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Investigations of the Haddock Stock on the Rockall Bank in 1969 and 1970

by

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Summary

The paper deals with the length and age composition, sex composition, gonad maturity, feeding and number of vertebrae of haddock from the Rockall Bank (based on data of field and laboratory investigations in July 1969 and August 1970). The 1968 year class of haddock on the Rockall Bank was the most abundant over the period 1956 to 1969 and all the other haddock year classes were poor.

The Rockall Bank haddock very much resemble those from the Ireland area according to the average number of vertebrae (53.44).

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Data on haddock of the Rockall Bank analysed in this paper were obtained in cruises of the R/V "Rossiya" on 24 and 25 July 1969 and on 21 and 22 August 1970. Trawlings were made with a 31 m nylon trawl with an 8 mm mesh nylon net inserted in the codend.

On the 24 and 25 July 1969 at depths of 170 m (the near-bottom temperature was 8.9°C) and 195-215 m 61 and 488 haddock respectively were caught per 1 hour's trawling. The haddock were mainly small. However, in April 1969 the Soviet stern trawler "Dostoevsky" while searching for Gadus poutassou on the Rockall Bank took up to 6 tons of small haddock per 1 hour's trawling at a depth of about 190 m.

Catches taken on the 21 and 22 August 1970 also consisted of small haddock. Per 1 hour's trawling 460 fish were caught at a depth of 240-258 m, 252 haddock were taken at a depth of 300-315 m, (the water temperature near the bottom was 9.1°C) and 370 specimens were caught at a depth of 340-355 m with a near-bottom temperature of 9.2°C.

During both cruises of the R/V "Rossiya" the length and age composition, sex composition, sexual maturity and feeding of haddock were examined and vertebrae were counted.[xx)] The age was determined by otoliths and checked by scales. In counting vertebrae the last vertebra with the urostyle plate was also taken into account and the data obtained were mathematically treated after Snedecor (1957). Areas where trawlings were conducted are shown in Figure 1.

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xx) Determinations of age and counting of vertebrae were made by Shestov and the preserved stomachs were examined by Blagodelskaya.

Length and age composition

Figure 2 and Table 1 show the length and age composition of haddock catches taken on the Rockall Bank in July 1969 and in August 1970. Catches consisted mainly of haddock of the 1968 year class; their average length was 22.6 and 26.2 cm and the age was 1+ year and 2+ year in 1969 and 1970 respectively. The 1969 and 1967-1964 year classes were very poor. According to data by Blacker (1963) almost half of the haddock catches taken in 1961 on the Rockall Bank belonged to the 1954 year class. The 1955 and 1953 year classes were considerably poorer, and the 1956-1960 year classes were not abundant either. Comparison of the data obtained by us with those by Blacker shows that the 1968 year class of haddock on the Rockall Bank is the most abundant over the period 1956 to 1969 and that all the other year classes are poor.

Figure 3 shows averaged curves of the weight increment of haddock on the Rockall Bank drawn on the basis of the data collected in July 1969 and August 1970.

Sex composition and maturity

Table 2 shows the sex composition and maturity of haddock (classified by length groups) sampled on the Rockall Bank in July 1969 and August 1970. During these years the females predominated in the samples. Late in July 1969 almost all haddock in the samples were immature. At the end of August 1970 all males in the samples were immature and mature females were more than 40 cm long.

Feeding

In July 1969 we analysed stomachs in 111 haddock from Rockall Bank on board the vessel, in August 1970 126 stomachs were examined and in addition 48 stomachs were preserved for examination on shore. Table 3 includes indices of feeding of haddock on the Rockall Bank in July 1969 and August 1970. In addition, results of the examination of haddock stomachs in the laboratory by weight quantity methods are represented by a circular graph (Figure 4). The area of the circle agrees with the total average index (I, in ‰), and the diameter of the circle is equal to $\sqrt{I}$ ($I = \frac{p}{P} \cdot 10.000$, where p is the total weight of the food (in g) and P is the total weight of the fish examined (in g)). Particular indices (i) expressed in per cent from the total index are represented by single sectors. The black sector of the small circle represents the number of empty stomachs (in %).

