Appendix NA-4

A New Research Program on The Blackback Flounder

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A. Nature and Status of the Fishery

In 1959, the blackback ranked number six in value among all species of fish landed in Massachusetts and number eight in poundage - $1,284,000 and 10,214,000 pounds respectively. Information as to what percentage of the catch comes from offshore, as opposed to territorial, waters is not available; roughly, 98% of the catch is made by otter trawl with gill nets, pound nets and hook lines accounting for the remaining 2 percent.

During the past decade the blackback catch dropped from the 1950 figure of 14,778,000 pounds to a low of 7,855,000 pounds in 1955, only to rise again to 1959's figure of 10,214,000. According to Perlmutter, the total New England catch began to experience a marked decline in the early 1930's, and, with respect to the inshore waters of Massachusetts at least, fishermen have stated that the blackback is nowhere near as abundant as it formerly was. Again, useful statistics on this aspect of the fishery are not available.

With respect to the sport fishery, the blackback ranks number one as far as total number of fish of any species caught by anglers in Massachusetts. According to a recent survey by the Massachusetts Division of Fish and Game, blackbacks accounted for 36% of the number of fish caught by sportfishermen during the period March, 1960 - February, 1961 and totaled 1,029,500 pounds. Blackbacks are caught during all seasons of the year to a greater or lesser extent, the greatest percentage of the catch occurring in spring and fall. According to the above survey, rowboat anglers in pursuit of flounder outnumber all other types.

B. General Biology

In Massachusetts waters, the blackback appears to spawn in winter and early spring. The great percentage of fish sampled north of Cape Cod were found to be ripe in early March and recently spent by mid-April. The sexually mature adults tend to move into the shoal waters of bays and estuaries during the spawning season, and spawning may occur in waters of salinities as low as 15‰.

At prevailing local temperatures, hatching occurs in approximately three weeks. The larvae appear to be rather

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feeble swimmers; those raised at the State Lobster Hatchery in aquaria were observed to swim to the surface, sink slowly back towards the bottom, and then repeat the process. (No larvae were raised through metamorphosis, although, according to Bigelow and Schroeder, it occurs approximately 5 to 6 weeks after hatching.)

Samples and otolith examinations of members of the Boston Harbor population suggest that fish 2-3 inches in length are in their first summer, 7-8 inches by their second summer (or approximately 1½ years old), 10-12 inches by their third summer, and 14-15 inches by their fourth. It is estimated that a 17-inch fish is probably in its seventh year.

It has been estimated that blackbacks reach sexual maturity by their third year. One male specimen, captured in one of the salt ponds on Martha's Vineyard in early winter, appeared to be fully ripe although only 4 inches in length.

The diet of the blackback appears to be varied, including worms, crustaceans and molluscs. Examination of the stomach contents of fish captured in Boston Harbor during summer suggested that amphipods are an important source of food.

The blackback is extremely hardy, withstanding wide variations in environmental conditions. They appear to thrive, for example, in the salt ponds of Martha's Vineyard, where bottom temperatures may exceed 25°c in summer and approach very nearly zero in winter, and where salinities may range from 10-30 o/00 during the course of a year. Both Boston Harbor and the Merrimack River support large flounder populations even though these waters are heavily polluted by domestic and industrial wastes.

C. Recent Research

In March, 1960, the Massachusetts Division of Marine Fisheries initiated a limited study of the blackback flounder resource of Boston Harbor, an area that has been closed to dragging since 1911 but that supports a thriving flounder sportfishery. The objectives of this study include a determination of 1) the seasonal occurrence of blackbacks in Boston Harbor, 2) the significance of Boston Harbor as a spawning and nursery area for this species, 3) the extent and pattern of seasonal movements of blackbacks in and out of the harbor, 4) the extent to which this population may contribute to the commercial otter-trawl fishery in areas outside the Harbor, and 5) rates of growth and other biological information concerning this particular stock. In

cooperation with the U. S. Bureau of Commercial Fisheries, which has agreed to furnish tags and rewards, 1500 fish have been tagged and released in this area since March, 1960.

