear. Despite the coincidence of feeding spectra between both species of wolffishes, as Albikovskaya (1983) also found, Atlantic Wolffish have a more diversified diet and it is more ichthyophagous than the spotted wolffish.

Family **Gadidae**

Gadus morhua, atlantic cod.

The mean stomach content is high (Table 5), and the emptiness index is very low (4%), which indicates strong feeding activity in this area in summer. The rate of regurgitation is 5%. It presents a wide prey spectrum with around fifty prey taxa. The diet is mostly made up of crustaceans (FO= 95%, V=61%) and fish (FO=23%, V=36%); of the former, amphipod hyperids stand out (IRI=12567) and of the latter, *Sebastes* sp. (IRI= 146). Another important prey was *P. borealis*.

With respect to the percentage by volume by length, in Table 5 it can be seen that specimens less than 20 cm feed almost exclusively on small crustaceans such as calanoid copepods, hyperids, euphausids and mysids; from 20 to 65 cm the diet becomes more diverse, and benthic prey such as polychaetes and bottom crustaceans were observed but their percentage was low, hyperids and fish being the main food resource; from 65 cm fish constitute the highest percentage by volume. The consumption of redfish stands out from 45 cm (Fig. 2a).

The Flemish Cap cod diet is well-kwown, and is described in recent studies (Albikovskaya and Gerasimova, 1993; Paz *et al.*, 1993; Casas and Paz, 1994, in prep.). Our cod stomach content analysis confirms the feeding pattern in this area.

Urophycis chesteri, longfin hake.

This species presents a high index of regurgitation, 39%, as could be expected for the gadiform fishes, since they have closed gas bladders (Bowman, 1986).

Crustaceans, mainly copepods (FO=30%, V=11%), amphipods (FO=26%, V=9%), natantia decapods (FO=24%, V=53%) and mysids (FO=24%, V=14%) make up its diet. Fish appear in a very small percentage (FO=4%, V=1%). Owing to the scarce number of stomachs containing food examined, only two length groups could be established, see Table 6. The main differences in volume between specimens smaller than 20 cm and those greater are seen as an increase in the length of the prey type and a greater percentage of preys related to the bottom in the diet of larger specimens (*P. norvegicus* and *P. borealis*). Longfin hake seems to be a benthopelagic predador as Methven and Mckelvie (1986) also observe.

Family **Macrouridae**

Nezumia bairdi, marlin-spike, common grenadier.

This species also presents a low emptiness index. Its diet is based as much on pelagic as on benthic preys: small crustaceans such as hyperids (FO=35%, V=17), euphausids (FO=13%, V=9) and mysids (FO=15%, V=11); near bottom shrimps (FO=18%, V=25%), small bivalves (FO=15%, V=2%) and polychaetes (FO=45%, V=22%). Fish contributed little to diet (FO=2%).

Food content does not essentially vary according to the growth of fish (Table 7, Fig. 2b), and although a fall is observed in pelagic preys, hyperids and chaetognaths, with respect to the benthic group, polychaetes, brittle stars, isopods, amphipods Gammarids and Crangonidae shrimps, both, together with the benthopelagic group, are present in all length groups. Marlin-spike is generalist in its feeding, like other grenadiers (Gushchin and Podrazhanskaya, 1984).

Macrourus berglax, roughhead grenadier.

Feeds essentially on two major categories: 1.- benthic group, echinoderms (FO=45%, V=5%), polychaetes (FO=36%, V=5%) and gammarids (FO=6%); or 2.- near bottom organisms: fish (FO=6%, V=45%), shrimps (FO=21%, V=27%). Hyperids also appear (FO=15%). The characteristic preys are: Brittle stars (IRI=3002), *P. borealis* (IRI=645), polychaetes (IRI=427) and *Serrivomer beani* (IRI= 275).

Macrourus berglax had been defined as a benthic predator (Hureau *et. al.*, 1979; Geistdoerfer 1979). The position of the

mouth, obliquely directed downwards, would facilitate bottom feeding (Marshall, 1965). In Flemish Cap roughhead grenadier diet changes substantially with length. The two groups considered, 1-14 cm and 15-31 cm, present food items of very distinct importance (Table 8). As roughhead grenadier grows, the intake of benthic group an hyperids decreases, and diet is composed basically of *Pandalus Borealis* and fishes.

The diet of common grenadier is similar to that of the small roughhead, the principal difference being the importance of mysids in the former and that of brittle stars in the latter. The different length range of both species can explain the differences in total food contents.

Family **Pleuronectidae**

Glyptocephalus cygnoglossus, witch flounder.

This small-mouthed flatfish is a typical benthic predator. Its basic diet is made up of polychaetes (FO=94%, V=80%), thin shelled small bivalves (FO=28%, V=4%), brittle stars (FO=17%, V=6%) and crustaceans, mainly benthic amphipods (Gammaridae) (FO=17%, V=7%). There are very small differences in food with increasing size (Table 9, Fig. 3a). The witch flounder mouth is ideally structured for feeding on polychaetes (Morris, 1981), which makes it a specialised feeder on endofauna.

Hippoglossoides platessoides, American plaice.

The proportion of empty stomachs was low (17%), compared with the rate in February-March (94%) in the same area (unpublished data from winter cod tagging survey in 1992). These great changes throughout the year in feeding activity have also been observed by Pitt (1973) and Zamarro (1992).

Benthic forms occurred most frequently in American plaice stomachs: echinoderms, principally brittle stars (FO=93%, V=85%), polychaetes (FO=5%, V=1%), bivalve molluscs (FO=7%) and small pelagic crustaceans such as hyperids (FO=5%, V=10%). With respect to the changes in the percentage by volume as size increases (Table 10), it can be seen that there is practically no variation with respect to its characteristic preys: brittle stars and small bivalves, while mysids and polychaetes diminish, and hyperids increase. Fish appear in a very small proportion and only in specimens smaller than 30 cm (Fig. 3b).

In a benthic predator, in which the basis of its diet is made up of prey groups very related to the bottom, the presence of pelagic preys such as hyperids and chaetognaths is very conspicuous. This is surely due to the fact that these pelagic preys come close to the bottom during the day, the vertical migration of mesopelagic fauna near the bottom of the continental slope provides a major food resource for demersal fishes (Sedberry and Musyc, 1978). It must be taken into account that American plaice in Flemish Cap is mainly distributed at around 200-300 m. of depth (Vazquez, 1993), and specifically those stomachs which contained hyperids were collected from specimens caught in this depth range.

Reinhardtius hippoglossoides, Greenland halibut.

It presents a high mean stomach content (Table 11) and a low emptiness index (Table 1), and this high feeding activity in summer has also been observed by other authors (Chumakov and Podrazhanskaya, 1986; Yang and Livingston, 1988; Rodríguez-Marín *et al.*, 1993).

It is a voracious benthopelagic predator which feeds on a wide variety of organisms. Its diet is mainly ichthyophagous (FO=38%, V=82%); Natantia (FO=25%, V=16%), anphipod hyperids (FO=47%, V=3%) and cephalopods (FO=2%, V=2%) practically make up the rest. The most important prey were *Serrivomer beani* (IRI=355), *Sebastes* sp. (IRI=157) and the Myctophidae family (IRI=42) in fish; and Hyperids (IRI=4147) and *P. borealis* (IRI=236) in crustaceans.

Specimens less than 20 cm feed almost exclusively on hyperids, from 20 cm shrimps, mainly P. borealis, progressively increase in importance up to 35 cm, the size from which the prey

spectrum widens and fish become the main component of diet (Table 11, Fig. 4a). Redfish is consumed by specimens over 34 cm, contributing 19% to the total prey volume. Chumakov and Podrazhanskaya (1986) and Pedersen and Riget (1993) also found *P. borealis* and *Sebastes* sp. to be important preys in the stomachs of Greenland halibut.

Family **Scorpaenidae**

1039 stomachs of the three redfish species and 175 of juvenile redfish (*Sebastes* sp.) were analyzed. The number of regurgitated stomachs reached high values for the 3 species and juveniles, with a mean of 34%. *Sebastes marinus* and *Sebastes fasciatus* show similar emptiness rates (Table 1), *Sebastes mentella* seem to be less active. The juvenile redfish population has a strong feeding activity. The month sampled corresponds to the peak of feeding activity in redfishes (Jones, 1970, Konstantinov *et al.*, 1985).

***Sebastes* juvenile.**
They feed almost exclusively on crustaceans: fundamentally calanoid copepods (FO=61%, V=52%), hyperids (FO=15%, V=15%) and mysids (FO=17%, V=14); chaetognaths (FO=8, V=5) make up the rest. In the two length ranges considered, 10-14 and 15-20 (Table 12), an increase is observed in the consumption of hyperids and mysids in the larger length group.

Sebastes fasciatus, acadian redfish.
A great consumer of crustaceans: calanoids (FO=54%, V=37%), hyperids (FO=22%, V=6%), mysids (FO=14%, V=8), shrimps (FO=12%, V=11%) and euphausids (FO=5%, V=3%); fish (FO=2%, V=14%) and chaetognaths (FO=11%) contribute little to diet. Clear tendencies are not observed as fish grow, except the beginning of the consumption of pelagic fish, myctophids, and *N. bairdi* from 25 cm (Table 13, Fig 4b).

Sebastes marinus, golden redfish.
Crustaceans, primarily copepods (FO=58%, V=34%) and hyperids (FO=27%, V=28%) were dominant in the diet, with chaetognaths (FO=34%, V=20%) also reaching strong importance. Fish only make up 10% by volume of total diet. The amphipods and copepods have inverse trends with increasing length of golden fish (Table 14, Fig. 5a), fish and natantia become important from 30 cm. Of the three species of Flemish Cap redfish, *S. marinus* seems to have the most pelagic feeding pattern.

Sebastes mentella, deepwater redfish, beaked redfish.
This is the most ichthyophagous species of the family, and despite this crustaceans still represent 64% by volume, notably shrimps (FO=38%, V=35%), hyperids (FO=36%, V=12%) and euphausids (FO=9%, V=10%). Fish obtain a FO=13% and V=31%. It presents a wider prey spectrum than the other two redfish species, being the only one which preys upon cephalopods.

The importance of the various preys change with predator size (Table 15). The percentage by volume of small beaked redfish (<25 cm) was dominated by planktonic crustaceans, hyperids, calanoids and mysids. For larger specimens (>24 cm), shrimps, mainly P. borealis and fish became more important (Fig. 5b).

