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Subarea 2

by W. Templeman

No groundfish investigations apart from hydrography were carried out in Subarea 2 during 1955.

Hydrography. An attempt was made in late July to take the two sections in northern and central Labrador which were last taken by the Investigator II in 1950, but the area was covered with floe ice and the stations could not be occupied.

The section across the Labrador current beginning off Seal Islands and extending across the Hamilton Inlet Bank area and shown in Figure 1 was taken by the Investigator II in July-August. In this section there was a much smaller volume of water below -10C. and below 0C. in 1955 than in 1954.

Subarea 3

by W. Templeman

The sampling, for size and age, of the commercial catch of the important groundfish species both offshore and inshore was continued at Bonavista, St. John's, Burin, Fortune, Ramea and Isle aux Morts. Location of catch and effort statistics were collected for the offshore vessels.

Haddock *Melanogrammus aeglefinus* (L.). The annual haddock survey on the Newfoundland Banks was carried out by the Investigator II in May and June. The 1949 year-class of haddock continued to predominate in the commercial sizes. This year-class and the total of all year-classes of haddock were most numerous at 41 centimetres on the Grand Bank and at 42 centimetres on the St. Pierre Bank. On the Grand Bank, haddock of the 1952 year-class with a modal size at 31 centimetres were plentiful on the southeastern part where also moderate numbers of the 1953 year-class with a modal size of 25 centimetres were present. Both these year-classes were considerably less plentiful in the southwestern portion of the bank. Only a few one-year-old haddock were obtained.

On the St. Pierre Bank haddock younger than the 1949 year-class were not found in significant numbers.

During the haddock survey on the Grand Bank between May 17 and June 18 the haddock had moved from the deeper water where they had spent the winter and were most numerous at 30 to 40 fathoms. The haddock were in greatest numbers in temperatures of 7 to 30C. and the cod in temperatures below 20C.

In research-vessel catches on the Grand Bank the year-class distribution of 617 haddock was: 1953 year-class 6%; 1952, 20%; 1949, 66%; 1946, 3%. Other year-classes were 1% or less. On St. Pierre Bank for 115 haddock, 90% belonged to the 1949 year-class and other year-classes were 2% or less.

Most of the Canadian haddock catch in the area was landed in the sound condition.

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Tagging and migrations. On the Virgin Rocks of the Grand Bank, 1,570 cod, Gadus callarias L., were tagged and 500 cod were tagged on the Southeast Shoal of the Grand Bank.

From the cod tagging on Burgeo Bank in 1954 there has been migration to the neighbouring coastal areas and some to the Gulf of St. Lawrence and to the eastern part of the south coast of Newfoundland and St. Pierre Bank. There were no recaptures from the Grand Bank.

Cod tagged on the northern plateau of St. Pierre Bank, 1954, were recaptured mainly near the tagging area and in the south-eastern coastal area of Newfoundland. Only about 1% have been recaptured on the Grand Bank and none in the Gulf of St. Lawrence or on the northeast coast of Newfoundland.

Cod tagged at St. Anthony and La Scie in 1954 have migrated along the coast northward toward southern Labrador and southward as far as Cape Race. Of several hundred recaptures from each tagging area, not one St. Anthony cod and only one La Scie cod has been recaptured in the Grand Bank - St. Pierre Bank area.

Cod tagged at Bonavista in 1954 have spread north and southwards along the east coast of Newfoundland. The four bank recaptures (out of 120 recaptures) were all taken on the northern slope of the Grand Bank.

Cod tagged in 1954 at Fermeuse and at Cape Pine and Cape St. Mary's on the Avalon Peninsula show a much greater relation to the banks than do the northern cod. Out of about 400 recaptures, 76 recaptures have come from the bank areas including 52 from the Grand Bank, 19 from St. Pierre and Green Bank, 1 from Burgeo Bank and 4 from Banquereau.

Of 499 American plaice, Hippoglossoides platessoides (Fabr.), tagged in St. Mary's Bay in June and September, 1954, only one has been recaptured; in 1955, inshore off the middle of the eastern side of the Avalon Peninsula, a distance of about 65 nautical miles from the point of tagging. From 1,000 American plaice tagged near the northern tip of the Grand Bank in October, 1954, there were 26 recaptures in 1955, all, except one, near the point of tagging. The one exception was caught on the northeastern part of the bank about 130 nautical miles from the tagging area.

Redfish, Sebastes marinus (L.). During the year, the redfish population in Hermitage Bay was sampled bi-monthly by the "Marinus".

