INTERNATIONAL COMMISSION FOR THE NORTHWEST ATLANTIC FISHERIES

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Canadian Researches, 1956

Subarea 2.

by W. Templeman

Examination of samples of redfish from 150 to 300 fathoms east of Hamilton Inlet Bank, Labrador, showed that only a very few very large common redfish, Sebastes marinus marinus (L.), were present while over 99% of the redfish were of the deep-water type Sebastes marinus mentella Travin.

The customary hydrographic section from near shore off Seal Islands, Labrador, to beyond the 500 metre line, east of Hamilton Inlet Bank, was taken by the Investigator II, August 4 to 6, 1956 (Fig. 1).

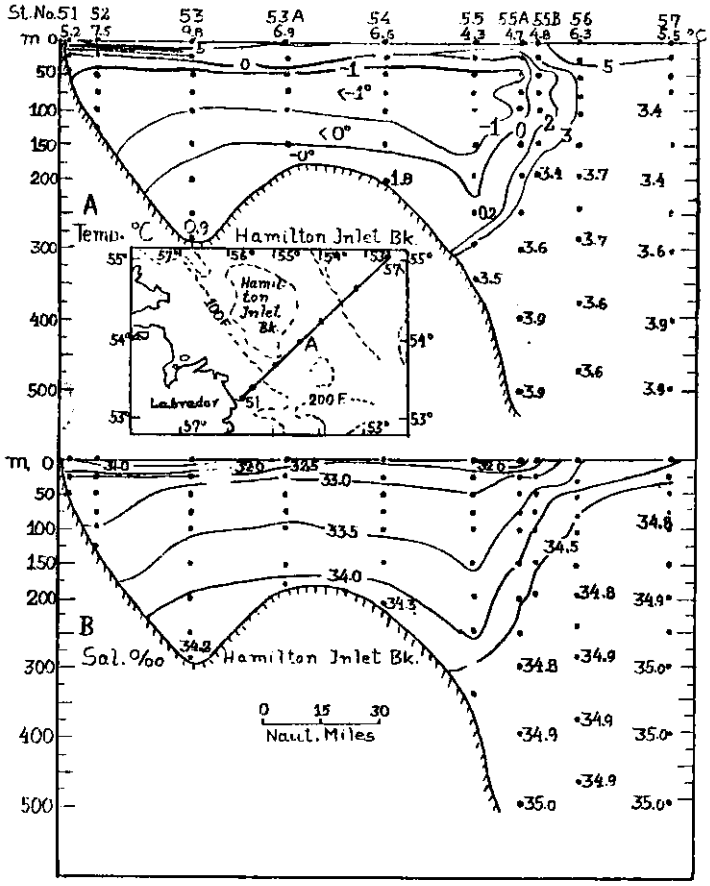

Fig. 1. Hydrographic section off Seal Islands, Labrador, August 4-6, 1956; A - Temperature °C.; B - Salinity ‰

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Temperatures in the upper warmer layer and in the intermediate cold layer were very similar to those of 1955. The volumes of water with temperatures below -1°C. and below 0°C. were similar inshore but offshore this cold water was a little greater in volume and extended more deeply in 1956 than in 1955. Bottom temperatures and temperatures in the offshore deep water, on the other hand, were higher (usually about 0.3°C.) than in 1955. Salinities were very similar to those of 1955.

Subarea 3. By W. Templeman

The St. John's Station continued to gather information on the location of catches and on catch per unit effort by the offshore groundfish fleet. The offshore commercial catches of groundfish were sampled for size and age, and the inshore cod catches were similarly sampled at Bonavista, St. John's and Burin.

Haddock Melanogrammus aeglefinus (L.). An otter-trawl survey for haddock and cod was carried out by the Investigator II on the Grand Bank in April and May and on St. Pierre Bank in early June. A few good haddock catches were made on the Grand Bank but only very small catches of haddock were obtained on St. Pierre Bank. On St. Pierre Bank there was excellent haddock fishing during the winter and early spring of 1956 when the fish were concentrated in deep water below 100 fathoms. By June the fish had apparently spread from the deep water over a great part of the bank area and were not found in commercial quantities by the research vessel either in June or in a later survey carried out in October. Also, except for occasional sporadic catches, there was very little commercial fishing for haddock on St. Pierre Bank in 1956 after the winter and early spring. The very numerous 1949 year-class, on which the fishery has depended since the autumn of 1953, evidently has become too scarce to sustain a fishery when the haddock are widely scattered during the summer, but may still be plentiful enough to give some good fishing in the winter time when the haddock are concentrated in deep water on the western slope of the bank.