The differences in the diet of the three redfish could be related to their distribution. S. marinus occupies shallower waters, between 150-300 m, S. fasciatus is situated preferably between 250 and 400 m, while S. mentella is found in a wider depth range, always below 350 m. The juvenile group (three species combined) live at between 150 and 400 m depth (Saborido-Rey, 1993).

Redfish is acknowledged to be a typical plankton-eater (Konstantinov et al., 1985; Lilly, 1987). Copepods, pelagic amphipods and euphausiids constitute the main food items in July-August (Albikovskaya and Gerasimova, 1993).

In relation to length increase, a general pattern is evident: crustaceans diminished in importance while fish and decapod crustaceans increased. This is typical of other fish which become ichthyophagous as length increases. *S. marinus* begins to eat fish at 30 cm., *S. fasciatus* at 25 cm and *S.*

mentella at 19 cm. The myctophids are the principal pisces prey in the two former species, while *S. mentella* additionally preys on *S. beani*, a species more abundant in deeper waters. Cannibalism is not typical of redfish although it may increase during some years (Albikovskaya and Gerasimova, 1993). In summer 1993, cannibalism only appeared in *S. marinus* and its value (FO=0.7%) was smaller than in the literature (Gavaris and Legge, 1981; Konstantinov *et al.*, 1985; Vázquez *et al.*, 1989).

P. borealis appear at 35-44 in *S. marinus*, at 20-24 cm in *S. fasciatus* and at 30-34 cm in *S. mentella*. Natantia crustaceans are a more important component in the diet of *S. mentella* than in the other redfish species.

Family **Zoarcidae**

Lycodes reticulatus, Arctic eelpout.

A great proportion of empty stomachs was found (Table 1). They feed on benthic invertebrates such as brittle stars (FO=90%, V=53%), off-bottom decapod crustaceans (FO=6%, V=34%) and polychaetes (FO=11%, V=3%). The diet composition varied with fish size. *P. borealis* and fish were found in the stomachs from 25 cm (Table 16, Fig. 6a).

Family **Rajidae**

Raja radiata, thorny skate.

It presents a very wide prey spectrum, and at the same time each stomach contains a great variety of different preys. Decapod crustaceans (FO=60%, V=36%), fish (FO=49%, V=55%), polychaetes (FO=37%, V=2) and amphipods (FO=36%, V=2%) constitute its main food resource. Specimens under 45 cm feed mainly on *P. borealis*, polychaetes and amphipods, those over 44 cm feed on shrimps, fish (*Sebastes* sp., *Anarhichas* sp., *S. beani*) and cephalopods, while those over 64 cm mainly eat fishes (Table 17, Fig. 6b).

Conclusions

The stomach contents of more abundant fishes from Flemish Cap are summarized in Table 2. There are three possible trophic types among fishes: those which feed on pelagic organisms; those which feed on benthopelagic organisms; and those which feed on benthic organisms. There are other characteristics such as body shape and size, mouth position and structure and stomach morphology which contribute to characterizing diet composition, and where fishes feed. The three species of the genus *Sebastes* consume primarily pelagic species, although they also feed on preys which migrate vertically such as shrimps, Euphausids and mysids. The benthic group fish is made up of American plaice, witch flounder, arctic eelpout, the two wolffishes and thorny skate. Lastly, the group of benthopelagic fish remains, longfin hake, cod, grenadiers, and Greenland halibut. This last group is made up of fish which make long vertical migrations (Brunel, 1965; Smidt, 1969; Langton and Bowman, 1978).

According to Alton (1973) in the Bering sea, even the demersal flatfish, which were previously considered as benthopelagic, obtain part of their nutrition from off-bottom animals. Therefore, few fish species are totally dependent on benthos for food. Cod, together with redfishes are the most important fish species (in biomass) in the Flemish Cap ecosystem, and as they prey on pelagic and benthopelagic organisms, these preys constitute the main food resource in the bank.

Prey abundance (and distribution) play a central role in diet selection. Keast (1970) has provided abundant evidence that various fishes in a community may share food resources, not only in what they eat, but where and when, and at what age. This is the case with preys such as Hyperids, *P. borealis* and *Sebastes* sp., as they all have great importance in the diet of fish in Flemish Cap, at least at some time in their life (at certain sizes).

It is necessary to take into account the fact that food composition, and consequently habitat, of fishes varies as they grow, which makes the general classification of their belonging to a certain group of those previously established a little unrealistic. The relationship between different length groups of

different species is something which must be studied in more detail, and this is our next aim.

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	Size range	Depth range	N.hauls	N.full	N.reg.	%E	Total
Family Anarhichadidae							
Anarhichas lupus	10- 73	132-481	34	141	0	40	236
Anarhichas minor	12-108	148-610	42	81	4	30	121
Family Gadidae							
Gadus morhua	13- 98	132-389	64	873	49	4	961
Urophycis chesteri	12- 35	280-486	17	46	29	14	87
Family Macrouridae							
Nezumia bairdi	2- 10	288-730	24	127	3	5	137
Macrourus berglax	5- 31	298-730	17	84	12	17	115
Family Pleuronectidae							
Glyptocephalus cygnoglossus	12- 56	148-730	49	178	0	13	205
Hippoglossoides platessoides	18- 59	148-639	50	338	0	17	409
Reinhardtius hippoglossoides	11- 79	221-730	50	392	4	26	534
Family Scorpaenidae							
Sebastes sp. juvenil	10- 20	190-420	18	88	64	13	175
Sebastes fasciatus	14- 40	221-486	30	109	103	26	285
Sebastes marinus	14- 47	132-420	39	142	114	24	336
Sebastes mentella	16- 46	148-692	34	162	132	43	418
Family Zoarcidae							
Lycodes reticulatus	18- 49	248-664	33	72	1	53	154
Family Rajidae							
Raja radiata	14- 82	155-730	52	127	3	12	147
Total		132-730	95	2 960	518	20	4320

Table 1.- Characteristics of stomach sampling. N.hauls: Number of hauls, N.full: Number of full stomachs, N.reg.: Number of regurgitated stomachs, %E: emptiness percentage.

PREDATOR SPECIES	COP	HYP	CHAE	EUP	FIS	PAN	OTHER DEC	MYS	MOL	ECH	POL
Sebastes marinus	***	***	***		*			*			
Sebastes mentella	**	***		**	**	*	***				
Sebastes fasciatus	***	**	*	*	*		*	**			
Sebastes (juveniles)	***	**	*					**			
Gadus morhua		***			**	*	*				
Urophycis chesteri	***	**		*		**	**	***			
R. hippoglossoides		***			***	**	*				
Nezumia bairdi	*	***		**			**	**	**	*	***
Macrourus berglax		**			**	**	**			***	**
Raja radiata		**		*	***	***	**				**
Anarhichas lupus					**	*			*	***	*
Anarhichas minor					**	**				***	
Lycodes reticulatus					*	*	*		*	***	*
H. platessoides		**							*	***	
G. cynoglossus									**	**	***

COP: Copepoda
HYP= Hyperiidea
CHAE= Chaetognata
EUP= Euphausiacea
FIS= Pisces
PAN= *Pandalus borealis*
OTHER DEC= O.Decapoda Crustacea
MYS= Mysidacea
MOL= Gastropoda & Bivalvia
ECH= Echinodermata (mainly ophiuroidea)
POL= Polychaeta

Table 2.- Summary of stomach contents of fishes studied.
*: 10<IRI<100, **: 101<IRI<1000 and ***: IRI>1001.

Anarhichas lupus

	13-29	30-39	40-49	50-73	TOTAL
CRUSTACEA	1.43	5.18	4.54	3.96	4.12
Amphipoda	-	3.54	0.08	0.11	0.35
Hyperiidea	-	3.54	-	0.11	0.33
Other Amphipoda	-	-	0.08	-	0.02
Decapoda	-	1.64	4.27	3.85	3.71
Anomura (Paguridea)	-	0.07	-	0.05	0.04
Natantia	-	1.57	4.27	3.80	3.67
Pandalus borealis	-	1.57	3.25	3.80	3.44
Pontophilus norvegicus	-	-	1.01	-	0.23
Pantopoda	1.43	-	0.10	-	0.05
Other Crustacea	-	-	0.08	-	0.02
ECHINODERMATA	92.74	27.86	37.60	23.29	28.17
Asteroidea	1.43	0.20	7.07	2.53	3.35
Echinoidea Irregularia	3.71	1.47	2.49	2.18	2.23
Echinoidea Regularia	-	-	0.27	0.92	0.69
Other Echinodermata	0.95	-	-	0.25	0.19
Ophiuroidea	86.64	26.20	27.77	17.42	21.71
MOLLUSCA	-	1.56	3.93	1.78	2.21
Bivalvia	-	0.77	2.50	1.70	1.78
Cephalopoda	-	-	1.01	-	0.23
Gastropoda	-	0.79	0.39	0.08	0.20
Nudibranchia	-	-	0.34	-	0.08
Other Gastropoda	-	0.79	0.05	0.08	0.12
Scaphopoda	-	-	0.03	-	0.01
PISCES	-	62.58	53.15	68.14	63.07
Serrivomer beani	-	19.66	-	-	1.41
Gadus morhua	-	-	-	20.50	14.08
Sebastes sp.	-	10.48	38.01	44.97	40.07
Raja radiata	-	2.95	-	0.62	0.63
Chauliodus sloani	-	29.49	-	-	2.11
Stomias ferox	-	-	3.80	-	0.84
Pisces unidentified	-	-	11.34	2.05	3.93
OTHER INVERTEBRATES	5.21	2.23	0.79	1.88	1.73
Chaetognata	0.76	-	-	0.01	0.02
Cnidaria	-	-	-	1.78	1.22
Anthozoa	-	-	-	1.37	0.94
Scyphozoa	-	-	-	0.41	0.28
Polychaeta	4.45	2.23	0.79	0.10	0.49
OTHER	0.62	0.59	-	0.95	0.71
Unidentified	0.38	0.59	-	0.95	0.70
Stones	0.24	-	-	-	-
NUMBER OF FULL STOMACHS	36	30	41	34	141.00
MEAN STOMACH CONTENT	0.58	2.54	5.78	21.52	
MEAN LENGTH	24.03	34.07	44.73	55.68	39.82

Table 3.- Prey items found in *Anarhichas lupus* stomachs, expressed as percentage by volume, by length group (cm.).

