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Assessment of Mackerel stock in the North-Western Atlantic ocean in 1974-1976

by

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A meeting of Bulgarian, the German Democratic Republic Polish and Soviet scientists was held in Moscow, March 17 - 21, 1975 to prepare materials on stock assessment for the ICNAF meeting in 1975. Data on the age composition of mackerel catches in 1974 were considered, stocks were assessed for 1974 - 1976, and the size of possible catch determined for 1976. Anderson unpublished material was used.

Mackerel catches taken by Bulgaria, the German Democratic Republic, Poland and the USSR in 1974 were on the level of their quota, with some minor differences. The catches of other countries in Subarea 5 and 6 were assumed to amount to 4.1 th.m.tons including 2.6 th.m.tons taken by Rumania /unofficial data/ and 1.5 th.m.tons by others i.e. on a level of their quota.

The data on the age composition of mackerel catches presented by the participating coutries were used to calculate the catches age composition of ther countries in ICNAF Subareas 3-6, on the assumption that the catches in SA 3 and 4 were on the level of the quotas /Table 1/. It was further assumed that mackerel in the North-Western Atlantic is represented by one population.

The data given in Table 1 show that the 1971 and 1972 year classes constituted the bulk of catches in 1974 /23.9% and 23.1% respectively/. The share of 1973 year class which amounted to 9.2% in1974 landings has been underestimated,as there was no USSR mackerel fishery in the fourth quarter of the year. The data from the trawl survey made by RV "Khronometer" in April 1974 in SA 5 showed that 25% of the catch was the 1973 year class. This generation was very abundant in the commercial catches of the German Democratic Republic, Bulgaria and the USSR. In the fourth quarter of 1974 and the first quarter of 1975 this year class constituted 50 - 60% /Individuals of 19 -28 cm./ /Fig.1/. The 1973 year class was also abundant in Polish catches in January and February of 1975 /Fig.2/.

To assess the size of mackerel stock in SA 3 - 6 materials on the abundance of 1971 and 1972 year classes published in Res. Doc. ICNAF 73/14, 73/98, 74/8, 74/10, 74/115, Redbook 1973 p.I pp.94, table 7 were considered, these year classes there being described as rich. It was found on the basis of analysis of the age composition of catches, as well as fishing mortalities in the years 1968 - 1974, that previous assumptions as to the abundance of 1971 and 1972 year classes 31% of 1967 year class /as one year old fish/, were underestimated. The obtained results indicated that each of these year classes constituted about 50% of 1967 year class and this abundance was used in assessment presented here. It should be pointed out that the abundance of the 1971 year class estimated by yearlings in Halifax in May, 1974 was based on rather rough assumptions on partial recruitment, therefore this cannot be regarded as final.

The abundance of 1973 year class was assumed to be equal 65% of 1967 year class/1.3 x1971y.c./ instead of 50% /1.6x 1971 y.c./ taken in Anderson unpublished assessment.

The analysis of fishing mortality in 1970 - 1974 made for age groups 1 - 3, showed that the estimates of partial recruitment adopted by the mackerel working group in Halifax /May, 1974/ were too high. Therefore it was decided to decrease the assumptions on partial recruitment of these age groups in both 1974 and 1975 from 25,50 and 90% to 10, 30 and 60% respectively according to tendences observed in previous years and results of fishing mortality estimates for the next few years.

The values of partial recruitment in 1973 for age groups 1 and 2 were decreased according to the above-mentioned assumptions as to recruitment and in accordance with the true catches of these year classes in 1973.

The results of assessment based on such entrance data showed - presuming that 1975 catch will be on a level with the quota set rof ICNAF Subareas 3 - 6 - that 1975 fishing mortality will be 0.5. If the fishing mortality in 1976 will be on a level with 1975, the catch will be 340 th.m.tons. Should the fishing mortality increase to 0.6 the possible catch will increse to 400 th.m.tons.

The estimation of population biomass /Tables 2 and 3/ showed no drop in mackerel stock in period between 1973 and 1976, the size being about 1.5 mln m.tons.

Table I

Age composition of mackerel catches in ICNAF
Subareas 5 and 6 in 1974 (mln individuals)

