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Results of Studies Conducted by the USSR in NAFO Divisions 4VWX in 1980

by

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A. State of fisheries

Silver hake. In 1980 the silver hake was the main fish species caught by the USSR fleet on Nova Scotian Shelf (Div.4). In 1980 the silver hake catch was 41,0 thous.tons compared with 45,1 thous.tons in 1979. The silver hake was caught in the area open for the fishing mainly from May to August. In May, its largest aggregations were found on the shelf slopes at 110-350 m depths; in June and July silver hake aggregations stayed in the same regions. The density of aggregations and, consequently, catches per haul, maintained approximately at the same level. In August the silver hake migrated in numbers to the shallow water regions in the north and its catches south of a banned region sharply declined. As in previous years, the bulk of the catches was represented by the individuals 28-35 cm in length at the age of 2-5 (Tables 1 and 2). The catch composition and abundance indices indicate that the 1978 year class was most numerous and other year classes were average-sized. Since the abundance of the 1978 year class will considerably decrease in 1982, a certain reduction of the stock size should be expected compared with 1981.

Argentine. The argentine catch in 1980 was just 0.5 thous. tons which is a very small catch given a USSR quota allocation of 9,3 thous.tons. In an alloted region it was taken as an insignificant by-catch during the fishing for silver hake and shortfin squid. The restrictions imposed in the fishery make it tech-

nically impossible to take the argentine quota. The argentine catches were mainly represented by the specimens 25-35 cm in length at the age of 5-9 (Tables 3 and 4). Although the argentine stocks are in good state, the future USSR catches of this species will be very limited due to existing restrictions.

B.Special studies

Hydrology. In August-December 1980 ecological surveys of the Scotian Shelf were conducted by SRTM-8072 and R/V ARGUS with the purpose of investigation into the factors controlling the survival of the silver hake eggs and larvae. During these surveys meteorological and hydrological observations were made and a total of 800 hydrological stations occupied.

The analysis of the water temperature distribution showed that during the entire observation period the water temperature in the near-bottom layer in the deep-water part of the shelf was higher than usual. So, for example, in Emerald Deep the near-bottom temperatures were 9.5°C in August, exceeded 10°C in September and were above 11°C in October. In November the surveys did not cover the shelf area, however, from the December data it can be concluded that the near-bottom temperatures gradually decreased throughout November and their values in the first ten-day period of December were at the level of the August values (9.2-9.6°C). The unusual increase of the near-bottom temperature in the Scotian Trough area can be related to intensified advection of slope waters to the shelf. This intensification might have been promoted by southern winds which were predominant in the period from August to October. It seems that a prolonged advection of warm slope waters affected the distribution of commercial species in the near-bottom layer. So, during the summer-autumn period the massive silver hake aggregations were not found in the traditional slope parts. At the same time the shortfin squids appeared on the slope in numbers.

Ichthyoplankton. In 1980, extensive surveys aimed at the studying of the silver hake survival at early stages of their

development were conducted by two Soviet and one Canadian ships under the joint program. Two ichthyoplankton surveys covering 130 stations each were made by SRTM-8072 in August and September. In the end of September and in October a silver hake fry abundance survey was conducted using a fry trawl at 100 stations.

The study of a larval silver hake "patch" conducted by R/V ARGUS involved a variety of observations: water temperature, salinity, chlorophyll, water transparency, zooplankton, eggs and larvae of silver hake. In addition, the experiments on comparative catchability of plankton-samplers Bongo under differing hauling conditions and fitted with various mesh-size gauze were made as well as of two models of Isaaks-Kidd trawls.

