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Relationship between Beginning of Spawning Migrations and Fatness of Mature Cod

by

T.S.Berger and L.D.Panasenko[x)]

Abstract

Influence of fatness on the beginning of spawning migration of cod is shown in the paper.

Cod had the highest fatness at the III stage of gonad maturity, when they begin spawning migration.

The aim of the present paper is to establish the relationship between the maturity of gonads, fatness of specimens and beginning of spawning migration of cod.

Data were collected on board the PINRO research vessels in the Bear Island-Spitsbergen area and off the north-western coast of Norway in September-December 1968-1972.

The ratio of liver weight to total weight of fish was taken as fatness index.

The sexual maturity of cod was casually determined according to 6-division scale (Sorokin, 1957, 1960).

The specimens spawned out but still at the stage of a relative rest (II) were referred to stage VI-II.

The age was determined by E.M.Mankevich and Z.P.Khomutova,

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x) The Polar Institute, 6 Knipovich Street, Murmansk, USSR

spawning rings being taken into account (1971).

It is known that beginning of sexual maturity of fishes depends rather on their length than on their age (Vasnetsov, 1953). The higher the rate of growth the younger the fishes enter the spawning stock (Sonina, 1969).

Our observations showed that cod reach sexual maturity at the length of 61-70 cm (males) and 71-80 cm (females) The greatest quantity of mature specimens are 81-90 cm long (males) and 91-100 cm long (females) (Table 1). The paper (Baranenkova, Khokhlina, 1964), where it is shown that length of spawning cod changes from 45 to 140 cm (the average length is 70-80 cm and 80-100 cm for males and females respectively) is borne out by these observations.

It is stated (Ponomarenko, 1970; Osadchich, 1934) that seasonal run of fatness of the Barents Sea cod of different physiological conditions had essential differences.

Fat accumulation in mature cod promotes not only resistance of organism to the influence of the environment, but serves as a base for normal development of sexual products.

The highest fat content (from 8.3 to 17.9%) was registered in cod at the stage III of gonad maturity when they migrated for spawning in October-November (Table 2).

The further development of gonads occurs during spawning migration when cod almost stop feeding and their fatness gradually drops (Fig.1).

Cod with gonads at the fourth stage of maturity were

caught on their migration routes to the spawning grounds on the Bear Island, Kopytov, Sóre, Fógley and Malangen Banks from October to December (Fig. 2). Fatness of cod at the fourth stage of maturity is lower than that at the stage III.

In October-December cod at the maturity stages VI-II had a lower fat content than that at the maturity stage III. Fatnes of immature fishes is, as a rule, lower than that of mature ones (Table 2). Comparison between fatness of repeated-spawned cod of the same length and that of recruits showed that fatness is higher in repeated-spawners (Table 3).

Observations conducted in 1968-1972 showed that in the autumn period cod at the stages III-IV of gonad maturity (with fatness over 8%) did not form stable concentrations and were in the state of spawning migration.

Thus, some idea of the stability and density of cod concentrations can be gained from the fatness and sexual maturity of cod, that is very important to know when forecasting the catches and distribution of fish.

Conclusions

1. Fatness of immature cod in autumn is lower than that of mature ones, while fatness of repeated spawners is higher than fatness of recruits.

2. Mature cod with fatness over 8% begin migrating for spawning, and as a rule they do not form stable concentrations in autumn.

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Table 1

Length composition of mature cod in the Bear Island-Spitsbergen area in 1971 and 1972

Sex	Number of cod by length groups					
	51-60	61-70	71-80	81-90	91-100	101-110
Males	-	9	54	109	56	6
Females	-	1	3	48	71	16

Table 2

Maturity and fatness (%) of cod of various length groups (Bear Island-Spitsbergen area, October-December 1971-1972)

Length groups / Maturity stages	Males				Females			
	Fatness				Fatness			
	II	III	IV	VI-II	II	III	IV	VI-II
31-40	6,4				5,1			
41-50	7,0				6,2			
51-60	6,1				6,0			
61-70	7,2	4,2			7,0			6,6
71-80	6,5	8,3	6,4	6,4	7,6	8,6		8,4
81-90	8,1	9,3	8,5	7,3	8,3	8,8	8,2	8,9
91-100		17,9	7,2	10,8	8,5	12,6	9,7	12,3
101-110		12,5	11,0	11,5		11,6	12,1	11,7
111-120							9,9	
Number	95	161	11	24	155	104	13	108

Table 3

Fatness of first time and repeated-spawned cod in the Bear Island-Spitsbergen area (1968-1972)