In Hermitage Bay at the present time the redfish length frequency curve is typically trimodal. The peaks are well separated indicating any occasionally successful years for larval survival. By means of a cover of 1/2 inch nylon or 3/8 inch cotton over the codend a numerous group of small redfish has been captured, well separated in length from larger fish. This group can thus be followed independently of age-readings, and has shown the following average total lengths (from the anterior tip of the lower jaw with the mouth closed to the mid-point of the fork of the caudal fin).

1953	December	- 7.1 cm.	1955	April	- 9.6 cm.
1954	June	- 8.1 cm.	1955	June	- 10.6 cm.
1954	September	- 8.8 cm.	1955	August	- 11.3 cm.
1954	December	- 9.0 cm.	1955	Oct.-Nov.	- 11.8 cm.

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A preliminary study of the scales and otoliths of these fish shows that at least 90% of the fish forming the above group were of the same year-class. These fish with scale ages showing an incomplete first year in December, 1953, showed 1+ years in December, 1954, and 2+ during August, 1955. In hundreds of sets, between December, 1953, and December, 1955, only three redfish were caught of a definitely more recent year-class.

The 0+ scale age-group first caught in 1953 was probably of the 1952 or the 1951 year-class since the scales of redfish are unlikely to appear in their first year.

Hydrography. In April the usual hydrographic sections on the southern part of the Grand Bank and on St. Pierre Bank were occupied by the Investigator II.

In July and August five hydrographic sections were taken from Bonavista to the southern slope of the Grand Bank. Compared with the 1954 section there was less water below -1°C. in the Bonavista section and the lowest temperatures were not as low. In the St. John's to Flemish Cap section (Figure 2) temperatures below -1°C. in the Avalon Channel were not as low as in 1954 but to the east and also immediately north of the Grand Bank there was more water below 0°C. and especially on the north fringe of the bank much more below 2°C. On the southwest slope of the Grand Bank there was much more cold water from the eastern branch of the Labrador Current extending westward along the southwest slope than in 1954, reflecting the greater amounts of cold water found on the northern parts of the bank.

Bottom temperatures in August were higher on the central part of the bank and lower on the southern part of the bank than in April.

The inshore upper warm-water layer did not remain as stable and as shallow throughout the summer as in 1954, and the inshore cod, though fairly abundant, were not so abundantly available in shallow water over so long a period as in 1954.

Subarea 4

by W.R. Martin

Cod. A population dynamics study of cod from Subdivision 4T has shown that the post-war conversion from line fishing to otter trawling has adversely affected the fish stocks. The sizes of cod caught are below the optimum for maximum landings. The best size for first capture has been calculated to be about 1½ kilograms, round weight. The study has shown that even with large-mesh nets, the present intensity of fishing is sufficiently high for best use of the resource (see Figure 3).

Cod tagging. Cod tagging was continued in the Bay of Chaleur region of the Gulf of St. Lawrence. From June to September, 1955, 3,851 cod were tagged in this area. The tagging was done from the 55 foot M.B. Mallotus, and most of the fish for tagging were caught by handline. Recoveries during 1955 are compared with recoveries from other cod taggings in Table 1. The percentage of tags recovered was relatively small, and cod showed more movement than in other areas.

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These tagging data are providing useful information on discreteness of stocks, growth rates and fishing mortality rates of cod.

Haddock otoliths. During 1955, the validity of the otolith method of aging Subarea 4 haddock was studied. Annual formation of one hyaline and one opaque zone was found in haddock otoliths sampled during the period 1947 to 1954. Dominant year-classes did not lose their relative importance, compared with adjacent year-classes, as they passed through the fishery. Fish from length modes, sampled as the modes moved along the length distribution scale, added one annulus per year to their otoliths. For these reasons, the majority of haddock-otolith age determinations were believed to be correct.

Mesh selection. The selective properties of cotton and nylon meshes were compared with those of manila meshes. The results of these studies are shown in Figure 4. Nylon meshes allow cod and haddock of a larger size to escape than do cotton or manila meshes of the same internal size. Cotton in turn allows larger fish to escape than manila. For the purpose of releasing small cod and haddock, a $4\frac{1}{2}$ inch mesh manila codend is about equivalent to a $4\frac{1}{4}$ inch mesh cotton and a 4 inch mesh nylon codend.

The effect of "chafing gear" (the protective material on top of some codends) on the release of small haddock was studied. When attached loosely, as specified in ICNAF mesh regulations, "chafing gear" did not affect the 50% selection point of a large-mesh codend. When attached tightly, "chafing gear" reduced the 50% selection point by 3 to 4 centimetres.