The following summarizes the results of this project to date:

1) Large numbers of sexually mature fish, ranging in length from 8 to 19 inches and representing at least five different year-classes, concentrate in the shoal waters of the Harbor during winter and early spring, where spawning apparently occurs.

2) After spawning, the spent fish appear to disperse from the spawning grounds and wander at random about the Harbor.

3) By mid-summer, large numbers of fish appear to concentrate in deeper, cooler water near the mouth of the Harbor, although many remain in the vicinity of the spawning grounds throughout the summer.

4) A fair percentage of tagged fish are recaptured in the same, presumably spawning, area in which they were released the previous winter. Whether, and the degree to which, they may have wandered from the spawning grounds during the interval is unknown.

5) An unknown percentage of the population actually departs the Harbor after conclusion of the spawning season and may wander considerable distances. Such movements appear to be random rather than orientated, as approximately equal numbers of tagged fish have been recaptured to the north, east and south of Boston Harbor. (One individual travelled approximately fifty miles in less than three and one-half months, to be recaptured in the vicinity of the Cape Cod Canal.)

6) Generally speaking, the average size of fish recaptured outside the Harbor is somewhat larger than that of the total number of fish initially tagged and than that of the fish recaptured inside the Harbor, suggesting a tendency for the larger members of the population to wander more extensively.

7) Tagged fish enter the otter trawl fishery outside the Harbor. The extent to which this population contributes to the commercial fishery is as yet unknown.

D. Current Research Part I

Winter flounder investigations are continuing through a cooperative effort by the Massachusetts Division of

Fisheries and Game and the Massachusetts Division of Marine Fisheries utilizing Dingle Johnson Funds.

This is a study of the ecology of the shallow water areas - creeks, bays and tidal marshes.

Objectives

To determine the seasonal occurrence and a relative abundance of winter flounder larvae and juveniles, seasonal and tidal variations in water temperature and salinity, and the nature of the bottom sediment and vegetation of nursery areas.

Procedure

Initial effort will be concentrated in the Buzzards Bay area with particular emphasis in Phinney's Harbor and Onset Bay. In each of these sections, the following procedure is being followed:

1. Juvenile flounder and larvae will be located for measurement and examination, by the use of a seine and/or plankton net. Sweeps or tows will be made at appropriate times of the year to determine the location of spawning and nursery areas.

2. Stations will be established at which regular temperature and salinity readings will be recorded, in relation to tidal and seasonal variations. These stations will be manned with maximum-minimum thermometers at times which will be determined by preliminary survey of tides and surface areas.

3. Areas found to be used as spawning and nursery grounds by winter flounder will be sampled for bottom and vegetative types. Bottom samples taken by Eckman Dredge and/or other suitable methods will be preserved for quantitative and qualitative examination. The sampling procedure and intensity will depend upon the nature and extent of the bottom type.

Vegetative sampling will consist of field identification, insofar as possible. Species samples will be preserved for positive examination and identification for quantitive and qualitative study.

4. Information gathered in the course of this study will be analyzed for future management plans and dissemination to cooperating agencies.

Current Research Part II

Creel Census

Objectives

To determine the sportfishing intensity in areas of the state where flounder tagging has been done and is currently

being done by the Massachusetts Division of Marine Fisheries.

Procedure

The following areas in which flounder tagging is in progress will be surveyed for fishing pressure and catch-per-unit-effort:

1. Buzzards Bay
2. Boston Harbor

These areas will be sampled during the period of highest known fishing intensity, and on a basis consistant with procedures developed in previous projects. This period ranges from April through October, with the greatest known pressure in the spring and fall.

The sampling schedule will be randomized; to include at least two week-end days and four weekdays in each month and area throughout the sportfishing period. Counts and creel samples will be conducted at known fishermen concentration points as follows:

1. Buzzards Bay:
   a. Caldara's Boat Livery, Rte. 28, Buzzards Bay
   b. Town Pier, Onset
   c. Town Dock, Monument Beach

2. Boston Harbor:
   a. Hough's Neck (Harvey's Livery)

A creel census agent will visit the above areas on at least the minimum number of days, and will endeavor to interview as many fishermen as possible. All data will be recorded on IBM cards by creel census agents only. Whenever possible, the census agent will take scale samples and measurements of the catch for future study.

