

ANNUAL MEETING - JUNE 1972Thermic conditions, catches and biology of the cod of Western Greenland

by

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During researches carried out from the 5th to the 11th December 1971, 1277 were measured; the sexual maturity, the degree of stomach repletion and the food composition of 1177 fish were determined. 1401 otoliths were read for age. The fish yield was based on 20 trial hauls with bottom trawl nets. Thermic characteristics was defined from four standard hydrographic sections.

2/ Thermic conditions

The waters of the Halibut Smaller Bank, during the first decade of December showed a cooling at the surface layers which went down to minus 0.3^oCentigrade. As a rule such a temperature hardly reached a depth of 75 m. In deeper layers temperature attained plus 4^oCentigrade.

On Fyllas Bank, in the first decade of December the temperature composition was similar, but the wedge of waters with temperatures below 0^oC extended from the surface to a depth of 400 m. In this layer there were steady temperatures ranging from - 0.1^oC to - 0.2^oC. In deeper layers they attained 3^o to 5^oC.

On Danas Bank by the end of the first decade of December in more shallow spots of the fishing ground the wedge of waters with temperatures below zero degree centigrade

ranged from the surface down to 50 meters. The nearer to the open sea the higher were temperatures from the surface to the bottom and these temperatures steadily grew with the increase of depth. At depths of 100 m and more temperatures attained 2 to 5°C.

On Nonane Bank, at the beginning of the second decade of December the wedge of temperatures below 0°C /to - 1.38°C/ ranged from the surface down to 100 - 150 m. At depths from 200 m on, as a rule there occurred temperatures of 3 to 5°C. The temperature measurements which have been carried out show that in the zone of cod fishing i.e. at depths of 200 m and more temperatures reached 2 - 5°C. The arrangement of these temperatures can be accepted as favourable to the cod stock and the fish yields under such conditions were relatively good.

3/ Catches and length of Cod

On the Halibut Greater Bank /66° 30'N - 55° 45'W/ at depths from 200 - 210 m, 750 to 1000 kg of fish in a haul per hour were caught. Cod constituted 70 - 80 % of the mass composition. The length ranged from 38 to 107 cm and the modal value from 69 to 90 cm /65 %/ - the mean length 77.7 cm.

On the south-western slopes of the Bananen Bank /64° 20'N - 53° 45'W/ at a depth of 210 m the yields reached 1250 kg in a haul per hour. Cod constituted 95 % of the mass. The length ranged from 43 to 101 cm - the modal length 54 - 68 cm /55 %/ - the mean length was 64.2 cm.

On Fyllas Bank /63°40'N - 52° 55'W/ at depths of 200 - 240 m the yield was 500 kg in a haul per hour, and it included 70 % of cod. Their length ranged from 30 to 99 cm, the modal length 45 - 70 cm /68 %/, the mean length 57.3 cm.

On Danas Bank /62° 50'N - 61° 55'W/ at depths of 200 - 280m, the fish yield was 500 to 3000 kg in a haul per hour. The mass composition was as follows: 40 - 60 % of cod and 40 - 60 % of redfish /Sebastes/. The length of cod ranged from 42 to 107 cm, the modal length 57 - 83 cm /83 %/, the mean length 72.1 cm. The length of redfish ranged from

25 to 56 cm, the modal length 40 - 50 cm /73.0 %/ the mean length 46 cm.

On Nonane Bank /62°10'N - 50°40'W/ at depths of 210 - 240 m the yield attained 350 - 650 kg in a haul per hour. Cod constituted 70 % of it. The length ranged from 33 to 104 cm, the modal length 51 - 83 cm /83 %/, the mean length 65.3 cm.

4. Sexual maturity

On all the investigated fishing grounds, the basic mass of cod was constituted by specimens of the II and III maturity stage in both sexes. In cases when smaller fish occurred, as for example on Fyllas Bank, very important quantities of fish of the I maturity stage occurred. An increased participation of the IV maturity stage appeared at the beginning of the first decade of December only /table 1/.

