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The percentage of capelin in the stomach contents of cod in ICNAF Subareas 2 and 3¹

by

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Investigations of the feeding habits and food intake of cod in Divisions 2J-3K and 3LNOP were conducted in the years 1962-1965. The material was obtained with the aid of a bottom trawl. Table 1 contains the data concerning the investigations and quantities of material collected.

Taken into account in the investigations were: feeding intensity of cod, kind of food and frequency with which it occurs in the stomach contents and in some cases - the percentage of particular food groups in the stomach contents.

As no capelin was noted in the stomach contents of cod from Division 3M, its feeding in this Division will not be presented here.

Feeding Intensity and Food Composition in the Cod

Data on the intensity of feeding were obtained by defining the extent to which the stomach was filled, applying a 5-grade scale (from 0 to 4). The results of investigations given in Table 2 show that in both Division 2J-3K and 3LNOP the cod feeds least intensively in winter, when the number of fish with empty stomachs exceeded 50%. The periods of most intensive feeding were summer and autumn in Div. 2J-3K, and spring-summer in Div. 3LNOP. In general, the cod fed less intensively in Div. 2J-3K than in Div. 3LNOP.

The composition of the stomach contents of the cod in Div. 2J-3K and 3LNOP is given according to the seasons, in Figs. 2 and 3. It results from the data the cod food was

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very varied in Div.3LNOP, slightly less in Div.2J-3K and depended on both the locality of the species, season and availability of food. From the point of view of frequency, there were usually one or two components of the food in Div. 2J-3K, and in Div.3LNOP the number of predominating components reached 4.

Capelin in the Composition of Food

Frequency of occurrence of capelin

The percentage of cod feeding on capelin in Div.2J-3K was not very high and amounted to 1.7 in the 1st and 2nd quarters and 2.6 in the 4th.

In Div.3LNOP an average of 32.9% of cod fed on capelin in the spring season. It can be seen from the data in Table 1, that the greatest number of cod feeding on capelin was in Div.3L and 3O, where the amount found in the stomach contents was from 30.6 to 85.9%. In Div.3N, however, no capelin was found in the stomach contents of the cod.

In Div.3LNOP 9.7% of the cod fed on capelin during the winter, 6.3% during the summer and only 0.7% in the autumn.

Percentage of capelin in the stomach contents of cod

It can be seen from the data in Table 3 that the mean percentage of capelin in the stomach contents of the cod differs in Div.2J-3K and 3LNOP and also varies depending upon the seasons.

During the 2nd quarter, capelin comprised 5% of the stomach contents of all cod investigated (irrespective of the lack or presence of capelin), and in the 4th quarter - only 0.7% in Div.2J-3K.

In Div.3LNOP, the percentage of capelin in the stomach contents of cod was 26.1% in the 2nd quarter and 2.5% in the 3rd, but only 0.4% in the 4th.

When taking into account only those cod which had capelin in the stomach contents, the percentage values are much higher (Table 3).

The percentage indices of capelin in the stomach contents of cod were highest in the spring, in Div.3LNOP. Data given in Table 1 show that the percentage of capelin in the stomach contents of cod in Div. 3L and 3O was from 6.8 to 64.2.

The importance of capelin in the stomach contents of cod depending upon its total length

In order to state whether or not there are differences in the feeding habits of cod depending upon their size, a graph has been drawn up which is based on material obtained from the Division during the period of the highest feeding intensity, i.e. in Div. 3L at the end of May and throughout June.

It can be seen from the graph that most frequently, cod with lengths of 31 to 60 cm fed on capelin. The extent to which cod feeds on capelin increases with the length up to 41-50 cm, and then gradually decreases with the increase in length.

The percentage of capelin in the stomach contents of cod thus also depended upon the length of the cod. Capelin comprised the major part of the stomach contents of 21-60 cm length class cod, and particularly in the 31-40 cm group.

