NOT TO BE CITED WITHOUT PRIOR
REFERENCE TO THE AUTHOR(S)

International Commission for the Northwest Atlantic Fisheries

Serial No. 5390

ICNAF Res. Doc. 79/VI/50

ANNUAL MEETING - JUNE 1979

Assessment of Mackerel Stock and Possible Catch in the Northwest Atlantic in 1978-80

by

V. I. Isakov
Atlantic Research Institute of Marine Fisheries and Oceanography (AtlantNIRO)
Kaliningrad, USSR

Abstract

Based on the data of the joint USA-USSR trawl survey conducted in January-March 1978 by the research vessel ARGUS the analysis of mackerel distribution in the USA shelf area was made, the minimum biomass estimated and age composition of the catches determined. The abundance of the spawning mackerel stock by 1979 was reported to reduce by 4.6 compared with 1970. The abundance of mackerel in 1980 is shown to be largely dependent on the 1978 year class strength provided that the fishing intensity in 1979 is maintained at a low level (F = 0.1) and that inconsiderable recruitment to the spawning stock of poor 1975-1977 year classes is expected. The mean strength of the 1978 year class (1 500-2 100 mill.sp.) will promote an increase in the spawning stock in 1980 by 1.8-8.6% respectively compared with 1979. The possible catch in 1979 may amount to 45-50 thous. tons without damage to the spawning stock.

Results and Conclusions

The stock size and possible catch were estimated from the data of the trawl survey conducted by the research vessel ARGUS on the USA shelf in January-March 1978.

As is evident from the distribution of mackerel catches (fig. 1), no appreciable aggregations of this species are available between the south-eastern slopes of Georges Bank and Hudson Canyon. The catches per half an hour hauling did not exceed a

few kilograms. Dense mackerel aggregations were found south of the Hudson Canyon at depths of 90-210 m. Most dense concentrations reported were from the gradient zone with the water temperature of 9.5-11.5°C.

The minimum mackerel biomass estimated from the survey data was about 30 thous.tons.

A repeated survey of discovered mackerel aggregations from 18 through 23 March showed that most dense mackerel concentrations occurred in the shelf area between the Norfolk Canyon and Baltimore at depths of 90-210 m, with the near-bottom water temperature of 9-12°C. The catches sharply decreased at greater and lesser depths.

The total area occupied by the aggregation was 638 sq.miles, the minimum biomass was estimated as 103 thous. tons and abundance as 264 mill. sp. As shown by the data of trawl survey conducted by KHRONOMETR in March-April 1974 the minimum mackerel biomass was 247 thous. tons thus indicating a decrease in the mackerel abundance during the 1974 to 1978 period.

The mackerel catch statistics for 1978 is not complete. It is highly suggestive that the Northwest Atlantic mackerel was fished by the USA and Canadian fleets whose catches did not exceed 20 thous. tons in recent years. Other countries did not conduct a direct fishery for mackerel in 1978 because of extremely small quota allocations. Considering the above-stated we assume that the mackerel catch in 1978 was 23 thous. tons. To assess the stock size and recruitment rate, we specified the age composition of commercial catches for 1977 and determined that of the catches taken by research vessels in 1978. It was assumed that in 1978 the age composition of commercial catches corresponded to that of the research catches. The analysis of the age composition of the 1977-1978 catches (table 1) indicated that the bulk of the 1977 catches was represented by 3 and 4 year olds of the 1973 and 1974 year classes. These year classes, aged 4 and 5, were numerous in the 1978 catches as well compris-

ing 51.6 and 15.7% respectively.

The 1973 and 1974 year classes had also prevailed in the 1975-76 catches and were considered as strong ones (Isakov et al., 1976).

The abundance of the youngs-of-the-year of the 1973 and 1974 year classes was calculated by means of the virtual population analyses. It constituted 2 493 and 2 922 mill. sp. respectively.