On the Grand Bank the numerous 1949 year-class provided almost all the haddock of commercial size, and two fairly numerous year-classes, 1952 and 1953, were approaching commercial size. Although the years 1950, 1951 and 1954 produced no significant survival of young haddock, there was evidently good survival of the 1955 year-class.

On St. Pierre Bank almost all the haddock of commercial size were from the 1949 year-class. There was no evidence of significant survival of young haddock of the 1950 to 1954 year-classes but there was a fairly good survival of the 1955 year-class. In the further survey of St. Pierre Bank in October there was preliminary evidence, also, of a good survival of the 1956 year-class of haddock. The 1955 year-class will not produce significant quantities of commercial fish before the autumn of 1959 or the spring of 1960.

Redfish Sebastes marinus (L.). Deep-water dragging. The Investigator II carried out deep-water explorations for redfish at depths from 100 to 400 fathoms north of Flemish Cap and off the southwest Grand Bank. A No. 3/4 35 otter-trawl with a 39-foot headrope and a 50-foot footrope, and with otter doors of 400 pounds each, was used on a single wire. North of Flemish Cap the average redfish catches per half-hour's dragging were as follows: 100 fathoms, 0 lb.; 150 fathoms, 150 lb.; 200 fathoms, 700 lb.; 250 fathoms, 1300 lb.; 300 fathoms, 500 lb.; 350 fathoms, 100 lb.; 400 fathoms, 0 lb. These were only half-hour drags with a very small net and with the

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inefficient single-wire type of fishing. The redfish were of moderate commercial size, the bottom was smooth, and it is indicated that good commercial fishing possibilities exist between 200 and 250 fathoms in this newly explored area.

On the southern part of the southwest slope of the Grand Bank the average catches of redfish per half-hour's dragging were as follows: 100 fathoms, 1170 lb.; 150 fathoms, 890 lb.; 200 fathoms, 920 lb.; 250 fathoms, 640 lb.; 300 fathoms, 190 lb.; 315 to 360 fathoms, 20 lb. In this area sizes increased with increasing depth.

Two subspecies. In 1956, for the first time, our biologists have observed that two varieties of redfish, Sebastes marinus marinus and Sebastes marinus mentella, are present in the Newfoundland area. The scarcer marinus type is usually orange yellow or golden yellow, possesses no beak or a rounded beak on the chin, has small eyes, and is different from mentella in a number of body proportions. The deep-water or mentella type is usually red to deep red, possesses a sharp and in older specimens often a long chin beak and has relatively large eyes. These, and other distinctions between these forms, were noted in June in Hermitage Bay and in July at Flemish Cap. The marinus form was the shallower and the mentella form the deeper and by far the more abundant; the commercial fishery in the subarea depends almost entirely on the mentella form. In the European and Icelandic area, on the other hand, marinus appears to be the more usual type in the commercial fishery. At Flemish Cap the marinus form was more abundant than the mentella in the small numbers of redfish secured at 150 fathoms. At 200 fathoms most of the redfish were mentella and a few, consisting of all the largest specimens, 43 to 53 cm., were marinus. At 250 fathoms, where the best catches were obtained, all were mentella, and at 300 fathoms all were very typical mentella. In Hermitage Bay, Newfoundland, only an occasional marinus type is present among the very numerous mentella. No evidence of marinus was found in redfish catches on the southwest slope of the Grand Bank but some are present south of Green Bank.

Other studies of redfish. Studies are being carried out on sexual maturity, fertilization and spawning, and on body proportions of redfish from various localities. Preliminary tagging experiments have been done, and researches on age and growth, ecology, food, and on many other features of redfish life history have been continued.

Flatfishes. Research has been renewed on the American plaice, Hippoglossoides platessoides (Fabr.) and the witch flounder, Glyptocephalus cynoglossus (L.). The present effort, which began in May for the plaice and in August for the witch flounder, has been concerned mainly with age and growth studies.

From the tagging of 1,000 plaice on the northern Grand Bank in October, 1954, 26 were recovered in 1955 and 4 in 1956. Most of these were recaptured within a radius of about 30 miles from the tagging site. The greatest migration was by a fish recaptured in October, 1955, on the eastern slope of the Grand Bank, 120 miles from the tagging area.