Redfish. Growth and maturity of Subdivision 4T redfish were studied. Female redfish were found to grow faster, mature at a larger size (25-30 cm.), and attain a larger size than male redfish. The modal lengths of males were 35 to 36 centimetres and of females 38 to 40 centimetres. Gulf of Maine redfish are reported to mature at a smaller size and reach a smaller adult size. On the other hand, European Sebastes marinus are reported to mature at a much larger size and attain a much larger adult size. Maximum releases of larvae in June was also found to be intermediate between Gulf of Maine (July) and northern Europe (May).

Halibut, Hippoglossus hippoglossus (L.). Statistics of halibut landings were reviewed. The greatest landings have been made by the Canadian offshore fleet. Vessels fishing for halibut contributed the greatest share of these offshore landings and most of the fish were "medium" and "large" (over 6 kg.). Otter trawlers and dory vessels fishing other species in the shallow water of the same regions, took only a small portion of the total weight landed, but a large proportion of the total number of halibut landed. Growth of the small halibut was believed to more than compensate for their natural mortality. It may be possible to increase halibut landings by reducing the catches of small halibut.

Fish eggs and larvae. Analyses of collections from five cruises made during 1955 have not been completed. Distribution and abundance of plankton showed four major areas of production south of the Laurentian Channel: (a) off southwestern Nova Scotia, (b) off northeastern Nova Scotia, (c) southern Gulf of St. Lawrence, and (d) northwestern Gulf of St. Lawrence. High plankton productivity would seem to be related to the bank areas. Summer plankton including young fish were scarce in 1955 as compared with relatively large quantities present at the same time in 1954.

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Hydrography. The Atlantic Oceanographic Group continued to make seasonal surveys of the Bay of Fundy, Scotian Shelf and the Gulf of St. Lawrence areas. Three cruises were made in 1955. The early summer survey was extended to the estuary of the St. Lawrence. The hydrographic section off Halifax is described in Figure 5. The surface layer was much warmer and less saline than in the summer of 1954, especially near the coast. The minimum temperature in the cold-water layer was lower in 1955 than in 1954.

Analysis of surface water temperatures at six points along the coast revealed a general decrease in 1955 as compared to the previous year. Short-term forecasting of annual mean surface water temperatures at St. Andrews, N.B., may now be done with some reliability. It is predicted that the mean temperature will decrease again in 1956. With some reservation, this downward trend from peak temperatures in 1953 applies to Subarea 4 generally.

Currents and volume transport have been calculated by dynamical methods for Cabot Strait from data collected through the years 1950-54. Great variations were found; currents were strongest in August and least in April and May. Currents were outward on the Cape Breton side and inward on the Newfoundland side.

Analysis of bottom temperatures on the Magdalen shallows (Subdivision 4T) shows that seasonal variation in bottom temperature is controlled by stratification. The thickness of the intermediate cold layer is of primary importance.

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TABLE 1 - SUBAREA 4 COD TAGGING EXPERIMENTS - 1953 to 1955

	Number Tagged	Recovered to Dec. 31/53	Recovered Jan. 1- Dec. 31/54	Recovered Jan. 1- Dec. 31/55	Total Recovered to Dec. 31/55
<u>1953 Lockeport - 4X inshore</u>					
Lea Hydrostatic	933	229 (25%)	91	4	324 (35%)
Yellow Petersen Disk	303	92 (30%)	70	5	167 (55%)
Red and White Petersen Disk	305	114 (37%)	78	7	199 (65%)
Monel Metal Strap	263	32 (12%)	43	3	78 (30%)
TOTAL	1,804	467 (26%)	282	19	768 (43%)
<u>1954 Canso - 4W inshore</u>					
Lea Hydrostatic	175		45 (26%)	18	63 (36%)
Yellow Petersen Disk	178		49 (28%)	37	86 (48%)
Red and White Petersen Disk	121		27 (22%)	28	55 (45%)
TOTAL	474		121 (26%)	83	204 (43%)
<u>1954 Louisbourg - 4V inshore</u>					
Lea Hydrostatic	318		42 (13%)	39	81 (25%)
Yellow Petersen Disk	298		52 (17%)	49	101 (34%)
Red and White Petersen Disk	194		51 (26%)	32	83 (43%)
TOTAL	810		145 (18%)	120	265 (33%)
<u>1955 Caraquet - 4T inshore</u>					
Lea Hydrostatic	1,206			78 (6%)	
Yellow Petersen Disk	2,645			160 (6%)	
TOTAL	3,851			238 (6%)	

