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REPORT
OF THE
ATLANTIC HERRING
INVESTIGATION COMMITTEE
1948



**Reprinted from the Annual Report of
The Department of Trade and Industry**

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ATLANTIC HERRING INVESTIGATION COMMITTEE

Once again, in accordance with an agreement executed between the contributing bodies, your Department contributed financially to the work of this committee. Investigations have been continued. Studies on herring populations, hydrographic conditions, methods of location, development of new gear and so on, have resulted in a mass of material, some of which has not yet been digested. A summary of such analyses as have been made is properly a part of this report and forms Appendix 1 attached hereto.

The committee was set up as an experimental body to answer a question, the importance of which was emphasized once again this year by the acute shortage of bait, "Is it possible by purse seining or other known methods to catch herring cheaply and in large quantity in any part of the Gulf of St. Lawrence at all times of the year?" The answer in part is negative, that is to say, herring do not school except at spawning time and near shore, no schools were found in the Gulf proper.

It is interesting to speculate that this may be due to the fact, discovered by the committee, that the herring of the Gulf area consists of a number of distinct populations, with international boundaries, so to speak, as sharply defined as those between separate states, and the over-exploitation or even complete destruction of the inhabitants of, say, the Shediac area would have little or no influence on the population of the area adjacent to the Bay of Islands.

So far the work has given negative answers, but time and money are saved by knowing where not to build a plant, as money may be made by knowing where. So far as the work has gone at present, it must be concluded that any industry which depends on a large, cheap and constant supply of herring in the Gulf area will not be successful. This conclusion may change as different gear is developed. The work of the committee on the problem of gear will be expanded and intensified next year.

Summary of Report of the Atlantic Herring Investigation Committee for the year 1947-48

The object of the Committee's investigation is to discover whether greater exploitation of the herring resources of the Gulf of

St. Lawrence is possible. The work carried out in the year 1947-48 was directed mainly to this end. Three boats were engaged in field work for the Committee. These were the "Harengus", an 84-foot seiner-dragger, and two smaller boats, the "Ahic" (42-foot) and the "Gulf Explorer" (47-foot) which were used for hydrographic work and exploring with sonic sounders. The "Ahic" was laid up in September and subsequently sold. Much of the scientific equipment on board was transferred to the "Harengus". Population studies were continued on herring from most parts of the Gulf of St. Lawrence and some preliminary tagging was carried out. Hydrographic work was greatly aided by co-operation with the Atlantic Oceanographic Group.

1. Exploratory Fishing.

The "Harengus" was engaged in searching for herring by means of a "Husun" sonic sounder from late May to mid-September. During this period she worked in the area around the Magdalen Islands, Cheticamp, the Gaspé coast and the Bay of Chaleur and on the outer coast of Nova Scotia, chiefly between Halifax and Shelburne. The boat was also equipped with a 200x20 fathom purse seine. The schools of fish which were detected were so scattered that purse seining was not profitable. While the gill-net fishery for herring on the outer coast of Nova Scotia was in process, the "Harengus" sounder did not detect any extensive schools and several purse seine sets were made without any worthwhile catches.

The M. B. "Ahic" traversed much the same areas in the Gulf as did the "Harengus" and operated a Bendix sonic sounder without notably different results. The "Ahic" covered courses between Cheticamp and the Magdalen Islands, from the Magdalens to North Point, P.E.I., North Point to Point Escuminac, N.B., and through Northumberland Strait in May and August. In July and August exploration was carried out along the north side of Prince Edward Island. Sonic Sounder records taken on all these cruises were consistent in showing only scattered groups of pelagic fish. The best records were secured near the Magdalen Islands in June, near West Point, P.E.I., at the end of May and off Souris, P.E.I., in early July.

The "Gulf Explorer", which was also equipped with a Bendix sonic sounder, explored the territory around Caraquet and Shippigan, N. B., the Gaspé coast and along the north shore of the Gulf

from Seven Islands to Havre St. Pierre, Que. The indications of fish were more marked in this region and they persisted throughout the period from May to September. Commercial and experimental catches of herring were made at several points. In many places discontinuous groups of fish were observed each time the boat visited the area. Some of the schools were probably dense enough to warrant attempting to capture them with a shallow purse seine.

The "Harengus" was dispatched to Bay of Islands on the west coast of Newfoundland and spent November and the first few days of December there and in Bonne Bay. The vessel at this time was equipped with both "Husun" and "Bendix" sonic sounders. At first only scattered schools of herring were encountered but these became more massive towards the end of November. During the day the schools were lying deep and it was not possible to reach them with the purse seine. During the period November 24th to December 1st, the herring concentrated in North Arm, Bay of Islands and five night sets of the purse seine captured approximately 470 barrels of them. The best catch was 200 barrels in one haul on November 26th. It is worth noting that although many gill-nets were set during the same period and in the same locality, they did not make large catches until after December 2nd.