The 1975, 1976 and 1977 year classes are estimated as poor ones since their proportion was small in both the 1978 catches and the catches of the previous years. This opinion is shared by the American and Polish scientists (Anderson and Paciorkowski, 1978). They estimated the 1975 year class abundance as 800 mill. sp., and the 1976 and 1977 year class abundance as 400 mill.sp. each. We used these values in our calculations with the assumption that the 1978 year class would be of average strength, and estimated its abundance as 1 500-2 100 mill.sp. With respect to the year classes that will be gradually entering the exploitable stock in 1979-80 the recruitment rates are as follows: 10% of the youngs-of-the-year, 45% of two year olds and 100% of three year olds and older. With these assumptions, the mackerel stock size in 1976-78 and the possible catch and stock size in 1979-80 were calculated (table 2 and 3).

The analysis of the data indicated that a trend towards a reduction of the mackerel stock that has been observed since 1971 will persist through 1979. By 1979 the abundance of the spawning stock decreased by 4.6 compared with 1970. In 1979 the stock size will be 569.6 thous. tons and the possible catch of 49 thous. tons may be taken provided that the fishing intensity is maintained at a low level ($F = 0.1$). In 1980 the mackerel abundance will be largely dependent on the 1978 year class strength. The mean strength of this year class (1 500-2 100 mill. sp.) will promote an increase in the spawning stock in 1980 by 1.8-8.6% respectively. The above data suggest that the mackerel catch of 45-50 thous. tons in 1979 will not result in reduction of the spawning stock in 1980.

References

1. ANDERSON E.D. and A.L.PACIORKOWSKI, 1978. A review of the Northwest Atlantic mackerel fishery. ICES, Symp.Biol.Bas.Rel.Fish. Stock Manag., No.11.

2. ISAKOV V.I., L.IVANOV, P.KOLAROV, W.MAHNKE, A.PACIORKOWSKI, V.A.RIKHTER, S.UCINSKI, B.VASKE., 1976. Reassesment of mackerel stock in ICNAF area. Int.Comm.Northw. Atlant.Fish., Ann. Mtg., Res. Doc. 76/XII/169 Ser.No. 4 065 (mimeographed).

Table 1. Age composition of mackerel catches in the Northwest Atlantic, 1977-78.

Age	1977[1]		1978	
	No.	%	No.	%
1	1.8	0.8	1.0	1.7
2	24.8	10.9	3.4	5.4
3	92.1	40.5	11.1	17.9
4	64.2	28.2	32.1	51.6
5	13.6	6.0	9.8	15.7
6	9.1	4.0	1.9	3.1
7	7.6	3.3	1.1	1.8
8	6.9	3.0	0.8	1.3
9	3.6	1.6	0.4	0.6
10	2.9	1.3	0.2	0.3
11+	0.9	0.4	0.4	0.6
Total (10^6)	227.5	100.0	62.2	100.0
Catch (000 t)	77.6	-	23.0	-

[1] Age composition of USSR, Polish and German Democratic Republic catches.

Table 2. Stock sizes of mackerel in Northwest Atlantic, 1966-78, with M = 0.30.

Year-class	Stock size (10^6) in 1976	1977	1978
1966	18.7	10.7	7.2
1967	54.0	30.4	20.1
1968	53.0	11.7	5.6
1969	84.5	34.6	19.8
1970	87.5	35.3	19.7
1971	169.0	70.8	44.7
1972	171.2	68.7	39.3
1973	905.6	391.2	234.7
1974	1,882.4	1,135.1	762.8
1975	800.0	541.6	398.6
1976	-	400.0	294.4
1977	-	-	400.0
Stock size (10^6)	4,226.9	2,730.0	2,246.9
Stock size (000 t)	952.4	714.5	659.0
Sp. stock (10^6)[1]	2,485.7	2,059.3	1,699.7
Sp. stock (000 t)	711.7	629.1	594.3
F[2]	0.560	0.140	0.043

[1] Spawning stock includes 50% of age 2 abundance and 100% of age 3 and older, except young of the year.
[2] Fishing mortality on age 3 and older.

Table 3. Spawning stock sizes and possible catch for Northwest Atlantic mackerel in 1978-80.