It is evident from Table 3 and Figure 4, that in July 1969 and August 1970 many haddock on the Rockall Bank did not feed at all. In stomachs of many fish only soil was found. The average index of stomach fullness was low. In August 1970 the total index (I) was 16.51 ‰ . Benthic animals predominated among food organisms: Ophiura (Ophiura albida, Ophiura sp.), Asteroidea, Decapoda (Brachyura, Macrura reptantia), Polychaeta, Amphipoda. Meganyctiphanes norvegica and fish were found singly.

In July 1969 Macrura reptantia, Amphipoda and Asteroidea occurred more often in haddock stomachs but in August 1970 they were not registered in haddock stomachs. In addition, Brachyura, Bivalvia, Polychaeta, Ophiura were often registered.

Number of vertebrae

The results of the counting of vertebrae in haddock on the Rockall Bank in July 1969 and August 1970 are shown in Table 4. The insignificant values of standard errors of the sample ($S_{\bar{x}}$) show that a sufficient number of haddock were examined. The number of vertebrae in haddock in our samples ranged from 51 to 56, whereas according to data by Wheeler (1969) the number of vertebrae in haddock in the areas of the British Isles and North-west Europe varies from 52 to 57 vertebrae. Insignificant standard deviations (S) and small variation coefficients (C) indicate a slight variability in the number of vertebrae in haddock on the Rockall Bank.

According to data by Tåning (1935) cited by Clark and Vladykov (1960), the average number of vertebrae in haddock from the Ireland area is 53.84, from the Faroes 53.88, from the Icelandic waters 53.96 and from the North Sea 54.04. Thus, as to the average number of vertebrae the haddock from the Rockall Bank resembles the haddock from the Ireland area.

References

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Table 1. Length and age composition (in %) and mean length of haddock in each age group on the Rockall Bank in July 1969 (upper figures) and August 1970 (lower figures).

Length in cm	Year classes							Total number	In %
	1969	1968	1967	1966	1965	1964	1963 and older		
16 - 20	- 8.5							47 -	8.5 -
21 - 25	- 2.4	82.7 35.7						454 413	82.7 38.1
26 - 30		4.0 56.7						22 614	4.0 56.7
31 - 35		- 2.0	0.2 -					1 22	0.2 2.0
36 - 40			1.5 0.4					8 4	1.5 0.4
41 - 45			- 0.3	- 0.3	0.5 0.1	0.4 -	0.9 -	10 7	1.8 0.7
46 - 50				- 0.1	- 0.3	0.4 0.3	0.2 0.7	3 15	0.6 1.4
51 - 55					- 0.1	- 0.2	0.7 0.1	4 4	0.7 0.4
56 - 60							- 0.3	- 3	- 0.3
Mean length	- 23.8	22.6 26.2	37.4 39.9	- 44.0	43.4 48.5	46.8 50.1	- -	24.6 26.8	
Total number	- 26	523 1 024	9 7	- 4	3 5	4 5	10 12	549 1 083	
In %	- 0.4	95.4 97.4	1.6 0.4	- 0.3	0.5 0.5	0.7 0.3	1.8 0.7		100 100
Number of fish examined	- 4	174 184	9 4	- 3	3 5	4 3	10 8	200 211	

Table 2. Ratio of mature and immature haddock classified by size groups; ratio of males and females of haddock on the Rockall Bank in July 1969 and August 1970 (in %).

