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Status of Herring Tagging Research in the Gulf of Maine

by

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Introduction

The migration and movements of herring in the Gulf of Maine have been the subject of debate since the early 1800's. It has been well known that herring migrate great distances for the purpose of feeding, spawning and overwintering. When the first catch quota was allocated for herring in 1972, it was agreed by the Commission of ICNAF that all three total allowable catches of herring should be based on the same management principles to allow for migration of herring stocks from one area to the other. Numerous studies were undertaken to solve the stock identification problem, the most direct of which has been tagging. This document outlines the development of tagging programs in the Gulf of Maine area, the stage of present analysis and general knowledge and where we need to go from here.

Early tagging studies

The tagging of herring in the Gulf of Maine began in 1957 in the Passamaquoddy Bay area (McKenzie and Skud, 1958). Tagging continued in 1958 in Passamaquoddy Bay and along the Maine Coast in 1960 and 1963. Of 161,000 young herring tagged only 2.5% were recovered and many of these recoveries were made within one day of release. Maroon celluloid opercular tags were used which were easily lost. The absence of offshore fisheries in those years precluded long distance recoveries. The data were analyzed in Anthony (1972).

Further tagging studies were proposed by scientists during the 1960's but such studies were not carried out for various administrative reasons. Canadian tagging experiments carried out in 1970 in the Gulf of St. Lawrence demonstrated that the stocks supporting the south coast of Newfoundland fishery in the fall and winter were also supporting the summer Gulf of St. Lawrence fishery. This was a very valuable discovery and led to recommendations in 1970 and 1971 that herring tagging studies begin in the Gulf of Maine - Georges Bank area. Canada began the tagging of herring in the Gulf of Maine at Grand Manan in November, 1973 and continued off Nova Scotia in 1974 with 48,000 tagged in the two years.

Recent tagging studies

The International Herring Tagging Program began under ICNAF in 1976 and continued to 1979. From 1976 to 1978 the U. S. in cooperation with USSR, Poland and Canada tagged 90,000 herring. Additionally Canada tagged 193,000 herring from 1976 to 1980 in the Nova Scotia area (NAFO subarea 4WX). The State of Maine tagged 52,887 herring from 1976 to 1978 and additional amounts in 1980. Preliminary results from these tagging studies have been presented in a variety of documents by Canada, the NEFC and the state of Maine. A thorough analysis has had to wait until most of the tags were recovered. From the 1976-1978 tagging this means waiting until 1979-1981 plus time for analysis, thus, the data could not be completely analyzed prior to 1981. Tagging studies are not only expensive but require time for recovery.

Canada has published preliminary summaries of its early tagging in Stobo, Scott and Hunt (1975, ICNAF Res. Doc. 75/38), Stobo (1975, ICNAF Res. Doc. 75/39), Stobo (1976, ICNAF Res. Doc. 76/VI/48), and Stobo (1976, ICNAF Res. Doc. 76/VI/101). The tagging since 1976 will be reported and, at least, partially analyzed at the annual NAFO meeting in September, 1981. All Canadian tag returns were placed on computer tape by the end of August, 1981.

The State of Maine has analyzed its data and presented some results in Speirs (1977, ICNAF Res. Doc. 77/VI/50) and in Chenoweth, Hunter, and Speirs (1980, Res. Reference Doc. 80/14, Maine). Further results will be reported at the September, 1981 NAFO meeting.

The first meeting of the International Herring Tagging Program in 1976, produced guidelines on how many fish to tag for a given objective (Anthony, 1976 ICNAF Res. Doc. 76/VI/66), set general tagging objectives, and outlined procedures for seeding experiments and tag recovery. Preliminary results of the tagging experiments are reported in Burns (1976, NEFC Report), Burns and Waring (1976 ICNAF Working Paper 76/XII/156), Burns (1977, NEFC Report), and Almeida and Burns (1978 NEFC Lab. Ref. Doc. 78/07). Another paper by Waring will be presented to the September meeting of NAFO considering all returns to data from the tagging studies done by the NEFC in conjunction with other countries under the auspices of the International Herring Tagging Program.

Results

The original tagging objectives of the International Herring Tagging Program in May of 1976 concerned three aspects: 1) movements and migration of herring, 2) stock identification and 3) mortality rates. Objective No. 1 has been partly met. A great deal of knowledge has been gained about the movements of herring throughout the year although an analysis of all tagging data needs to be completed prior to elaborating on the details of the results. However, feeding and overwintering migrations have been identified. The migration rates have been observed and the distances of the two migrations have been estimated. For example, herring from the overwintering Chedabucto Bay group also are part of the feeding group in the Bay of Fundy in August. This was not known before the tagging studies. Herring from this feeding area overwinter in two directions: North to Chedabucto Bay and South to Cap Cod Bay and even

south of the Cape in cold winters. The proportions that go each way will not be known until we do repeated tagging of this feeding complex for several years (replications) and analyze the tag returns in conjunction with catch and effort information. Juvenile herring along the Maine coast move locally during the summer months but major migrations do not occur until the fall and spring of the year. Movement is very reduced from November to May in most areas. Movements into and out of Chedabucto Bay are an exception to this.

Objective No. 2 has been partially met but there are problems in defining a "stock" at tagging time. Herring from other stocks feed and migrate through areas when spawning is occurring or just about to occur so definition of the local stock is difficult. Learning that, however was significant. Tagging must occur on spawning fish and the logistics of this are difficult. Returns from tagging experiments on ripe and running fish have been poor, in general. Tagging mortality on ripe and running fish appears to be high. Therefore, few fish of a known spawning stock have been tagged.

Objective No. 3 has not been met except that the State of Maine has published one estimate of fishing mortality from its tag returns. Successful estimation of mortality rates requires a more concentrated release of tags than we have, so far, been able to provide upstream from the fishery and before the major fishing begins. This in turn requires knowledge of the movements of the herring over a several month period.

Summary

The original plan of the International Herring Tagging Program was to tag herring from 1976-1978 and to analyze all results by 1980. With the demise of ICNAF and the shift of Canada's herring tagging interests to areas other than the Gulf of Maine and of one of its herring specialists to the tagging of other species, this has slipped a year. All participants in the International program agreed that future tagging should depend on the carefully analyzed results of the experiments conducted in 1976-1978. To optimize the results from any future tagging requires the knowledge gained from full analyses of the past experiments. At a Joint Canadian-United States Herring Workshop in December of 1978, the participants endorsed the idea that a Working Group should meet on a yearly basis to exchange tagging data and ideas. The group further recommended that herring tagging should be continued by both countries, with emphasis on tagging ripe and running fish (the original objective No. 2 of the International Herring Tagging Program). Annual meetings of those involved in tagging operations were advised to exchange information and to further discuss and coordinate the tagging activities.

It is anticipated that at the September 1981 meeting of NAFO, the Herring Working Group will review the U.S. tagging report and the latest Canadian analysis and summarize the knowledge gained to date which, in turn, should provide recommendations for further research.

