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Estimation of stock and total allowable catch of mackerel
in the Northwest Atlantic for 1977-1978

by

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Introduction

In 1976 the estimated mackerel catch taken by USSR and Poland exceeded the half of the total mackerel catch from the Northwest Atlantic. The comparison of the Soviet and Polish mackerel age readings of the 1976 catches showed certain discrepancies. Therefore, at the Special ICNAF Meeting held in December 1976 it was suggested to use the combined USSR and Poland length-age keys to revise the USSR catches for 1976. Since the precise determination of age composition of the catch is a decisive factor in estimation of the stock and total allowable catch, this suggestion is worthy to be discussed.

The estimation of the stock and total allowable catch for 1977-1978 is made with regard for the recent information on the mackerel catches in 1977.

The catches and their size composition

The conditions for the mackerel fishery are favourable in 1977. The mackerel catch quota for January-February is likely to be taken by the USSR fleet. The mackerel catch per effort has increased as compared to that in 1976. A considerable proportion of the mackerel catch was yielded by the ships of the BMRT type in pelagic fishery. From preliminary data the catch per hauling hour by the BMRT type ships is 5.49 tons. As compared to 1976 the catch per effort has increased by 54%.

As is evident from the analysis of the 1977 catch size composition, the bulk of the catch is made of the fish of 31-34 cm (44.4%) (fig.1). Mean length of the 1973 year class fish is 29.4-29.6 cm in the I quarter of 1977 (table 1). Since the average length increment for mackerel in the fourth year of life is 2.4 cm (Isakov V.I., 1976), the length of 4 year olds of the 1973 year class at the average growth rate will be approximately 32 cm. Therefore, it can be suggested that the mackerel of 31-33 cm prevailing in the 1977 catches belongs to the strong 1973 year class. The 1974 year class with the mean length of 30-31 cm in 1977 was less pronounced in the USSR catches.

The comparison of the Soviet and Polish age readings on mackerel

The principal discrepancies in the USSR and Poland length-age keys related to the I quarter of 1976. The comparison of the results showed that 18.4% (18 out of 98) of the fish ranging from 25 to 27 cm was considered to be 3 year olds according to the USSR data, while from the Polish data it followed that the number of this age group did not exceed 2% (table 1). In the comparison of mean lengths both of 2 and 3 year olds no significant differences were observed between the Polish and Soviet data. Simultaneously, marked variations occurred in the Polish age keys in the April-May period compared to the data for the I quarter. The ratio of age groups 2 and 3 within the length range of 25-27 cm was similar to the USSR data, while in April-May the proportion of 3 year olds ranging from 23 to 27 cm was accordingly 29.2% and 61.1% compared to 2% given for January-March. The increase of the mean length of fish with age is one of the factor indicative of the precision of age determination. Therefore, a sharp decrease of the mean length of 3 year olds from 31.1 cm to 27.2 cm in the period from March to May reveals a discrepancy in the Polish age reading for 1976.

Thus, from our viewpoint, there is no reason to revise the USSR catches for 1976 using the combined USSR and Poland length-age keys, therefore, the age composition of the mackerel catch for 1976 given in table 2 is based on the data presented at the Special ICHAF Meeting held in December 1976 (Isakov et.al, 1976).

Estimation of the stock and total allowable catch

In estimation of the stock and total allowable catch the indices of the year class abundance, the fishing mortality rate and the estimate of partial recruitment given in the joint report (Isakov et. al, 1976) were used, with regard for the Report of the ad hoc Working Group on Mackerel, December 1976, on the poor 1975 year class which was estimated as 1.250 mill.sp. The 1973 year class well represented in the USSR catches in 1977 is considered to be a strong one as in the recent years (Isakov et. al, 1976).

It is assumed that the catch quota set for 1977 will not be taken by some countries, and the value of F will be 0.2.

According to a suggested version of calculation (table 3) the abundance of spawning stock in 1978 will increase by 9.4% compared to 1977, and the total allowable catch ^{of} 165 thous. tons may be recommended at $F_{opt} = 0.35$.

References

1. ISAKOV V.I. 1976. On some results of biological studies on mackerel from the Northwest Atlantic. Int. Comm. Northw. Atlant. Fish. Res. Doc. 76/VI/52, Ser. No. 3838.
2. ISAKOV V.I., L.IVANOV, P.KOLAROV, W.MAHNKE, A.PACIORKOWSKI, V.A.RIKHTER, S.UCINSKI and B.VASKE. 1976. Reassessment of mackerel stock in ICHAF Area. Int. Comm. Northw. Atlant. Fish. Res. Doc. 76/XII/169, Ser. No.4065.
3. ICHAF, 1976. Report of the ad hoc Working Group on Mackerel - December 1976. App. III.