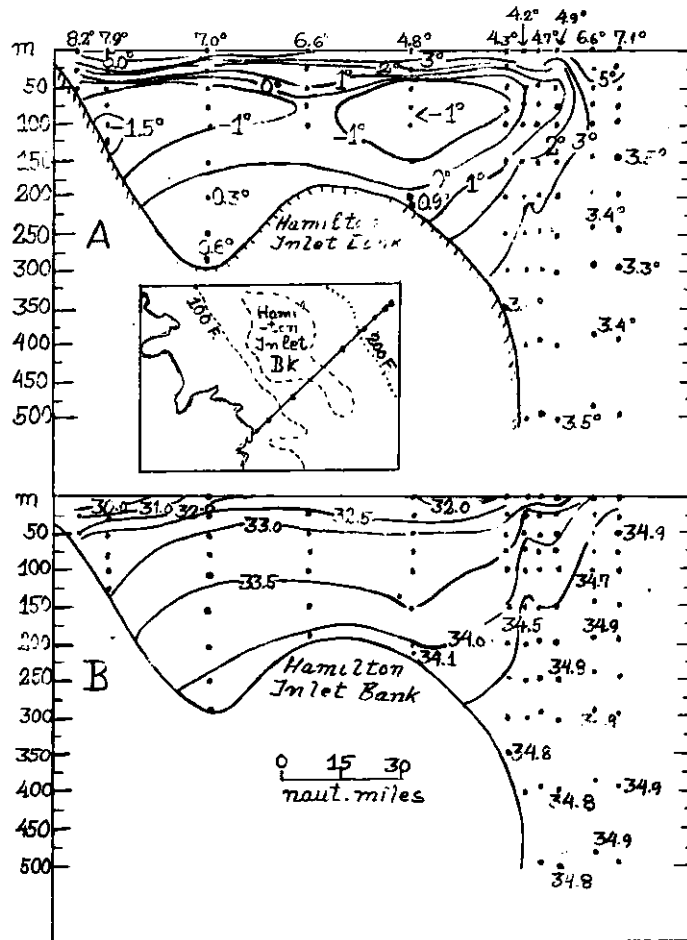


Figure 1. Hydrographic section off Seal Islands-Hamilton Inlet Bank, Labrador, July 31-August 1, 1955; A - Temperature °C.; B - Salinity ‰/oo.

