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A. Status of the Fisheries

In 1965, 13 Polish factory trawlers fished mainly for redfish and a little less for cod in Subareas 2 and 3. They made 26 trips to the ICNAF area compared with 21 trips made by 10 factory trawlers in 1964. In addition, 1 stern freezer trawler (1 trip) and 4 side freezer trawlers (7 trips) were operated in Subarea 5, mainly for herring. Total catches amounted to 56,628 metric tons, an increase from 37,844 tons taken in 1964.

Catches by major species in 1964 and 1965 are shown in Table 1.

Table 1. Catches by Polish vessels in the ICNAF area in 1964 and 1965.

	1965		1964	
	metric tons	%	metric tons	%
Redfish	24,708	43.6	21,414	56.6
Cod	21,719	38.4	10,865	28.7
Flatfish	7,373	13.0	4,888	12.9
Other groundfish	1,381	2.6	641	1.7
Herring	1,447	2.4	35	0.1
Total	56,628	100.0	37,843	100.0

The above percentage data show a relative decrease in landings of redfish and increase of cod, other groundfish and herring. The greatest increase, both in tonnage and in percentage, has been for cod. The tonnage of flatfish caught was greater in 1965 but the percentage caught was nearly the same as in 1964.

The catch distribution and total fishing effort in 1965 is shown in Table 2.

Table 2. Catch and effort by Polish fishing fleet in ICNAF Divisions, 1965.

ICNAF Div.	Catch (m. tons)	No. hours fishing	No. hauls	No. days fished
<u>Factory trawlers</u>				
1B	17	30	19	2
1C	11	16	13	2
1F	16	17	12	2
2H	2,789	743	634	74
2J	19,046	7,554	4,717	679
3K	18,417	8,796	5,575	751
3L	3,313	2,827	1,501	199
3M	7,107	4,573	2,395	320
3N	290	269	128	18
4W	71	55	38	5
5Z	3,912	1,958	1,050	142
<u>Freezer trawlers</u>				
2J	1,009	1,187	619	101
5Z	630	885	412	71

There was one trip only to Subarea 1. With regard to the very low fishing yield, the trawler left these grounds for fishing grounds in Subarea 2. Table 2 indicates that fishing was carried out mainly in Div. 2J and 3K, where the catches were good in winter and spring. The yield per day and fishing unit in these two Divisions throughout the 1965 fishing period was 28.5 and 24.5 tons respectively. In comparison with data given for the year 1964, the yield per fishing unit in 1965 was greater in Div. 2J and smaller in Div. 3K. In other Divisions fished, the yield per day of the factory trawlers ranged from 16.1 (3N) to 37.7 (2H) tons.

The yield per one hour fished of the factory trawlers for the years 1962, 1963, 1964 and 1965 was 1.65; 2.15, 1.86 and 2.11 tons respectively. From the figures given above in 1965, both the increase in catch and yield per unit effort are obvious.

Table 3 shows the particular fishing grounds for redfish, cod and flatfish.

Table 3. Total catch (m. tons) of most important species in 1965

ICNAF Div.	Redfish	Cod	Flatfish
1B	-	15	1
1C	3	7	2
1F	-	16	-
2H	171	2,585	33
2J	8,162	9,398	2,270
3K	13,344	1,718	3,351
3L	1,109	910	1,294
3M	1,805	5,073	228
3N	89	77	117
4W	-	69	2
5Z	25	1,851	75
Total	24,708	21,719	7,373

#### Redfish

Fishing for redfish was carried out mostly in April and May in Div. 3K and in July and August in Div. 2J. Catches were good in the spring, when in April and May the catch per 100 hours trawling for this species was 216.6 and 155.0 tons. In July and August the yield was less, giving 144.1 and 133.1 tons per 100 hours trawling respectively.

#### Cod

In January and February, Polish factory trawlers fished for cod mainly in Div. 2J, where the catch per 100 hours trawling was 406.4 and 322.7 tons respectively. Ice hampered fishing. In May, in Div. 3K, catches were generally poor, giving 31.9 tons of cod per 100 hours fishing. In the autumn the trawlers operated on Flemish Cap Bank, where the catches of cod per 100 hours in October, November, December amounted to 168.6, 105.5 and 104.5 tons respectively. On other fishing grounds and during other months of 1965 the catch of cod was quite poor.

#### Flatfish

The fishery for flatfish was conducted mostly in March in Div. 2J and April in Div. 3K. The greatest abundance of flatfish, unfortunately for a short period, was found in Div. 2J, where the average catch per 100 hours trawling was 311.2 tons. In Div. 3K, this yield was 91.8 tons. In 1965, total catches of flatfish amounted to 7,373 metric tons of which there were 83 tons of halibut and 956 tons of Greenland halibut.