Size groups, in cm	July 1969						August 1970					
	♂			♀			♂			♀		
	Immature	Mature	Number of fish	Immature	Mature	Number of fish	Immature	Mature	Number of fish	Immature	Mature	Number of fish
16 - 20	100	-	4	100	-	3	-	-	-	-	-	-
21 - 25	100	-	76	100	-	84	100	-	56	100	-	41
26 - 30	-	-	-	100	-	7	100	-	38	100	-	63
31 - 35	-	-	-	100	-	1	100	-	1	100	-	5
36 - 40	100	-	3	100	-	5	100	-	-	-	-	-
41 - 45	87.5	12.5	8	100	-	2	100	-	3	33.3	66.7	3
46 - 50	100	-	2	100	-	1	100	-	2	15.4	84.6	13
51 - 55	-	-	-	25	75	4	-	-	-	16.7	83.3	6
56 - 60	-	-	-	-	-	-	-	-	-	-	100	1
Number of fish			93			107			102			132
Ratio of males and females			46.5			53.5			43.6			56.4

Table 3. Peculiarities of feeding of haddock on the Rockall Bank in July 1969 and August 1970.

Food objects	July 1969		August 1970	
	Occurrence frequency, x) %	Mean particular index (i)	Occurrence frequency, %	Mean particular index (i)
Meganyctiphanes norvegica	0.9	-	-	0.17
Fish	0.9	-	1.6	1.90
Ophiura sp.	2.7	-	17.5	2.10
Brachyura	1.8	-	6.3	0.19
Bivalvia	2.7	-	18.3	-
Polychaeta	1.8	-	5.5	0.03
Macrura reptantia	18.9	-	-	-
Amphipoda	16.2	-	-	-
Asteroidea	3.6	-	-	-
Food digested	9.0	-	15.9	7.10
Ground	14.4	-	13.5	5.00
Number of stomachs examined	111		174	
Number of empty stomachs, in %	33.3		36.4	
Average index of stomach fullness xx)	1.40		0.90	
Average total index, (I) in %	-		16.51	

Note: x) From the total number of stomachs examined.
xx) According to the 5-mark scale.

Table 4. Vertebrae counts in haddock on the Rockall Bank in July 1969 and August 1970.

Date	Number of vertebrae						Number of fish	$\bar{x} \pm S_{\bar{x}}$	S	C
	51	52	53	54	55	56				
July 24 1969	1	4	26	26	4	-	61	53.46±0.10	0.78	1.46
July 25 1969	-	7	75	52	5	-	139	53.40±0.05	0.64	1.20
August 21 1970	-	7	51	46	5	1	110	53.47±0.07	0.72	1.35
Total	1	18	152	124	14	1	310	53.44±0.04	0.70	1.30

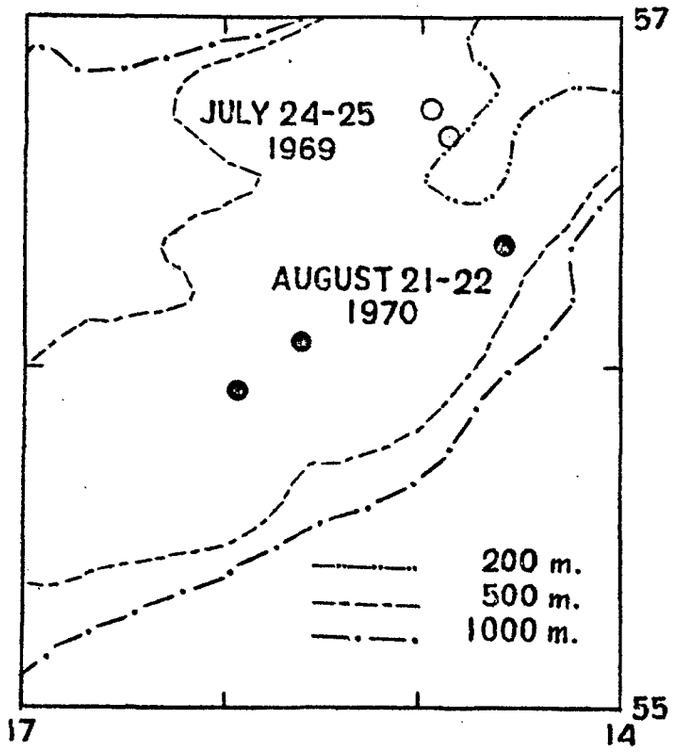

Figure 1. Areas on the Rockall Bank where trawlings were made in July 1969 and August 1970.