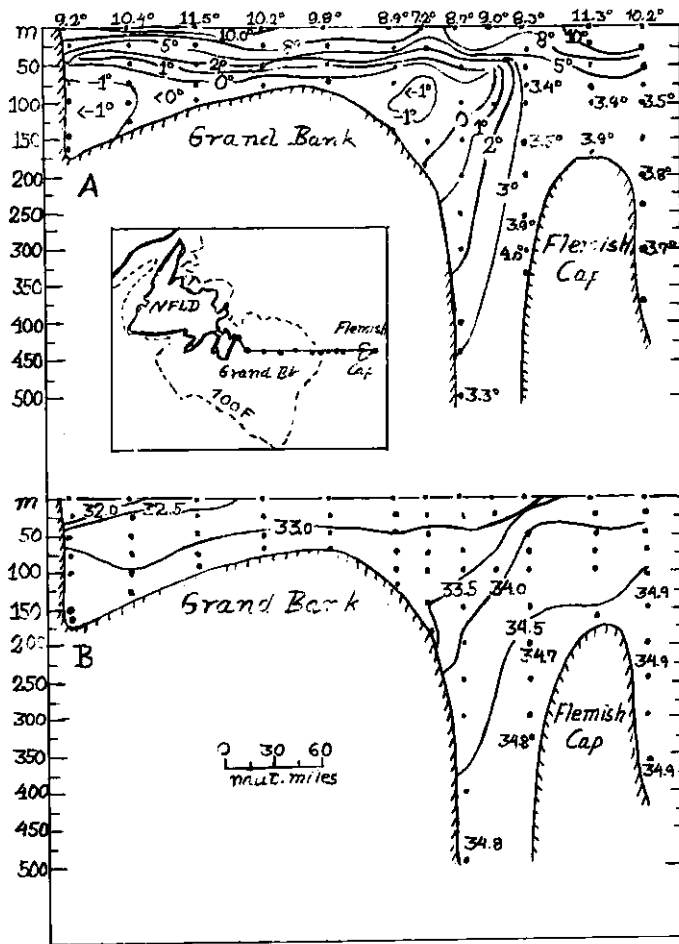
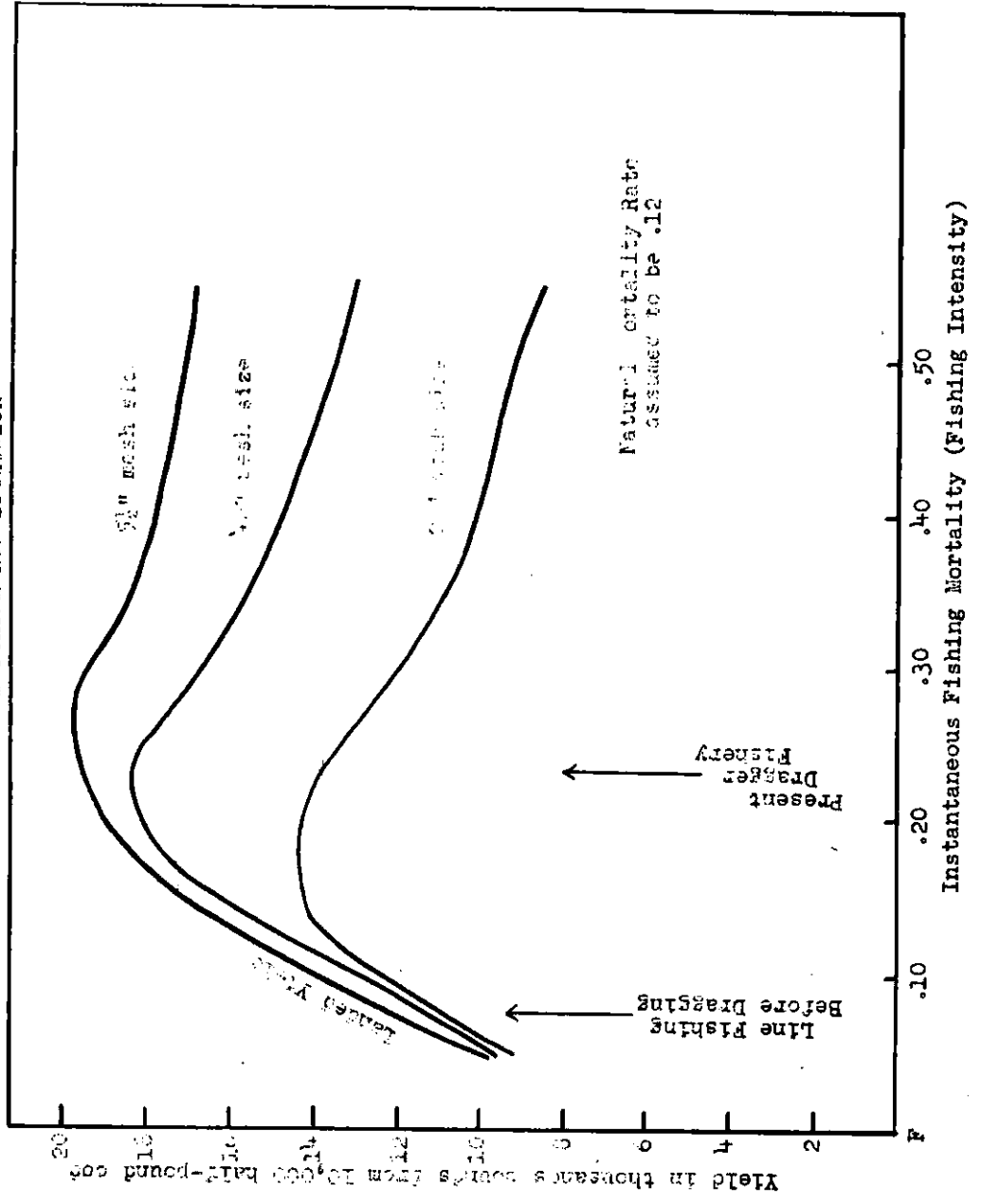