Conclusion

It was found from the data that only in Div. 3LNOP, during the spring, was capelin the basic component of the stomach contents of the cod. It played a modest role during the winter season. In other seasons in Div. 3LNOP and all seasons in Div. 2J-3K, capelin played a very small role in the feeding of cod. Capelin was primarily noted in the stomach contents of 31-60 cm length class cod.

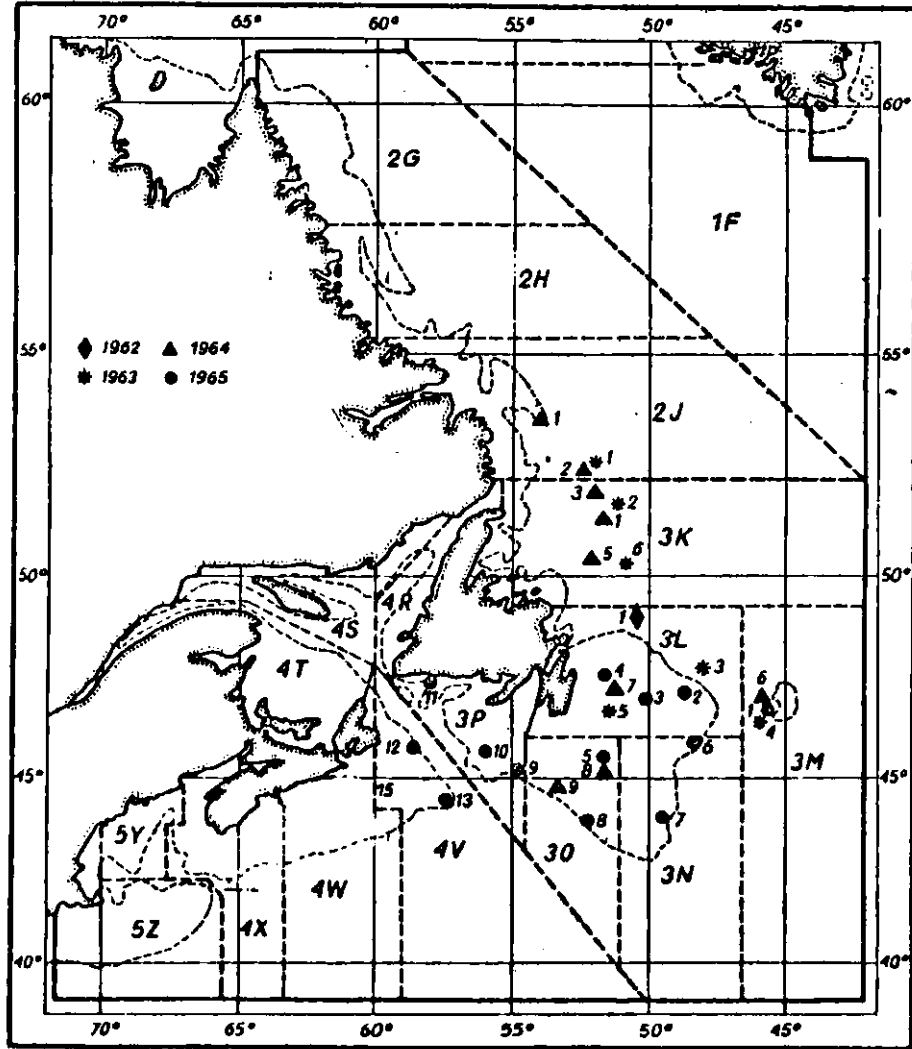


Fig. 1. Distribution of sites where samples were taken for investigations related to the food and feeding of cod for 1962—1965 (figures mean the numbers of sampling sites in particular years). In the map the division into areas and their designation are according to ICNAF