Herring

The Polish herring fishery on Georges Bank in 1965 might be regarded as a pilot reconnaissance. In September the freezer trawlers had an average yield per 100 hours trawling of 87 tons of herring.

B. Special Research Studies

I. Hydrography

During two cruises of R/V Wieczno in April-May and August-October, the hydrographic studies were carried out from the Great Bank of Newfoundland to Georges Bank. The results of temperature measurements are given in Tables 4 and 5.

Table 4. Water temperatures on fishing grounds in Subareas 3 and 4 in April-May 1965.

Date 1965	Fishing Ground	Position	Temperature in °C							
			Depth in m							
			0	10	25	50	60	65	80	100
20 Apr	East of Great Nfld. Bank	46°11'N;48°32'W	0.75	0.37						0.10
2 May	Banquereau Bank	44°34'N;57°22'W	1.75		1.10		0.47			
13 "	" "	44°21'N;58°01'W	1.87		1.68	1.12		1.11		
16 "	" "	44°35'N;57°27'W	2.00			1.00	0.94			
17 "	Artimon Bank	45°11'N;58°23'W	1.00			0.06				0.35

The surface salinities measured on fishing grounds oscillated from 32.18‰ on Banquereau Bank to 32.88‰ on the east slope of the Great Newfoundland Bank. At 50 m, the salinity was more constant (32.43 to 32.61‰).

Table 5 shows that changes in surface temperatures on Georges Bank from August to October were rather small. In deeper layers, these changes were greater.

II. Plankton

Plankton samples were collected from the research vessel in April and May on slopes of Great Bank of Newfoundland and Banquereau Bank. Additional samples were taken in August and September on the fishing grounds of Georges Bank. Sampling of plankton was made from the bottom to the surface.

III. Biological Studies

1. Sampling. Between 16 April and 7 June 1965, catches made by the Wieczno were sampled in Div. 3L, 3M, 3N, 3O, 3P, 4V, 4W. The total number of samples taken on this trip are shown in Table 6.

Table 6. Samples of fish taken from 16 April-7 June 1965.

Species	No. measured	No. of pairs of otoliths
Cod	35,050	4,732
Redfish (mentella)	12,719	1,467
Redfish (marinus)	414	303
American plaice	12,259	1,180
Witch flounder	840	275
Yellowtail flounder	4,072	446
Halibut	52	52
Greenland halibut	32	32
Haddock	7,502	275
Silver hake	472	102
Argentine	587	72

Table 5. Water temperature on fishing grounds in Subareas 3, 4 and 5 in August-October 1965.

Date 1965	Fishing ground	Position	Temperature in °C, Depth in m							
			0	20	40	60	80	100	140	150+
6 Aug.	SW slopes of Gr.NFL Bank	44°09'N 51°18'W	16,2	-	-	9,5	-	-	-	-
7 "	" "	44°25'N 53°09'W	15,9	-	-	1,8	-	-	5,7	-
8 "	" "	44°30'N 53°23'W	16,5	10,3	5,6	4,3	5,9	5,8	4,2	-
10 "	Banquereau	44°29'N 59°25'W	15,8	4,0	3,7	3,3	-	-	-	-
11 "	" "	44°27'N 60°01'W	15,7	6,8	2,3	2,2	2,4	-	-	-
12 "	" "	43°55'N 59°19'W	14,9	-	10,4	-	-	-	-	-
13 "	Sable Island Bank	43°36'N 60°09'W	14,7	13,5	2,2	1,5	-	-	-	-
14 "	" "	43°57'N 60°50'W	15,9	11,0	3,7	-	-	-	-	-
15 "	" "	43°44'N 60°34'W	15,5	11,9	4,9	-	-	-	-	-
19 "	Emerald Bank	43°21'N 62°12'W	18,5	11,3	5,7	3,3	2,7	3,5	-	-
19 "	" "	43°21'N 62°22'W	18,0	-	5,7	-	-	-	-	-
21 "	" "	43°09'N 64°02'W	16,5	11,6	1,6	1,3	1,2	-	-	-
22 "	La Have	43°32'N 64°21'W	9,1	4,0	2,5	0,8	1,4	2,4	-	5,3
31 "	Georges Bank	42°04'N 67°36'W	15,4	13,3	11,4	-	4,9	4,6	-	-
1 Sept.	" "	42°01'N 67°42'W	14,4	12,9	9,8	7,8	-	-	-	-
2 "	" "	42°05'N 67°36'W	15,5	13,5	13,2	-	-	-	-	-
3 "	" "	41°28'N 68°30'W	13,8	13,3	13,2	6,0	4,9	4,4	-	-
4 "	" "	41°20'N 69°32'W	14,8	13,6	13,0	11,6	-	-	-	-
6 "	" "	40°36'N 68°10'W	16,0	16,8	10,3	7,2	6,9	-	-	-
8 "	" "	40°34'N 67°24'W	17,2	13,7	6,4	5,9	6,1	6,1	-	-
9 "	" "	41°00'N 67°03'W	14,7	13,4	10,3	7,4	-	-	-	-
11 "	" "	42°10'N 67°12'W	13,6	11,4	10,1	8,0	-	-	-	-
12 "	" "	42°12'N 67°32'W	14,2	13,0	10,0	8,5	4,3	3,8	4,7	-
15 "	Brown Bank	42°34'N 66°10'W	12,7	7,7	4,3	4,4	4,1	3,5	-	3,9
17 "	Georges Bank N	42°02'N 67°41'W	13,7	13,6	9,8	8,4	-	-	-	-
18 "	" "	41°30'N 66°34'W	14,5	11,9	10,8	7,3	5,8	-	-	-
20 "	" "	41°07'N 68°47'W	14,3	-	-	-	9,6	-	-	-
22 "	" "	40°48'N 68°06'W	16,4	15,5	10,1	9,5	-	-	-	-
24 "	" "	40°33'N 67°52'W	16,4	12,4	9,1	6,4	-	6,7	-	-
25 "	" "	41°56'N 67°08'W	14,6	12,4	-	-	-	-	-	-
1 Oct.	" "	42°00'N 67°27'W	13,8	13,4	-	-	-	-	-	-
2 "	" "	40°05'N 69°12'W	14,2	13,8	12,6	13,7	6,8	12,1	-	-