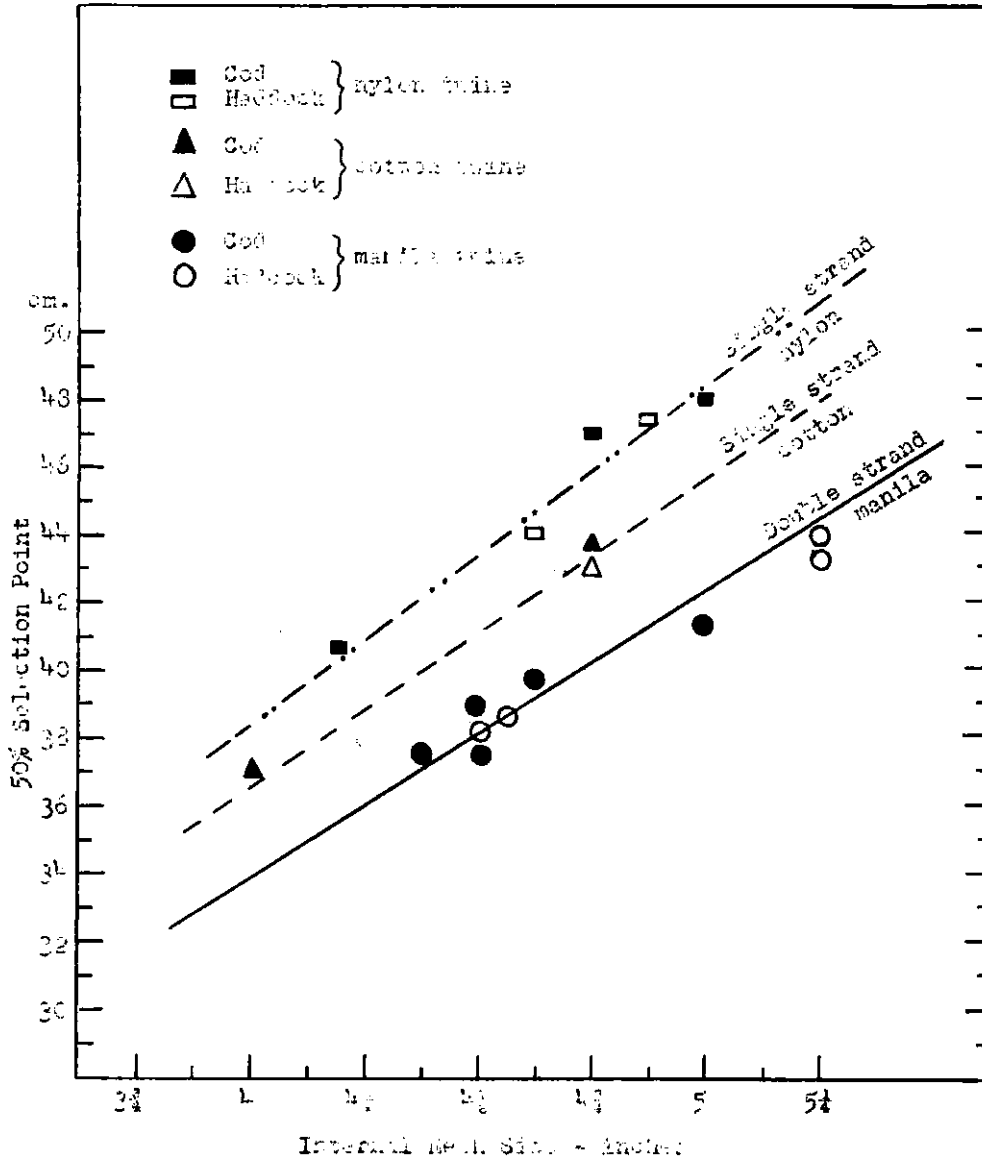


