

Alewife and Blueback Herring are Species of Concern Facing Many Threats

Dwayne Meadows

Endangered Species Division, Office of Protected Resources (F/PR3), National Marine Fisheries Service,
1315 East West Highway, Silver Spring, MD 20910, Dwayne.Meadows@noaa.gov



alewife (*Alosa pseudoharengus*) and Blueback Herring (*A. aestivalis*) are two Atlantic Coast anadromous herrings that have undergone drastic population declines throughout much of their range. For example, fishery landings have declined from 40,000 tons in the 1950s to less than 3,500 tons in 2005 (FAO, 2007). As a result, these two species are categorized as “Species of Concern” by the National Marine Fisheries Service (NMFS, 2006).

Species of Concern (see <http://www.nmfs.noaa.gov/pr/species/concern>) are those species about which NMFS has some concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the Endangered Species Act (ESA). The NMFS created the Species of Concern Program in 2004 (NMFS, 2004) to:

- identify species potentially at risk of extinction
- identify data deficiencies and uncertainties in those species’ status and threats
- increase public awareness about those species
- stimulate cooperative research efforts to obtain the information necessary to evaluate species status and threats; and
- foster voluntary efforts to conserve the species before ESA listing becomes warranted.

As part of these goals the program funds grants to state management agencies to do “in-the-water” conservation actions. Another pot of money is available for NMFS staff to do conservation work with Species of Concern.

Alewife and Blueback Herring (Fig. 1) are collectively referred to as river herring as they are often difficult to distinguish by casual observers. Blueback Herring are similar

in appearance to Alewife. However, they can be distinguished by differences in eye diameter, body depth, and the color of the abdominal cavity membrane (Munroe, 2002). They also have many similarities—and a few differences—in their ecology and biology, which I will describe below.

There are several threats to both species that have likely contributed to their decline. These threats include:

- loss of habitat due to decreased access to spawning areas from the construction of dams and other impediments to their migration, limiting their upstream range in most river systems
- alterations to water flow and other important habitat characteristics
- other types of habitat loss or degradation, including thermal and toxic discharges, water withdrawal facilities, channelization and dredging, and poor land use practices associated with farming, logging, and urbanization
- direct fishing and bycatch in ocean fisheries such as for Atlantic Herring (*Clupea harengus*)
- increased predation due to recovering Striped Bass (*Morone saxatilis*) populations; and
- climate change.

The river herring fishery is one of the oldest documented fisheries in North America, dating back over 350 years in some areas. Until the late 1960s, it was exclusively an inshore fishery in the U.S. However, in the late 1960s, distant-water fleets began fishing for river herring off the Mid-Atlantic coast (Haas-Castro, 2006). According to the Food and Agriculture Organization of the United Nations, other countries such as Cuba, Bulgaria, Germany, the Netherlands, Poland, Spain,



Fig. 1.
Alewife (above) and Blueback Herring (below). Photo credit: Jim Nagus, Tennessee Department of Wildlife Resources.

and the former Union of Soviet Socialist Republics reported landings of river herring from 1966 through 1977 and again from 1984 through 1989 (FAO, 2007).

River herring are also taken as bycatch in other ocean fisheries using various gear types including gillnets, bottom otter trawls, and menhaden purse seines (ASMFC, 1999). Along the East Coast, there are extensive recreational fisheries for river herring in many rivers using hook and line (e. g., Delaware River) or various types of dip nets and seines (ASMFC, 1999).

River herring are managed by the Atlantic States Marine Fisheries Commission (ASMFC) under a Fisheries Management Plan for American Shad (*A. sapidissima*) and river herring (see <http://www.asmf.org>). This plan was implemented in 1985 to facilitate cooperative management and stock restoration among the Commission's member states. Restoration efforts have involved habitat improvement, and fish passage, stocking and transfer programs. The management plan was amended in 1999 and mandated that regulations be

maintained for river herring and that more conservative measures be considered. In response to their declining trend, the states of Massachusetts, Rhode Island, Connecticut, and North Carolina have instituted moratoriums on taking and possessing river herring.

Alewife are currently distributed from Newfoundland through North Carolina, though historically they were found as far south as South Carolina. In contrast, Blueback Herring have a wider distribution and occur from Cape Breton in Nova Scotia to the Saint Johns River in Florida. However, most Blueback Herring are concentrated from the Chesapeake Bay south. Alewife may live up to 10 years and reach lengths of between 14 and 15 inches (36–38 cm) (Munroe, 2002), while Blueback Herring are believed to live up to eight years and reach a maximum size of approximately 16 inches (40 cm) (VIMS, 2004).

Both species are anadromous and ascend coastal rivers in the spring to spawn. Alewife spawning migrations begin in the southern portion of the range and move progressively



Fig. 2.

Fish bypass ladder installed on Parker River Dam, Byfield, MA, 2000, NOAA Restoration Center Community-Based Restoration Program. Photo credit: NOAA photo library.

northward and are initiated when water temperatures reach approximately 41-50°F (5-10°C) (Munroe, 2002). Blueback Herring spawn from late March through mid-May, arriving in coastal waters approximately a month later than Alewife (VIMS, 2004). Alewife spawn over a wide range of substrates such as gravel, sand, detritus, and submerged aquatic vegetation, which are found in large rivers, small streams, ponds, and large lakes. Spawning generally takes place when water temperatures are 61-66°F (16-19°C) (Haas-Castro, 2006). Blueback Herring use a greater variety of habitats in areas where they co-occur with Alewife, including faster flowing waters; spawning sites include areas with submerged aquatic vegetation, rice fields, swampy areas, and small tributaries upstream from the tidal zone (VIMS, 2004).