There has been some new work on body proportions of plaice in different areas. It is planned to extend the scope of the flatfish work in 1957.

Cod Gadus callarias L. Cod investigations were devoted mainly to age and growth and other population studies. In the otter-trawling surveys of the Investigator II on the southern half of the Grand Bank the first four age groups of cod could be recognized from the frequency measurements alone. This will allow an excellent check on age determination in this southern Grand Bank area for which age reading in cod is difficult.

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Plankton. Zooplankton was collected on hydrographic cruise 34 of the CNAV Sackville during September 15 to 30, 1956 in the Newfoundland area. Vertical tows were made with a 3/4 metre net (# 10 mesh) from a depth of 50 metres. Generally, high zooplankton production (to 40 cc. /20 m3) was shown near Cabot Strait, over the Grand Banks and in Trinity Bay; and very low production over the Laurentian Channel, south of the banks, near the Newfoundland south coast and off Trinity Bay. Fish larvae included capelin at four stations on the Grand Bank and six stations in Trinity Bay, and American plaice, witch flounder, Greenland halibut, Reinhardtius hippoglossoides (Walb.) and silver hake, Merluccius bilinearis (Mitch.) in Trinity Bay, mostly taken in oblique tows with a high-speed all metal plankton sampler.

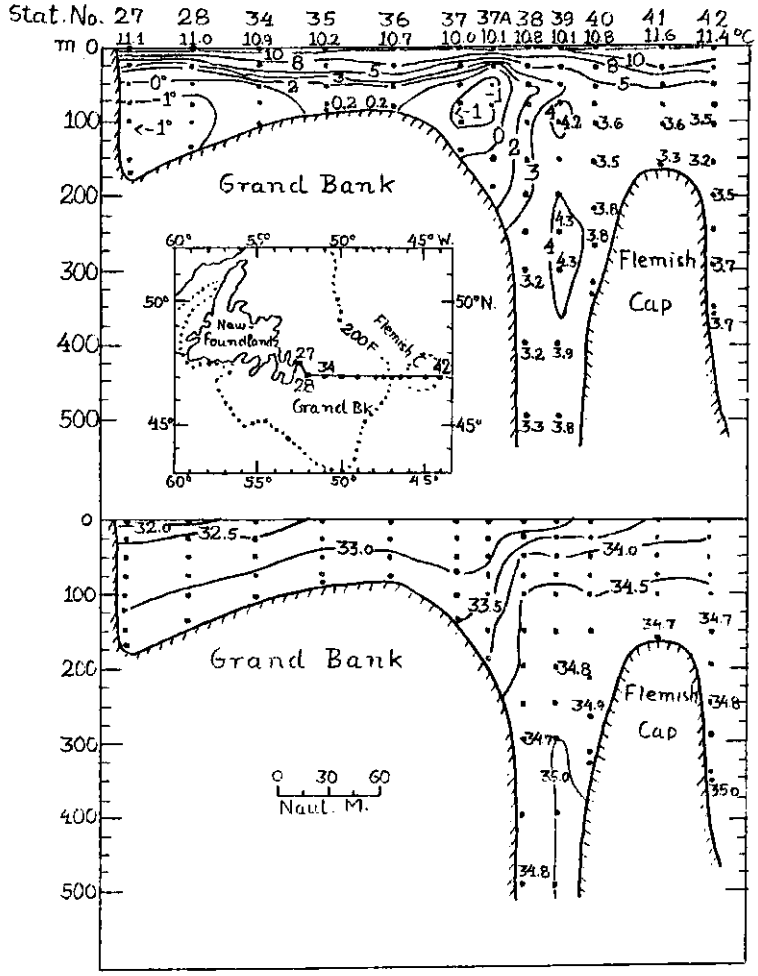

Fig. 2. Hydrographic section, St. John's-Grand Bank-Flemish Cap, July 25-August 1, 1956; A - Temperature °C.; B - Salinity ‰

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Hydrography. In July and August the regular five hydrographic sections were taken from Bonavista to the southern slope of the Grand Bank. In addition once or twice a month throughout the year the station 5 miles off Cape Spear, in 176 metres was occupied. Daily surface temperatures were taken in St. John's harbour. Considering the whole water column down to 500 metres, temperatures were not greatly different from those of 1955.

