

Observations on Newly Introduced Landlocked Alewives in Maine

Robert T. Lackey*

*Current Address:

*Department of Fisheries and Wildlife
Oregon State University
Corvallis, Oregon 97331*

Citation: Lackey, Robert T. 1970. Observations on newly introduced landlocked alewives in Maine. *New York Fish and Game Journal*. 17(2): 110-116.

Email: Robert.Lackey@oregonstate.edu

Phone: (541) 737-0569

Web: <http://fw.oregonstate.edu/content/robert-lackey>

OBSERVATIONS ON NEWLY INTRODUCED LANDLOCKED ALEWIVES IN MAINE¹

Robert T. Lackey

Research Fellow
Department of Fishery and Wildlife Biology,
Colorado State University

ABSTRACT

Three Maine lakes were stocked in 1966 with landlocked alewives taken from Cayuga Lake, New York. Two lakes supported alewives in 1969. Spawning activity apparently took place from about mid-June to mid-August. Growth of both transplanted alewives and their progeny was very rapid. Alewives occupied the mid- to upper water in summer and fall, but descended to deeper water in winter and spring. The food of alewives was almost entirely microcrustacea, although a few insects were eaten.

In recent years the landlocked alewife (*Alosa pseudoharengus*) has been studied extensively as forage for piscivorous game fish. As part of a general research program to improve the sport fisheries of the state, in particular that for landlocked salmon (*Salmo salar*), the Maine Department of Inland Fisheries and Game introduced landlocked alewives into three lakes. Spawning habits, growth rates, seasonal depth distribution and food habits of this species are reported here.

ORIGINAL DISTRIBUTION

Alewives were apparently originally limited to the Atlantic coast of North America and probably occurred only in the anadromous form (Threinen, 1958). However, introductions and altered waterways have extended their distribution into many freshwater lakes. Today there are many completely landlocked populations in the midwestern and eastern United States and in Canada, and additional introductions are planned in other areas. Lake Ontario, as well as Seneca, Cayuga and Keuka Lakes in New York, have supported landlocked alewives since the late nineteenth century. Lakes Erie, Huron, Michigan and Superior have all acquired populations since 1930 (Miller, 1957). Freshwater alewife populations were established, apparently by fishermen, in New Jersey in 1850 (Gross, 1953). Several small Connecticut lakes have long supported landlocked alewives, although the method of introduction is unknown (Brooks and Dodson, 1965).

INTRODUCTION INTO MAINE

In June 1966, about 3,000 adult landlocked alewives were transported by truck from Cayuga Lake, New York, and planted in three

¹Supported by the Maine Department of Inland Fisheries and Game. The New York State Conservation Department cooperated in making it possible to obtain alewives from Cayuga Lake.

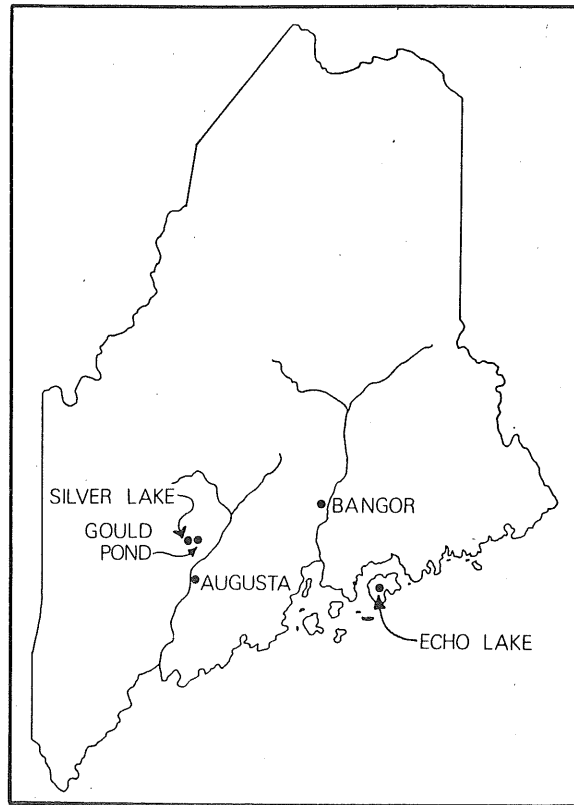


Figure 1. Map of Maine showing location of lakes used for experimental introduction of landlocked alewives.

