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Perspectives for capelin fishery and their stocks status in the Barents Sea

by

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Résumé

Entre les années 1974 et 1979 la masse biologique des ressources du capelan a baissé environ de 30 à 35 %.

Les mesures de régulation de l'exploitation de cette espèce, en particulier la limitation du petit faux-poisson non maturé, nécessitent un strict contrôle de leur exécution.

Le début de l'exploitation des générations de 1977 et de 1978 dont l'abondance est considérablement plus basse que celle des générations précédentes, fait prévoir la diminution ultérieure des ressources et la baisse en 1981 de la limite annuelle de la pêche du capelan jusqu'à 1,2-1,0 million de tonnes.

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x/ PINRO, M u r m a n s k, USSR.

Abstract

Biomass of capelin stocks reduced from 1974 to 1979 approximately by 30-35%.

The measures of capelin fishery regulations, in particular, the limitation of incidental catch of small immature fish require the strict rules for their conduction.

With entry of the 1977 and 1978 year classes with the abundance considerably lower, compared to that of the previous generations, into the fishery, a greater deterioration of capelin stocks status and reduction of annual limit for their yield in 1981 approximately up to 1.2-1.0 mill.tons are expected.

Introduction

In recent years the Barents Sea capelin was of paramount importance in the fishery industry of the USSR and Norway. A great attention was paid to capelin investigations both by the Soviet and foreign scientists. For the rational exploitation of their stocks the USSR and Norway put the regulation of capelin fishery in force since 1978.

The main regulation measures were: the introduction of the annual limit of yield with subdivisions into national quotas (on the basis of the joint investigations of their stocks assessment), closure of fishing in summer period since 1 May throughout 15 August and limitation of the incidental catch of small immature fish up to 11 cm long in the volume of 15% of the yield in specimens.

Discussions

The joint Soviet-Norwegian investigations on assessment of the Barents Sea capelin stocks are carried out in September-October since 1974. The results of these observations showed that in autumn 1979 (due to data of the III Soviet-Norwegian Working Group) the biomass of adult capelin constituted 4.09 mill.tons (Table I). Compared to that of the previous year the biomass of capelin stocks decreased by 0.36 mill.tons, but in comparison with that of 1974 - almost by 30%.

The results of estimates with application of the mathematical models also indicate the gradual reduction of this fish stocks. Their biomass estimated in 1979 by means of Allen's model was equal to 4.3 mill.tons, that was appro-

ximately by 33% lower than that in 1974, and due to assessment by VPA method the reduction of biomass constituted about 35% (Table I).

The deterioration of stocks status above-mentioned can be explained by the following reasons. The analysis of the relationship between the capelin stocks and their total yield (Table2) is an evidence of a sharp intensification of fishery press starting since 1976. In 1978 and 1979 over 20% of the total fish stocks were annually caught, whereas the mature stock biomass was 20.8% and 14.8%, respectively. Such relation between the stocks and yield could be obtained because of increase of by-catch of capelin at the younger age. The data, given in Table 3, indicate the fact, that the young fish (at the age of 1 and 2 years) was caught in very great numbers. In 1973-1975 the portion of the young capelin in total yield constituted 13-16 milliards of specimens, that corresponded to 20% of the total their yield. In 1977-1979 the total yield of this immature fish reached 40-50 milliards of specimens, i.e. almost 30%. And only before 1973 and in 1976 the by-catch of fry did not exceed 13%.

An increase of incidental catch of small capelin is well seen and from data in Table 4. If in spring period 1971-1979 the percentage of catch of the young capelin during the first two years of their life was equal to 11-17%, then in autumn period their incidental catch almost annually exceeded 20%, and in 1978 and 1979 it constituted nearly half of the total yield.

A considerable yield of the young capelin, particularly, in the autumn fishing period at the constant catching the large capelin led to reduction of the recruitment to the mature stock and to total deterioration in the stocks status. Based upon this, the incidental catch of small immature capelin (up to 11 cm long) was adjusted at the 8-th Session of Mixed Soviet-Norwegian Commission on Fishery to be not more than 15% of the yield in specimens.

Along with this the observed decrease of the capelin stocks is explained by poor recruitment into their commercial stock caused by appearance of year classes with decreased abundance. The investigations on the O-group capelin determined that the 1974 and 1975 year classes (Table 5) were ones of the richest (Anon., 1978). High abundance of these year classes caused a good recruitment to the commercial capelin stock and permitted to have the total volume of annual yield in 1977 equal to 2.8 mill.tons (Table 1). A subsequent decrease of abundance of the successive generations of this fish and deterioration in their stocks status resulted in need of fishery regulation. On the basis of the assessment of capelin biomass the optimum allowable catch in 1979 was defined in volume of 1.8 mill.tons. It should be noted, that in 1979 the fish of the rich 1975, 1976 and average 1977 year classes (Table 5) at the age of 4, 3 and 2 years (Table 4) constituted the main part of the yield.

In 1980, the 1976 and 1977 year classes will dominate in the commercial stock. The decrease of biomass by 1980

led to necessity of reduction of TAC for capelin up to 1.6 mill.tons (Table 5).

In 1981 the fish of average 1977 and poorest 1978 year classes will enter the fishery. Taking this into account, the further reduction in capelin stocks volume and allowable annual yield, approximately up to 1.0-1.2 mill.tons should be expected.

Under these conditions the fishery has to be conducted within the strict time-limits and with realization of regulation measures by all means.

The Norwegian scientists also worry about the perspectives of capelin fishery; they also stated the deterioration in the stocks status (Anon., 1979).