The operations in Bay of Islands proved that both types of sonic sounder would indicate the presence of herring in quantity and that it was possible to capture them with a purse seine. Since similar methods of detection and capture were unsuccessful during the summer in the Gulf and on the Atlantic coast it seems reasonable to conclude that the herring were not present in adequate concentration.

While similarly equipped the "Harengus" visited Fortune Bay on the south coast of Newfoundland during March, 1948. After some preliminary scouting massive schools of herring were located in Mal Bay between March 19th and 23rd. These were first fished with gill-nets and subsequently a very large catch was taken, but not landed, in the purse seine. It was estimated that the catch consisted of well over 500 barrels of large herring. The strain was too great for the seine, which parted and permitted most of the catch to escape. These operations were hampered by onshore winds and as

the herring were lying close to shore at most times it was not possible to operate the seine.

Summarizing the above it may be said that large schools of herring were only encountered in the fall and winter months and that no herring were found except in close proximity to the coast.

2. Population Studies.

It is important to know to what extent the herring in the Gulf of St. Lawrence migrate both in the Gulf and outside it. While some preliminary tests were made of tagging methods no tagging of live fish was carried out during the period under consideration. But the study of herring from various localities, which was undertaken intensively in 1946-47, was continued. Samples were secured from 21 points in the Gulf, on the outer coast of Nova Scotia and from the south and west coasts of Newfoundland. One hundred and seventy-seven samples were examined, 36,859 herring were measured, the age of 9,933 was determined and vertebrae counts were made on 10,168. This work was carried on by Messrs. Tibbo and Day with assistance of technicians. The following excerpts are taken from their conclusions.

Length and age composition analyses of the 1947 sampling corroborate the results of the previous report. These are: (a) an extensive spring fishery is carried on for spawning herring in all Estuary, Gaspé and southern Gulf of St. Lawrence areas. The fish are large and four to eight years old. They are gradually replaced through late May and June by smaller and younger fish which are three to five years old. (b) a comparatively small late summer and fall fishery is carried on in the Estuary and on the Gaspé coast for small immature herring. A fall fishery for large spawning herring is centred off Miscou and Shippigan Islands, N. B., and North Rustico, P. E. I. These herring are seven to eight years old. (c) extensive late summer and early fall spawning stocks of large, six to eight-year-old herring are exploited along the Canadian Atlantic coast. (d) an extensive winter and spring fishery is carried on along the west and south coasts of Newfoundland for large herring. These are spring spawning fish, ten to twelve years old.

There is evidence that some years are more productive of herring than others. The 1939, 1941 and 1943 year classes of herring

are dominant throughout most of the Estuary, Gaspé and Gulf areas sampled. On the Atlantic coast the 1940 class is dominant.

Studies of the rate of growth substantiate the 1946 indications of an Estuarial and Gaspé growth type, a Gulf-spring growth type, a Gulf-fall growth type and an Atlantic coastal-fall growth type. Further evidence for separate populations is derived from vertebrae count studies. The average vertebrae counts are highest in the Estuary of the Gulf of St. Lawrence and lowest along the Canadian Atlantic coast. The vertebrae studies suggest the following divisions: (1) an Estuarial spawning population; (2) a Gaspé and Bay of Chaleur spawning population; (3) a southern Gulf of St. Lawrence population; (4) a Canadian Atlantic coastal population; (5) a Newfoundland west coast population, and (6) a Newfoundland south coast population.

Comparison of conditions in the Gulf of St. Lawrence indicates that the water was colder in the spring of 1943 than in the same period of 1941. The average vertebrae counts for the 1943 and 1941 year classes of spring spawning herring have been shown to vary inversely as the spring temperatures. Conversely the summer of 1943 was warmer than that of 1941 and the herring of the 1943 year class made greater growth in their first year than did those of the 1941 year class.

It was not feasible to study the movements and intermingling of the herring stocks by the more direct tagging method. Herring caught by purse seine in Bay of Islands were not suitable for tagging. Experiments were conducted to test the efficiency of recovery of silver plated steel and green celluloid tags when known numbers were put through processing plants. In all experiments the recovery was low; the highest was 51.8 per cent for green celluloid tags put through a canning plant at Bay of Islands, Newfoundland.

3. Hydrographic Investigations.

The hydrographic investigations were conducted in part from the Committee's own boats and in part in co-operation with the Atlantic Oceanographic Group. This co-operation made it possible to cover the whole Gulf of St. Lawrence area more completely than was hitherto possible. Temperature and salinity determinations were made at a large number of representative stations and these

will aid in understanding the water conditions and circulation in the Gulf which presumably have a bearing on the distribution and migrations of herring and other fish. Dr. Lauzier had charge of this work.