In the Flemish Cap section, July 25-August 1 (Fig.2), the volume of water below -1°C. was approximately the same as in 1955 and the volume below 0°C. slightly less. The top of the Grand Bank was covered with slightly warmer water and there was also a greater volume, than in 1955, of water above 3°C. in the channel between the Grand Bank and Flemish Cap. Salinities also were significantly higher than in 1955 in the Grand Bank-Flemish Cap channel.

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Subarea 4.

by W.R. Martin.

Tagging. Cod, Gadus callarias L., and haddock, Melanogrammus aeglefinus (L.), were tagged in Subdivision 4T during 1956 to provide additional information about movements, mixing of stocks, growth, and the proportion of stocks being taken by the fisheries. Otter-trawl caught fish were tagged for the first time in this area. In May, 733 cod were tagged off northern Cape Breton in 40 to 100 fathoms. In July and August, 1775 cod were tagged off northern New Brunswick in 30 to 50 fathoms. In September and October, 994 haddock were tagged in the eastern Northumberland Strait region in 20 to 30 fathoms.

A large proportion of the tags attached to cod and haddock in the years 1953 to 1955 have been recovered. Disk tags have given higher returns than hydrostatic tags. The high percentages of recaptures from inshore Nova Scotia taggings (50 to 60% for disk-tagged cod and 37% for disk-tagged haddock) demonstrate that the fishery takes a high proportion of the stocks on these grounds. The lower percentage recovery from Gulf of St. Lawrence cod taggings is consistent with the lower annual mortality there, as determined from age analyses.

Cod tagged in the Gulf of St. Lawrence moved about more than those of inshore Nova Scotia waters. Tag returns have shown that the Gulf stocks support two main fisheries: one in the western Gulf of St. Lawrence during summer by Canada, the other in the Cabot Strait area in winter mainly by European fleets.

Preliminary results of haddock tagging in the southern Gulf of St. Lawrence indicate a similar seasonal movement out of the Gulf in the autumn to Nova Scotia grounds.

Haddock Aging. Canada and the United States continued their joint study of haddock age reading. Age determinations for 973 haddock revealed differences between scales and otoliths. Disagreement in age readings per sample increased with increasing age and averaged 40%. In general, disagreements were randomly spread up to 8 years. However, above 8 years the otolith age readings were a year or more higher than the corresponding scale readings. Independent estimates of growth from tagging supported earlier conclusions that the use of haddock

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otoliths is valid for age determinations. Canadian and U.S. biologists have now agreed to use the otolith method for aging subarea 4 haddock.

High Cod Landings. In 1956 cod fishing in Subdivision 4T was exceptionally good (Fig. 3). Landings of cod in the provinces of Quebec, New Brunswick and Prince Edward Island totalled 118 million pounds, gutted weight, the largest landings on record. Individual as well as total catches were large. The average landings per week for "Gloucester" class draggers increased from 21 thousand pounds in 1955 to 27 thousand pounds in 1956.

The cod landed by draggers at Caraquet, N.B., were considerably larger (average weight 5.8 lb.) than those landed in 1955 (average weight 4.2 lb.) and the average age increased from 6.3 years in 1955 to 7.2 years in 1956.