Conclusions

1. In recent years a noticeable deterioration in the capelin stock status was observed. In 1979 their biomass constituted 4.09 mill.tons, that was approximately by 30-35% lower the 1974 level.

2. Under the conditions of reduction of the total capelin stocks, their incidental catch of fry over the limited level leads to the accelerated reduction of stock biomass. Therefore, the capelin yield should be conducted within the strict fishery regulation measures.

3. In 1981, with entry of the 1977 and 1978 year classes of low abundances into the fishery, a greater reduction of capelin stocks is expected. In relation to this the decrease of TAC up to 1.0-1.2 mill.tons is possible.

References

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Table 1

Assessment of capelin stocks, thou.tons

Year	Instrumental method (autumn surveys)		Mathematical methods			Total annual yield
			Allen's method	VPA estimates		
	Norway	USSR		Total stocks x/	Mature stock	
1971	5700	-	7100	7205	2849	1392
1972	6600	-	6400	8249	2359	1592
1973	3900	-	5200	12032	1443	1336
1974	5900	13000	6100	11510	3566	1148
1975	6500	2600	5600	9794	4778	1373
1976	5700	3000	6600	7202	4128	2545
1977	4970	2311	6450	5080	1879	2854
1978	4450	4920	3600	5346	720	1838
1979	4100	4100	4310	7463	1100	1691,7

x/ by mid-autumn of each year

Table 2

The relationship between the total biomass of capelin stocks, mature part of their stock (due to data of the Soviet estimates by VPA method by average spring period of each year) and total yield in 1971-1979, thou.tons

Year	Stocks biomass	Mature stock	% of the mature stock	Annual yield (USSR and Norway)	Yield's % of the total stocks
1971	11088,4	4497,4	40,6	1392,5	12,6
1972	12684,5	4166,7	32,8	1591,6	12,6
1973	17904,1	2658,1	14,9	1335,8	7,5
1974	17052,4	5591,6	32,8	1148,0	6,7
1975	14750,3	7528,3	51,2	1373,5	9,3
1976	11813,8	7438,2	62,9	2545,3	21,4
1977	8955,7	4016,4	44,9	2854,6	31,9
1978	8580,6	1742,6	20,8	1838,4	21,4
1979	7463,0	1100,0	14,8	1691,7	22,6

Table 3

Total capelin yield in 1971-1979 by age groups (spec. x 10^{-9})

Age	1971	1972	1973	1974	1975	1976	1977	1978	1979 x/
I	0,054	3,249	9,931	I,600	I,600	2,200	2,I00	2,240	0,I65
2	7,826	5,504	6,525	II,300	I4,000	I6,400	52,000	37,I50	I8,I36
3	6,855	24,882	5,222	I3,800	23,800	32,400	40,300	25,550	34,30I
4	46,533	28,690	32,067	24,600	33,500	6I,200	58,900	38,040	53,65I
5	3,I2I	I7,793	I6,094	8,600	3,I00	30,500	29,700	I5,400	I2,729
6	0,036	0,I25	I,225	0,I00	0,I00	0,400	0,600	2,600	I,223
7	-	-	0,03I	-	-	-	-	-	0,II3
Total	64,425	80,243	7I,095	60,000	76,I00	I43,I00	I83,600	I20,980	I2I,356

x/ due to preliminary data

Table 4

Age composition of capelin in spring and autumn periods 1971-1979, % (the USSR data)

Year	Age, years							Number of spec.	Average age, years
	I	2	3	4	5	6	7		
Spring period									
1971	1,8	4,8	85,6	7,6	0,1			2507	3,9
1972	0,2	20,4	43,5	35,6	0,3			1829	4,1
1973	0,2	4,8	55,1	36,6	3,3			3508	4,4
1974	2,7	13,2	54,5	29,2	0,4			2535	4,0
1975	0,6	10,7	75,0	13,2	0,5			2592	4,0
1976	2,6	13,4	57,1	26,7	0,2			2587	3,9
1977	2,7	12,6	43,2	35,7	5,7	0,1		3360	4,3
1978	0,1	15,0	53,2	27,5	4,1	0,1		2849	4,0
1979	0,3	17,9	63,8	16,3	1,6	0,1		4484	4,0
Autumn period									
1971	0,3	23,6	42,5	33,1	0,5	-	-	1176	3,1
1972	4,7	15,0	55,9	22,6	1,8	-	-	2960	3,0
1973	19,4	25,1	24,0	26,6	4,7	0,2	-	3394	2,8
1974	8,7	28,2	52,6	9,7	0,8	-	-	498	2,9
1975	5,3	22,0	43,5	28,4	0,7	0,1	-	3518	3,1
1976	0,6	24,2	43,1	27,7	4,2	0,2	-	4631	3,1
1977	2,1	29,8	41,2	21,9	4,8	0,2	-	3384	3,0
1978	-	52,0	33,9	13,2	0,9	-	-	2500	2,6
1979	0,4	40,7	51,5	6,9	0,4	0,1	-	1951	2,7

Table 5

Indices of abundance of the 0-group capelin

(Anon.1978, 1978A)

Parameters	: 1971:	1972:	1973:	1974:	1975:	1976:	1977:	1978:
Index	151	275	125	359	320	281	194	40
Abundance	3	3	2	3	3	3	2	1

Table 6

Quotas of the Barents Sea capelin yield, in thou.tons

Year	Season	USSR	Norway	Total
1979	Spring	375	650	1025
	Autumn	350	425	775
	Total	725	1075	1800
1980	Spring	360	540	900
	Autumn	280	420	700
	Total	640	960	1600