		1974 0	73 I	72 2	71 3	70 4	69 5	68 6	67 7	66 8	65 9	64 10	63 III	62 II2+I	Total No. (mln)	Total Weight (th. tons)	Mean Individ. Weight
Bulgaria	%	-	0,9	32,9	29,6	7,4	14,4	5,7	7,4	1,3	0,4						
	mln	-	0,6	23,4	21,0	5,3	10,2	4,1	5,2	0,9	0,3				71,0	20.7	292
GDR	%	0,5	9.6	13.9	10.9	8.9	13.5	15.9	19.7	4.5	2.0	0.2	0.2	0.1		60.0	
	mln	0.9	16.7	24.2	19.0	15.5	23.6	27.8	34.3	7.9	3.5	0.4	0.4	0.2	174.4	60.0	344
Poland	%	1.0	16.0	29.9	17,0	9.3	9,6	8.0	6.8	1.7	0.5	0.2					
	mln	3.6	56.0	104.8	59.5	32.5	33.7	28.0	24.0	6.0	1.8	0.9			350.9	96.1	274
USSR	%	-	4.0	19.2	35.7	9.3	9.0	10.8	9.6	1.9	0.3	0.1	0.1	+			
	mln	-	14.7	70.1	130.7	34.0	33.3	39.6	35.1	7.0	1.2	0.2	0.2	0.1	366.1	108.6	295
	%	0.5	9.2	23.1	23.9	9.1	10.4	10.3	10.2	2.3	0.7	0.2	0.1	+			
	mln	4.5	88.0	222.5	230.2	87.3	100.8	99.5	98.6	21.8	6.8	1.5	0.6	0.3	962.4	285.4	296
(Ass.) OTHERS	mln	0.1	1.3	3.2	3.3	1.3	1.4	1.4	1.4	0.3	0.1	+	+		13.8	4.1	296
T O T A L	mln	4.6	89.3	225.7	233.5	88.6	102.2	100.9	100.0	22.1	6.9	1.5	0.6	0.3	976.2	289.5	296
Subareas 3 to 4																	
SA 3 + 4	mln	0.9	17.1	42.9	44.4	16.9	19.3	19.1	19.0	4.3	1.3	0.4	0.2		185.8	55.0	296
Subareas 3 to 6																	
GRAND TOTAL	%	0.5	9.2	23.1	23.9	9.1	10.4	10.3	10.2	2.3	0.7	0.2	0.1	+			
	mln	5.5	106.4	268.6	277.9	105.5	121.5	120.0	119.0	26.4	8.2	1.9	0.8	0.3	1162.0	344.5	296

Table 2

Predicted fishing mortalities, stock sizes and catches in S A 3 – 6

Year	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	Age 4 +
									F								
1973	.6	.6	.6	.6	.6	.6	.6	.6	.6	.6	.54	.18	.03				.60
74				.26	.40	.92	1.19	.91	1.21	.70	.60	.23	.13	.03			.82
75					.20	.29	.66	.78	.62	.79	.50	.43	.36	.19	.06		.50
76						.20	.29	.66	.78	.62	.79	.50	.43	.36	.19	.06	.50

Year	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	Age 1 + No. x 10^6	Age 1 + Wt (000 mt)
									Stock size (x 10^6)									
1973	1	+	4	12	18	38	102	553	471	675	624	2535	(3492)				8525	1458
74	+	+	2	5	7	15	42	225	192	275	270	1569	2581	(4540)			9795	1471
75				3	3	4	9	67	42	101	110	924	1680	3264	(3492)		9699	1526
76					2	2	3	21	16	31	48	368	713	1981	2413	(3492)	9178	1473

Year	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	(10^6) Total no	(000 mt) Landings
									S A 3 – 6 Catches – No. (x 10^6)									
1973	+	+	1	5	7	15	40	219	186	267	229	356	96	+			1422	419
74			+	1	2	8	26	119	120	122	106	278	269	106			1162	344
75					+	1	4	32	17	49	38	280	438	483	182		1524	343
76						+	1	10	8	14	24	131	223	522	361	182	1476	340

TABLE 3. **Mackerel stock record in S A 3 - 6**

	Age Group	W (kg)	Part. Recr.	1973	1974	1975	1976
Stock	0						
	I	.095	25	(3492)	(4540)	(3492)	(3492)
	2	.175	50	2535	2581	3264	2437
	3	.266	90	624	1569	1680	2001
	4	.350	100	675	270	924	735
	5	.432	↓	471	275	110	383
	6	.506		553	192	101	49
	7	.564		102	225	42	34
	8	.615		38	42	67	17
	9	.659		18	15	9	23
	10	.693		12	7	4	3
	11+	.693		5	7	6	4
	N s (x 10^6) age 1 +			8525	9795	9699	9178
	W s (000 tons)			1458	1471	1526	1473
Catch	0			+	5	-	-
	I			96	106	182	182
	2			356	269	483	361
	3			229	278	438	522
	4			267	106	280	223
	5			186	122	38	131
	6			219	120	49	24
	7			40	119	17	14
	8			15	26	32	8
	9			7	8	4	10
	10			5	2	1	1
	11+			2	1	-	-
	N c (x 10^6)			1422	1162	1524	1476
	W c (000 tons)			419	344	343	340
	Fishing Effort (f)						
	Fishing Mort. $(F)_4$ +			0.6	0.82	0.5	0.5