The work falls into two main divisions: (1) the offshore cruises of which there were three and (2) more frequent observations at three shore stations.

A spring cruise was carried out during the period May 18th to June 2nd using the "Harengus", "Ahic" and "Gulf Explorer". Fifty-five stations were occupied. These covered the southern and western portions of the Gulf; a line from the Magdalen Islands to St. George Bay and several stations on a line from Bonne Bay, Nfld., towards Harrington Harbour, Que. A more extensive summer cruise during the period August 30th to September 11th was made with the "New Liskeard" and "Lloyd George" supplied by the Atlantic Oceanographic Group and the "Ahic" and "Gulf Explorer" supplied by the Atlantic Herring Investigation Committee. Sixty-six stations distributed over the entire Gulf were occupied. The fall cruise was divided into two parts. The "Gulf Explorer" occupied twenty-three stations in the southern Gulf between October 20th and 28th. A cruise by the "New Liskeard", November 19th to 29th resulted in data being secured for sixteen stations on sections across the Laurentian channel between the Magdalen Islands and St. George Bay; from Anticosti Island to American Bank; from Gaspe to the North Shore west of Anticosti and one station north of Anticosti in the Jacques Cartier channel.

Only the data from the southern portion of the Gulf were worked up when the annual report was prepared and the following statements will refer to that area. The cross sections and horizontal sections show a consistent pattern of temperature and salinity distribution. This pattern consisted of low salinity and high temperature waters spread along the Prince Edward Island and Cape Breton coasts, which was somewhat counter-balanced by high salinity and low temperature waters in the Bradelle Bank and Magdalen Islands areas. In general the maximum surface temperature was recorded in either the Miramichi area, Northumberland Strait or George Bay. The minimum surface salinity was observed in the Miramichi area during the spring cruise, off North Rustico during the summer cruise and in Northumberland Strait during the early fall cruise. The main

body of low salinity water was always located in the Miramichi area. It was also encountered in Northumberland Strait during the spring and early fall cruises and along the Prince Edward Island coast during the summer cruise. As in previous cruises the minimum water temperature was always observed in the Bradelle Bank area.

In comparing the 1946 and 1947 spring cruises there was a general tendency toward cooler waters at the surface and warmer water in the lower layers in 1947. The salinity was higher in 1947 in the surface layers but there was no appreciable difference within the deeper layers. During the summer cruises the temperature was generally lower in 1947 than in 1945 and 1946. Salinities were lowest in 1947 except in the Bradelle Bank and Magdalen Island areas, where the salinity of the bottom layers was at a minimum in 1945. In general for the three-year period, 1945-47, the temperatures during the early fall cruises were lowest in 1947. The salinities were least in the upper layers and greatest in the lower layers during the October 1947 cruise.

Three shore stations were in operation for varying periods during 1947. These were at Grand River, Que.; North Rustico, P.E.I., and Cheticamp, N. S. The Committee is indebted to Dr. J. L. Tremblay, Director of the Station Biologique du St. Laurent, for much of the Grand River data and to Dr. L. P. Chiasson of St. Francis Xavier University for assistance at Cheticamp. From these observations it was noted that there was a lag of approximately five to six weeks in the time of occurrence of minimum surface salinity from Grand River to Cheticamp. A lag of three weeks occurred in the time of maximum surface temperature at the same stations. There is evidence of a movement of the water masses from Gaspé to Cape Breton with mixing occurring along the way.

4. Staff.

A. H. Leim, B.A., Ph.D.

Investigator-in-Charge.

(Seconded by Fisheries Research Board of Canada).

L. Lauzier, M.Sc., D.Sc.

Hydrographer.

(Seconded by Province of Quebec).

S. N. Tibbo, N.Sc., M.A.	Zoologist. (Seconded by Newfoundland).
L. R. Day, M.A.	Zoologist.
B. A. M. Bartlett, B.Sc. (Mrs.)	Senior Technician.
P. J. Gibson, (Miss)	Junior Technician.
M. A. Dougherty, (Miss)	Stenographer (from April 15).
R. J. Simpson	Field Technician (Apr. 17 - Oct. 31).
G. Moisan	Field Technician (May 6 - Sept. 12).
C. K. Darrach, M.B.E.	Master of "Harengus" (to Oct. 17).
W. R. Collishaw	Master of "Harengus" (from Oct. 11).
H. H. Butler	Master of "Ahic" (to Oct. 25).
L. J. Lewis	Master of "Gulf Explorer".

In addition the boats had the following crew:

"Harengus"—Mate, Engineer, Cook, 5 seamen fishermen.

"Ahic"—One helper.

"Gulf Explorer"—Engineer.