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Summary of Research and Status of Fisheries

in Subarea 4

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A. Status of fisheries

During 1968, Canada, France, Portugal, Spain, USSR, UK and USA have fished significantly in Subarea 4. The main species fished have been cod, haddock, redfish, silver hake, American plaice, pollock and white hake for groundfish and herring, mackerel and argentine for pelagic fish, and sea scallops for molluscs.

The table below compares the catches of these species in 1967 and 1968:

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	Canada		France		Germany Poland		Portugal		Spain		USSR		UK		USA		Total	
	67	68	67	68	67	68	67	68	67	68	67	68	67	68	67	68	67	68
1	122.1	150.6	12.4	23.5			7.4	6.9	43.9	59.0	1.7	5.9	5.2	-	1.5	0.9	194.3	246.9
lock	40.7	38.8							2.0	3.3	0.8	0.6			5.0	3.2	48.5	45.9
lfish	63.9	81.4	0.4	0.8							0.2				22.0	21.0	86.5	103.5
iver ce											2.5	3.4					2.5	3.4
frican rice	18.2	18.3	0.2												0.2		18.4	18.6
lock	12.2	16.3							1.7	0.8	0.3	0.2			0.5	0.3	14.8	17.7
te e	7.8	4.5							0.4		0.3				0.2		8.7	4.5
ring	260.0	334.5			10.7	0.7					0.6	2.8					260.6	348.2
kerel	11.0	10.9									9.4						11.2	20.5
entline											4.2	1.6					4.2	1.6
llops	7.0	15.0															7.0	14.9

As we can see, the catches of almost all the species have increased, in some cases substantially. Only for haddock, white hake and argentines has there been some decrease.

Regarding cod, the biggest increase comes from Canada (Nova Scotian ports) presumably in great extent from Divisions 4V, 4W and 4X.

The haddock fishery decreased slightly, 1963 was the dominant year-class but, as the following ones are very poor, the stocks could not sustain a big catch. USSR catches come as bycatches, since their vessels could not find good concentrations of fish. US fleet increased the effort in Browns Bank but in Subarea 4 the catch decreased by almost two thousand tons. No increases are expected for the next years.

The Canadian rising trend for redfish since 1963 results from the good catches made in the Gulf of St. Lawrence (Divisions 4R, 4S and 4T). US landings come mainly from the Gulf of St. Lawrence (slight increase) and also from the Scotian Shelf (Div. 4V, 4W and 4X) where some decline was again shown. As a whole, if there is a lower yield in 1969 than in 1967-68, the crisis will not be, probably, of long duration.

Only the USSR made some catches in the silver hake stocks. The landings increased slightly but the level is still rather low and, except in some periods, the fish is taken as bycatch.

Concerning pollock, only one country, Canada, reports an increased landing which is small and very influenced by market demands.

The herring fishery increased greatly, mainly due to the rapid expanded Canadian industry. The biggest increase occurred in Div. 4X and 4T, although some concentrations have been also detected in Div. 4W and 4V, which until now has not been very important for this species. Federal Republic of Germany reports a big catch of herring caught with pelagic nets from Div. 4V. Herring in this stock were very old, with most fish being from year-classes before 1959.

The mackerel landings show a big increase due to the Soviet fleet that from 1,200 tons caught up to 1968, reached more than 9,000 tons in 1968. The catches were made mainly during spring and summer. The Canadian landings show a slight decrease relatively to 1967 with a great variability between Divisions caused, probably, by the differences of water temperature there observed.

The argentine catches made by USSR continued to drop which is explained by the fact that the trawlers don't search specially for this species. The stocks seem to be slightly exploited.

A big increase of sea scallop landings is due to the Canadian fishery exclusively. The offshore fishery remained at the same level compared with 1967 (Lurcher Region, Div 4X). The big increase came from the inshore fishery in the Bay of Fundy and from the southern part of Div 4T.

## B. Hydrographic Studies

Canada (Res.Doc.69/7) reports observations made on water circulation, water properties and ice forecast survey. The study of the mixing of water from the Labrador current and the Gulf Stream was undertaken. Also the study of the exchange of water between St. Margaret's Bay and off-lying areas was continued. Other studies of water circulation are: Bay of Fundy-Gulf of Maine and the south-western part of St. Lawrence. Concerning the water properties, the long-term cooling trend along the Canadian mainland coast was again detected in 1968 although less evident than in previous years. Between January and April an intrusion of relatively high temperature and high salinity waters in the deeper layers of the Gulf of Maine was observed with influences on the waters of Bay of Fundy-Gulf of Maine from

Poland (Res.Doc.69/13) made some hydrographic observations on water temperature, salinities, oxygen and phosphate contents. Along the Shelf of Nova Scotia it was noted, in March, a rise in temperatures both at the surface and at the bottom from east to west. Some indications relating good concentrations of haddock are given.

USSR conducted studies on hydrographic conditions (Res.Doc.69/17, 69/53 and 69/62) which led to the conclusion that an intensive inflow of the Gulf Stream water must occur.