Maine lakes. They were predominantly 2- or 3-year-old fish and ranged in total length from 130 to 150 millimeters. About 750 were released in Silver Lake (Figure Eight Pond) and 750 in Gould Pond of the Summer Haven Chain of ponds near Augusta (Figure 1). The remaining 1,500 were stocked in Echo Lake on Mount Desert Island.

Silver Lake covers 11.7 hectares with a maximum depth of 20 meters. Gould Pond covers 7.1 hectares with a maximum depth of 11 meters. Both are kettle-type ponds of glacial origin surrounded by gravel ridges. Inlets and outlets are absent except for a small overflow into Gould Pond from another small kettle-type pond during periods of heavy rainfall. Echo Lake is 94.8 hectares in area and 19 meters deep, of glacial origin and surrounded by mountains. Permanent inlet and outlet streams are present.

An alewife population had become well established at Silver Lake by 1969. Intensive netting in Gould Pond indicated that introduced alewives failed to reproduce or survive their first winter. Alewives in Echo Lake spawned successfully in the summer of introduction and subsequent summers. The population has increased enormously.

SPAWNING

Odell (1934) observed alewife spawning in Seneca Lake, New York, from late May to mid-August. Pritchard (1929) found alewife spawning in Lake Ontario to be somewhat variable, but most frequently in late May and early June. Landlocked alewives in Lake Hopatcong, New Jersey, spawned in late June (Gross, 1953, 1959). Rothschild (1966) observed alewives spawning in Cayuga Lake mainly in July. Anadromous alewives generally ascend rivers in May and June in Maine and enter lakes and ponds to spawn (Havey, 1961). A limited amount of spawning takes place in deadwater stretches of rivers and streams.

Alewife spawning activity in Silver Lake was observed in 1966, 1967, 1968 and 1969. Robert Foye (personal communication) observed surface thrashing by alewives in shallow water during several evenings from mid- to late June and early July of each year since introduction. Such activity was also noted by Rothschild (1966) for alewives in Cayuga Lake.

Alewife behavior that could be interpreted with certainty as spawning activity was not observed in Echo Lake. Ripe fish were taken from mid-June to mid-August in 1967. The majority of these

TABLE 1. GROWTH (TOTAL LENGTH IN MILLIMETERS) OF LANDLOCKED ALEWIVES IN ECHO LAKE COMPARED WITH THAT IN OTHER WATERS* AND WITH GROWTH OF ANADROMOUS ALEWIVES IN LONG PONDS§

Age	Maine		New York			Lake Michigan	Lake Ontario
	Echo Lake	Long Pond	Cayuga Lake	Seneca Lake	Kensico Reservoir		
0+	89	..	75	30	..	96	40
I+	114	135	102	68	55	139	77
II+	175	221	121	144	86	158	134
III+	..	274	130	151	98	173	156
IV+	..	310	138	168	113	..	161
V+	..	315	144	172	130	..	184

* Data derived as follows: Cayuga Lake (Rothschild, 1965); Seneca Lake (Odell, 1934); Kensico Reservoir (Breder and Nigrelli, 1936); Lake Michigan (Norden, 1967); Lake Ontario (Graham, 1956).

