



Life History and Habitat Needs

Geographic Range

Atlantic herring inhabit both the eastern and western halves of the North Atlantic Ocean basin. In the western Atlantic Ocean, Atlantic herring range from Labrador, Nova Scotia to Cape Hatteras, North Carolina.

Movement/Migration

Adult herring make extensive north-south migrations between summer spawning grounds on Georges Bank and the Gulf of Maine and overwintering areas in southern New England and the Mid-Atlantic region. Migration is triggered by thermal, oceanic fronts that develop between cold continental shelf waters and warm continental slope waters.

Habitat Use & Spawning

Atlantic herring is a pelagic species found in the open ocean, but the benthic zone is especially important for its reproduction. In U.S. waters, herring spawn mainly in two areas: the Gulf of Maine and Georges Bank/Nantucket Shoals. Spawning begins in July and continues until December. Spawning grounds are located in high-energy environments with strong tidal currents and high salinity (32 – 33).

The eggs form a thick mat adhering to a variety of bottom substrates, including gravel (ranging from pebbles to boulders), shell fragments, and aquatic plants. Eggs require water temperatures ranging from 7 – 15°C and depths from 5 – 90 m, and will not survive if covered by mud or fine sand. High-energy environments (well-mixed water with currents of 1.5 – 3.0 knots) are ideal for survival. Incubation time on the bottom is between 10 and 30 days, depending on temperature.

Larvae have been observed in depths up to 1,500 m, but are generally found in depths in the 41 – 220 m range and temperatures below 12.5°C in the Gulf of Maine, Georges Bank, and southern New England. Larvae that develop in the coastal portions of the Gulf of Maine usually remain inshore, and enter bays and estuaries to overwinter. Larvae from Nantucket Shoals and Georges Bank typically drift southwest, occasionally moving as far south as southern New Jersey.

Similar to other zooplankton, Atlantic herring larvae exhibit daily vertical movements in the water column. These vertical migrations are thought to be a mechanism by which larvae hold their relative position in response to strong tidal currents. Over the course of a day, juveniles also demonstrate vertical migration, possibly in response to prey movements or as a mechanism of predator avoidance. Such movements also correspond to changes in light intensity.

Juvenile Atlantic herring school in inshore areas of the Gulf of Maine and off southern New England in the spring. In summer and fall, juveniles migrate from nearshore waters to wintering grounds in deep bays or offshore areas. In general, juveniles are commonly found in waters with temperatures from 2.5 – 14.5°C, depths between 4 – 300 m, and salinities ranging from 20 – 32. Adults occupy the same geographic range and similar habitats as juveniles, but typically prefer more saline (> 28) waters.

Threats to Habitat

- Physical and chemical alterations to seabed and water column habitats, caused by human activities (coastal development, channel dredging, marina construction, bottom-tending fishing gears, point and non-point source pollution with heavy metals and oils)
- Agriculture and silviculture (nutrient loading, introduction of animal wastes, salts, or pesticides, erosion, sedimentation, and silt suspension)
- Energy-related activities (Oil and gas exploration and production, offshore wind), as alosine species are highly sensitive to sound
- Climate change-related shifts in temperature and other oceanographic parameters

ASMFC Fish Habitats of Concern

Estuaries and embayments are important nursery grounds for juveniles.

Recommendations to Improve Habitat Quality

- Establish measures to protect spawning aggregations or egg masses.
- Develop permitting conditions and planning considerations to avoid or mitigate adverse impacts to fish habitats of concern (e.g., dredging windows to reduce impacts to locations of eggs and spawning activity).
- Coordinate the development and implementation of nonpoint source pollution control plans.
- Strengthen enforcement of sewage discharge controls and ensure proper operation of septic systems.
- Review adequacy of water quality standards to protect all life-stages of Atlantic herring.
- Review oil spill prevention and response plans and implement area-wide oil spill contingency plans.
- Develop contaminated sediment remediation plans.
- Establish and enforce no discharge zones in marinas and ports.
- Educate recreational boaters on how to reduce water contamination from fuel spills and waste disposal.
- Identify and implement habitat protection and restoration needs in National Estuary Program Comprehensive Coastal Management Plans.

Habitat Research Needs¹

- More precisely identify Atlantic herring spawning areas in time and space, and collect data on species distribution and relative abundance in inshore waters. Acoustic techniques appear to be a promising survey approach to address both of these questions (Wurtzell et al. 2016).
- Collect information on how oceanographic features (waters masses and currents) affect the distribution of larval, juvenile, and adult herring, and how these features may be influenced by climate change. For example, does the timing of the growing season affect herring stocks (Henderson et al. 2017)?
- Determine the value of using protected areas to conserve and enhance herring stocks. The New England Fishery Management Council is currently developing an amendment to address localized depletion issues through spatial management measures.

Additional Information

Atlantic herring are managed by the ASMFC under Amendment 2 to the Fishery Management Plan (2006) for Atlantic Sea Herring and subsequent addenda. The plan can be obtained on the ASMFC website www.asmfc.org or by contacting the ASMFC Habitat Program Coordinator at 703.842.0740.

To protect spawning aggregations, three inshore Atlantic herring spawning areas of Eastern Maine, Western Maine, and Massachusetts-New Hampshire have independent closures during the fall that may begin on the default dates of August 15, September 1, and September 21, respectively. Actual closure effective dates are based on detection of ripe females.

Atlantic herring are also managed by the New England Fishery Management Council (<http://www.nefmc.org/management-plans/herring>).

Literature Cited Henderson, M. E., K. E. Mills, A. C. Thomas, A. J. Pershing and J. A. Nye. 2017. Effects of spring onset and summer duration on fish species distribution and biomass along the Northeast United States continental shelf. *Reviews in Fish Biology and Fisheries* 27(2): 411-424.

Wurtzell, K. V., A. Baukus, C. J. Brown, J. M. Jech, A. J. Pershing and G. D. Sherwood. 2016. Industry-based acoustic survey of Atlantic herring distribution and spawning dynamics in coastal Maine waters. *Fisheries Research* 178: 71-81.

¹ Note that the next Atlantic herring benchmark stock assessment is scheduled for 2018.