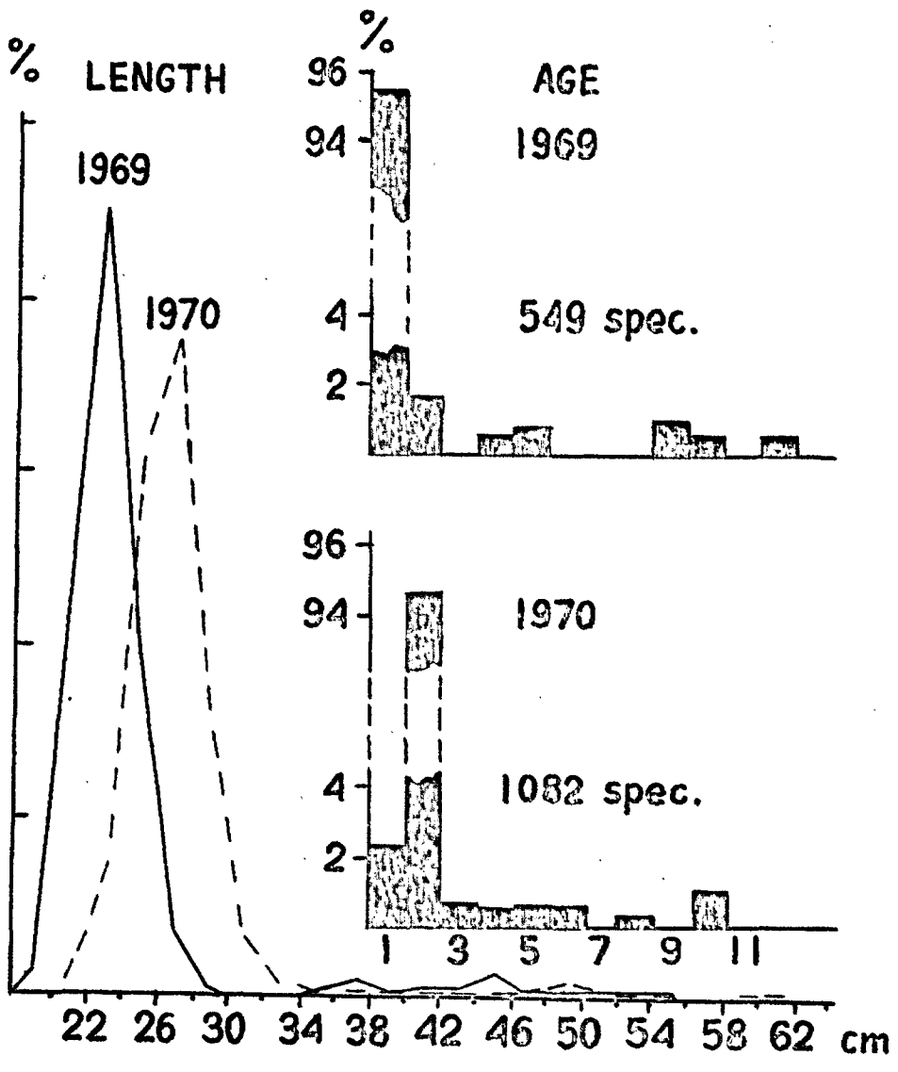

Figure 2. Length and age composition of haddock on the Rockall Bank in July 1969 and August 1970.