Current Research Part III

Another cooperative program is being carried out by the Bureau of Commercial Fisheries and the Massachusetts Division of Marine Fisheries.

Problem: Determine through serological and electrophoretic investigation whether or not detectable differences in blood characteristics are present in blackback populations from various areas along the New England coast.

Procedure: Collect blood specimens from the various sampling areas. Areas accessible to the Division of Law Enforcement patrol vessels, from which fish will be caught

for blood samples, are: Ipswich Bay, Salem, Boston Harbor, Plymouth, Cape Cod Bay, Chatham (Pleasant Bay), south Cape Cod shore, Menemsha Bight, Buzzards Bay. (Samples from offshore grounds will be obtained through other means.) Collecting material and instruction of Division of Marine Fisheries men in its use will be provided by the Bureau of Commercial Fisheries, Woods Hole. A sample of about 100 blood specimens from an area is required. It should be collected in a single day, if possible, and in not more than 3 days where the entire sample cannot be obtained in a day. Blood samples are to be brought to the Bureau of Commercial Fisheries, Woods Hole, as quickly as possible (within 24 hours) after collection for serological examination.

Collection of blood samples began in August and will continue throughout the fall.

E. Projected Research

The Bureau of Commercial Fisheries and the Massachusetts Division of Marine Fisheries plan to implement the following blackback marking study upon the completion of present projects.

Purposes

1. To obtain data on movements of blackbacks by size and sex, from various areas (inshore grounds, intermediate grounds, and offshore grounds).

   (a) What is the seasonal pattern of movement?
   (b) Is there a trend away/toward particular areas?
   (c) What differences, if any, are there with respect to fish size? sex?

2. To obtain data on exploitation and mortality of blackbacks by area and fish size

   (a) What proportion are caught by sport fishermen? Commercial fishermen?
   (b) What is the harvest rate in different areas?
   (c) What sizes of fish are caught inshore? Offshore?

3. To obtain data on blackback subpopulations
   (a) How many groups (stocks) of blackbacks are there?
   (b) What is the origin of offshore blackbacks?

Methods

Tagging experiments in the different areas will be planned using information from 1) past blackback marking studies, and 2) serological investigation of relationship of

fish from different areas. The tagging is planned for spring 1963. Total tags to be used: 8,500. Fish will be tagged on inshore grounds north and south of Cape Cod, intermediate grounds off Cape Cod, and offshore New England grounds. Fish for tagging are to be selected by size groups, based on length distribution of fish in tagging area. Six of tagged fish to be recorded where possible.

1. Inshore grounds - 4000 tags
   a) North: Boston Harbor - 2000 tags
      (alternate areas: Ipswich Bay, Cape Cod Bay, Salem)
   b) South: Buzzards Bay - 2000 tags
      (alternate areas: ponds along the south shore of Cape Cod)

2. Intermediate grounds - 3000 tags
   a) Off Nauset - 1000 tags
   b) Nantucket Sound - 1000 tags
   c) Nantucket Shoals - 1000 tags

3. Offshore grounds - 1500 tags
   The fish will be tagged on Georges Bank, probably on Georges Shoal and Cultivator Shoal.

Manpower and Materials

1. Tags. Tags and rewards will be provided by the Bureau of Commercial Fisheries, Woods Hole.
2. Vessels and manpower
   a) Inshore. Tagging to be done by Division of Marine Fisheries personnel using Massachusetts enforcement vessels.

   b) Intermediate Grounds. Tagging to be done by Division of Marine Fisheries personnel using chartered commercial fishing vessels. Funds for charter to be provided by Bureau of Commercial Fisheries, Woods Hole.

   c) Offshore Grounds. Tagging to be done by Bureau of Commercial Fisheries using Albatross IV or commercial fishing vessel (chartered). Funds for charter, if used, to be provided by Bureau of Commercial Fisheries, Woods Hole, Massachusetts.