Anarhichas minor

	12-49	50-59	60-108	TOTAL
CRUSTACEA	41.78	38.21	13.96	28.69
Amphipoda (Hyperiidea)	0.59	-	-	0.12
Decapoda	41.20	38.21	13.96	28.58
Anomura (Paguridea)	-	-	0.83	0.35
Brachyura (*Lithodes maja*)	0.88	-	-	0.18
Natantia	40.32	38.21	13.14	28.05
Pandalus borealis	40.20	35.11	12.93	26.77
Other Crangonidae	-	3.10	0.21	1.26
Other Natantia	0.12	-	-	0.02
ECHINODERMATA	30.85	46.17	15.83	30.30
Asteroidea	7.86	13.96	5.39	9.13
Ophiuroidea	21.11	32.21	10.43	20.80
Echinoidea Irregularia	1.17	-	-	0.23
Echinoidea Regularia	0.70	-	-	0.14
MOLLUSCA	0.66	0.17	0.14	0.25
Bivalvia	0.44	0.17	0.14	0.21
Scaphopoda	0.22	-	-	0.04
PISCES	25.23	2.73	41.71	23.68
Pisces unidentified	-	0.02	10.43	4.41
Sebastes spp.	25.23	2.71	31.28	19.27
OTHER INVERTEBRATES	0.88	12.72	21.41	14.02
Cnidaria	-	6.83	0.56	2.82
Anthozoa	-	-	0.56	0.23
Scyphozoa	-	6.83	-	2.58
Ctenophora	-	0.16	20.85	8.86
Polychaeta	0.44	0.47	-	0.26
Porifera	0.44	5.27	-	2.08
OTHER	0.59	-	6.95	3.05
Stones	0.59	-	-	0.12
Offal (waste products)	-	-	6.95	2.93
NUMBER OF FULL STOMACHS	30	30	21	81.00
MEAN STOMACH CONTENT (cc)	11.36	21.49	34.25	
MEAN LENGTH	37.77	54.63	69.67	52.28

Table 4.- Prey items found in *Anarhichas minor* stomachs, expressed as percentage by volume, by length group (cm.).

Gadus morhua

	13-14	15-19	20-24	25-29	30-34	35-39	40-44
CRUSTACEA	100.00	84.44	91.15	90.91	93.08	95.41	93.22
Amphipoda	68.18	48.54	88.28	79.01	89.85	77.40	83.62
Gammaridae	-	-	0.14	-	0.08	-	-
Hyperiidea	68.18	46.60	87.79	78.16	89.66	77.29	83.00
Other Amphipoda	-	1.94	0.35	0.85	0.12	0.11	0.62
Copepoda (Calanoida)	14.55	19.31	0.42	1.21	0.18	-	-
Decapoda	8.18	1.39	0.50	9.27	2.83	15.02	9.59
Anomura (Paguridea)	-	-	-	0.15	-	-	0.02
Brachyura (*Chionoecetes opilio*)	-	-	-	1.41	-	-	-
Natantia	4.18	1.39	0.50	7.58	2.78	14.68	9.44
Lebbeus polaris	-	-	-	0.25	-	-	0.19
Pandalus borealis	-	1.39	-	3.04	0.93	13.31	6.02
Sergestes arcticus	-	-	-	-	0.65	-	0.27
Spirontocaris lilljeborgi	-	-	-	0.91	-	0.13	0.51
Pontophilus norvegicus	-	-	-	0.29	-	0.19	0.25
Sabinea sarsi	-	-	-	-	-	0.29	0.06
Other Crangonidae	-	-	-	1.65	0.09	-	0.03
Other Natantia	4.18	-	0.50	1.45	1.12	0.76	2.13
Other Decapoda	-	-	-	0.13	0.05	0.34	0.12
Euphausiacea	4.55	3.19	0.12	0.01	0.04	-	-
Isopoda	-	-	-	-	-	0.30	-
Mysidacea	9.09	12.01	1.84	1.10	0.18	2.57	0.01
Other Crustacea	-	-	-	0.32	-	0.12	-
ECHINODERMATA (Ophiuroidea)	-	-	0.14	-	0.01	-	-
MOLLUSCA	-	-	-	0.32	0.23	-	0.56
Bivalvia	-	-	-	-	0.04	-	0.06
Cephalopoda	-	-	-	0.32	-	-	0.49
Decapoda	-	-	-	-	-	-	0.49
Other Cephalopoda	-	-	-	0.32	-	-	-
Gastropoda	-	-	-	-	0.19	-	-
PISCES	-	10.56	2.97	5.09	5.39	3.29	6.10
Nezumia Bairdi	-	-	-	-	-	-	1.11
Fish larva	-	1.81	0.06	0.10	0.25	0.08	-
Myctophidae	-	-	-	-	-	-	0.49
Anarhichadidae	-	-	-	-	0.15	-	0.22
Triglops murrayi	-	-	-	0.68	1.01	0.57	1.66
Lumpenus lumpretaeformis	-	8.75	2.91	1.70	1.81	2.64	0.36
Pisces unidentified	-	-	-	2.61	2.17	-	2.25
OTHER INVERTEBRATES	-	4.86	5.75	3.67	1.24	0.69	0.13
Chaetognata	-	0.28	0.14	2.42	0.96	0.09	0.03
Cnidaria	-	-	-	0.07	0.08	-	0.01
Anthozoa	-	-	-	-	0.08	-	-
Scyphozoa	-	-	-	0.07	-	-	0.01
Polychaeta	-	4.58	5.61	1.19	0.19	0.60	0.09
OTHERS							
Unidentified	-	0.14	-	-	-	0.62	-
Stones	-	-	-	-	0.05	-	-
NUMBER OF FULL STOMACHS	9	62	51	162	160	62	111
MEAN STOMACHS CONTENT (cc)	0.12	0.23	1.70	2.45	5.06	8.36	14.60
MEAN LENGTH	13.89	16.37	23.14	27.14	31.73	37.45	42.18

Table 5.- Prey items found in *Gadus morhua* stomachs, expressed as percentage by volume, by length group (cm.).

Gadus morhua

	45-49	50-54	55-59	60-64	65-69	70-95	TOTAL
CRUSTACEA	85.01	77.91	69.32	62.43	52.41	13.75	61.39
Amphipoda	70.76	71.58	58.94	56.56	37.85	7.27	52.06
Gammaridae	0.09	0.01	1.13	-	0.03	-	0.07
Hyperiidea	70.31	71.47	57.38	56.56	37.46	7.27	51.77
Other Amphipoda	0.36	0.10	0.44	-	0.35	-	0.22
Copepoda (Calanoida)	-	-	-	-	-	-	0.06
Decapoda	14.24	6.28	9.89	5.87	14.56	6.48	9.08
Anomura (Paguridea)	-	0.73	-	-	0.76	-	0.17
Brachyura	-	-	-	-	7.61	3.04	1.66
Chionoecetes opilio	-	-	-	-	-	0.31	0.11
Hyas sp.	-	-	-	-	-	0.22	0.05
Lithodes maja	-	-	-	-	7.61	2.51	1.50
Natantia	14.19	5.56	9.89	5.81	6.19	3.03	7.11
Lebbeus polaris	0.05	-	-	-	1.05	-	0.16
Pandalus borealis	10.96	2.44	8.23	3.51	3.19	2.36	4.82
Sergestes arcticus	1.31	2.19	0.84	0.81	0.26	0.06	0.67
Spirontocaris lilljeborgi	0.44	0.42	-	-	0.18	-	0.21
Spirontocaris sp.	-	-	0.77	-	-	-	0.03
Pontophilus norvegicus	0.05	-	-	-	0.15	-	0.06
Sabinea sarsi	0.16	-	-	-	-	-	0.04
Other Crangonidae	-	-	-	-	0.15	-	0.07
Other Natantia	1.22	0.50	0.04	1.48	1.20	0.61	1.06
Other Decapoda	0.05	-	-	0.06	-	0.41	0.14
Mysidacea	0.01	0.05	-	-	-	-	0.14
Other Crustacea	0.01	-	0.49	-	-	-	0.03
MOLLUSCA	1.10	0.22	-	-	0.33	4.25	1.31
Bivalvia	-	-	-	-	0.03	0.05	0.02
Cephalopoda	-	-	-	-	0.30	0.10	1.27
Other Cephalopoda	-	-	-	-	0.30	0.10	0.07
Decapoda	1.10	0.22	-	-	-	4.10	1.21
Rossia Macrossoma	1.10	-	-	-	-	-	0.17
Other Teuthida	-	-	-	-	-	4.10	0.97
Other Decapoda	-	0.22	-	-	-	-	0.07
PISCES	13.73	16.35	30.31	37.30	46.69	81.12	36.16
Serrivomer beani	-	-	-	-	-	1.15	0.27
Synaphobranchus kaupi	0.39	-	-	-	-	-	0.06
Fish larva	0.07	-	-	-	-	-	0.03
Myctophidae	0.18	0.28	3.21	1.18	-	0.04	0.42
Anarhichadidae	0.49	-	-	-	-	18.69	4.52
Anarhichas minor	-	-	-	-	-	4.48	1.06
Anarhichas spp.	0.49	-	-	0.91	-	14.21	3.46
Anarhichas lupus	-	-	-	0.91	-	-	0.13
Triglops murrayi	-	-	-	-	0.20	0.26	0.33
Sebastes sp.	5.81	13.15	26.80	30.63	40.61	56.80	25.96
Lumpenus lumpretaeformis	3.61	-	-	-	-	0.44	0.92
Mallotus villosus	-	-	-	-	2.03	-	0.24
Pisces unidentified	3.19	2.91	0.30	4.59	3.85	3.75	3.17
OTHER INVERTEBRATES							
Chaetognata	-	-	0.28	-	0.18	-	0.15
Cnidaria (Scyphozoa)	0.02	-	0.08	0.01	-	-	0.01
Polychaeta	0.13	0.07	-	0.26	0.39	0.60	0.35
Polynoidae	0.02	-	-	-	0.18	-	0.02
Other Polychaeta	0.11	0.07	-	0.26	0.21	0.60	0.33
OTHERS							
Stones	-	-	-	-	-	0.27	0.07
Offal (waste products)	-	5.45	-	-	-	-	0.54
NUMBER OF FULL STOMACHS	89	48	16	37	30	36	873.00
MEAN STOMACHS CONTENT (cc)	27.99	34.40	44.41	63.27	65.73	108.49	
MEAN LENGTH	46.90	51.44	56.63	62.59	66.63	78.69	38.3

Table 5 cont.- Prey items found in *Gadus morhua* stomachs, expressed as percentage by volume, by length group (cm.).

