

The Landlocked Alewife: Landlocked Salmon Food of the Future?

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LANDLOCKED SALMON FOOD OF THE FUTURE?

ONE MAJOR PROBLEM confronting fishery biologists managing Maine's famed landlocked salmon fisheries is providing the best forage for this highly prized fish. Providing adequate forage becomes especially important as salmon grow to legal size and larger, when their feeding preference gradually changes from insects to small fish.

American smelt are a favorite food of landlocked salmon. Salmon with an ample supply of smelts available grow rapidly and usually have deep, full bodies. The potential of smelt to support a productive salmon fishery is unquestioned; but for unknown reasons, smelt are subject to extreme fluctuations in abundance. For this reason, the Fishery Research and Management Division is attempting to find a forage fish to supplement smelt in at least some Maine lakes.

Maine biologists presently feel that landlocked alewives show good forage potential. Anadromous (sea-run) alewives, the same species as the small landlocked form, inhabit many coastal lakes during the summer. Young alewives, spawned and hatched in these lakes, provide summer and fall forage for various game fish, including landlocked salmon. However, prior to this study, little was known about the feeding habits of landlocked salmon with alewives available during the *entire* year.

In June, 1966, about 1,500 alewives were transported from Cayuga Lake, New York, to Maine. Several hundred were planted in Silver Lake (Figure Eight Pond) and Gould Pond of the Summer Haven chain of ponds near Augusta. Neither pond has an outlet, so the species will not spread to other waters via this route. The remaining alewives were planted in Echo Lake, Mount Desert Island. Echo Lake, a 234-acre cold-water lake, was selected for intensive study of the forage value of landlocked alewives. Echo supports salmon, brook trout, and smelt. The lake is not part of a drainage system from which an introduced fish might spread and eventually prove undesirable.

Active research by the author began one year after introduction of the alewives. To catch these rather small

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fish (most were less than four inches in total length when the study was started), it was necessary to design and build a new type of fishing gear. Conventional gill nets most commonly used by the Maine fishery biologist fish only the bottom eight feet of a lake but can be modified to fish the top eight feet. The open water of a lake, typical alewife habitat, is not fished with these gill nets except when mid-depth sets are made. These are difficult to carry out successfully. Vertical gill nets, developed by the Fishery Division, were easy to use and solved this difficulty.

Information was obtained on the habits of the newly introduced alewife. Spawning in shallow water occurs during June, July, and August, and is not limited to a relatively short time period as observed in several other states. Growth of both the introduced alewives and their progeny hatched in Echo Lake was very rapid. Introduced fish reached a total length of seven to eight inches, quite large for fresh-water alewives.

Alewives hatched in Echo Lake had a faster rate of growth during their first two years than any other reported alewife growth, including Lake Michigan. A large proportion of the alewife diet has been small, suspended animal life, but insects have often been taken when available.



The author removes young landlocked alewives from vertical gill net at Echo Lake.

Salmon were introduced into Echo Lake the year before introduction of alewives and have since shown about average growth compared to salmon from other Maine lakes. The diet of these salmon, which averaged about 14 inches in total length during this study, was about two-thirds fish and one-third insects. Smelts were eaten mainly in summer and fall, ninespine sticklebacks in summer, and alewives in spring.

A small population of brook trout were found to be heavy feeders on insects and small, inshore, forage fish. Ninespine sticklebacks and banded killifish were favorite foods. Smelt were found in trout stomachs at various times throughout the year, alewives were found in spring, but insects were consistently the most important food item.

Competition can be an important consideration in the successful management of any fishery. We are presently confronted with a competition relationship between landlocked alewives and smelt that is not fully understood, primarily because each population will eventually adjust to the presence of the other. Both fish eat similar foods although smelts seem to favor insects more than alewives do. In addition, both species are found in open water away from shore. The ultimate effect of this competition on each population is not yet known but will be determined by further research.

It might prove beneficial to the fishery as a whole to maintain two stunted populations of forage fish (smelt and alewives) that could be swallowed by smaller salmon. While both species fluctuate widely in abundance from time to time, there is a good possibility that the two species will not fluctuate downward simultaneously. Thus, one species would likely be available for forage in large numbers.

Future management use of the landlocked alewife will largely be determined by the results of the Echo Lake study, similar studies in other Maine lakes (perhaps on other game fish), and results from other states' fishery research programs. At this relatively early stage of study, alewives have shown a potential to solve some of our forage fish problems; but before introducing them widely, we must, through additional work, be certain that this step will definitely improve management for new or existing landlocked salmon fisheries.

The author is now studying for his doctorate in fisheries at Colorado State University, Fort Collins, Colorado.