Table 1

Data on the material examined

Year	Division	Number of station	Month	Depth in m.	Type of fishing	Number of cod investi- gated acc.to:		Percentage of capelin in stomach contents of cod	Mean percentage of capelin in stomach contents of a single cod
						feeding intensity	kind of food		
1962	3L	1	October	330	C	156	156	0	0
	2J	1	February	330-340	C	329	-	3,4	-
	3K	2	February	148-236	C	561	-	0	-
	3K	6	December	?	C	88	85	2,6	0,7
1963	3L	3	January	320-330	C	311	-	9,7	-
	3L	5	November	105-130	C	146	146	1,4	0,7
	3M	4	March	300-450	C	534	-	0	-
	2J	1	April	176-188	R	171	-	0	-
1964	2J	2	June	295-450	R	515	366	0	0
	3K	3	June	400-430	R	128	-	0	-
	3K	4	June	260-435	R	323	163	0	0
	3K	5	June	220-240	R	303	92	8,4	15,0
	3L	7	July	120-140	R	451	451	80,2	63,2
	3M	6	June	260-440	R	252	43	0	0
	30	8	June/July	70-80	R	689	528	5,0	5,0
	30	9	July	100-120	R	50	50	0	0
	3L	2	May/June	120-220	R	402	402	51,4	40,3
	3L	3	June	80-84	R	406	406	30,6	15,7
	3L	4	June	120-140	R	414	414	70,0	52,5
	1965	3M	1	April and June	180-360	R	278	278	0
3N		6	April	120-180	R	716	716	0	0
3N		7	April	40-180	R	137	137	0	0
30		8	April	110-180	R	235	235	85,9	64,2
30		5	May	68-90	R	413	413	13,3	6,8
3P		11	April	220-260	R	48	48	9,7	3,1
3P		9	April	120	R	32	32	46,4	31,2
3P		10	April/May	60-330	R	409	409	21,6	10,4

x/ Research stations numbered in accordance with Fig.1.

C - Commercial fishing

R - Research fishing

Table 2

Feeding intensity of ood

Quarters of the year	Divisions 2J - 3K					Mean	Divisions 3LNOP					Mean
	% of fish with various amounts of stomach contents						% of fish with various amounts of stomach contents					
	empty	traces	modest amount	large amount	full		empty	traces	modest amount	large amount	full	
	0	1	2	3	4		0	1	2	3	4	
I	54,8	30,1	12,8	2,1	0,1	0,5	66,8	15,2	13,1	3,9	1,7	0,6
II	22,9	36,5	31,2	7,9	1,4	1,2	10,8	36,5	34,4	11,6	6,7	1,9
III	6,0	35,5	38,0	16,6	3,8	1,7	14,4	25,6	28,8	18,8	12,3	1,9
IV	3,4	33,0	50,0	12,5	1,1	1,7	20,3	25,4	40,1	12,2	2,0	1,5

Table 3

Percentage of capelin in the stomach contents of ood

Quarters of the year	Divisions 2J - 3K			Divisions 3LNOP		
	Mean percentage of capelin in the stomach contents of ood		Mean percentage of ood with empty stomachs	Mean percentage of capelin in the stomach contents of ood		Mean percentage of ood with empty stomachs
	Concerns all ood investigated	Concerns ood with capelin in stomach contents		Concerns all ood investigated	Concerns ood with capelin in stomach contents	
I	No investigation		22,9	No investigation		10,8
II	5,0	27,7		26,1	58,9	
III	No investigation		3,4	2,5	38,5	14,4
IV	0,7	50,0		0,4	15,5	20,3