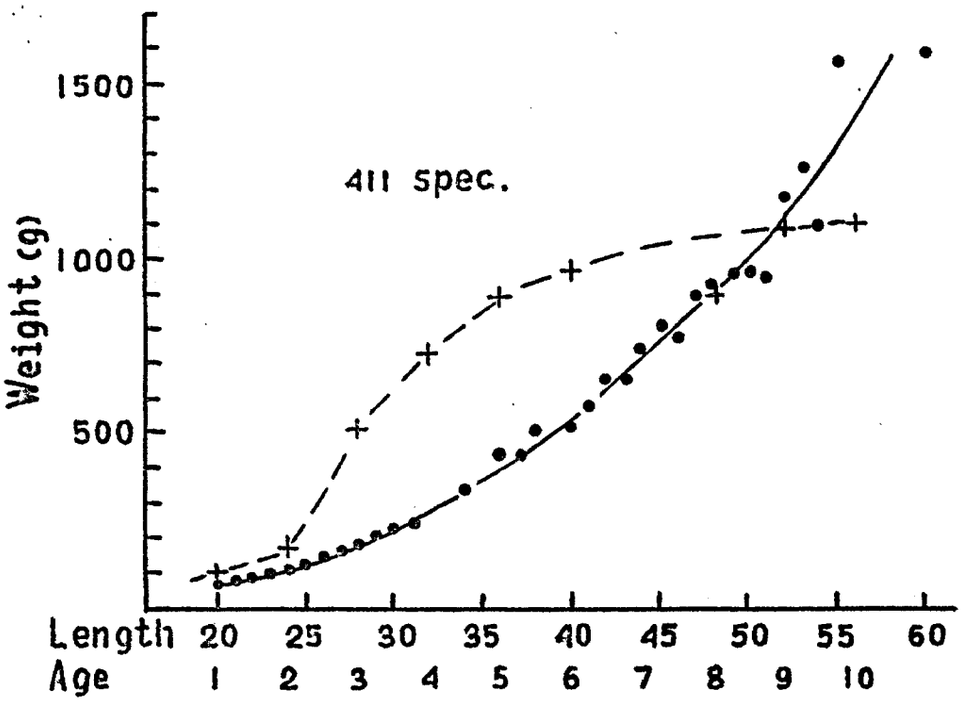

Figure 3. Average weight of haddock on the Rockall Bank by the end of July 1969 and by the end of August 1970.

Dots = average weight of haddock for each cm;

Crosses = average weight of haddock of each year class.

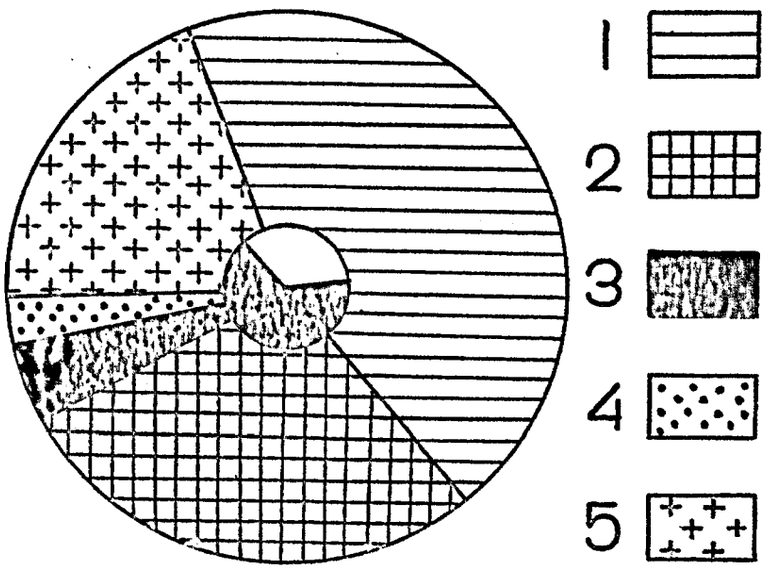

Figure 4. Characteristics of feeding of haddock on the Rockall Bank in August 1970.

1. Fish. 2. Food digested. 3. Ophiura.
4. Meganyctiphanes norvegica, Brachyura, Polychaeta.
5. Soil.