Urophycis chesteri	12-19	20-32	TOTAL
CRUSTACEOS	100.00	98.88	99.16
Amphipoda	22.83	4.36	9.00
Hyperiidea	21.75	3.02	7.72
Other Amphipoda	1.08	1.34	1.28
Copepoda (Calanoida)	11.50	10.22	10.54
Decapoda	8.00	68.99	53.68
Natantia	6.67	68.99	53.35
Pandalus borealis	-	44.13	33.05
Pontophilus norvegicus	-	5.31	3.97
Other Natantia	6.67	19.55	16.32
Other Decapoda	1.33	-	0.33
Euphausiacea	11.67	-	2.93
Mysidacea	38.00	6.20	14.18
Other Crustacea	8.00	9.11	8.83
PISCES			
Pisces unidentified	-	1.12	0.84
NUMBER OF FULL STOMACHS	15	31	46.00
MEAN STOMACH CONTENT (cc)	0.40	0.58	
MEAN LENGTH	17.27	23.19	21.26

Table 6.- Prey items found in *Urophycis chesteri* stomachs, expressed as percentage by volume, by length group (cm.).

Nezumia bairdi

	2-4	5-7	8-10	TOTAL
CRUSTACEA	84.26	71.98	66.71	71.52
Amphipoda	34.15	20.68	15.61	20.39
Gammaridae	1.70	3.78	3.48	3.51
Hyperiidea	32.45	16.90	12.13	16.88
Copepoda (Calanoida)	-	0.99	1.35	1.01
Cumacea	-	0.31	-	0.19
Decapoda	9.57	23.49	31.10	24.49
Natantia	9.57	23.49	31.10	24.49
Pandalus borealis	-	3.47	-	2.14
Pasiphaea tarda	-	4.17	-	2.57
Pontophilus norvegicus	-	-	5.81	1.71
Other Crangonidae	-	2.31	4.13	2.64
Other Natantia	9.57	13.53	21.16	15.43
Euphausiacea	-	10.54	9.45	9.28
Isopoda	-	0.42	0.48	0.40
Mysidacea	38.40	10.80	2.00	10.67
Other Crustacea	2.13	4.75	6.71	5.10
ECHINODERMATA (Ophiuroidea)	-	1.45	0.42	1.02
MOLLUSCA (Bivalvia)	3.72	1.00	2.42	1.66
PISCES				
Lumpenus lumpretaeformis	-	2.65	-	1.63
OTHER INVERTEBRATES	12.02	21.59	30.45	23.35
Chaetognata	1.06	0.09	0.39	0.27
Cnidaria	-	0.43	1.48	0.70
Scyphozoa	-	0.31	1.48	0.63
Other Cnidaria	-	0.12	-	0.08
Polychaeta	10.96	21.06	28.58	22.38
UNIDENTIFIED	-	1.33	-	0.82
NUMBER OF FULL STOMACHS	20	80	27	127.00
MEAN STOMACH CONTENT (cc)	0.24	0.41	0.57	
MEAN LENGTH	3.40	6.08	8.48	6.17

Table 7.- Prey items found in *Nezumia bairdi* stomachs, expressed as percentage by volume, by length group (cm.).

Macrourus berglax

	5-14	15-31	TOTAL
CRUSTACEA	28.04	30.93	30.91
Amphipoda	15.71	0.53	0.60
Gammaridea	-	0.19	0.19
Hyperiidea	15.71	0.34	0.41
Decapoda	3.21	29.68	29.57
Natantia	3.21	29.54	29.43
Acanthephyra pelagica	-	0.54	0.54
Pandalus borealis	-	26.61	26.49
Sergestes arcticus	-	0.14	0.14
Sergia robusta	-	0.14	0.14
Other Crangonidae	-	0.19	0.19
Other Natantia	3.21	1.92	1.93
Other Decapoda	-	0.14	0.14
Euphausiacea	-	0.70	0.69
Isopoda	2.14	-	0.01
Other Crustacea	6.96	0.02	0.05
ECHINODERMATA	32.14	5.23	5.35
Echinoidea Irregularia	-	1.60	1.59
Echinoidea Regularia	-	0.05	0.05
Ophiuroidea	32.14	3.58	3.71
MOLLUSCA	-	1.88	1.88
Bivalvia	-	0.16	0.15
Cephalopoda Decapoda	-	1.63	1.62
Sepiida	-	0.47	0.46
Teuthida	-	1.16	1.16
Gastropoda	-	0.10	0.10
UNIDENTIFIED	-	0.05	0.05
PISCES	3.57	54.61	54.39
Serrivomer beani	-	45.01	44.81
Pisces unidentified	3.57	9.61	9.58
OTHER INVERTEBRATES	36.25	7.29	7.42
Cnidaria	9.29	2.49	2.52
Anthozoa	-	0.33	0.32
Scyphozoa	9.29	2.16	2.19
Polychaeta	26.96	4.75	4.84
Polynoidae	-	1.62	1.61
Other Polychaeta	26.96	3.13	3.23
Tunicata (Thaliacea)	-	0.06	0.06
NUMBER OF FULL STOMACHS	18	67	85.00
MEAN STOMACH CONTENT (cc)	0.16	9.63	
MEAN LENGTH	8.11	19.09	16.76

Table 8.- Prey items found in *Macrurus berglax* stomachs, expressed as percentage by volume, by length group (cm.).

Glyptocephalus cynoglossus

	16-24	25-29	30-34	35-39	40-44	45-56	TOTAL
CRUSTACEA	0.94	7.19	6.44	4.43	6.46	10.57	7.78
Amphipoda	0.94	5.53	2.97	2.87	5.38	10.33	6.66
Gammaridae	0.19	5.53	2.63	2.88	5.38	10.33	6.58
Hyperiidea	0.75	-	0.35	-	-	-	0.07
Copepoda (Calanoida)	-	-	-	-	-	0.25	0.10
Decapoda	-	0.18	2.97	0.48	0.10	-	0.49
Natantia	-	0.18	2.97	0.48	0.10	-	0.49
Other Crangonidae	-	-	2.97	0.48	-	-	0.46
Other Natantia	-	0.18	-	-	0.10	-	0.03
Isopoda	-	-	0.50	-	-	-	0.07
Other Crustacea	-	1.49	-	1.08	0.98	-	0.46
EQUINODERMATA (Ophiuroidea)	-	7.46	0.50	7.39	2.08	8.57	5.66
MOLLUSCA	2.74	5.09	4.31	5.07	4.21	4.78	4.60
Bivalvia	2.74	4.65	3.81	5.07	3.97	4.06	4.15
Gastropoda	-	0.44	0.50	-	0.25	0.72	0.45
OTHER	1.89	-	0.40	-	-	-	0.12
Unidentified	-	-	0.40	-	-	-	0.05
Stones	1.89	-	-	-	-	-	0.07
PISCES	-	-	-	-	-	0.10	0.04
Pisces unidentified	-	-	-	-	-	0.10	0.04
OTHER INVERTEBRATES	94.43	80.26	88.37	83.11	87.25	75.97	81.80
Polychaeta	94.43	80.26	88.37	83.11	87.25	71.82	80.05
Sipunculida	-	-	-	-	-	4.15	1.75
NUMBER OF FULL STOMACHS	25	31	24	28	34	36	178.00
MEAN STOMACH CONTENT	0.21	0.37	0.84	0.75	0.90	1.79	
MEAN LENGTH	22.28	27.13	31.58	37.46	41.91	49.39	36.00

Table 9.- Prey items found in *Glyptocephalus cynoglossus* stomachs, expressed as percentage by volume, by length group (cm.).

Hippoglossoides platessoides

	18-24	25-29	30-34	35-39	40-44	45-49	50-59	TOTAL
CRUSTACEA	4.02	1.69	5.01	9.23	7.05	28.08	0.78	11.92
Amphipoda	-	0.21	0.78	9.23	3.09	28.03	0.78	10.53
Gammaridae	-	-	-	0.23	-	-	-	0.03
Hyperiidea	-	0.21	0.78	9.00	3.09	28.03	0.78	10.49
Decapoda	-	0.28	4.23	-	3.82	-	-	1.24
Anomura (Paguridea)	-	0.28	-	-	-	-	-	0.01
Natantia	-	-	4.23	-	3.26	-	-	1.08
Pandalus borealis	-	-	-	-	2.81	-	-	0.70
Other Natantia	-	-	4.23	-	0.45	-	-	0.38
Other Decapoda	-	-	-	-	0.56	-	-	0.14
Mysidacea	2.87	0.84	-	-	-	-	-	0.08
Other Crustacea	1.15	0.35	-	-	0.14	0.05	-	0.08
EQUINODERMATA	75.92	89.30	88.80	89.01	91.66	71.70	99.10	86.31
Asteroidea	-	-	-	-	-	0.51	4.59	0.97
Echinoidea Irregularia	-	-	-	-	-	-	1.22	0.22
Echinoidea Regularia	-	-	-	-	1.21	0.10	-	0.33
Ophiuroidea	75.92	89.30	88.80	89.01	90.45	71.09	93.29	84.79
MOLLUSCA	-	0.81	0.51	0.28	0.93	0.22	0.11	0.43
Bivalvia	-	0.81	0.51	0.28	0.93	0.22	0.11	0.43
Pectinidae	-	-	-	-	-	-	0.06	0.01
Other Bivalvia	-	0.81	0.51	0.28	0.93	0.22	0.05	0.42
PISCES	10.86	6.38	-	-	-	-	-	0.45
Fish larva	3.22	0.20	-	-	-	-	-	0.05
Pisces unidentified	7.64	-	-	-	-	-	-	0.09
Lumpenus lumpretaeformis	-	6.18	-	-	-	-	-	0.31
OTHER INVERTEBRATES	9.20	1.62	5.68	1.20	0.36	-	-	0.83
Chaetognata	-	-	-	0.34	-	-	-	0.05
Polychaeta	9.20	1.62	5.68	0.86	0.36	-	-	0.78
OTHER	-	0.21	-	0.29	-	-	-	0.06
Unidentified	-	-	-	0.27	-	-	-	0.04
Stones	-	0.21	-	0.02	-	-	-	0.01
NUMBER OF FULL STOMACHS	20	57	45	69	68	48	31	338.00
MEAN STOMACH CONTENT (cc)	0.44	0.62	1.00	1.60	2.62	4.29	4.11	
MEAN LENGTH	22.60	26.60	31.64	37.19	42.00	46.71	52.03	37.48

Table 10.- Prey items found in *Hippoglossoides platessoides* stomachs, expressed as percentage by volume, by length group (cm.).