§ Back-calculated from older fish (Havey, 1961).

were fish introduced from Cayuga Lake, but several Echo Lake-hatched alewives appeared to be sexually mature when captured. This observation is interpreted as a strong indication that landlocked alewives will spawn as 2 year olds. Rothschild (1966) collected ripe 2 year olds in Cayuga Lake, and Gross (1953) felt that alewives in Lake Hopatcong, New Jersey, matured at 2 years. Ripe fish in Echo Lake were usually taken in shallow water (2-3 meters) over mud-rock bottom.

GROWTH

Monthly growth of alewives hatched in Echo Lake and growth rates of alewives inhabiting other lakes are given in Table 1.

To a large extent the exceptionally rapid growth of Echo Lake alewives can be attributed to the existence of a vacant or near-vacant niche within the fish fauna of the lake. The only pelagic plankton feeder in Echo Lake prior to introduction of alewives was the American smelt (*Osmerus mordax*). The smelt population was estimated to be quite small during the project period (Lackey, 1968a).

SEASONAL DEPTH DISTRIBUTION

Small-meshed vertical gill nets were designed and built to determine the depth distribution of landlocked alewives in Echo Lake (Lackey, 1968b). Additional data were gathered by setting horizontal gill nets at known depths.

By far the most abundant of the several year classes of alewives in Echo Lake when this study was started were fish hatched from adults introduced from Cayuga Lake. This first spawning in the new environment was highly successful, and it is not unlikely that 1966 year class alewives were more abundant in 1967-68 than those of the 1967 year class. Seasonal depth distribution of the 1966 year class at that time is presented in Figure 2.

The relatively shallow distribution (3 to 6 meters) of alewives from June to November and deeper distribution later indicate a definite trend. With the coming of winter, the alewives moved into the lake depths.

Although data were obtained on other alewife year classes, not enough information is available to make quantitative statements. The 1967 year class appeared to follow roughly the same distribution as that of the 1966 year class based on available captures. It is not known, however, where these fish were located immediately after hatching.

Galligan (1951, 1962) reported on the depth distribution of alewives in Cayuga Lake. Alewives exhibited a pronounced inshore

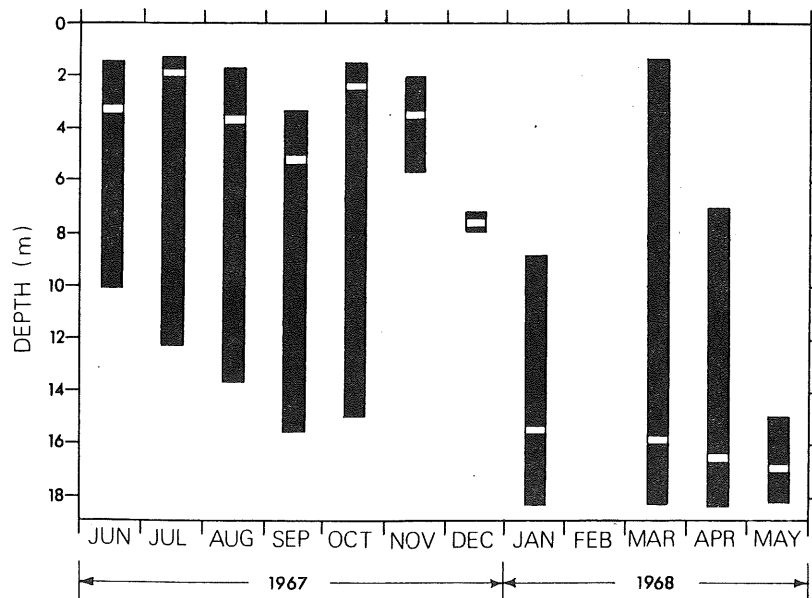


Figure 2. Seasonal depth distribution of landlocked alewives of 1966 year class in Echo Lake as determined from vertical and horizontal gill netting in 1967-68. Solid bars represent depth range; white area in each bar represents depth of highest concentration of fish.

movement in late June and July associated with the shallow-water spawning habits of the species. Galligan further reported that Cayuga Lake alewives moved to deeper water during late summer and fall. Breder and Nigrelli (1936) hypothesized that alewives take up a pelagic distribution in winter. Gross (1953, 1959) reported similar results for Lake Hopatcong in New Jersey.

