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Studies Conducted by the USSR in NAFO Subarea 4 in 1981

by

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A. A state of Fishery

Silver hake. In 1981 of the total allowable catch of 75 thous. tons a quota of 48.4 thous. tons was allocated for the USSR. In 1981 the silver hake catch was 37.4 thous. tons compared with 41,0 thous. tons in 1980 and 45.1 thous. tons in 1979. The catches taken by other countries were insignificant and amounted to 762 tons. Thus, the total catch was considerably below the allowable catch of 75 thous. tons. The silver hake was caught by large freezer trawlers (BMRT-type) on the southern slopes of Nova Scotia Shelf in the areas from Emerald to Sable Banks during second half of April to early August. The species were caught at 100-350 m depths in April-June and 100-200 m in July. Early in August the silver hake fishing was closed since the shortfinned squid quota was taken and the ships left the Nova Scotia area. The bulk of the catches was represented by the individuals at the age of 3-5 and 28-35 cm in length. Mean length, weight and age were 31.5 cm, 224 g and 3.5 years old, respectively (tables 1-2). The 1978 year class was numerous and in 1982 the bulk of the catches will be represented by this year class at age 4.

Argentine. The argentine catch in 1981 was only 0.1 thous. tons which is a very small catch given a USSR quota allocation of 3,4 thous. tons. It may be explained by the fact that in the regions allotted for fishing by the USSR fleet the commercial aggregations were not formed by the argentine and it was taken as an insignificant by-catch during the fishing for silver hake.

The argentine catches were mainly represented by the specimens 27-34 cm in length with mean length of 30.7 cm and weight of 257 g (table 3).

Shortfinned squid. The USSR catches of the shortfinned squid was 4.9 thous. tons with a quota allocation of 5.0 thous. tons. The species was taken as a by-catch in the silver hake fishery at 100-150 m depths mainly in June and July. In June the bulk of the catches was represented by the specimens of 17-19 cm mantle length (mean length of 18.2 cm and weight of 108.1 g), in July by the specimens of 18-22 cm with mean length of 22.4 cm and weight of 156.2 g (table 4). The shortfinned squid stocks are underfished off Nova Scotia as well as over entire Northwest Atlantic. The total catch in divisions 3 and 4 in 1981 constituted only 25.9 thous. tons with total allowable catch of 150 thous. tons. The main reason for this is the allocation of insignificant quotas by Canada to the other countries.

#### B. Special studies

##### 1. Environmental conditions

a) Hydrology. Hydrological observations were made by means of BT during ichthyoplankton surveys and surveys on fry abundance aboard SRTM "EKLIPTIKA" from 26 August to 12 September, from 22 September to 9 October and from 19 October to 7 November. A total of 78 stations was completed during each survey. The analysis of the water temperature distribution by different layers showed that its value mostly exceeded the long-term mean level. The comparison of long-term mean level of heat content of Nova Scotia Shelf waters with that of previous years makes it possible to suppose that a continuing tendency of water heating is observed in this area.

b) Zooplankton. The results of processing of zooplankton samples collected on Nova Scotia Shelf during the silver hake spawning in August-September and analysis of the obtained data indicated that zooplankton biomass averaged about 10 g under sq. m over the entire area. The densest aggregations (some 4 g under sq. m) were recorded west of Sable Bank and off Emerald Bank.

The regions of the densest aggregations of larval silver hake were coincident with areas of the highest biomass of food zooplankton for larvae (Oithona spp., eggs and nauplii of Copepoda, Calanus finmarchicus, Centropages spp., Pseudocalanus spp.).

c) Ichthyoplankton. According to the results of the ichthyoplankton surveys aimed at studying of silver hake spawning efficiency on Scotian Shelf during 1977-1980 the massive spawning occurred in August and September in the areas between Browns Bank and Sable Island. Eggs and larvae was drifted in south-western direction. Massive transport of larval silver hake outside the shelf area was not observed. The loss of eggs at embryonal stage was rather high (60%). The abundance of larvae on the Scotian Shelf amounted to  $6.4 \times 10^{12}$  in September 1977,  $8.4 \times 10^{12}$  in 1978,  $15.0 \times 10^{12}$  in 1979 and  $10.0 \times 10^{12}$  in 1980.

According to the data on haulings the abundance of silver hake fry was  $2.6 \times 10^8$  specimens in October 1978,  $0.5 \times 10^8$  specimens in 1979 and  $0.5 \times 10^8$  in 1980. As noted earlier the 1978 year class was numerous.

Examination of larvae and fry survey conducted in the winter-spring period 1981 indicated that the spawning of the short-finned squids occurred within 5-6 months on the continental slope. The larvae concentrated in the surface waters and early youngs near the Gulf Stream edge from where they migrated to the shelf waters when growing. The transportation of some larval youngs to the southernmost coastal areas is limited by eddies separating from the northern edge of the Gulf Stream and moving in the west and south-west direction.