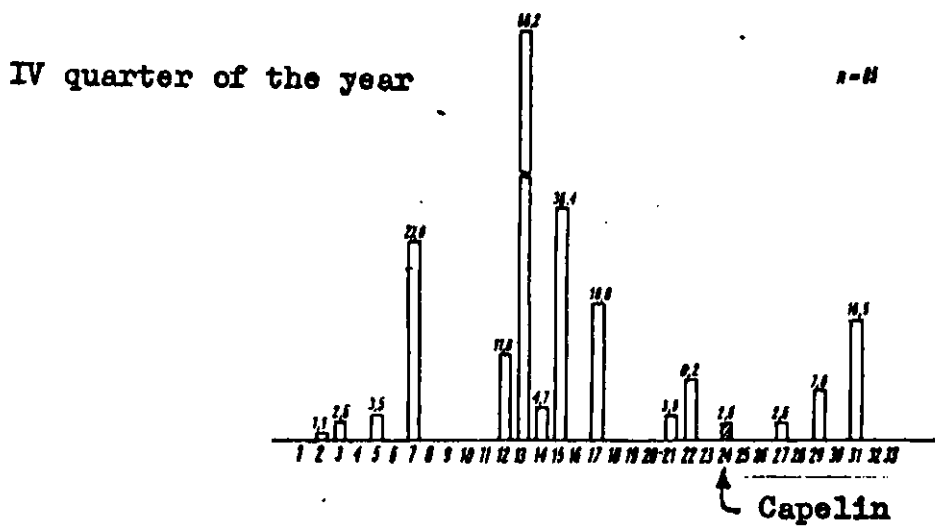
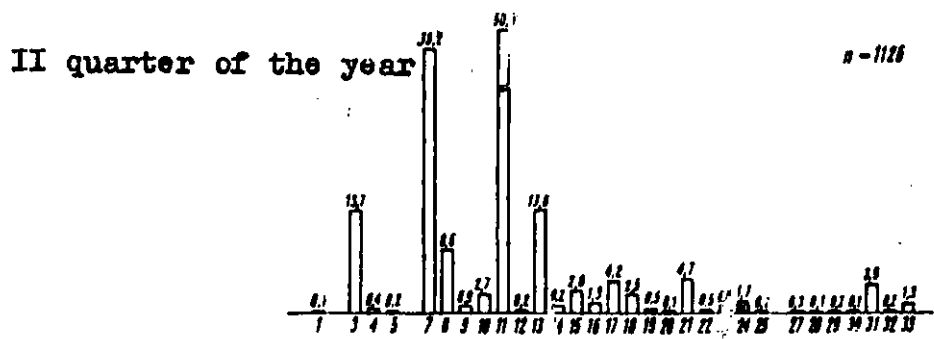
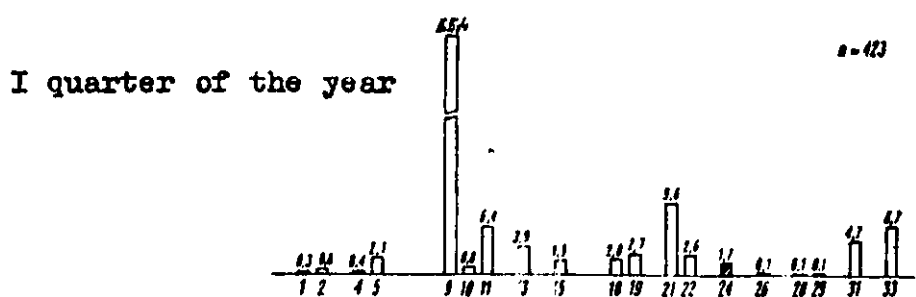
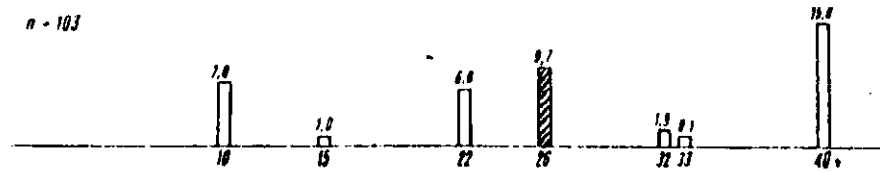


Fig. 2. Food composition and frequency of occurrence of different groups of cod food (in %) in South Labrador and North Newfoundland waters (Divisions 2J and 3K):

1 - jelly fish; 2 - corals; 3 - Actinaria; 4 - Ctenophora; 5 - Nemertini; 6 - Priaputida; 7 - Polychaeta; 8 - Copepoda; 9 - Euphausiacea and Mysidacea; 10 - Cumacea, 11 - Amphipoda; 12 - Isopoda; 13 - shrimps; 14 - hermit crabs; 15 - crabs; 16 - unidentified Decapoda; 17 - snails; 18 - molluscs; 19 - unidentified Cephalopoda; 20 - star fishes; 21 - ophiuroids; 22 - holothurians (sea cucumbers); 23 - herring; 24 - capelin; 25 - white barracudina; 26 - atlantic saury; 27 - american sand lance; 28 - redfish; 29 - american plaice; 30 - unidentified Pleuronectidae; 31 - other fishes and unidentified ones; 32 - waste from gutted fish; 33 - unidentified food. The letter n designates the number of cod specimens with food in their stomachs