The distribution of alewives in Echo Lake followed the general pattern reported by Galligan (1951, 1962), Gross (1953, 1959) and Breder and Nigrelli (1936), but differed in several respects. In summer and fall alewives in Echo Lake occupied the upper strata of the lake, mainly away from shore. With the onset of winter, there was a marked movement to the deeper waters where they remained until the following summer.

FOOD

Food habits of 1966 year class alewives are summarized in Figure 3. Analysis of stomach contents through careful estimation of volume for each item, expressed as a percentage of the total volume, proved to be of comparable accuracy to actual measurement by water displacement. The amount of material in even a full alewife stomach

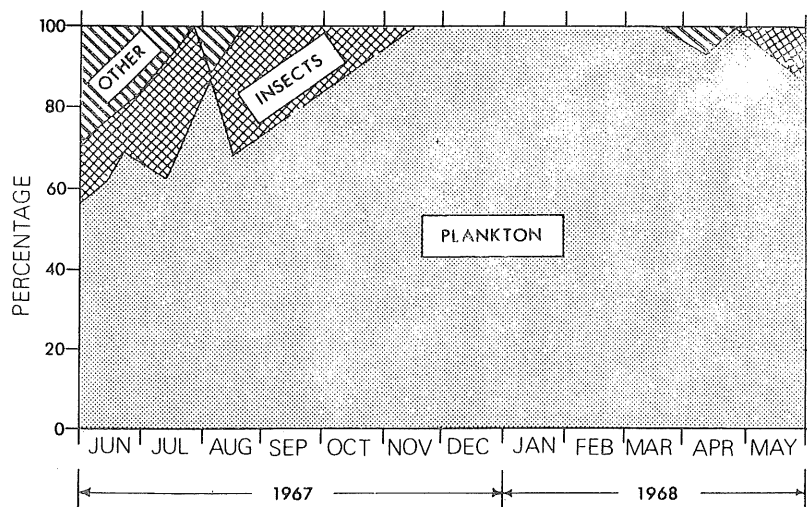


Figure 3. Seasonal food (by volume) of landlocked alewives of 1966 year class collected in Echo Lake in 1967-68.

was always very small, and a marked degree of homogeneity of diet during much of the year minimized errors associated with subjective evaluations (Lackey, 1969).

The diet of Echo Lake alewives agreed quite closely with that determined by other workers for other lakes. Hutchinson (1968) reported that alewives in Black Pond, a small pond in northern New York, fed extensively on dipteran larvae when available (mainly in September). Unfortunately, no data are available on fall, winter and spring feeding habits of alewives in Black Pond. Odell (1934) found microcrustacea to constitute 46 per cent of the alewife diet by volume in Seneca Lake, New York. Odell also found insects and alewife eggs making up a significant part of the diet in June and July. The diet of alewives in Lake Michigan has been found to be mainly copepods and amphipods (Morsell and Norden, 1968). Young-of-the-year anadromous alewives have been observed in Maine by Robert Foye (personal communication) in stomachs of mature adult anadromous alewives while still in freshwater.

However, the diet of alewives in Echo Lake differed in several respects. Utilization of dipteran larvae was similar to that reported by Hutchinson for Black Pond, but it was quite different from that reported by Morsell and Norden for Lake Michigan. This might be expected because of the greater availability of Diptera in a small lake. Morsell and Norden also found copepods and the amphipod, *Ponto-*

poreia affinis, the main food items, while midge larvae, ostracods and hydracarina formed minor parts of the diet.