A tagging study conducted on the Saint John River in New Brunswick, Canada, indicated that river herring return with accuracy not only to their home rivers but also to birth areas within those rivers (Jessop, 1994). Later work by Bentzen


and Paterson (2005) found that anadromous populations from the St. Croix, LaHave and Gaspereau Rivers in Maine and Nova Scotia differed genetically. Anadromous and rare landlocked populations that do not migrate to the sea from the St. Croix River were found to be genetically divergent. Bentzen and Paterson (2005) even found some genetic differences between fishes from two different tributaries to the St. Croix (Dennis Stream and Milltown). These results indicate that Alewife do home to their natal streams, and that there is at least partial reproductive isolation between spawning runs, even at the level of tributaries of the same stream (Bentzen and Paterson, 2005).

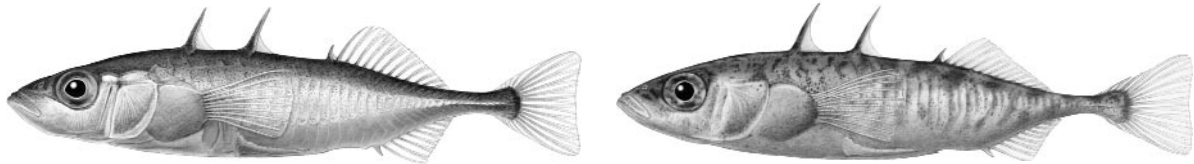
For both species, adults migrate quickly downstream after spawning and little is known about their life history while in the marine environment. However, they are believed to be capable of migrating long distances (over 1200 miles or 1930 km) seasonally, spending the cooler months further south (VIMS, 2004), and they do reproduce for multiple years. Most Alewife reach sexual maturity by age four and females are capable of producing between 60,000 and 300,000 eggs annually throughout their range (Haas-Castro, 2006). Female Blueback Herring mature at age 5, but males generally mature at between 3 and 4 years of age and at a smaller size than the females.

Alewife feed predominantly on zooplankton in streams, while at sea they prey on small fishes, such as Atlantic Herring, eel, sand lance, cunner and other Alewife as well as eating the eggs/larvae of other fish species (Munroe, 2002). At sea, Alewife are a highly migratory, pelagic, schooling species, and they undertake seasonal migrations most likely in response to changing water temperatures (Munroe, 2002). Like Alewife, Blueback Herring are planktivores, preying primarily on ctenophores, calanoid copepods, amphipods, mysids, and other pelagic shrimp and small fish while at sea (Munroe, 2002). They too are a pelagic, schooling species. While at sea, they undertake seasonal migrations in response to changing water temperatures (Munroe, 2002).

Besides managing the coastal fisheries, efforts have begun to address the other threats facing these species. General efforts at improving stream habitat quality have helped in many places. In addition, specific measures by NMFS and others to breach dams and/or provide fish ladders (Fig. 2) have provided river herring access to spawning grounds they have not been able to reach for generations. But stronger and more widespread efforts are needed to ensure these species coexist with us through the 21st century and beyond. I encourage the members of NANFA to get involved.

Literature Cited

- ASMFC (Atlantic States Marine Fisheries Commission) 1999. Amendment 1 to the Interstate Fishery Management Plan for Shad & River Herring. ASMFC Fishery Management Report No. 35. 76 p.
- Bentzen, P., and I. G. Paterson. 2005. Genetic analyses of freshwater and anadromous alewife (*Alosa pseudoharengus*) populations from the St. Croix River, Maine/New Brunswick. Final Report to Maine Rivers, 3 Wade Street, Augusta, ME 04330.
- FAO (Food and Agriculture Organization of the United Nations) 2007. Online search at <http://www.fao.org/fi/website/FIRetrieveAction.do?dom=topic&fid=16140> (retrieved 23 July 2007).
- Haas-Castro, R. 2006. Status of fisheries resources off the northeastern US. Retrieved 26 Dec. 2007 (<http://www.nefsc.noaa.gov/sos/spsyn/af/herring/>).
- Jessop, B. M. 1994. Homing of alewives (*Alosa pseudoharengus*) and blueback herring (*A. aestivalis*) to and within the Saint John River, New Brunswick, as indicated by tagging data. Canadian Tech. Rep. Fish. Aquat. Sci. No. 2015. 22 p.
- Munroe, T. A. 2002. Herrings. Family Clupeidae. In: B. B. Collette, and G. Klein-MacPhee (Eds). *Bigelow and Schroeder's fishes of the Gulf of Maine*. Washington, D.C.: Smithsonian Institution Press.
- NMFS (National Marine Fisheries Service). 2004. Endangered and threatened species; establishment of species of concern list, addition of species to species of concern list, description of factors for identifying species of concern, and revision of candidate species list under the Endangered Species Act. *Federal Register* 69 (73) [15 April]: 19975-19979. Available at <http://www.nmfs.noaa.gov/pr/pdfs/fr/fr69-19975.pdf>.
- . 2006. Endangered and threatened species; revision of species of concern list, candidate species definition, and candidate species list. *Federal Register* 71 (200) [17 Oct.]: 61022-61025. Available at <http://www.nmfs.noaa.gov/pr/pdfs/fr/fr71-61022.pdf>.
- VIMS (Virginia Institute of Marine Sciences). 2004. Blueback Herring page. <http://www.fisheries.vims.edu/multispecies/femap/Fish%20Pages/Blueback%20Herring.htm> (retrieved 26 Dec. 2007). 



The Threespine Stickleback

*This stickleback's armor is nifty;
Compared to the Ninespine it's thrifty.
While three spines might seem
A taxonomist's dream,
This species might really be fifty.*

— Emily S. Damstra