The oceanographic observations made by the USA are reported in Res.Doc.69/34. They include vertical and horizontal distribution of temperature, salinity, oxygen and chlorophyll. Also, drift bottles and sea-bed drifters were released.

### C. Biological Studies

1. Cod. Concerning this species, Canada (Res.Doc.69/7) continued the study of the southern part of the Gulf of St. Lawrence. The observations made in September have shown that the usual 3-year-olds were not as abundant as in 1967. The same applies to the 1964 year-class which was expected to be more abundant in 1968 than it really is. Important studies have also been made on rates of survival of eggs and larvae in relation to environmental conditions: ice cover, water temperature, availability of food for larval fish, etc. Stomach contents were also studied and surveys of studying the populations of benthic organisms in relation to food selection by cod and other groundfish species.

2. Haddock. The Canadian observations made during three surveys (Div 4W and 4X) (Res.Doc.69/7) show that the 1964-67 haddock year-class are small and that, probably, the 1968 year-class may be better than those of the previous 4 years in Div 4W.

Polish observations (Res.Doc.69/13) indicate that the haddock abundance is rather low and that the mean length of the fish was 49.7 cm. The age-group IV, the most abundant, was very poor. A decrease in yield shall be expected.

Some data from Soviet research (Res.Doc.69/17) indicate that the haddock ages, in the sample, ranged from 1 to 10 years old and that the most abundant were 1, 2, 5 and 6 years old.

USA (Res.Doc.69/19) has continued cooperative researches with Canadian scientists on the stocks of Div 4X. The main conclusions are: an increase of the mortality and a decrease in abundance. Some studies on recruitment predictions in Div 4X have also been made (Res.Doc.69/85), and show poor year-class abundance from 1964 through 1968.

3. Other groundfish. Canada (Res.Doc.69/7) reports some studies on silver hake and sand lance. The studies made on gill diseases of silver hake are in favour of a relationship between the intensity of disease and the abundance of juveniles.

USSR (Res.Doc.69/17) reports the age composition of the silver hake catches: the dominance of the 2 and 3-year class reveals, probably, the entrance into the fishery of the 1965 and 1966 year-class with abundances that are higher than that of the 1964 recruitment.

Poland (Res.Doc.69/13) presents some studies on redfish, American plaice and yellowtail. They comprise length measurements, age determinations and catches per unit of effort.

4. Herring. Canada /Res. Doc. 69/7/ gives some results on this species; the development time of artificially fertilized eggs from spring spawning herring in Division 4T and from autumn spawning from the same division; larval abundance and distribution in Division 4X which show variations both in vertical distribution and size of larvae; size range and age composition indicate that only for the Nova Scotian side and Bay of Fundy are differences, the mean length and age being somewhat lower /the difference is probably due to differences in season of sampling/. In Division 4X the 1966 year-class was dominant and in Division 4T the 1959 and 1960 year-class continued to be the most abundant. Canada conducted also studies on fat content but the seasonal variation is greater for spring spawners; no consistent relationship was found between mean length and fat content. The fatness is bigger mainly during May and June with lower values in April. Res. Doc. 69/48 /Canada/ deals with an attempt to identify sub-populations on basis of growth characteristics of immature herring /mainly age group I/.

Poland /Res. Doc. 69/13/ reports some results on this species. Secondary to the observations made smaller fishes /up to age VI inclusive/ are found at depths of 90-100 m while the older fish occur at greater depths where they are less concentrated. The lengths ranged between 27 and 39 cm. In Res. Doc. 69/57 this country gives detailed information on length and age compositions, sexual maturity, feeding and rate of growth.

USA /Res. Doc. 69/45/ gives some data on age, length and maturity of herring. The principal conclusions are: the younger fish seem to be more numerous in Nova Scotia in 1968; the 1963 year-class is more abundant in the samples, with the 1964, 1962 and 1961 following; the spawning took place earlier in 1968 than in 1967. In Res. Doc. 69/60 the United States report results on the fecundity of fish from Nova Scotia. Comparisons are made with fishes from Georges Bank and the Gulf of Maine and there is an indication that the fecundity levels were different.

5. Other pelagic fish. Canada /Res. Doc. 69/7/ presents data on argentinines; intestinal parasites, fecundity and spawning concentrations.

#### D. Other studies.

UK /Res. Doc. 69/18/ proceeded with the program of the Continuous Plankton Recorder. A sampling of 4,651 miles in Subarea 4 has been made. Canada /Res. Doc. 69/1/ also reports some work on plankton made in Subarea 4, on the distribution of fish eggs and larvae in order to investigate the factors affecting recruitment and reduction of size and age composition of commercial catches of groundfish. Also the study of factors affecting the survival of eggs and larvae and fecundity have been taken into consideration.

USSR /Res. Doc. 69/52/ reports a trawl survey made on the Scotian shelf where the distribution and abundance of fishes and species have been investigated. Browns Bank /Division 4X/ is characterized by rather different distribution and abundance of species than in adjacent waters.