LITERATURE CITED

- BREDER, C. M., JR., AND R. F. NIGRELLI. 1936. The winter movements of the landlocked alewife, *Pomolobus pseudoharengus* (Wilson). *Zoologica* 21 (13): 165-175.
- BROOKS, J. L., AND S. I. DODSON. 1965. Predation, body size, and composition of plankton. *Science* 150 (3692):28-35.
- GALLIGAN, J. P. 1951. The distribution of lake trout and associated species in Cayuga Lake. M. S. thesis, Cornell Univ. Library.
- . 1962. Distribution of lake trout in Cayuga Lake, New York. *N. Y. Fish and Game Jour.* 9 (1):44-68.
- GRAHAM, J. J. 1956. Observations on the alewife, *Pomolobus pseudoharengus* (Wilson), in fresh water. *Univ. Toronto Stud., Biol. Ser.* 62. (Ont. Fish. Res. Lab. Publ. 74).
- GROSS, R. W. 1953. Some observations on the landlocked alewife, *Pomolobus pseudoharengus* (Wilson), in New Jersey. *N. J. Fish Surv. Rep.* 2, N. J. Dept. Cons. Econ. Devel.:157-164.
- . 1959. A study of the alewife, *Alosa pseudoharengus* (Wilson), in some New Jersey lakes, with special reference to Lake Hopatcong. M. S. thesis, Rutgers Univ. Library.
- HAVEY, K. A. 1961. Restoration of anadromous alewives at Long Pond, Maine. *Trans. Am. Fish. Soc.*, 90 (3):281-286.
- HUTCHINSON, B. P. 1968. Food selectivity of the alewife, (*Alosa pseudoharengus*, Wilson) and its effect on the zooplankton of a small Adirondack lake. Paper presented at Northeast Division Meetings, Am. Fish. Soc., New Hamp.
- LACEY, R. T. 1968a. Seasonal abundance and availability of forage fishes and their utilization by landlocked Atlantic salmon and brook trout in Echo Lake, Mount Desert Island, Maine. M. S. thesis, Univ. of Maine Library.
- . 1968b. Vertical gill nets for studying depth distribution of small fish. *Trans. Am. Fish. Soc.* 97 (3):296-299.
- . 1969. Food interrelationships of salmon, trout, alewives, and smelt in a Maine lake. *Trans. Am. Fish. Soc.* 98 (4):641-646.
- MILLER, R. R. 1957. Origin and dispersal of the alewife, *Alosa pseudoharengus*, and the gizzard shad, *Dorosoma cepedianum*, in the Great Lakes. *Trans. Am. Fish. Soc.* 86:97-111.
- MORSELL, J. W., AND C. R. NORDEN. 1968. Food habits of the alewife, *Alosa pseudoharengus* (Wilson), in Lake Michigan. *Proc. 11th Conf. Great Lakes Res.*:96-102.
- NORDEN, C. R. 1967. Age, growth, and fecundity of the alewife, *Alosa pseudoharengus* (Wilson), in Lake Michigan. *Trans. Am. Fish. Soc.* 96 (4):387-393.
- ODELL, T. T. 1934. The life history and ecological relationships of the alewife (*Pomolobus pseudoharengus* (Wilson)) in Seneca Lake, New York. *Trans. Am. Fish. Soc.* 64:118-124.
- PRITCHARD, A. L. 1929. The alewife (*Pomolobus pseudoharengus*) in Lake Ontario. *Univ. Toronto Stud., Biol. Ser.* 33 (Ont. Fish. Res. Lab. Publ. 38).
- ROTHSCHILD, B. J. 1965. Aspects of the population dynamics of the alewife, *Alosa pseudoharengus* (Wilson), in Cayuga Lake, New York. *Am. Midl. Nat.* 74 (2):479-496.
- . 1966. Observations on the alewife (*Alosa pseudoharengus*) in Cayuga Lake. *N. Y. Fish and Game Jour.* 13 (2):188-195.
- THREINEN, C. W. 1958. Life history, ecology, and management of the alewife (*Pomolobus pseudoharengus* (Wilson)). *Wisc. Cons. Dept., Pub. No.* 223.