Reinhardtius hippoglossoides	11-14	15-19	20-24	25-29	30-34
CRUSTACEA	100.00	98.50	95.27	90.80	78.88
Amphipoda (Hyperiidea)	97.12	97.21	56.42	68.86	14.38
Decapoda	0.96	0.73	35.47	21.60	64.50
Anomura (Paguridea)	-	-	-	-	1.92
Natantia	0.96	0.40	35.47	21.60	62.58
Pandalus borealis	-	-	35.47	4.32	57.56
Other Natantia	0.96	0.40	-	17.28	5.01
Other Decapoda	-	0.33	-	-	-
Other Crustacea	1.92	0.56	3.38	0.35	-
MOLLUSCA	-	-	-	-	3.21
Bivalvia	-	-	-	-	0.01
Cephalopoda		-			
Decapoda; *Brachioteuthis* sp.)	-	-	-	-	3.21
PISCES	-	1.50	4.73	8.60	17.82
Serrivomer beani	-	-	-	-	2.88
Nezumia bairdi	-	-	-	-	6.73
Pisces unidentified	-	1.50	4.73	8.21	4.81
Anarhichas sp.	-	-	-	-	1.79
Lumpenus lumpretaeformis	-	-	-	-	1.60
Fish eggs	-	-	-	0.39	-
OTHER INVERTEBRATES	-	-	-	0.60	0.04
Polychaeta	-	-	-	0.60	0.04
UNIDENTIFIED	-	-	-	-	0.05
NUMBER OF FULL STOMACHS	19	69	24	47	32
MEAN STOMACH CONTENT	0.27	0.62	1.23	1.97	9.75
MEAN LENGTH	13.05	16.75	23.17	26.53	32.75

Table 11.- Prey items found in *Reinhardtius hippoglossoides* stomachs, expressed as percentage by volume, by length group (cm.).

Reinhardtius hippoglossoides

	35-39	40-44	45-49	50-54	55-79	TOTAL
CRUSTACEA	45.42	21.61	7.65	2.93	12.00	16.02
Amphipoda (Hyperiidea)	8.06	0.13	0.31	0.18	-	2.74
Decapoda	37.35	21.48	7.34	2.70	11.96	13.24
Natantia	37.35	21.48	7.34	2.52	11.96	13.12
Acanthephyra pelagica	-	1.74	-	0.21	0.17	0.30
Gennadas sp.	-	-	-	0.07	-	0.02
Pandalus borealis	36.72	17.41	6.81	1.72	11.79	11.82
Pasiphaea tarda	-	-	-	0.18	-	0.04
Pontophilus norvegicus	-	-	-	0.24	-	0.05
Sergestes arcticus	-	-	-	0.06	-	0.01
Spirontocaris lilljeborgi	-	-	0.02	-	-	-
Other Natantia	0.63	2.34	0.51	0.04	-	0.87
Other Decapoda	-	-	-	0.18	-	0.04
Euphausiacea	-	-	-	0.05	0.03	0.02
Other Crustacea	-	-	-	-	0.02	0.03
ECHINODERMATA	0.36	0.20	0.01	-	0.50	0.18
Asteroidea	-	-	-	-	0.50	0.14
Ophiuroidea	0.36	0.20	0.01	-	-	0.04
MOLLUSCA	-	-	3.48	1.21	1.29	1.72
Cephalopoda						
Decapoda	-	-	3.28	1.21	0.02	1.30
Histioteuthis sp.	-	-	-	-	0.02	0.01
Illex coindeti	-	-	3.28	-	-	0.91
Other Decapoda	-	-	-	1.21	-	0.26
PISCES	54.23	78.12	88.46	95.56	86.21	81.89
Serrivomer beani	11.50	32.73	39.56	43.04	25.74	31.99
Gadidae	-	2.72	-	-	18.90	5.62
Gadus Morhua	-	-	-	-	18.90	5.30
Urophycis sp.	-	2.72	-	-	-	0.32
Nezumia bairdi	-	-	1.69	10.13	2.92	3.74
Antimora rostrata	-	-	-	15.07	-	3.25
Mictophidae	-	-	12.90	3.01	3.01	5.07
Lampadena speculigera	-	-	12.90	3.01	3.01	5.07
Other Myctophidae	14.23	-	8.68	5.33	0.99	4.47
Parelepis atlantica	-	3.13	-	-	-	0.37
Sebastes sp.	4.31	23.74	15.41	14.47	31.45	19.23
Chauliodus sloani	-	-	-	0.08	-	0.02
Mallotus villosus	5.75	-	-	-	-	0.26
Stomias ferox	3.16	-	-	-	-	0.14
Pisces unidentified	15.28	15.80	10.22	4.43	3.20	7.58
OTHER INVERTEBRATES						
Cnidaria	-	0.07	-	-	-	0.01
Porifera	-	-	0.12	0.30	-	0.10
OTHERS Offal (waste products)	-	-	0.28	-	-	0.08
NUMBER OF FULL STOMACHS	35	42	59	38	27	392.00
MEAN STOMACH CONTENT (cc)	9.94	21.91	36.12	43.66	79.96	
MEAN LENGTH	36.69	42.07	47.25	51.87	59.44	34.87

Table 11 cont.- Prey items found in *Reinhardtius hippoglossoides* stomachs, expressed as percentage by volume, by length group (cm.).

Sebastes juvenile	10-14	15-20	TOTAL
CRUSTACEA	96.36	94.93	95.26
Amphipoda (Hyperiidea)	3.64	18.04	14.74
Copepoda (Calanoida)	53.64	51.15	51.72
Decapoda (Natantia)	-	0.68	0.52
Mysidacea	8.64	15.47	13.91
Other Crustacea*	30.45	9.59	14.38
OTHER INVERTEBRATES			
Chaetognata	3.64	5.07	4.74
NUMBER OF FULL STOMACHS	29	59	88.00
MEAN STOMACH CONTENT (cc)	0.15	0.25	
MEAN LENGTH	12.86	16.05	15.00

*.- Unidentified crustaceans due to their digested condition.

Table 12.- Prey items found in *Sebastes* juvenile stomachs, expressed as percentage by volume, by length group (cm.).

Sebastes fasciatus	16-19	20-24	25-40	TOTAL
CRUSTACEA	98.87	98.86	65.70	83.76
Amphipoda	1.69	7.64	10.33	8.44
Hyperiidea	1.69	6.54	5.07	5.52
Other Amphipoda	-	1.10	5.26	2.92
Copepoda (Calanoida)	39.44	47.38	25.11	36.67
Decapoda	0.28	20.00	3.29	10.99
Natantia	0.28	20.00	3.29	10.99
Pandalus borealis	-	6.33	-	3.00
Sergestes arcticus	-	3.00	-	1.42
Other Natantia	0.28	10.68	3.29	6.57
Euphausiacea	-	3.27	2.41	2.65
Mysidacea	12.39	5.38	9.21	7.62
Other Crustacea*	45.07	15.19	15.35	17.38
PISCES	-	-	31.80	14.49
Nezumia bairdi	-	-	9.87	4.50
Myctophidae	-	-	21.93	9.99
OTHER INVERTEBRATES				
Chaetognata	1.13	1.14	2.50	1.76
NUMBER OF FULL STOMACHS	17	58	34	109.00
MEAN STOMACH CONTENT	0.42	0.82	1.34	
MEAN LENGTH	17.88	22.47	27.91	23.45

*.- Unidentified crustaceans due to their digested condition.

Table 13.- Prey items found in *Sebastes fasciatus* stomachs, expressed as percentage by volume, by length group (cm.).

Sebastes marinus

	14-19	20-24	25-29	30-34	35-44	TOTAL
CRUSTACEA	90.93	82.73	73.18	67.98	60.06	69.54
Amphipoda	3.33	33.41	15.80	23.70	42.69	28.18
Hyperiidea	3.33	33.41	15.80	23.70	42.69	28.18
Copepoda (Calanoida)	51.48	46.29	50.10	43.12	6.51	33.68
Decapoda	-	-	1.43	-	9.43	3.69
Natantia	-	-	1.43	-	9.43	3.69
Pandalus borealis	-	-	-	-	8.57	2.91
Other Natantia	-	-	1.43	-	0.86	0.78
Mysidacea	2.78	-	0.86	1.16	1.43	1.04
Other crustacea*	33.33	3.03	4.99	-	-	2.95
PISCES	-	-	-	1.73	29.49	10.30
Myctophidae	-	-	-	-	11.43	3.88
Sebastes sp.	-	-	-	-	0.06	0.02
Pisces unidentified	-	-	-	1.73	18.00	6.40
OTHER INVERTEBRATES						
Chaetognata	9.07	17.27	26.82	29.71	10.46	20.06
UNIDENTIFIED	-	-	-	0.58	-	0.10
NUMBER OF FULL STOMACHS	14	41	45	24	18	142.00
MEAN STOMACH CONTENT (cc)	0.19	0.32	0.78	0.72	1.94	
MEAN LENGTH	17.64	22.24	27.31	31.54	37.44	26.89

*.- Unidentified crustaceans due to their digested condition.

Table 14.- Prey items found in *Sebastes marinus* stomachs, expressed as percentage by volume, by length group (cm.).

