

Investigations of the Newfoundland Herring in 1957-58

by

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From June 1957 to September 1958 the Fisheries Research Board of Canada, Biological Station, St. John's, Nfld., conducted a project of herring research and exploratory fishing. During these 18 months a 57-foot vessel was used continuously to survey the southern and western Newfoundland areas with echo-sounder, and numerous fishing experiments were carried out with drift-nets and set-nets at the bottom.

A report of these operations has been published (Olsen, 1961), and here we shall draw the attention to the main results, as they seem to have relevance to some of the questions to be discussed in this Symposium.

The investigations were initiated by the serious difficulties experienced in the preceding years in the Newfoundland herring fishery. This fishery has long traditions, and similar to most other fisheries the yield has varied from year to year and also fluctuated over long periods. During and shortly after the Second World War there was a period of good years with a record of 164 million pounds landed in 1946.

10 years later the catch was only ^{abt.} 26 million pounds. This decline was experienced in all areas of the island, but most strongly on the south coast. Thus in Fortune Bay, which was previously one of the centres of the herring fishery, no large bodies of herring have been observed for years, and the traditional fishery in this area has virtually ceased to exist.

Poor market conditions and other economic factors in the post-war period quite likely contributed to the decline, but it is also evident, at least on the south coast, that the reduced landings have been associated with a marked decrease in abundance of herring at the times and places the fishermen used to catch them.

The fishery for herring in Newfoundland is based on pre-spawning and spawning concentrations, close to the shore, and with the exception of a handful of purse-seiners operating on the west coast, the herring are caught with set-nets at the bottom or with small seines. The boats used are too small for operations at any distance from the coast.

The exploratory fishing and the echo-surveys indicated that during summer the herring were sparsely distributed offshore in the warm surface layer of water. There were possible aggregations off the west coast in areas of large horizontal temperature gradients, but nowhere did they appear to be abundant enough for successful commercial exploration in offshore waters.

During summer the herring might also occasionally accumulate in some of the many bays and inlets of the island, where they used to be found more regularly and in larger concentrations in the autumn, winter and spring.

The material collected from both inshore and offshore waters indicated a relatively low mortality rate in the adult population, and no great fluctuations in relative year-class strength. The growth rate appeared to be fairly high, exceeding that found by Tibbo (1956) in 1942 to 1944 in the same general areas.

The summer samples gave distinct evidence of two or more groups with different spawning times. Some herring were recovering from a recent spawning while others were maturing to spawn later in the year. This picture was confirmed by the samples collected in the fall and winter, which contained fish of nearly all stages of sexual maturity. Smaller or greater numbers of spawning herring were found in January, March, June, July, September, October and November, and an analysis of the material with regard to stage of maturity (see Table 1, page 3) suggests that some spawning herring were present in nearly every month of the year. The material did not suffice for an assessment of the relative importance of the seasons, but there might be one main season in the spring or early summer, particularly on the west coast, another peak in the autumn, and, at least on the south coast, a considerable winter spawning.

¹⁾ This work was carried out by the Fisheries Research Board of Canada, Biological Station, St. John's Nfld.

This extreme spread in spawning time contradicts Tibbo's findings in 1942-44 and in 1946-48 (Tibbo, 1956 and 1957), showing a May/June spawning which is further confirmed by all previous relevant literature, right back to 1891. It would, therefore, appear that sometimes during the last 12-14 years (perhaps gradually) the Newfoundland herring, which previously seemed to spawn only in the spring or early summer, changed their spawning habits very greatly.

A change of this nature would have a great impact on the fishery if it were effective for any substantial proportion of the population. It is therefore not very surprising that it seems to have coincided with a period of a steadily declining fishery.

Due to the seasonal warming of the surface layer of water, a change from spring spawning to spawning later in the year would tend to move the spawning concentrations of herring into deeper waters farther offshore. They would then be mostly out of reach for the Newfoundland fishermen with their small vessels and light gear.

It is further realised that in a species which changes habitat regularly as it undergoes the yearly cycle of physiological development, mass concentrations will usually only occur by individuals which are in approximately the same stage of development. The effect of a great spread in spawning time would therefore be a general dispersion of the fish. Thus, on the south coast of Newfoundland where probably the spread in spawning time is most extreme, the herring seemed to be particularly scattered and scarce.