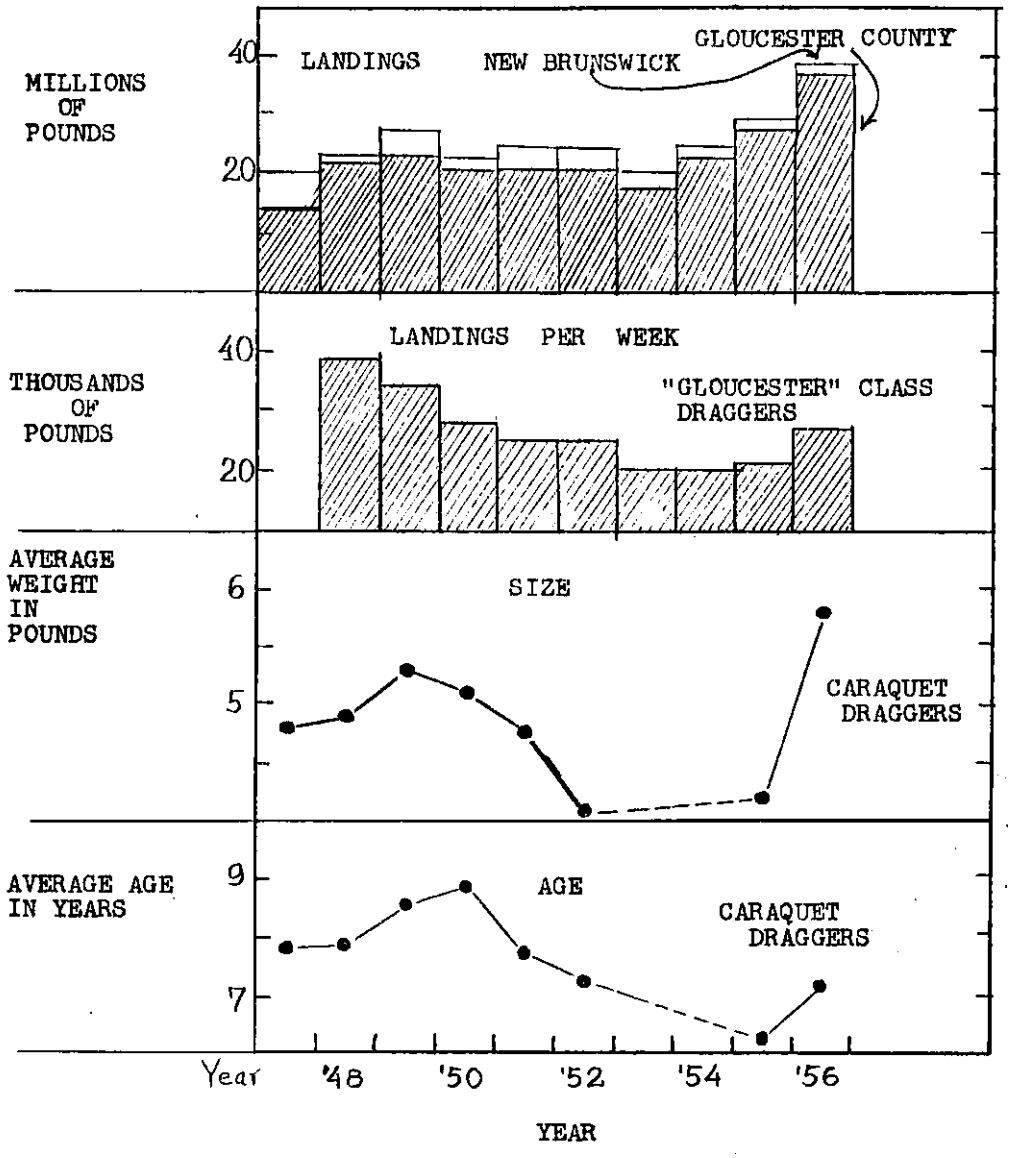

FIG. 3. Annual variation in landings, landings per week, sizes and ages of cod landed, in northern New Brunswick from subdivision 4T during the years 1947 to 1956.

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The growth rate of these cod was much higher in 1955-56 than in the period 1947-52. This was particularly true for the larger fish-eating cod. Seven- to nine-year-old fish were about 2 pounds heavier than formerly. It appeared that the faster growth was brought about by the increased availability of moribund herring during an epidemic of fungus disease (Ichthyosporidium hoferi). Reduced density of cod also may have contributed to the increased growth rate.

The landings of Gulf cod did not increase in numbers in 1956, but the larger sizes of cod produced a substantial increase in landings by weight.

Discarded Cod. Seven trips on commercial draggers in the southern Gulf of St. Lawrence (Subdivision 4T) provided data on the sizes and numbers of cod discarded at sea (Fig. 4). Three-inch mesh manila nets were used. Small draggers of about 25 gross tons working in 20 to 45 fathoms of water discarded 55% by number and 14% by weight. Larger draggers of about 40 tons working on larger fish in 30 to 125 fathoms discarded 18% by number and 4% by weight of the fish caught. The 4 1/2-inch mesh now required by regulation would have reduced the numbers of cod discarded at sea in 1956 by about half. In order to reduce the observed wastage of cod to a minimum, the mesh size would have to be about 5 1/2 inches, inside, stretched, wet, used measure.