The processing of the ichthyoplankton samples collected in August and September 1979 was completed in 1980. According to preliminary results the massive spawning of the silver hake took place west of Sable Island, as in the previous years. The loss of eggs was the highest at early development stages (60 - 70%), during the cleavage, overgrowing and gastrulation, and considerably decreased at the stage of formed embryo. The abundance of larvae on the Scotian Shelf amounted to 15×10^{12} sp. in August and 10×10^{12} sp. in September. The largest reported aggregations of the silver hake fry in October were from the Scotian Trough area. The total abundance of silver hake fry in October 1979 was 5×10^{7} sp. The feeding study of the larval silver hake based on the survey data obtained in August and September 1979 showed that the ration of the larvae 2.0-5.9 mm in length was mainly represented by nauplial copepods, and in the food mass of larger larvae (6-30 mm) Calanus finmarchicus and other copepods were prevalent. The proportion of feeding larvae was fairly high and averaged to 90%.

Table 1 Size composition of silver hake (%%) in the area of Nova Scotia

Length, cm	1977	1978	1979
10-11	+	-	-
12-13	+	+	+
14-15	0.1	+	0.1
16-17	0.6	0.3	1.2
18-19	1.4	0.5	2.5
20-21	1.4	1.2	2.4
22-23	0.8	2.5	2.4
24-25	1.5	6.0	4.3
26-27	7.6	9.0	10.5
28-29	17.4	14.5	21.6
30-31	25.8	25.3	23.1
32-33	27.0	20.6	18.1
34-35	11.3	11.7	7.8
36-37	3.7	5.1	3.7
38-39	0.9	1.9	1.3
40-41	0.3	0.7	0.6
42-43	0.2	0.3	0.2
44-45	+	0.2	0.2
46-47	+	0.1	+
48-49	+	0.1	+
50-51	+	+	+
52-53	+	+	+
54-55	+	+	-
56-57	+	+	-
Total,%	100.0	100.0	100.0
Mean length	30.6	30.6	29.6
No.meas.fish	73731	79259	41693

Table 2 Age composition of silver hake (%%) in the area of Nova Scotia

Age, years	1977	1978	1979
1	2.7	0.5	6.9
2	8.9	18.5	24.5
3	44.1	37.5	37.1
4	35.9	32.8	21.6
5	7.1	8.9	7.9
6	1.0	1.2	1.4
7	0.3	0.4	0.5
8	+	0.2	0.1
9	+	+	+
10	-	+	-
Total, %	100.0	100.0	100.0
Mean age	3.40	3.40	3.06

Table 3 Size composition of argentine (%%) in the area of Nova Scotia

Length, cm	1977	1978	1979
11	-	+	-
12	-	0.1	-
13	-	0.2	-
14	-	0.1	-
15	-	+	-
16	+	-	-
17	-	-	-
18	-	0.1	-
19	-	0.3	-
20	0.1	0.3	-
21	1.9	+	0.3
22	5.4	0.2	-
23	17.3	2.6	0.6
24	11.6	11.8	3.1
25	2.1	27.9	4.0
26	1.4	25.7	4.4
27	2.1	11.2	7.2
28	3.9	4.1	11.6
29	7.2	3.4	6.5
30	10.8	3.6	2.0
31	9.3	3.4	4.6
32	10.2	2.3	9.3
33	6.9	1.4	9.9
34	4.6	0.5	10.3
35	1.5	0.4	9.1
36	1.3	0.1	4.8
37	1.2	0.1	3.7
38	1.0	0.1	3.7
39	0.2	0.1	1.8
40	+	+	1.5
41	-	+	1.1
42	-	+	0.5
Total, %	100.0	100.0	100.0
Mean length	28.1	26.3	31.6
No.meas.fish	3451	8219	599

Table 4 Age composition of argentine (%%) in the area of Nova Scotia

Age, years	1977	1978	1979
1	+	0.3	-
2	-	0.5	-
3	2.6	3.4	0.3
4	34.6	53.0	6.9
5	7.5	17.3	21.1
6	13.5	6.4	12.6
7	14.5	11.7	12.1
8	13.8	4.6	22.3
9	7.6	1.2	11.0
10	2.7	0.7	4.3
11	1.1	0.3	2.6
12	1.1	0.4	3.8
13	0.6	0.2	1.8
14	0.3	+	0.2
15	0.1	+	0.8
16	+		0.2
Total, %	100.0	100.0	100.0
Mean age	6.11	5.0	7.3