During the second trip of Wieczno, between 6 August and 2 October, the sampling was carried out in Div. 4V, 4W, 4X and 5Z. The samples collected are shown in Table 7.

Table 7. Samples of fish taken from 6 August-2 October 1965.

Species	No. measured	No. of pairs of otoliths
Haddock	29,637	1,355
Herring	24,077	1,770
Silver hake	4,264	320
Mackerel	2,176	488
Redfish (mentella)	4,225	-
Red hake	658	90
Argentine	4,739	426
Alewife	811	259
Blueback	394	60
Butterfish	944	80
Pollock	9	9
Cod	1,271	22
Ocean pout	54	54
American plaice	1,757	107
Yellowtail flounder	1,006	105
Witch flounder	76	21
Halibut	37	37

The results of these measurements will be presented in the Sampling Yearbook for 1965.

2. Cod. Throughout the 1965 fishing season on the different grounds of Subareas 3 and 4, the length composition of cod in the catches ranged from 25 to 80 cm. In the Newfoundland area the fish were considerably older and longer than on the fishing grounds of Nova Scotia. Mean length of Newfoundland cod was 57.9 cm and of Nova Scotia cod 47.5 cm. The fish were 3 to 7 years old (1962 to 1958 year-classes).

In Div. 3M the 1958 year-class (mean length 52.8 cm) was very abundant, while in Div. 3L different year-classes - 1962 to 1958 (mean length 49.9 cm) - were observed. In the northern part of Div. 3O the year-classes 1959 and 1958 (mean length 66.0 cm) were dominant, while in the same Div. 3O but on the Green Bank the year-classes 1962 and 1961 were dominant. In Div. 3P the year-classes 1962 to 1958 were represented in the catches (mean length 54.1 cm).

On the Nova Scotia fishing grounds (Div. 4V and 4W) the 1963 to 1961 year-classes (mean length 37.1-57.6 cm) were mainly caught.

The investigation of racial characteristics show that average number of dorsal fin rays of cod on Scatari Bank and on Flemish Cap Bank was 19.73 and 21.08 respectively. The average number of vertebrae from cod on the east slopes of Great Bank of Newfoundland was 53.49; on St. Pierre Bank, 53.43 and Banquereau Bank, 53.20.

3. Redfish. The catches of redfish in 1965 were made at depths of more than 200 m. Of the two types of redfish, the mentella-type made up 90-100% of the total weight of both types. On the fishing grounds of Newfoundland and Flemish Cap (Div. 3K, 3P, 3M) the mean length of redfish was 25.9 cm, whereas on the fishing grounds of Nova Scotia (Div. 4V and 4W) the mean length was 28.1 cm.

The largest mentella-type redfish were 35.0 cm mean length and were captured on Flemish Cap.

The mean length of marinus-type redfish from Flemish Cap was 43.1 cm, however north of Burgeo Bank (Div. 3P) - 46.3 cm.

Observations on the stage of sexual maturity carried out from the second half of April till the first week of June have shown that on the fishing grounds of Newfoundland the greater number of redfish have gonads in the resting stage, while in May on the fishing grounds of Nova Scotia a large proportion of redfish (up to 8.4%) have larvae developing in the gonads and have quite mature eggs.