In March-April 1981 the abundance of young shortfinned squids averaged 10 billion specimens over the area of 71014 sq. miles between Nova Scotia Shelf and Sargasso Sea.

## 2. Biological studies

a) Feeding of larvae and fry of silver hake. In August-October the main food organisms for larval silver hake of 2-24 mm in length were nauplii, Oithona spp., Calanus finmarchicus, Centropages

spp. of 0.8-2-4 mm in length. In the food mass of the hake fry (30-70 mm) the larger organisms (2-9mm) were prevalent in October. The food was found in the intestines of almost all fry, i.e. the intensity of their feeding was high.

b) Feeding of adult silver hake. In October 1979 the adult hake fed mainly on its youngs, other fish species as well as on shrimps and euphausiids.

### 3. Studies on selectivity of trawl cod-end

In 1981 the experiments on catchability of trawls with mesh of 60 mm and 90 mm in the cod-end were made by the Soviet and Canadian scientists aboard the vessel of BMRT-type. The catchability of trawls with mesh of 90 mm was found to average 30% of trawls with 60 mm mesh.

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

Length, cm	1979	1980	1981
10-11	-	+	
12-13	+	+	
14-15	0,1	+	
16-17	1,2	0,2	+
18-19	2,5	0,4	0,2
20-21	2,4	0,7	0,4
22-23	2,4	1,8	0,3
24-25	4,3	3,5	0,8
26-27	10,5	7,8	3,9
28-29	21,6	14,0	16,4
30-31	23,1	24,5	32,1
32-33	18,1	24,2	24,4
34-35	7,8	14,1	13,0
36-37	3,7	5,0	5,2
38-39	1,3	2,2	2,1
40-41	0,6	0,7	0,7
42-43	0,2	0,3	0,3
44-45	0,2	0,4	0,2
46-47	+	0,1	+
48-49	+	+	+
50-51	+	0,1	+
52-53	+	+	+
54-55	-	+	+
56-57	-	+	+
58-59	-	+	+
60-61	-	-	+
62-63	-	-	+
Total, %	100,0	100,0	100,0
Mean length	29,6	31,1	31,5
Mean weight, g	226	202	224
No. of sp.	41693	56701	36482
Gear	trawl	trawl	trawl
Mesh size	60 mm	60 mm	60 mm

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

Age, years	1979	1980	1981
1	6,9	1,4	0,7
2	24,5	16,8	9,9
3	37,1	36,2	42,6
4	21,6	32,4	33,0
5	7,9	9,6	10,3
6	1,4	2,2	2,6
7	0,5	0,6	0,7
8	0,1	0,5	0,1
9	+	0,2	0,1
10	-	0,1	+
Total, %	100,0	100,0	100,0
Mean age	3,1	3,4	3,5
Gear	trawl 815 hake	trawl 815 hake	trawl 815 hake
Mesh size	60 mm	60 mm	60 mm

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

Length, cm	!	1979	!	1980	!	1981
21		0,3		-		-
22		-		-		0,2
23		0,6		-		-
24		3,1		0,6		-
25		4,0		10,4		0,9
26		4,4		18,3		4,7
27		7,2		18,5		11,5
28		11,6		23,7		11,6
29		6,5		17,1		14,7
30		2,0		10,0		9,8
31		4,6		0,7		8,2
32		9,3		0,2		10,6
33		9,9		0,1		7,1
34		10,3		0,1		8,0
35		9,1		0,2		4,4
36		4,8		0,1		2,7
37		3,7		-		2,9
38		3,7		-		1,8
39		1,8		-		-
40		1,5		-		0,2
41		1,1		-		0,5
42		0,5		-		0,2
Total, %		100,0		100,0		100,0
Mean length		31,6		27,6		30,7
No. meas. fish		599		955		548
Mean weight, g		310		226		257
Gear		bottom trawl		bottom trawl		bottom trawl
Mesh size		60mm		60mm		60mm

Table 4 Size composition of shortfinned squid catches (%) in 1981

Length, cm	June	July
13,5	0,1	+
14,0	0,4	+
14,5	0,7	0,1
15,0	1,2	+
15,5	2,2	0,3
16,0	3,4	0,4
16,5	5,6	1,3
17,0	8,7	1,5
17,5	12,2	3,1
18,0	12,8	4,1
18,5	14,9	6,0
19,0	10,5	8,8
19,5	9,0	9,1
20,0	4,6	12,5
20,5	4,0	9,3
21,0	2,2	12,9
21,5	1,8	6,2
22,0	1,2	9,9
22,5	3,4	4,1
23,0	0,4	4,6
23,5	0,4	2,0
24,0	0,2	1,9
24,5	0,1	0,8
25,0	+	0,8
25,5	-	0,1
26,0	-	0,2
26,5	-	+
27,0	-	+
Total, %	100,0	100,0
No. of sp.	1,868	4730
Mean length	18,5	20,4
Mean weight	108,1	156,2
Gear	trawl 815 hake	trawl 815 hake
Mesh size	60 mm	60 mm