Sex	Males				Females			
	first time spawners		repeated spawners		first time spawners		repeated spawners	
Length groups	Number of spec.	Fatness, %	Number of spec.	Fatness, %	Number of spec.	Fatness, %	Number of spec.	Fatness, %
5I-60	8	7,8	5	6,8	-	-	-	-
6I-70	27	8,6	27	8,7	2	9,7	-	-
7I-80	25	8,3	I3I	9,3	6	9,7	20	I0,4
8I-90	23	8,3	I59	8,9	26	8,I	78	9,05
9I-I00	I3	9,7	23	I0,4	22	9,6	I2I	I0,5
I0I-II0	-	-	I8	II,3	3	I0,9	69	II,5
II0-I20	-	-	-	-	-	-	I0	I0,4

Headings for Figures

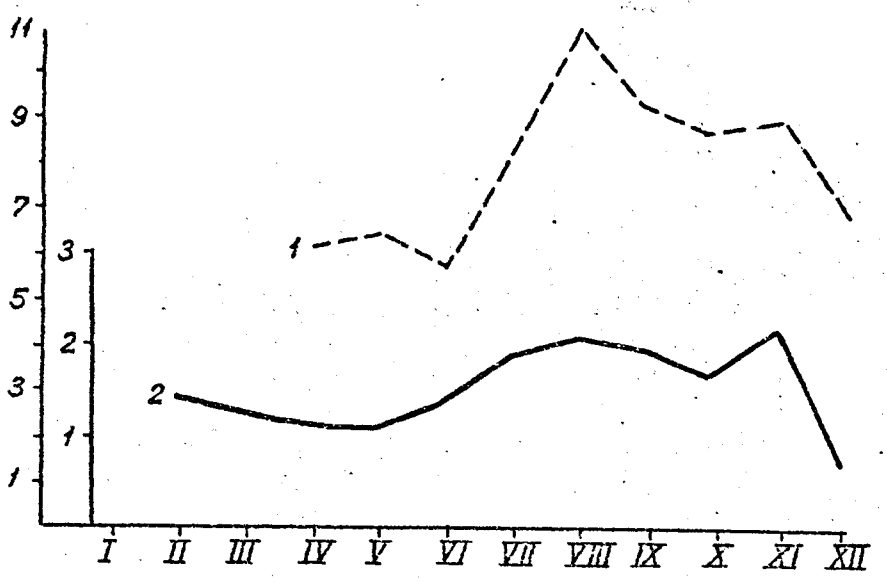
to the paper by T.S.Berger and L.D.Panasenko "Relationship between Beginning of Spawning Migrations and Fatness of Mature Cod".

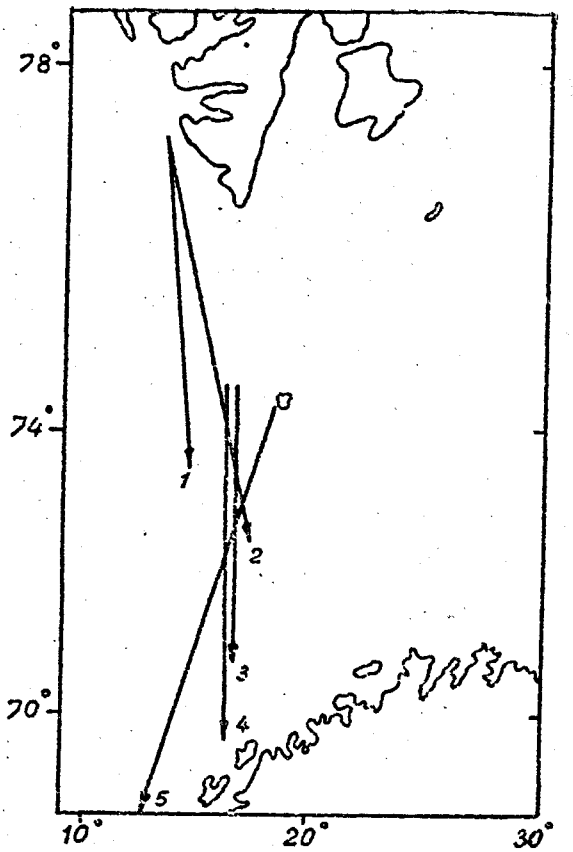
Fig.1. Seasonal changes in the amount of food in the stomach (2) and fatness (1) of cod.

Fig.2. Migrations of mature tagged cod in January - March.

Designations:

Number	Tagged	Recaptured
1	Sept.24,1968	Jan.29,1969
2	Sept.9,1968	Febr.8,1969
3	Oct.11,1968	Febr.16,1969
4	Nov.13,1968	March 3,1969
5	July 2,1970	March 26,1971





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