5. Stomach repletion and food composition

The Cod intensity of feeding was generally characterized by a great diversity. The most numerous participation of fish with full stomach was observed at Fyllas and Danas Banks, whereas fish with empty stomachs were prevailing at Bananeh Bank /table 2/.

Among food components the prevailing group was constituted by tiny fish, *Amodytes* sp. *Mollotus villosus* and young redfish.

Depending on the area the food composition diversified markedly. And so, near the Halibut Greater Bank for example, an important part in the composition of food was played by shrimps /*Pandalus borealis*/, as much as 35.4 % /table 3/.

On the Halibut Smaller Bank, however, the participation of Ophiuroidea was more important and the food not precisely defined.

On Nonane Bank, in the food, besides fish, there was a more marked participation of Ophiuroidea.

6. Age composition

The Cod caught on the fishing grounds of Western Greenland was represented by 12 year classes. They were fish of 3 to 14 years of age.

In Div. 1 B specimens of 6 and 7 years of age were the prevailing groups. These were generations born in 1964 and 1965 /table 4/.

In Div. 1 C besides the numerous year classes mentioned above, there was serious increase of fish of 4 and 5 years of age that is of generations born in 1966 and 1967. These year classes, however, constituted an exception as they occurred in such quantities in this area only.

In Div. 1 D a similar prevalence of cod of 6 and 7 years of age occurred. In Div. 1 E fish of 6 and 7 years of age occurred too.

In general the whole fishing ground of Western Greenland showed in 1971 as in 1970 a prevalence of fish of 6 and 7 years of age; their average participation amounted to more than 20 %, this being almost identical to the previous year. There was, however, a sensible lack of younger generations. A quite insignificant affluence of youngsters and a relatively stabilized high composition of the 1964 - 1965 generations caused in 1971 an increase of more than 5 cm in the mean length of cod in comparison with the year 1970.

7/ Estimation of the cod stock

It is supposed that the steadily increasing crisis in the cod catches on the fishing grounds of Western Greenland is caused by the following three factors:

First, there is undoubtedly a sensible lack of fertile generations in the sixties, with the exception of generations born in the years 1964 and 1965. But these generations too, have been considered as relatively fertile only.

The second cause supposed to have reduced the stock was the steadily increase pressure of fisheries, specially

marked in the years 1967 - 1968. Biologic researches carried out in winter 1971 showed that a prevailing position in the trawl-net catches was occupied by a relatively big cod appertaining to the generations born in years 1964 and 1965. As to the completion of the stock by younger year classes, this problem is still a matter of serious concern, as practically they occurred in insignificant quantities.

The third reason, undoubtedly causing negative changes in the stock, as suggested by Moiseev, may be the systematic cooling of waters on the fishing grounds of Western Greenland. As suggested by some specialists, cod begins shifting quite decidedly to areas situated farther south.

It is difficult to foresee how far the changes happening in the environment will influence the cod stock; there is no reason, however, to think that fishing conditions can radically improve in the nearest time. If unfavourable changes in the environment are really developing, whatever legal steps may be taken, they will not improve the regeneration of the cod stock in the expected manner. For the time being, it may be supposed that suggestions tending to put into force fishing restrictions in this area will be aimless. They should be backed by a minutious examination of the environment, and when it will be confirmed that the conditions of cod are not beyond the norms, then it will be possible to apply protective means.

TABLE 1

Degree of sexual maturity of cod on the fishing grounds of Western Greenland
in December 1971 / in %/

Place of fishing position	Name of fishing ground	Date	Depth of fishing in m	Number of examined fish	Scale of maturity according to Maier				%				
					I	II	III	IV					
66°32'N 54°36'W	Hallibut Greater Bank	5.12.71	220-230	77	4.3	6.4	10.9	12.9	69.7	42.0	15.1	38.7	200
64°16'N 53°44'W	Bananen Bank	7.12.71	210	300	18.5	6.5	31.5	63.0	48.6	23.4	1.4	7.1	200
63°38'N 52°54'W	Fyllas Bank	9.12.71	240-320	200	50.0	31.4	21.7	42.7	27.5	8.6	0.8	17.3	200
62°54'N 51°56'W	Danas Bank	10.12.71	280	300	5.3	5.3	19.1	30.2	75.6	50.9	-	13.6	200
62°07'N 50°45'W	Nonane Bank	11.12.71	210-240	300	22.4	24.1	29.8	54.3	47.8	13.2	-	8.4	200