Table 1. Length-age keys of the catches at age 2 and 3 and size composition of the commercial Soviet and Polish catches in 1976

Size group	USSR SG I - SA 5			Poland January Div. 6B			Poland March SA 5ze			Poland April SA 5ze			Poland May SA 5ze		
	Age : 2	Age : 3	Age : 3	January : size : comp.,%	Age : 2	Age : 3	March : size : comp.,%	Age : 2	Age : 3	April : size : comp.,%	Age : 2	Age : 3	May : size : comp.,%		
17				1											
18				1											
19				1											
20				2											
21				3											
22				6											
23				12											
24				34											
25				101											
26				113											
27				76											
28				56											
29				54											
30				101											
31				82											
32				43											
33				45											
34				42											
35				71											
36				69											
37				45											
38				27											
39				10											
40				4											
41				1											
42				1											
mean size (mm)	44	98	1000	240	134	98	1000	77	96	1000	111	72	1000		
No. of samples	25.9	29.51	28.3	25.83	30.0	30.1	29.4	26.6	28.6	29.6	24.9	27.2	25.6		
			30		12	3	3			3			2		

Table 2. Age composition of the mackerel catches from the Northwest Atlantic in 1976

Countries:	Year classes											thous. sp.	Catch (tons)	Mean weight of the specimen(g)	
	1975	1974	1973	1972	1971	1970	1969	1968	1967	1966	1965				
	1	2	3	4	5	6	7	8	9	10	11				
<u>SA 5 + 6</u>															
Bulgaria	%	16.0	47.6	21.3	5.7	3.8	1.8	1.9	1.0	0.6	0.2	0.1	58584	13240	226
	thous. sp.	9373	27887	12478	3339	2226	1054	1113	586	352	117	59			
GDR	%	6.7	23.8	26.7	8.9	9.3	9.8	6.8	5.5	1.5	1.0	-	113211	37020	327
	thous. sp.	7587	26944	30227	10076	10529	11095	7698	6227	1698	1132	-			
Poland	%	16.9	29.6	25.2	7.7	6.5	4.2	3.5	3.7	2.2	0.5	-	203985	53240	261
	thous. sp.	34473	60380	51405	15707	13259	8567	7139	7547	4488	1020	-			
USSR	%	0.6	36.3	45.4	5.9	4.6	1.8	2.8	2.2	0.4	-	-	414757	87099	210
	thous. sp.	2488	150557	188299	24471	19079	7466	11613	9125	1659	-	-			
Other countries	%	4593	22698	24117	4593	3850	2432	2364	2027	675	203	-	67552	16280	241
	thous. sp.	4593	22698	24117	4593	3850	2432	2364	2027	675	203	-			
Total	%	6.8	33.6	35.7	6.8	5.7	3.6	3.5	3.0	1.0	0.3	+	858089	206879	241
	thous. sp.	58512	288466	306526	58180	48943	30614	29927	25512	8872	2472	59			
<u>SA 3 + 4</u>															
	%	0.9	11.4	23.7	15.4	22.3	5.6	3.6	11.3	4.2	0.5	1.1	59534	28121*	472
	thous. sp.	544	6784	14093	9172	13279	3358	2132	6715	2499	283	675			
<u>SA 3 - 6</u>															
Total	%	6.4	32.2	35.0	7.3	6.8	3.7	3.5	3.5	1.2	0.3	0.1	917623	235000	256
	thous. sp.	59056	295250	320619	67358	62222	33972	32059	32227	11371	2755	734			

* USSR and Canada catches

Table 3. Total allowable catch of mackerel in the Northwest Atlantic for 1977-1978

	1976			1977			1978		
	Spawning stock	F ₃₊	Catch	Spawning stock	F ₃₊	Catch	Spawning stock	F ₃₊	Catch
	thous. t.		thous. t.	thous. t.		thous. t.	thous. t.		thous. t.
F ₁ = F ₃₊ x 0.10	669.7	0.6	252.2	577.0	0.20	93.0	631.0	0.35	165.0
F ₂ = F ₃₊ x 0.45									
<u>Recruitment</u>									
Year class 1975 =	12500								
" " 1976 =	15000								

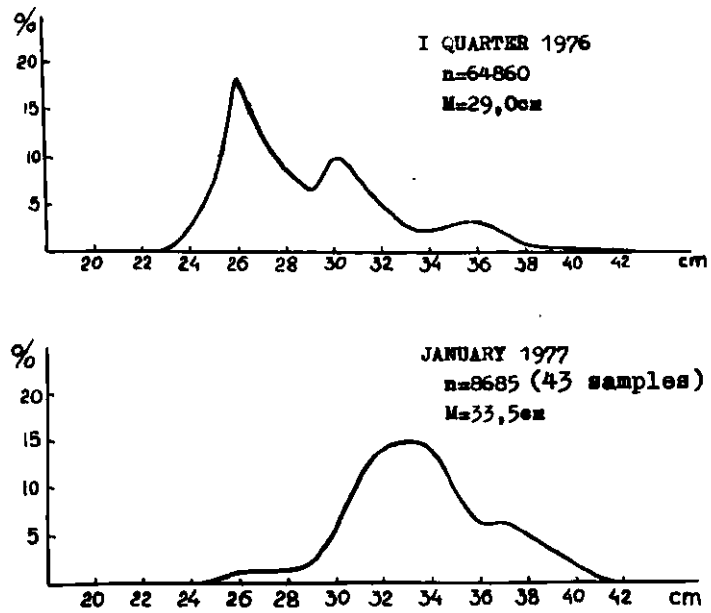


Fig. 1. Mackerel length composition in commercial catches taken from Subarea 5 + Statistical Area 6 in the first quarter of 1976 and 1977.