Figure 2. Hydrographic section, St. John's-Grand Bank-Flemish Cap; July 20-25, 1955; A - Temperature °C.; B - Salinity ‰.

Figure 3
 GOD
 Gulf of St. Lawrence - sub-division 4T
 Off northern New Brunswick



Comparison of 50% selection points for cod and haddock with codends of manila, cotton and nylon twines



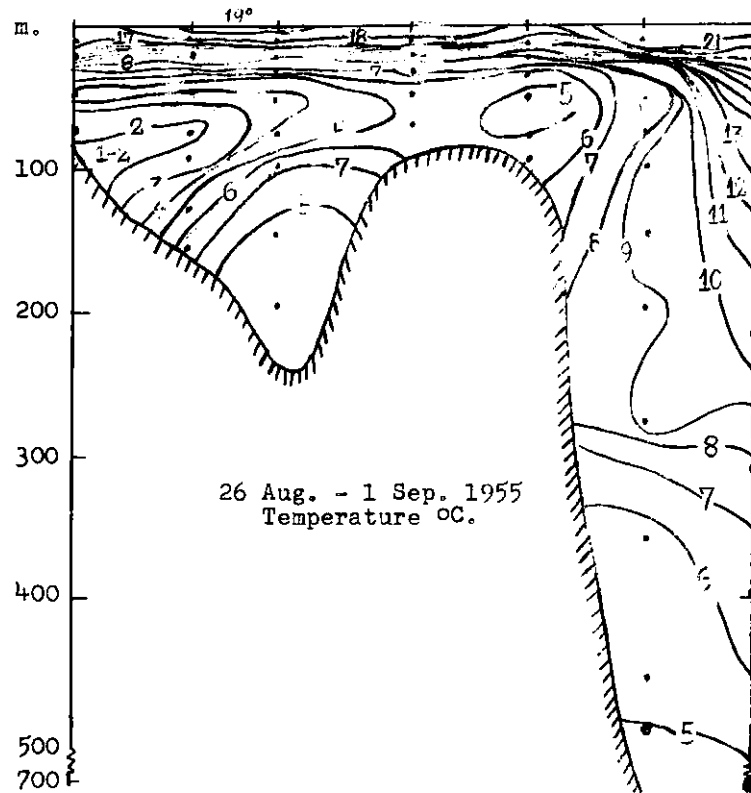
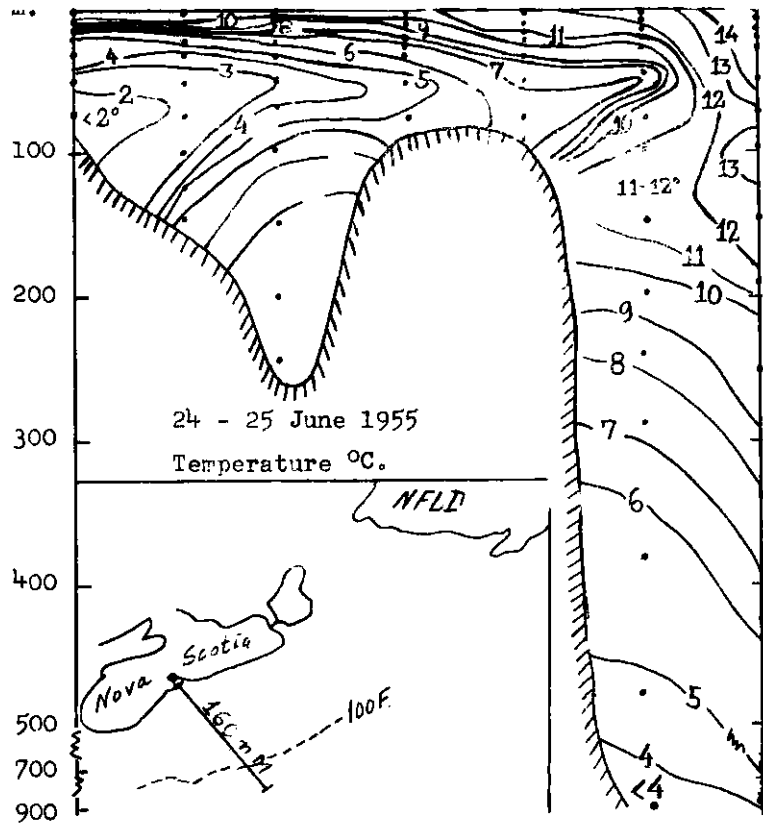


Figure 5. Hydrographic section across the Scotian Shelf off Halifax, 1955.

Figure 5 (continued)