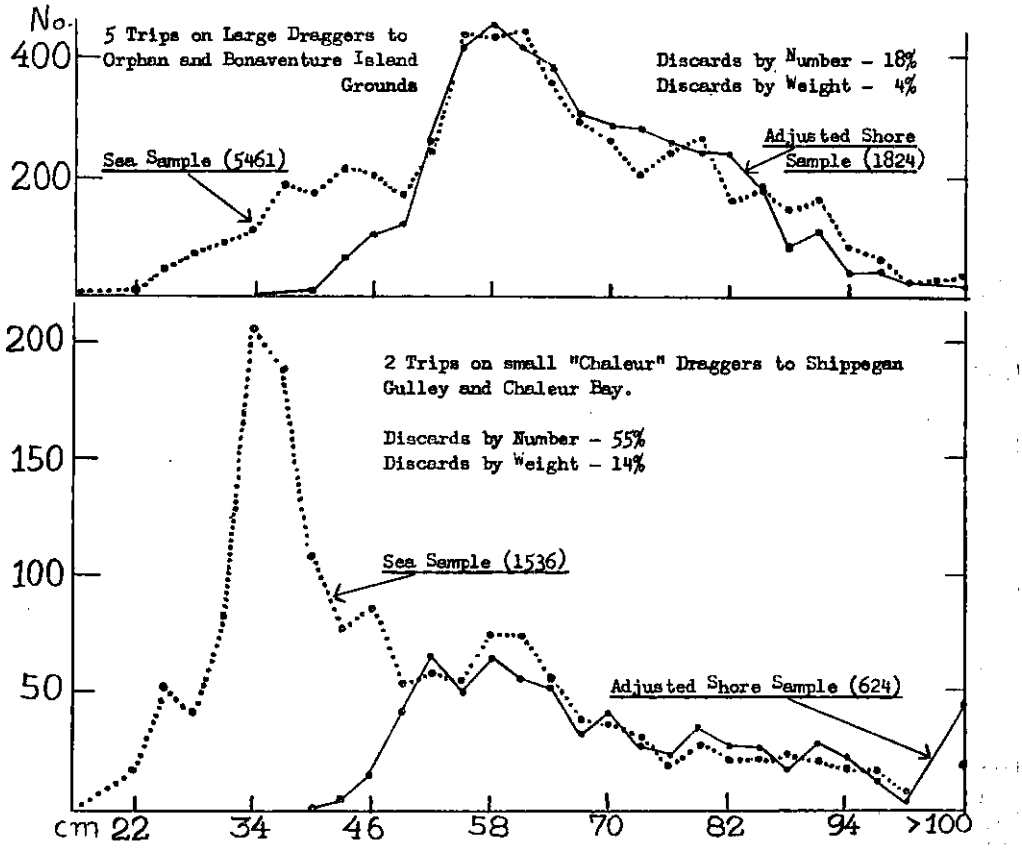

FIG. 4. Numbers and sizes of cod caught and landed by commercial draggers fishing from northern New Brunswick ports in Subdivision 4T, based on seven sea trips during the period 30 May to 5 September, 1956. Shore sample adjusted to give equal numbers of cod to sea sample above 49 cm.

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Mesh Selection. Three experimental trips on commercial otter trawlers during 1956 provided information which is pertinent to the implementation of mesh regulation in Subarea 4:

(1) Tests have shown that a short piece of "chafing gear" on top of the codend, when applied as specified by ICNAF recommendations, does not reduce the escapement of haddock and cod through a large-mesh codend. However, a long piece of chafing gear does reduce escapement.

(2) The use of double codends greatly reduced the sizes and numbers of small fish which would escape from a single codend of the same mesh size. The results showed that additional strength in codends should be obtained from increased size or strength of twine rather than from double codends if mesh selection is to be effective (in releasing small fish).

(3) Field studies with double-strand, 80-yard, braided nylon codends showed that a mesh size of 4 3/8 inches was equivalent to 4 1/2-inch manila in releasing fish. In these studies the sizes of haddock released from the codends were smaller than the sizes of cod released from the same codends (selection factors-- 3.8 for cod and 3.3 for haddock.).

(4) The suitability of large-mesh manila codends for incidental redfish catches was tested in the Gulf of St. Lawrence. A 4 1/2-inch mesh codend released about 50% of the 28 cm. redfish. With this large-mesh codend a very small proportion of the sizes of redfish now landed in Canada were released, and meshing of redfish was less serious than generally predicted.

Plankton. Analyses of plankton studies carried out in 1954 and 1955 showed that both seasonally and annually, in surface waters, heavy zooplankton concentrations (900 c.c. per tow) were associated with low temperatures (9-14°C.) and light concentrations (200 c.c. per tow) with high temperatures (17-19°C.).