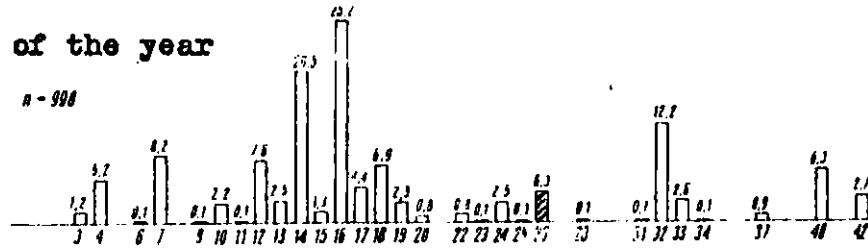
I quarter of the year



II quarter of the year



III quarter of the year



IV quarter of the year

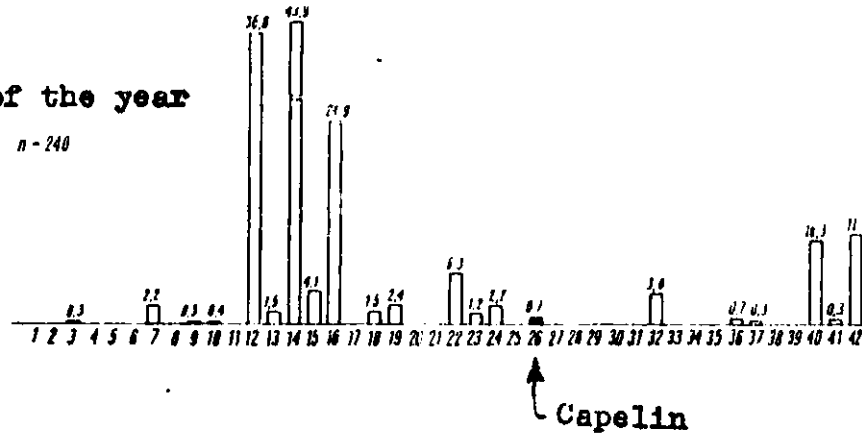


Fig. 3. Food composition and frequency of occurrence of different groups of food (in %) in Grand Bank waters (Divisions 3L, 3N, 3O, 3P):

1 - jelly fish; 2 - corals; 3 - Actinaria; 4 - Ctenophora; 5 - Nemertini; 6 - Pylaeopoda; 7 - Polychaeta; 8 - Copepoda; 9 - barnacles; 10 - Euphausiacea and Mysidacea; 11 - Cumacea; 12 - Amphipoda; 13 - Isopoda; 14 - shrimp; 15 - hermit crabs; 16 - crabs; 17 - unidentified Decapoda; 18 - snails; 19 - molluscs; 20 - Decapoda (Decapodidae); 21 - Octopoda (Octobranchia); 22 - ophiuroids (brittle stars); 23 - sea urchins; 24 - holothurians; 25 - herring; 26 - capelin; 27 - *Notoacopelus* spp.; 28 - cod; 29 - haddock; 30 - unidentified Gadidae; 31 - eelpouts; 32 - american sand lance; 33 - redfish; 34 - arctic hooknose sculpin; 35 - mottled sculpin; 36 - *Careproctus ranula*; 37 - american plaice; 38 - unidentified Pleuronectidae; 39 - eggs of *Selachiformes*; 40 - other fishes and unidentified ones; 41 - waste from gutted fish; 42 - unidentified food. The letter n means the number of cod specimens with food in their stomachs.