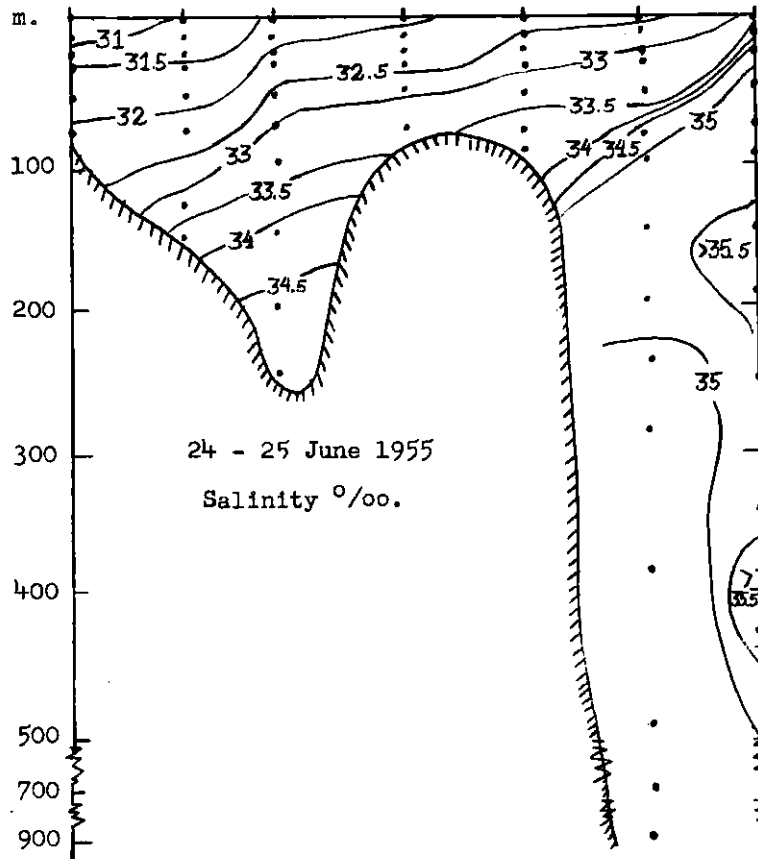
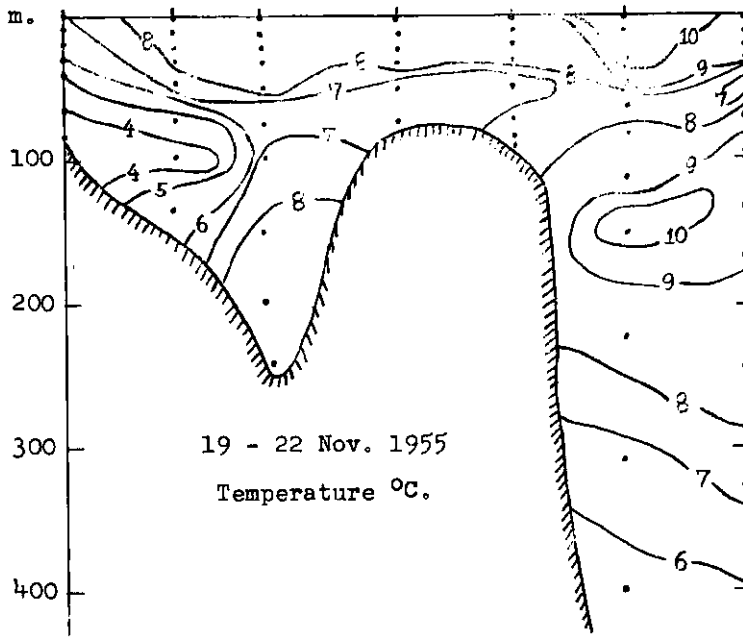
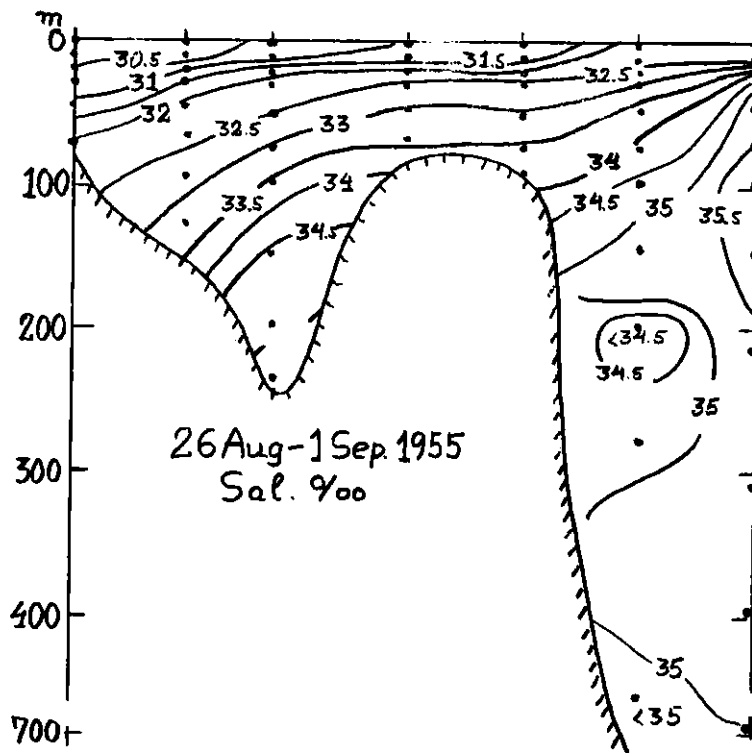


Figure 5 (concluded)



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19 - 22 Nov. 1955.

Salinity ‰

Not yet reported.