Hydrography. The long-term program of seasonal surveys, initiated in 1950, covering a network on the Scotian Shelf, the entrance to the Bay of Fundy, and the Gulf of St. Lawrence has been continued by the Atlantic Oceanographic Group. The hydrographic section off Halifax, N. S., was surveyed three times (Fig. 5, attached). The surface layer was colder in the summer 1956 by an average of 2°C. The minimum temperature in the cold-water layer was lower in 1956 than in 1955 by an average of 0.5°C.

At shore stations, continued observations of surface water temperatures, revealed a general decrease in 1956 as compared to the previous year. It was the third consecutive year of general cooling.

The circulation pattern on the Scotian Shelf based on temperature and salinity observations since 1950, shows certain persistent features. The net flow is always found to be southwesterly around Cape Breton varying in magnitude seasonally, from a minimum in the early spring to a maximum during the summer months. The flow is normally to the southwest all along the Atlantic Coast of Nova Scotia, until it reaches Cape Sable. In this area, the flow is evidently divergent with part moving northward towards the Bay of Fundy and part moving southward. The region of divergence appears to fluctuate somewhat in position with volume transport proportions in each branch varying markedly.

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Observations in the central Gulf of St. Lawrence, during the summer, have shown that the Gaspé Current is in part continuous along the southern edge of the Laurentian Channel as far as Cabot Strait. Another portion spreads out over the Magdalen Shallows.

A reasonable correlation has been found between the ratio of haddock to cod landings in ICNAF Subarea 4 and a reliable index of water temperatures over the area. This is in agreement with the known difference in temperature preferences of the two species. This relationship may be of use in forecasting groundfish landings on the basis of temperature trends.

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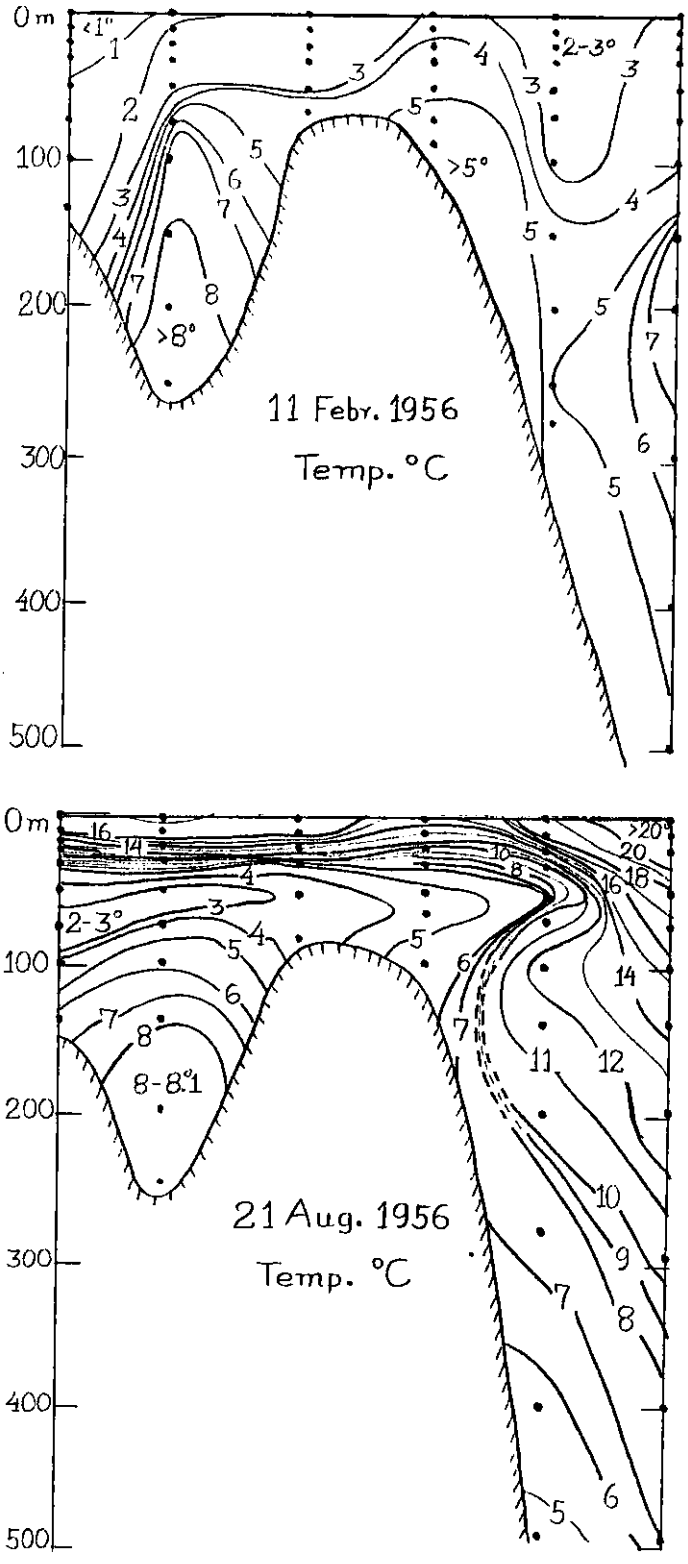