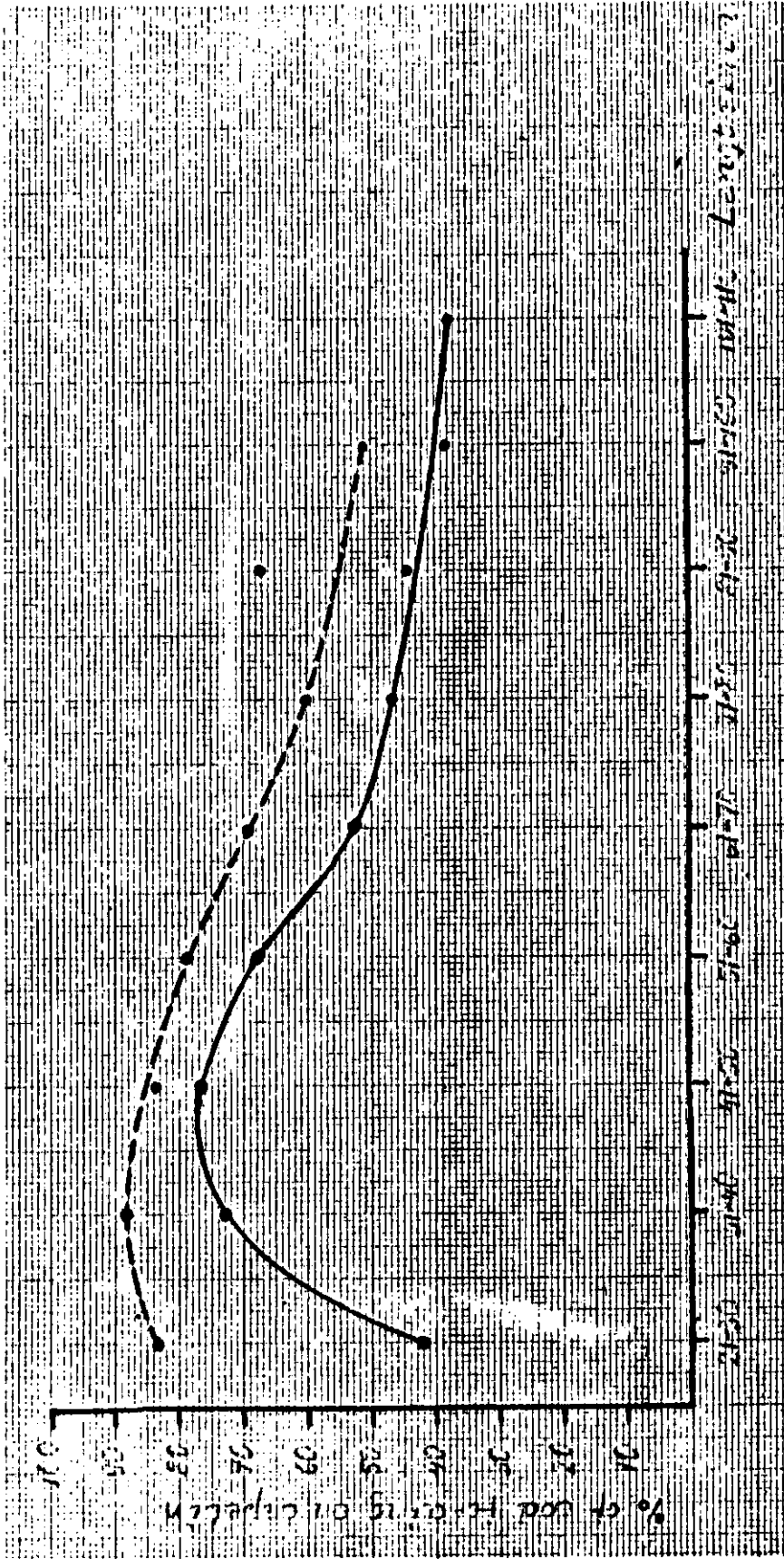


Fig. 4. Extent to which cod feeds on capelin, depending upon the total length of the cod /based on investigations conducted in Div. 3L at the end of May and throughout June/.

- frequency with which capelin occurs in the stomach contents of cod, in %
- - - - percentage of capelin in the total food intake of cod.