4. Flatfish. Length measurements of American plaice were taken during fishing operations on the fishing grounds of both Newfoundland and Nova Scotia. The mean length of these fish were from 27.6 to 45.2 cm respectively. The most abundant among them were the length classes 30 to 40 cm.

Individual weights ranged from 250 to 2,150 grams (mean 979 grams).

In the samples there were found to be present fish from 2 to 28 years old (year-classes 1963-1936). In the catches fish 6, 7, 8 and 9 years old (year-classes 1959, 1958, 1957 and 1956) predominated.

Witch occurred only on the fishing ground of St. Pierre Bank and over the southern slopes of the Great Newfoundland Bank. Mean lengths in catches ranged from 32.0 to 42.0 cm.

Yellowtail was found in Divisions 3L, 3O, 3P, 4V and 4W. Length composition included fish of mean length 32.0 to 42.0 cm.

5. Haddock. In August large concentrations of haddock were encountered over the western slopes of Georges Bank. The best catch was 3,500 kg per hour, with 92% haddock. According to samples the catch consisted mainly of fish 3 years old (26.5%), 4 years old (30.4%) and 5 years old (38.3%), making in total 95.2%. Most abundant in the catch were fish of 38 to 42 cm length. On other fishing grounds, haddock occurred in considerably smaller number dispersed over various feeding grounds.

6. Silver hake. In August abundant concentrations of this species were found only over the northern and western slopes of Georges Bank. In trawl catches made on these fishing grounds silver hake was only 4 to 17% of the landed mass and was taken at a rate of 150 to 185 kg per hour. Fish of 27-29 cm length were most abundant in these catches. In the region of Sable Island Bank, where silver hake was scarce and was a by-catch of 1.4%, the individuals were mostly large fish, reaching the length of 33 to 38 cm. In the samples fish were 3 to 8 years old, though the most abundant were 5 and 6 years old and amounted to 44.7% in relation to total mass of silver hake landed.

7. Argentine. In August and September over the northwestern slopes of Sable Island Bank, up to 3,500 kg per hour of argentine were taken in some hauls. On Sambro Bank the catch of argentine alone reached 2,400 to 4,000 kg per hour. Slightly smaller yields were obtained from Browns Bank. Fish 22-26 cm long were most abundant in the catches.

During the spring months two size-groups of argentine occurred on the fishing grounds of Sambro Bank. Here, the mean length of the smaller fish was 17-19 cm and, of the larger fish, 27-28 cm.

From the samples it was found that the catches consisted mainly of fish 4, 5, 6 and 7 years old (total 53.5%). The life span of the fish aged was in general large; some individuals were 30 years old and about 50 cm long.

8. Herring. Samples were taken from the herring catches made on Georges Bank. Age compositions revealed that, in the period August-October, herring belonging to the year-classes 1960 and 1961 made up 68.8% of the

catches. These fish were 24.0 to 36.9 cm long. Herring of the length 28.0 to 31.9 cm made up 85% of catches. Mean length of particular age groups of herring were as follows: II (year-class 1962) - 26.0 cm; III (1961) - 27.6 cm; IV (1960) - 29.0 cm; V (1959) - 30.5 cm; VI (1958) - 31.7 cm; VII (1957) - 32.8 cm and VIII (1956) - 33.5 cm.

9. Other Species. The data relating to other species is presented in Research Document No. 66-42, B. Draganik and Cz. Zukowski - The rate of growth of Butterfish (*Poronotus triacanthus*) (Peck) and Ocean pout (*Macrozoarces americanus* Block and Schneider) from the region of Georges Bank.

#### IV. Studies on Selectivity

In order to eliminate double codends used by stern trawlers, investigations were made on codends which were enforced in one case with netting having meshes double the size of the meshes of the primary netting of the codend itself; in another case with netting having meshes four times larger than the primary netting. After such kind of chafing gear was applied, the selectivity was investigated and found to be sufficiently good. The investigations included the following species: cod, haddock, redfish, American plaice and yellowtail. The results, in detail, are presented in Research Document No. 66-21, W. Strzyzewski. - The effect of the use of chafing gear on the selection factor.

Some further investigations also dealing with selectivity are given in another Research Document No. 66-28, B. Draganik and Cz. Zukowski - Investigations on the selectivity of bottom trawl codend, type BS-2, in relation to haddock.

#### V. Economical Study

Fishery economists were present on board the factory trawler Andr6meda in her second trip (19.8-18.12.1965) to the ICNAF fishing grounds - collecting data and studying problems of vessel operation and catch disposal (production of fillets, headed fish meal, oils).

As regards fish stock conservation, the crew aboard the vessel reported that in consideration of economic aspects, they were as a rule in search for such size of fish (cod and redfish) which would be best fit for the processing lines requirements, i. e. they avoid catches of small, young fish.