Sebastes mentella

	19-24	25-29	30-34	35-46	TOTAL
CRUSTACEA	91.27	85.56	84.95	48.40	63.80
Amphipoda	21.78	16.53	7.63	11.08	12.21
Hyperiidea	18.95	16.36	6.72	11.08	11.91
Other Amphipoda	2.83	0.17	0.91	-	0.30
Copepoda (Calanoida)	15.06	7.29	1.70	1.04	3.11
Decapoda	30.48	36.58	65.56	27.69	35.42
Natantia	23.49	36.58	64.84	27.69	35.00
Sergestes arcticus	1.20	-	2.90	2.50	1.97
Sergia robusta	-	-	11.05	1.30	2.43
Pandalus borealis	-	-	34.42	6.85	9.23
Parapasiphaea sulcatifrons	-	-	0.91	0.19	0.25
Pasiphaea tarda	-	-	-	11.11	6.56
Other Pasiphaeidae	-	0.77	-	0.07	0.20
Other Natantia	22.29	35.81	15.56	5.67	14.36
Other Decapoda	6.99	-	0.72	-	0.43
Euphausiacea	-	16.13	8.70	8.10	9.54
Mysidacea	1.20	0.38	-	-	0.14
Other Crustacea*	22.74	8.65	1.36	0.50	3.38
MOLLUSCA	-	-	-	6.94	4.10
Cephalopoda (Decapoda; Teuthida)	-	-	-	6.94	4.10
PISCES	7.29	13.03	14.76	43.80	31.18
Serrivomer beani	-	-	-	11.00	6.49
Myctophidae	-	6.39	-	11.11	7.92
Lumpenus lumpretaeformis	1.20	-	-	-	0.05
Fish larva	-	-	1.27	-	0.19
Other Pisces	6.08	6.64	13.50	21.69	16.53
OTHER INVERTEBRATES	1.45	1.42	0.29	0.68	0.81
Chaetognata	1.45	1.19	0.29	0.31	0.54
Cnidaria	-	0.23	-	0.05	0.08
Polychaeta	-	-	-	0.32	0.19
UNIDENTIFIED	-	-	-	0.19	0.11
NUMBER OF FULL STOMACHS	33	68	27	34	162.00
MEAN STOMACHS CONTENT (cc)	0.50	1.15	2.04	6.35	
MEAN LENGTH	21.88	26.54	32.00	38.38	28.99

*.- Unidentified crustaceans due to their digested condition.

Table 15.- Prey items found in *Sebastes mentella* stomachs, expressed as percentage by volume, by length group (cm.).

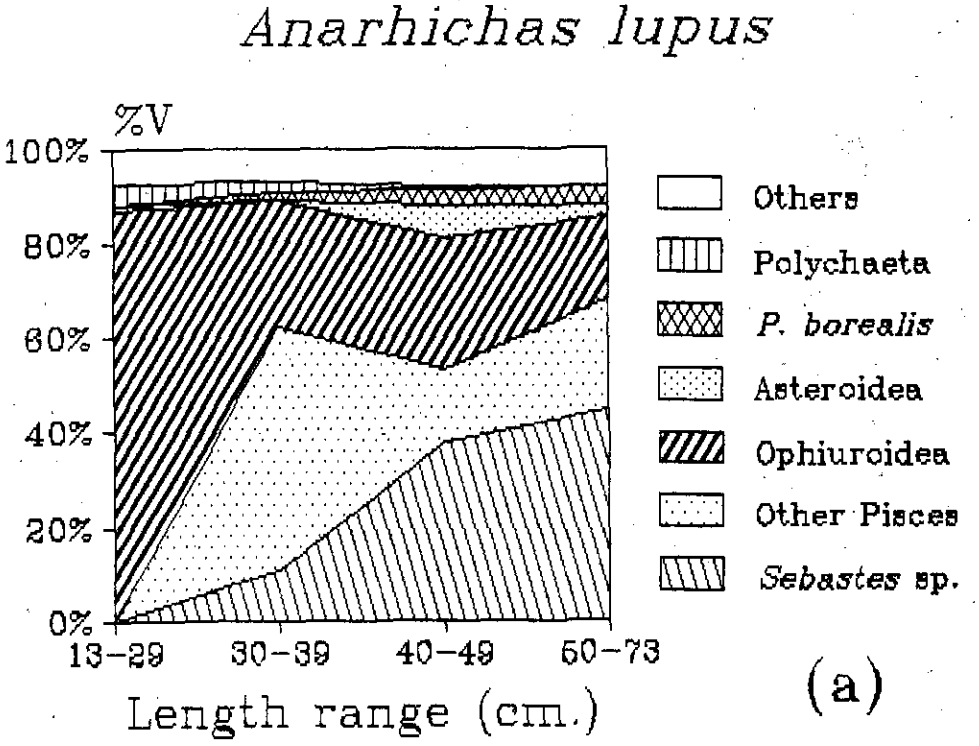
Lycodes reticulatus	21-24	25-29	30-45	TOTAL
CRUSTACEA	10.65	25.60	41.38	34.13
Amphipoda	0.32	0.60	0.09	0.26
Decapoda	10.32	25.00	41.28	33.87
Natantia	10.32	25.00	41.28	33.87
Pandalus borealis	-	25.00	27.52	24.36
Other Natantia	10.32	-	13.76	9.51
EQUINODERMATA (Ophiuroidea)	77.74	67.50	42.57	52.84
MOLLUSCA (Bivalvia)	0.97	1.60	0.41	0.80
PISCES				
Nezumia bairdi	-	-	13.76	8.60
OTHER INVERTEBRATES	10.65	5.30	1.88	3.64
Polychaeta	9.03	5.20	1.88	3.47
Sipunculida	1.61	0.10	-	0.17
NUMBER OF FULL STOMACHS	12	24	36	72.00
MEAN STOMACH CONTENT	0.26	0.42	0.61	
MEAN LENGTH	22.83	27.67	34.81	30.43

Table 16.- Prey items found in *Lycodes reticulatus* stomachs, expressed as percentage by volume, by length group (cm.).

Raja radiata

	14-44	45-54	55-64	65-82	TOTAL
CRUSTACEA	70.72	52.51	41.14	26.51	37.92
Amphipoda	13.28	3.50	0.69	0.07	1.53
Gammaridae	12.55	2.56	0.35	-	1.19
Hyperiidea	0.73	0.94	0.34	0.07	0.33
Decapoda	56.23	47.95	39.39	26.30	35.74
Anomura (Paguridea)	2.57	0.60	0.21	-	0.30
Brachyura	0.48	0.12	2.74	0.08	1.00
Chionoecetes opilio	-	-	2.29	-	0.76
Hyas sp.	0.48	-	-	0.08	0.06
Lithodes maja	-	-	0.45	-	0.15
Natantia	53.18	47.22	36.44	26.22	34.44
Crangonidae	0.48	0.09	0.03	-	0.05
Pandalus borealis	50.14	37.38	33.63	24.95	31.18
Pontophilus norvegicus	-	2.32	0.99	0.22	0.81
Sergestes arcticus	0.76	-	0.88	0.22	0.43
Sergia robusta	-	-	0.25	-	0.08
Spirontocaris lilljeborgi	-	0.31	-	-	0.05
Other Natantia	1.81	7.12	0.66	0.83	1.84
Euphausiacea	1.01	0.70	1.06	0.09	0.56
Isopoda	-	0.23	-	-	0.04
Mysidacea	0.02	0.02	-	-	-
Pantopoda (Pycnogonidae)	-	0.12	-	-	0.02
EQUINODERMATA	0.24	-	0.18	-	0.07
Asteroidea	0.24	-	-	-	0.01
Ophiuroidea	-	-	0.18	-	0.06
MOLLUSCA	0.36	4.55	2.13	6.13	4.24
Bivalvia	-	-	0.02	-	0.01
Cephalopoda	0.36	4.55	2.10	6.13	4.23
Decapoda	-	1.95	0.36	-	0.44
Histioteuthis sp.	-	1.39	-	-	0.23
Rossia macrossoma	-	-	0.36	-	0.12
Other Sepiolidae	-	0.56	-	-	0.09
Octopoda	-	1.86	1.73	5.22	3.24
Bathypolypus arcticus	-	1.39	1.50	5.22	3.09
Other Octopoda	-	0.46	0.23	-	0.15
Other Cephalopoda	0.36	0.74	0.02	0.91	0.55
PISCES	11.83	36.72	55.00	66.98	55.19
Serrivomer beani	-	6.97	4.69	10.23	7.32
Gadus morhua	-	-	0.38	27.66	12.64
Macrouridae	-	1.55	4.05	-	1.60
Myctophidae	-	5.57	-	2.71	2.13
Paralepididae	-	-	-	7.19	3.25
Aspidophoroides monopterygius	-	-	0.53	-	0.18
Anarhichas sp.	-	-	25.09	11.06	13.37
Triglops murrayi	0.71	0.33	-	-	0.09
Sebastes sp.	9.98	13.08	9.91	-	5.94
Lumpenus lumpretaeformis	-	2.75	1.31	0.18	0.96
Chauliodus sloani	-	-	3.15	-	1.05
Pisces unidentified	1.14	6.48	5.88	7.94	6.66
OTHER INVERTEBRATES					
Cnidaria (Scyphozoa)	1.66	-	0.79	-	0.35
Polychaeta	15.18	6.22	0.77	0.38	2.23
NUMBER OF FULL STOMACHS	29	33	39	26	127.00
MEAN STOMACH CONTENT (cc)	7.26	19.58	34.16	69.53	
MEAN LENGTH	35.07	50.15	59.85	70.54	53.86

Table 17.- Prey items found in *Raja radiata* stomachs, expressed as percentage by volume, by length group (cm.).



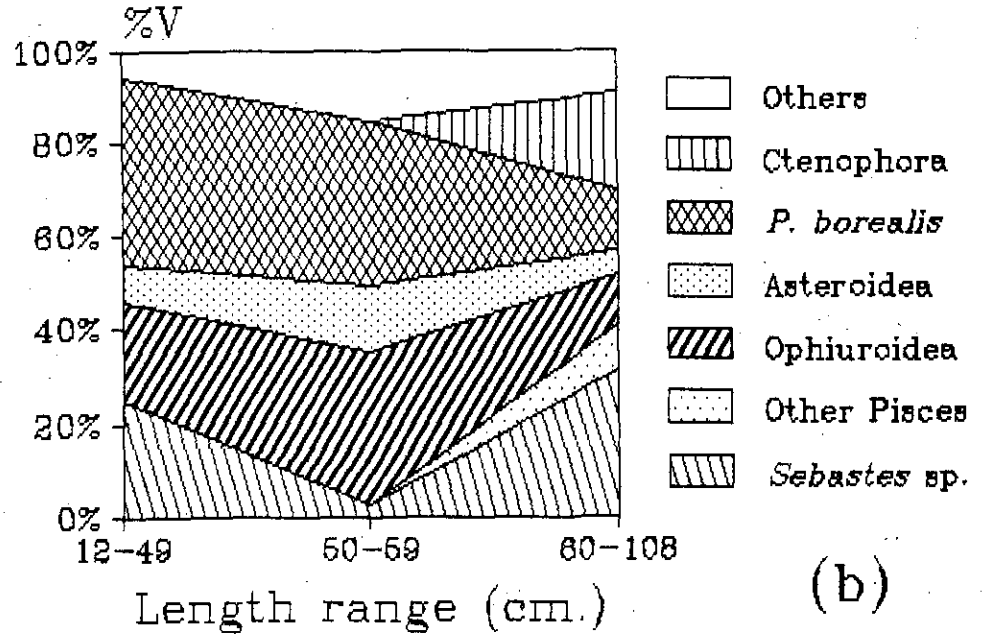


Figure 1.- Volume of various food components by length groups, given as cumulative percentages.