	1978	1979	1980[2]	1980[3]
Stock size (10^6)	594.7	569.6	579.8	618.3
F[1]	0.04	0.10	0.10	0.10
Catch (000 tons)	23.0	48.6	47.4[4]	50.3[4]

[1] Fishing mortality on age 3 and older.
[2] Stock size assuming 1978 year-class = 1500×10^6.
[3] Stock size assuming 1978 year-class = 2100×10^6.
[4] Catches exclude young of the year.

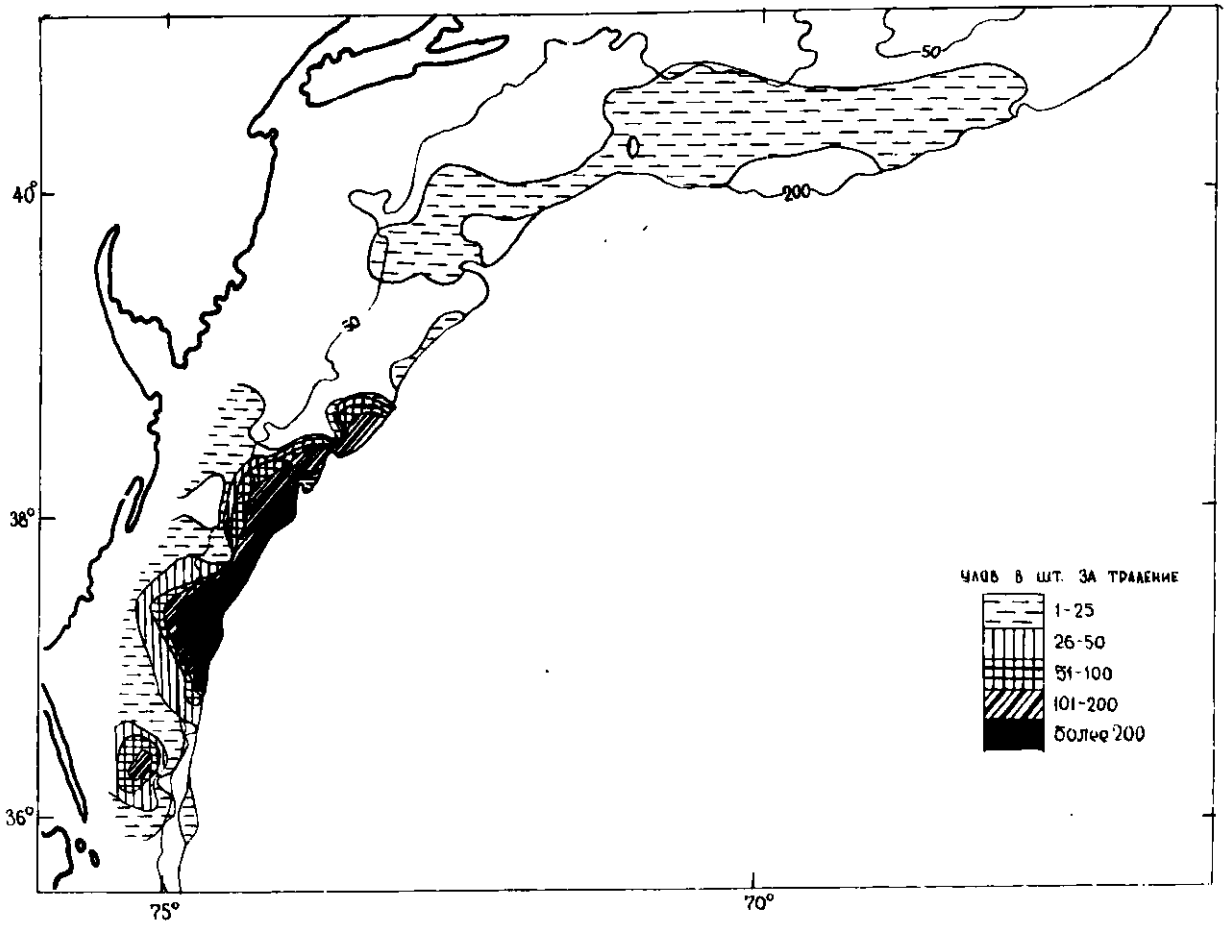

Fig. 1. Distribution of mackerel catches on the USA shelf.
26 January - 14 March, 1978.