Alewife by Ethan Nedeau

In the recreational anglers' hierarchy of fishes, the alewife, Alosa pseudoharengus, is situated somewhere between the white sucker and creek chub. Bait. Sure, you can eat them during lean times, and maybe the old hands will wax poetic about smoked and salted alewife, but nowadays the fish are likely to be used for pet food, fertilizer or lobster bait. Yet their importance may be far greater than most of our other native fishes. Alewives bring an enormous influx of marine-derived nutrients to freshwater ecosystems. They are a forage fish for many predators and they are the only known host for the freshwater mussel Anodonta implicata, the alewife floater.

Alewives were once a prominent-albeit seasonal-member of the native fish community in Atlantic coastal watersheds. They traversed streams from South Carolina to Newfoundland, seeking spawning areas in lakes, ponds and slow-moving portions of rivers. Small coastal ponds might have supported a few thousand fish, whereas a large watershed such as the Penobscot River could have supported tens of millions. Today, some rivers still support abundant populations of spawning alewives, yet man-made obstructions and pollution confine alewives to a small percentage of their ancestral spawning areas. In the St. Croix River watershed, alewives historically swam into Spednic Lake. Scientists estimate that the watershed might have supported 14 to 38 million spawning alewives and their anadromous look-alike, the blueback herring, Alosa aestivalis. Collectively, these two species are called river herring, or gaspereau. After closure of the Vanceboro dam in 1987, the Grand Falls Dam in 1991 and the Woodland Dam in 1995, nearly the entire watershed was inaccessible to these fish, and in 2002 only 900 river herring returned from the sea to spawn.

Spawning alewives present nutrients to freshwater ecosystems in the form of eggs, excreted materials and their dead and decaying bodies. Each female produces 60,000 to 467,000 eggs annually and may spawn up to seven or eight years in her lifetime. In a single lake, billions or trillions of eggs, as well as a huge volume of sperm, may be released into the water each spring-essentially "protein packets" for aquatic animals such as zooplankton, bryozoans, clams and insect larvae. The alewives that die before returning to the sea, which may be 25 percent of the spawning population in the Northeast U.S., but greater than 75 percent of the population in mid-Atlantic watersheds, are eaten by scavengers such as crayfish, turtles, eels, raccoons, gulls and bald eagles.

Ospreys, bald eagles, cormorants and great blue herons prey heavily on migrating alewives each spring, at a time when some of these birds are nesting and rearing their chicks. In polluted rivers, organic chemicals and heavy metals (such as PCBs, dioxin and mercury) bioaccumulate in the tissues of resident fish, and these toxins are then passed to birds that consume them. Alewives are a healthier prey item for fish-eating birds than resident freshwater fish because they have not accrued these toxins in their bodies. Thus, a large alewife run will help to curtail the harmful effects of biomagnification on fish-eating birds.

Some anglers worry that anadromous alewives might have a detrimental effect on sport fisheries, but nothing could be further from the truth. Adult anadromous alewives do not compete with freshwater fish because they essentially stop feeding during the migration and spawning period, and do not resume feeding until they reach brackish water on their way back to sea. Since alewives are planktivores, the vast majority of their food is zooplankton, small crustaceans and insect larvae. Even at sea, fish comprise a miniscule proportion of an alewife's diet. One 1994 study published in the Fishery Bulletin, examined

1,215 alewife stomachs and found that larval fish represented only 1.4 percent by volume of total prey items.

Migratory alewives and their offspring are key forage for fish predators. Striped bass, northern pike, pickerel and lake trout are among the fish that consume adult alewives in freshwater or estuaries, in addition to the large number of predators in the marine environment. Striped bass will follow migrating alewives for many miles up estuaries and rivers, providing a recreational fishery in May and June. Some scientists have speculated that damming of coastal rivers contributed to the collapse of the cod fishery in the Gulf of Maine by reducing the abundance of alewives, one of the cod's principal prey items. Restoration of pelagic and groundfish stocks in the Gulf of Maine would likely benefit from restoration of alewife populations.