Fig.5 – Hydrographic Section across the Scotian Shelf off Halifax. 1956.

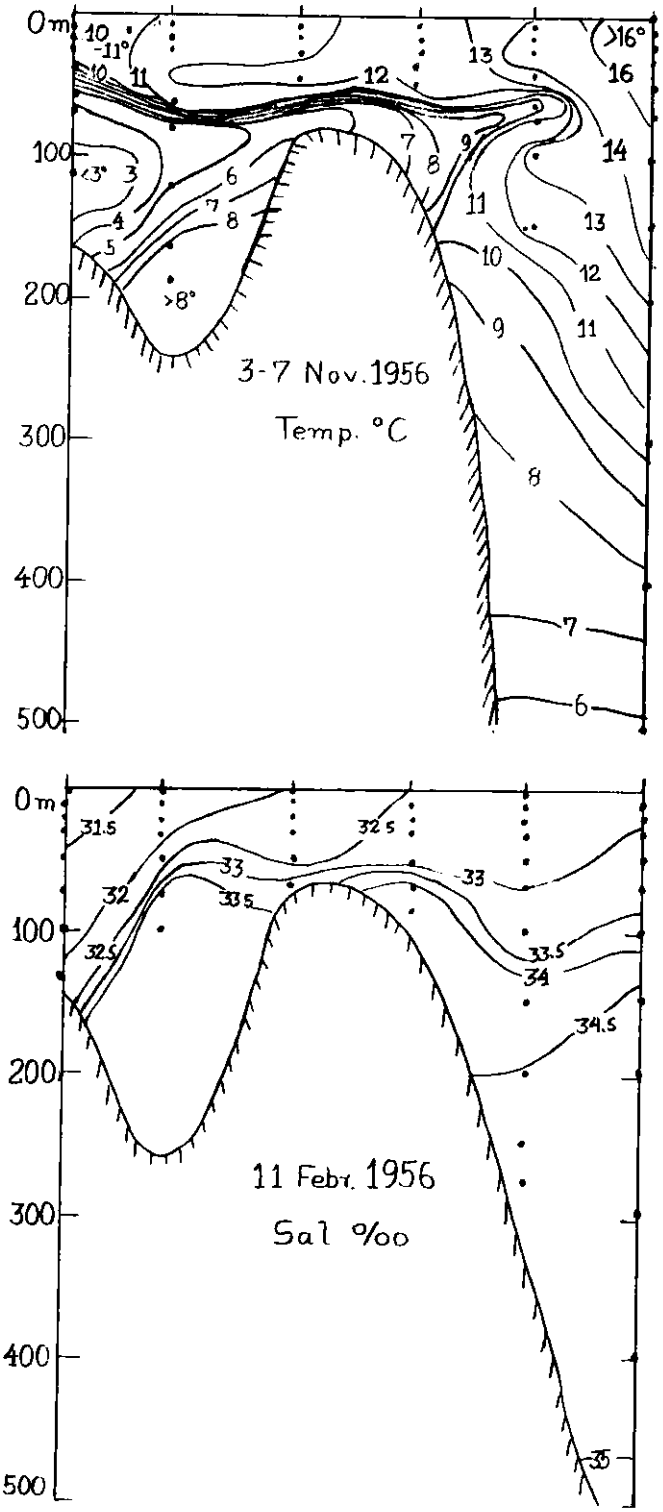

Fig.5 (cont'd) - Hydrographic Section across the Scotian Shelf off Halifax. 1956.