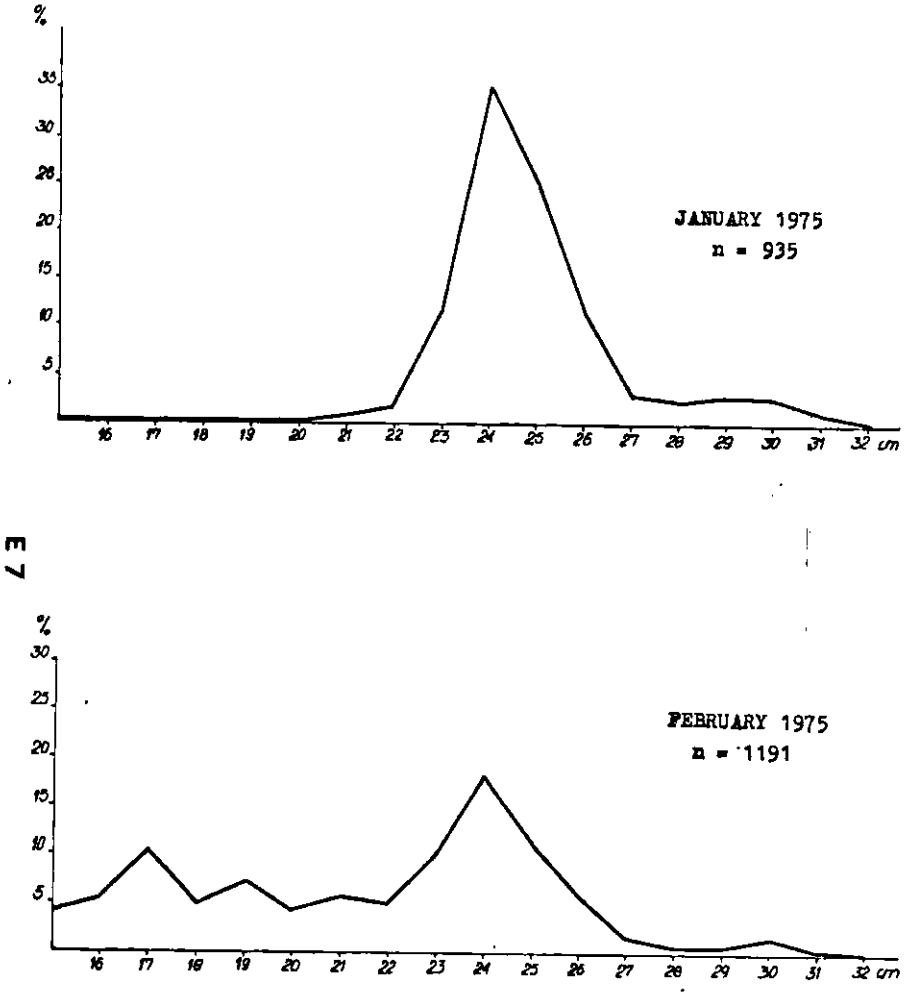

Fig. 2

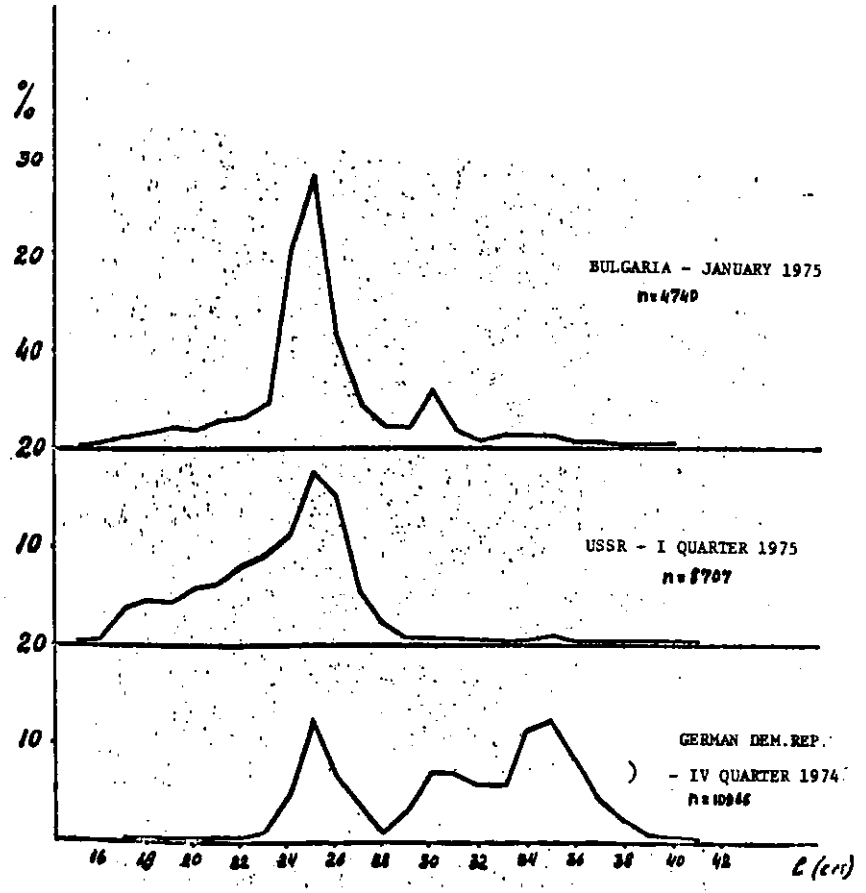

Fig. 1. Size composition of mackerel (per cent) in catches of fishing vessels in Subareas 5 and 6, IV quarter 1974 - I quarter 1975.