Young-of-the-year alewives present a spring, summer and fall picnic for our important game fish. They live in freshwater for three to seven months and grow two to five inches before descending the watershed and entering the ocean. They are eaten by many fish such as perch, bass, salmon and trout. In studying both blueback herring and alewife in Massachusetts coastal lakes, scientists determined that Alosa was the most important fish prey consumed by largemouth bass (based on number in individuals consumed), and that Alosa are an energy-rich prey that provide a high growth potential for largemouth bass. The scientists concluded that "Our simulations show that the presence of 'trophy' largemouth bass found in southeastern, coastal Massachusetts was not solely related to water temperature across the state but rather was related to predator diet and, specifically, to the presence of anadromous herring in largemouth bass diets."

The freshwater mussel connection

Freshwater mussels are large bivalved molluscs, superficially resembling a marine quahog, which inhabit large permanent waterbodies throughout North America. They are one of the most endangered groups of animals on Earth. In North America alone, nearly 75 percent of the 297 native species are listed officially as Special Concern, Threatened or Endangered in all or parts of their range, including eight of the thirteen species native to coastal New England and the Canadian Maritime provinces.

The larvae of freshwater mussels are obligate fish parasites. Female mussels release larvae into the water, where they must find a suitable host fish and attach to its fins or gills. Mussels are often specific about the fish they can parasitize, and if environmental factors change the abundance or availability of the host fish, then mussel reproduction is compromised. The alewife is the only known vertebrate host for the freshwater mussel Anodonta implicata (alewife floater), though the blueback herring and American shad, Alosa sapidissima, are also suspected hosts.

The alewife floater is often abundant in Atlantic coastal rivers and lakes, and its distribution is closely tied to, and dependent upon, the alewife. If a dam blocks alewives from reaching historical spawning grounds, then the alewife floater will go extinct in upstream areas. Some evidence suggests that the alewife floater was extirpated in several coastal watersheds in the last four centuries. For example, it is noticeably absent in rivers and lakes of southern coastal Maine, where dams were built as early as 1634. Anadromous fish migrations were halted decades and even centuries before scientists

could document fish or mussel populations in some watersheds. A quotation from the 1867 Fish Commissioner's Report, referring to salmon in the Saco River, is particularly telling: "We could obtain no estimate of their numbers in former times, as they had ceased to be plenty beyond the recollection in the present generation."

Freshwater mussels are filter feeders that remove large amounts of algae, zooplankton, bacteria and sediments from the water. Scientists have estimated that freshwater mussels in the tidal Hudson River filtered 5.3 million gallons of water per day! Mussels store enormous amounts of nutrients and minerals in their tissues and shells, such as carbon, nitrogen, potassium and calcium. Freshwater mussels usually comprise the greatest proportion of animal biomass in aquatic systems, far outweighing all other animals combined, including fish. They are a food item for suckers, sturgeon and catfish, as well as mammals such as otters, muskrats and raccoons. Mussels are sensitive to environmental changes and pollution, and are ideal biomonitors for assessing the health and recovery of aquatic ecosystems. Elimination of alewives will eliminate these many services that the alewife floater provides.

The productivity, diversity and health of coastal freshwater habitats depend in part on an unimpeded spring migration of alewives, and in the same way, the Gulf of Maine depends on an unimpeded summer and fall migration of alewives back to the ocean to fuel marine food webs. By blocking and degrading the conduits that connect headwaters to the sea, we have severed the two-way flow of energy between the ocean and its watershed. It is difficult to imagine how any creatures-from mussels living in our lake and river bottoms, to striped bass that follow alewives from sea to rivers, to eagles and cormorants that gather at spawning rivers each spring in hungry anticipation of Alosa-have not been affected by the disruption of alewife reproduction in the Gulf of Maine. Restoration of alewives will involve removing dams or installing better-designed fishways that allow both upstream and downstream passage, dealing with pollution problems and maintaining adequate stream flow.

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