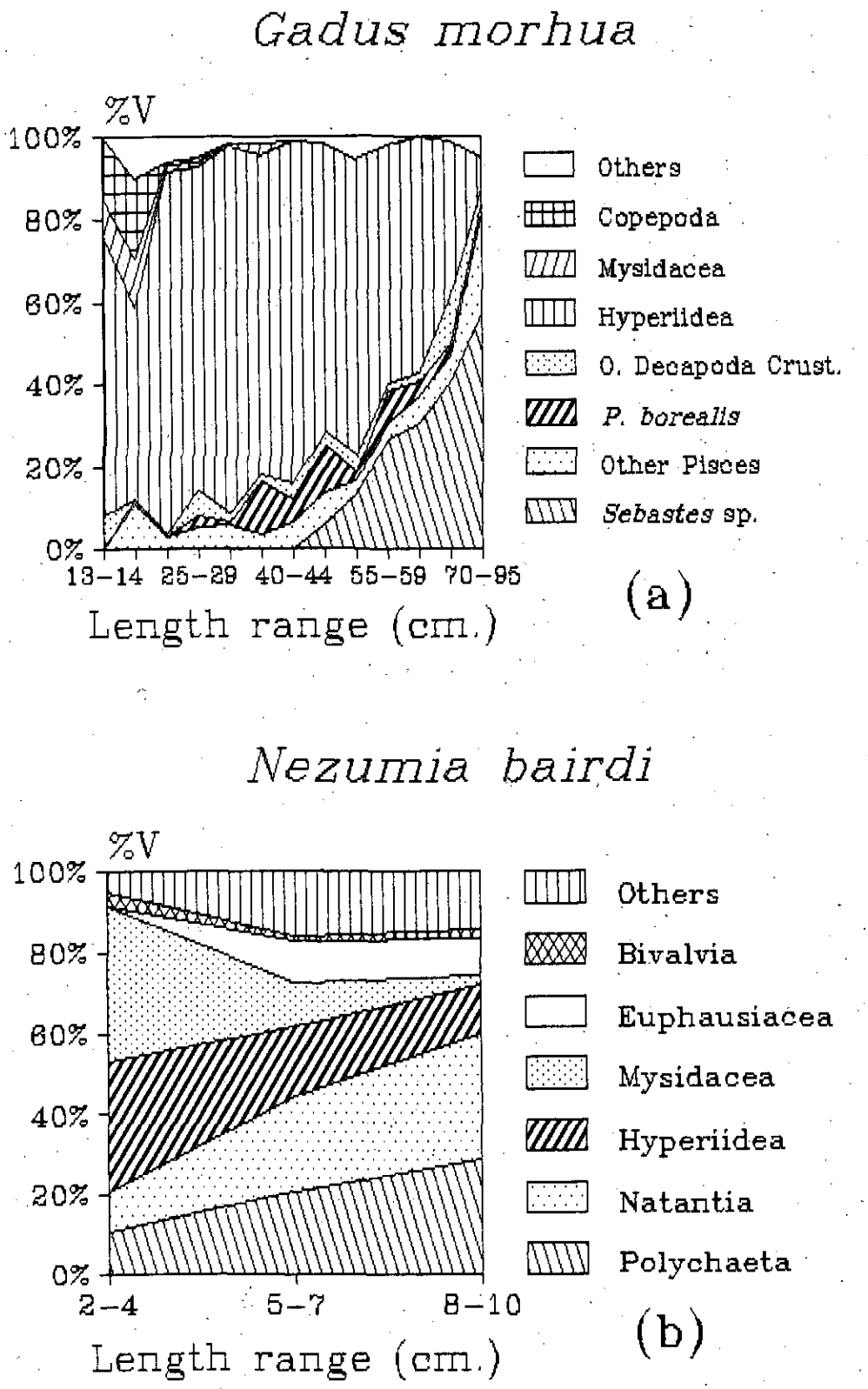
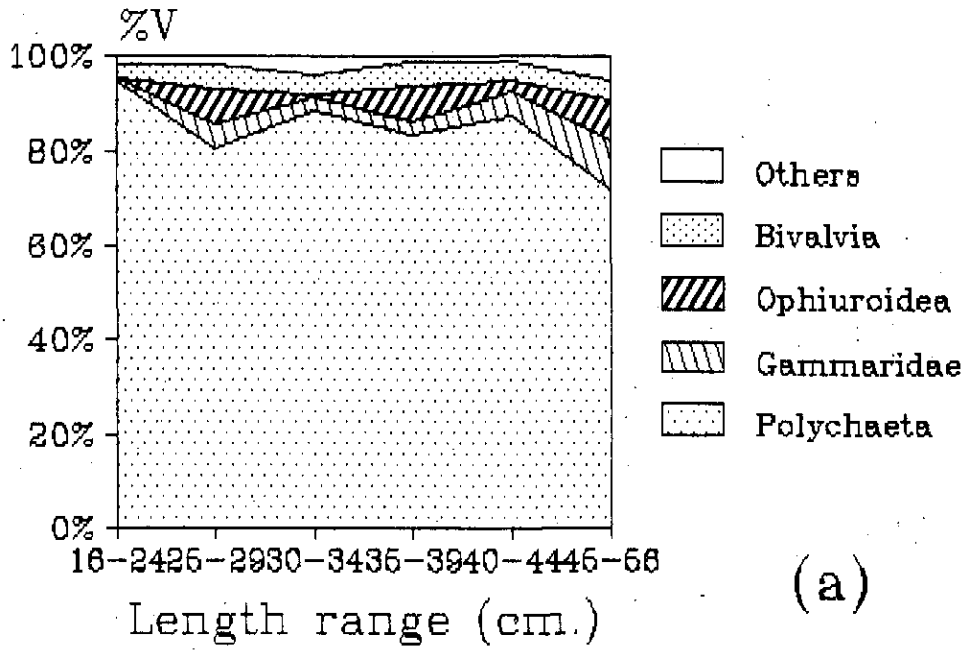


Figure 2.- Volume of various food components by length groups given as cumulative percentages

Glyptocephalus cynoglosus



Hippoglossoides platessoides

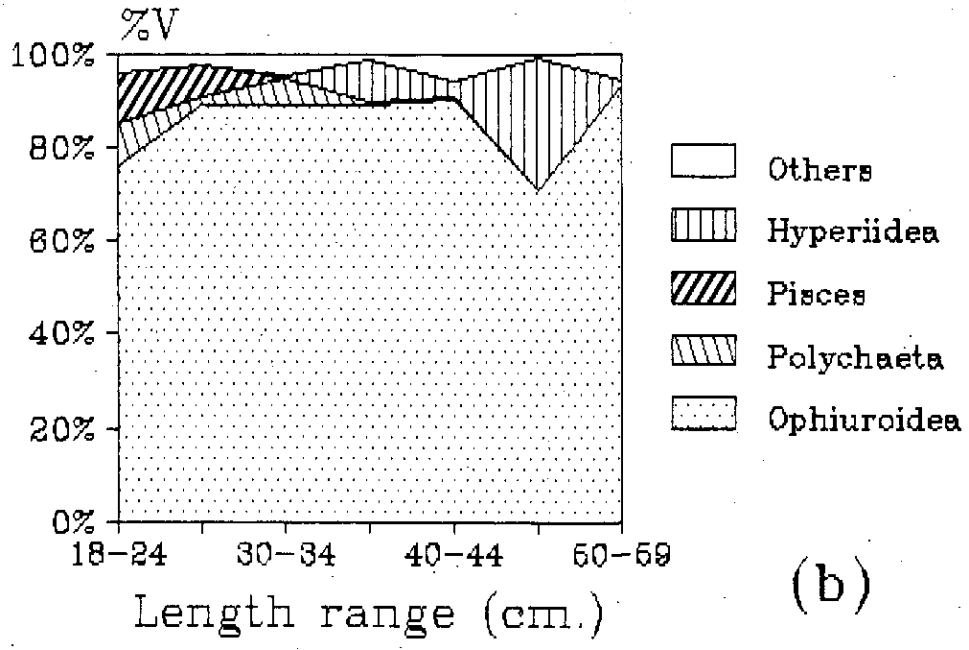


Figure 3.- Volume of various food components by length groups given as cumulative percentages.