TABLE 2

Degree of reptition of the stomach of Cod on the fishing grounds of Western Greenland
in December 1971 /in %/

Place of fishing	Name of fishing	Date	Depth of fishing	Number of examined	Degree of reptition of stomach						
					1/4	1/2	3/4	full	empty	reversed	%
66°32'N 54°36'W	Hallibut Greater Bank	5.12.71	220-230	77	20.8	27.2	24.7	23.4	3.9	-	100
64°16'N 53°44'W	Bananen Bank	7.12.71	210	300	21.9	8.0	1.7	1.0	67.1	0.3	100
63°38'N 52°54'W	Pyllas Bank	9.12.71	240-320	200	10.5	12.0	7.0	38.0	32.0	0.5	100
62°54'N 51°56'W	Danas Bank	10.12.71	280	300	6.0	12.6	20.3	31.8	29.3	-	100
62°07'N 50°45'W	Noname Bank	11.12.71	210-240	300	19.7	17.7	2.0	60.6	60.0	-	100

TABLE 3

Food composition of cod on the fishing grounds of the Western Greenland
in December 1971 / % /

Place of catch	Date	Depth in m	Number of examined fish	Food components																In %		
				Fish and remnants	Fry and larvae	Fish offal	Ctenophora	Jellyfish	Mollusca	Oligochaeta	Polychaeta	Ophiuroidea	Cucumaria	Crustacea	Enphausiacea	Shrimps	Idotea viridis	Decapoda	Indef. food		Other food	
66°32'N																						
54°36'W	5.12.71	220-230	116	56.8	0.9	-	1.8	-	0.8	-	-	-	-	-	-	-	35.4	-	4.3	-	100	
64°16'N																						
53°44'W	7.12.71	210	104	61.5	1.0	-	-	3.8	1.8	1.0	1.0	9.6	-	1.0	1.0	1.0	1.0	2.9	-	9.6	4.8	100
63°38'N																						
52°54'W	9.12.71	240-320	137	70.2	0.7	-	2.0	-	1.3	5.3	-	2.0	0.7	1.6	2.6	6.0	-	-	4.6	-	100	
62°54'N																						
51°56'W	10.12.71	280	220	92.5	-	0.4	-	-	0.4	0.5	-	2.3	0.5	0.9	-	0.9	-	-	1.6	-	100	
62°07'N																						
50°45'W	11.12.71	210-240	147	45.8	0.7	-	4.6	6.7	-	4.7	-	23.0	2.4	5.6	-	3.4	1.4	0.7	-	-	100	

Table 4. Age of cod on the fishing grounds of Western Greenland in December 1971 (in %).

Generation	Age	A r e a				
		1 B	1 C	1 C	1 D	1 E
1968	3	-	-	-	-	0.3
1967	4	8.1	24.9	1.0	9.7	4.0
1966	5	8.2	51.3	21.0	10.1	8.4
1965	6	24.7	16.6	48.6	28.1	26.2
1964	7	21.6	2.8	21.4	23.6	19.5
1963	8	10.3	1.4	4.1	13.5	24.6
1962	9	6.2	1.4	0.3	9.9	13.4
1961	10	12.4	0.5	0.3	3.2	2.7
1960	11	5.2	0.5	3.0	1.4	0.3
1959	12	4.1	0.5	0.3	-	0.3
1958	13	2.1	-	-	0.2	0.3
1957	14	1.0	-	-	0.2	-
n		97	216	295	495	298

Table 5. Mean length of cod on the fishing ground of Western Greenland in the years 1970-1971 (in cm).

Area	Y e a r s	
	1970	1971
1 B	-	73.2
1 C	51.5	59.5
1 D	68.3	66.7
1 E	59.3	65.8