Finally one can raise the question of what effect such a condition might have on recruitment. Unfortunately, no data exist on which sound assessments can be made of past or present population size of the Newfoundland herring, and the apparent decrease in abundance might merely be the result of a change in availability.

However, since all known herring populations and in particular those of great abundance, are characterised by a relatively short and well defined spawning period, it is likely that this condition is the one which provides the best recruitment, and thus safeguards the survival of the species. It is therefore reasonable to assume that the change towards the great spread in spawning time has not only affected the availability of the Newfoundland herring, but has also caused a reduction in population size. This would explain the increased growth rate mentioned previously, if we assume that the rate of growth is density dependent.

Summary

The Newfoundland herring fishery decreased rapidly from a record of 164 million pounds landed in 1946 to 26 million pounds in 1956. A study conducted in 1957-58 gave evidence of an unusual spread in spawning time with some spawning in nearly all months of the year. This contradicts all previous reports which indicate a well defined spawning time in the spring or early summer. It is suggested that the change in spawning habits has adversely affected the availability, and possibly also the recruitment of the herring in Newfoundland waters.

References

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| Tibbo, S. N. | 1956 | "Populations of herring (<u>Clupea harengus</u> L.) in Newfoundland waters". J.Fish.Res. Bd. Canada, <u>13</u> (4):449-66. |
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Table 1. Percentage distribution of maturity stages (immature fish excluded).

Date	Locality	Maturity stages in %						N
		III	IV	V	VI	VII	VIII	
1957								
June 18	St. George's Bay	-	3.0	1.0	-	96.0	-	100
June, 26, 27	Hermitage Bay	8.1	41.0	28.1	-	20.0	2.7	295
July 16, 19	Hermitage Bay and Connaigre Bay	60.5	14.5	13.7	-	5.1	6.3	256
July 31, Aug. 1	Off Bonne Bay and Cow Head	38.0	45.6	6.4	-	2.1	7.9	329
Aug. 8, 9	Strait of Belle Isle and off Pt. Riche	45.1	36.2	12.5	-	-	4.2	335
Aug. 8, 9	Old Perlican, T.B.	18.8	56.3	21.9	-	-	3.1	64
Aug. 17	Conche	8.9	73.8	16.2	-	-	1.1	179
Aug. 28, 29	Port aux Basques and Hbr. Le Cou	15.6	64.8	18.1	-	-	1.5	199
Sept. 23-26	Fortune Bay	27.0	17.4	50.4	5.2	-	-	115
Oct. 16	Bay of Islands	85.1	12.3	1.7	0.4	-	0.6	701
Oct. 17, 18	Off Port au Port Bay	81.8	15.1	3.1	-	-	-	192
Oct. 19	Port au Port Bay	93.4	5.7	1.0	-	-	-	317
Nov. 8	Port au Port Bay	60.9	26.4	12.3	0.5	-	-	220
Nov. 19	Fortune Bay	94.5	2.8	-	-	-	2.8	36
1958								
Jan. 4	Fortune Bay	42.9	25.7	4.8	1.0	21.0	4.8	105
Jan. 21, 24	Placentia Bay	46.0	25.2	11.7	2.5	2.5	12.3	163
Jan. 29	Placentia Bay	13.4	6.1	11.2	12.3	19.6	36.9	179
Febr. 5-10	Fortune Bay	71.2	18.6	3.4	-	3.4	3.4	59
Mar. 14	Placentia Bay	28.0	25.0	14.0	2.0	-	31.0	100
May 4, 5	Fortune Bay	74.1	11.7	11.1	-	1.9	1.2	162
June 3	Hermitage Bay	64.4	6.8	0.5	-	3.2	25.2	222
June 18	St. Mary's Bay	47.8	17.1	1.6	1.0	-	32.6	387
July 9, 17	Off Portland Hill and Pt. Riche	64.4	27.6	4.6	-	1.2	2.3	87
July 21	Conche	62.7	13.5	1.6	-	-	22.2	126
July 26	Bonne Bay	79.0	-	-	10.5	10.5	-	19
July 31	Current Island	58.5	27.8	8.0	1.4	0.5	3.8	212