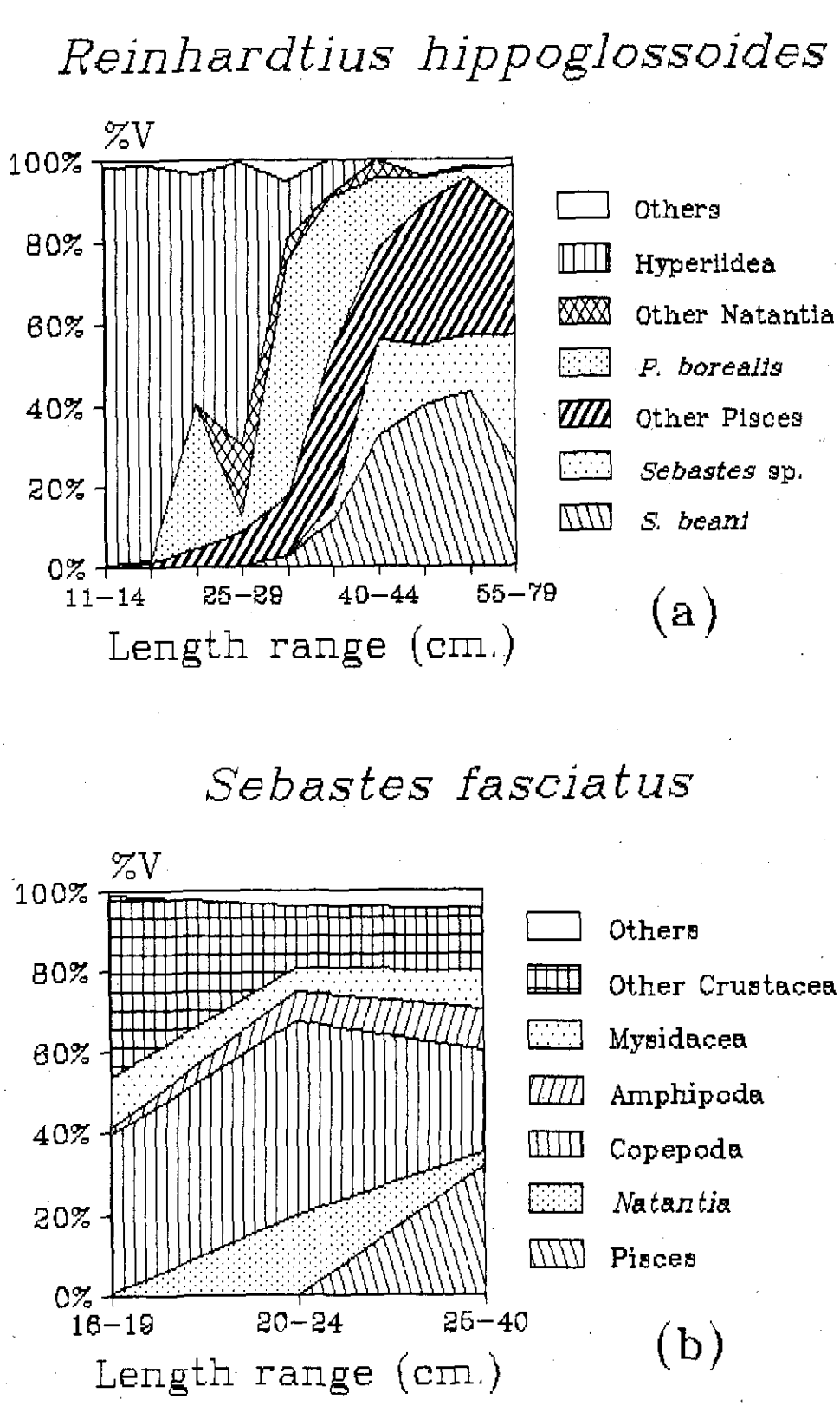
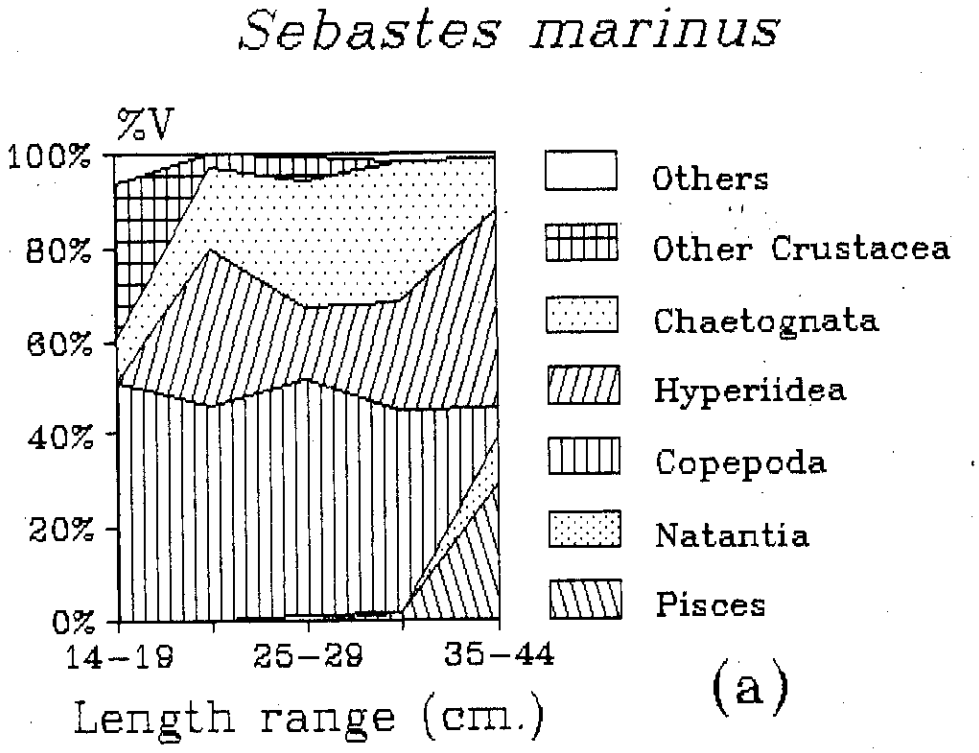


Figure 4.- Volume of various food components by length groups given as cumulative percentages.



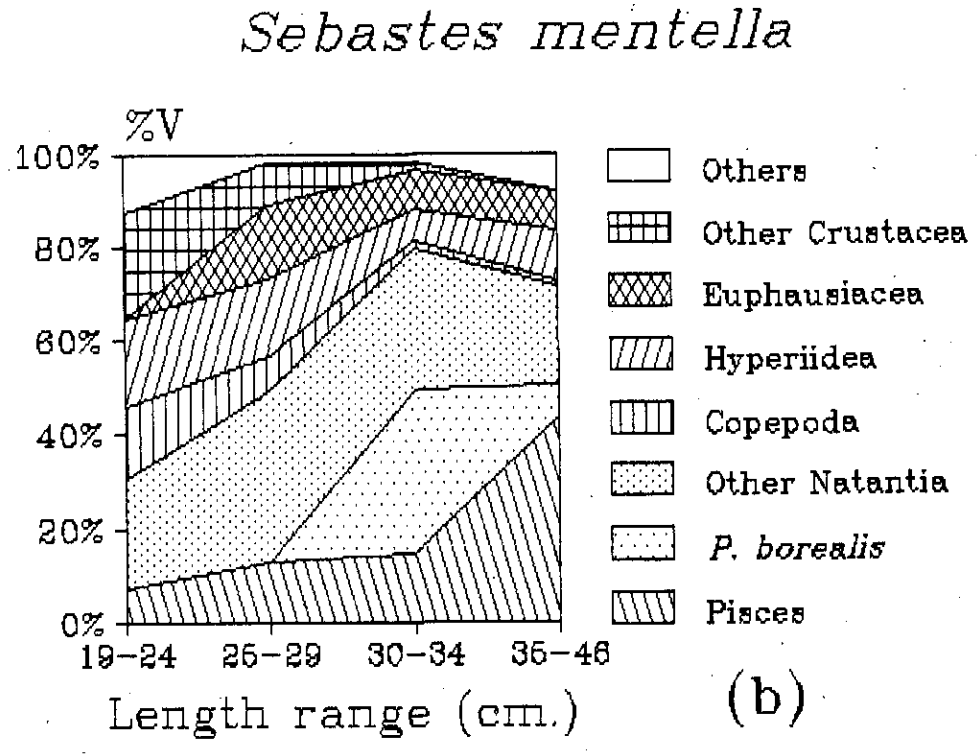


Figure 5.- Volume of various food components by length groups given as cumulative percentages.

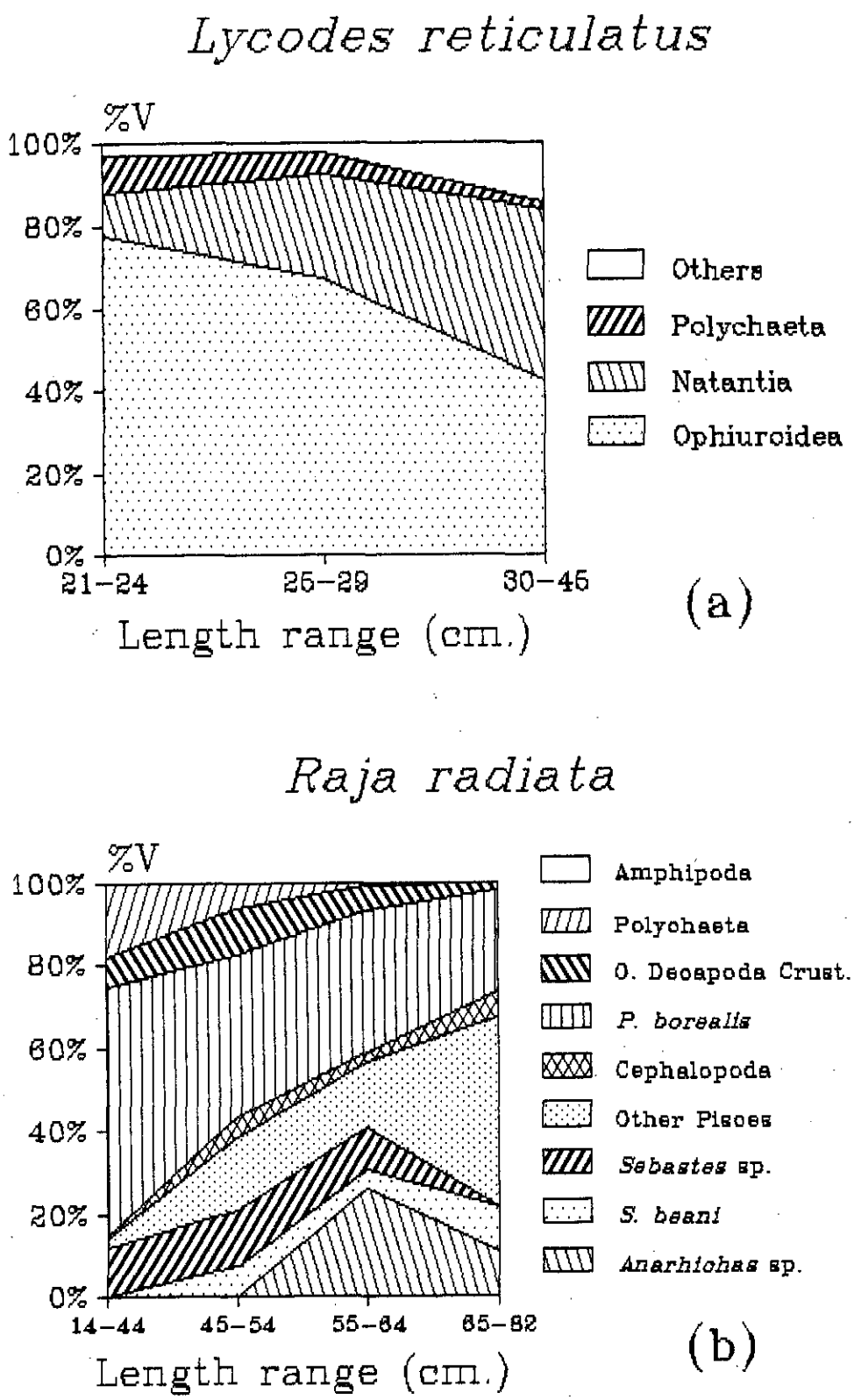


Figure 6.- Volume of various food components by length groups given as cumulative percentages.