

West Harbor Pond American Eel Life-cycle Study

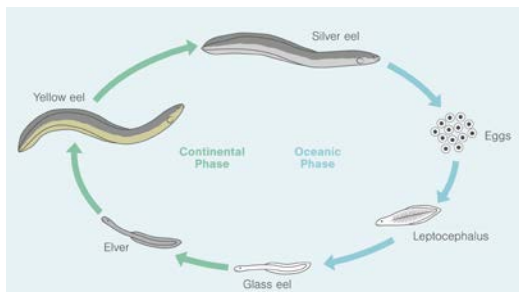
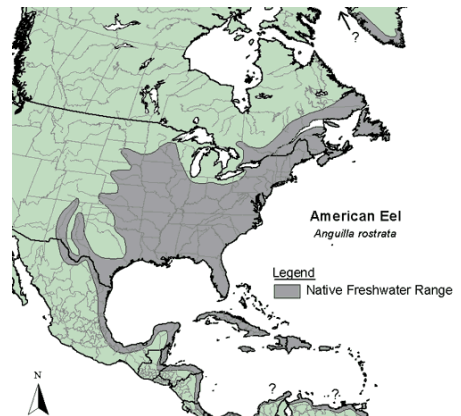
Jason Bartlett

Maine Department of Marine Resources

Maine is one of two remaining states (South Carolina being the other) with a glass eel fishery. All other coastal states have closed their glass eel fisheries due to recent stock assessments showing the eel population is declining. In order to keep the fishery, the Atlantic States Marine Fisheries Commission (ASMFC) requires Maine to conduct a 17-year life-cycle study of the American eel (*Anguilla rostrata*). The Maine Department of Marine Resources (DMR) began the study on West Harbor Pond in 2018. This is the only study of its kind in Maine, so your pond is very important! This study will look at all life stages of the eel and investigate multiple aspects of eels such as: density, growth rates, average length and weight, and age at maturity.

Where do eels live?

American eels have a vast range where they live. Eels are found as far north as Greenland and as far south as Northern South America. This includes the US Atlantic and Gulf coasts, Mexico, Central America, and the Caribbean Islands. They inhabit all types of aquatic environments from lakes and ponds to rivers and streams of all sizes. Most eels migrate to freshwater, but some will live in brackish and even saltwater environments. Eels are one of the most diverse fishes in terms of where they live.



Which came first—the eel or the egg?

Let's start with the egg. All American eels spawn somewhere in the Sargasso Sea, located south of Bermuda, during our winter months. The exact location and timing are big mysteries. After the eggs hatch the tiny, willow leaf-shaped larva float in the ocean currents for as long as a year. As they approach the continental shelf in late winter, they transform into glass eels and take on the typical eel shape. This is the stage that is harvested in Maine. Soon after entering our coastal streams and rivers, glass eels start to darken and search for places to live. This elver stage lasts for the first year or so. After that the eels enter the yellow phase of life and remain in the pond until they mature; how long depends on several factors such as density and food availability. When mature eels leave the pond in fall to spawn, they enter the silver phase and take on this color as well as undergoing other physiological changes. It is believed that all eels die after spawning. They are essentially one population, and an eel that grew up in Mexico can spawn with an eel from Maine.

The eel fisheries

The fishery for glass eels (also called the elver fishery) in Maine begins in March and runs through early June. The fishery is highly regulated now with a cap on the number of licenses (425), and a quota for the number of pounds of eels (9,688) that can be harvested. This weight is divided (not equally) among the license holders. Each harvester is issued a swipe card so that the fishery is easier to keep track of, and to help prevent poaching.

Glass eels are harvested with either a fyke net or dip net. The harvest takes place at night along the shores of tidal portions of rivers or streams. The eels are then sold to dealers and eventually make their way to aquaculture facilities in Southeast Asia where they are grown out and used for sushi. In recent years the price-per-pound has been around \$2,000, bringing in about \$20 million to Maine. This year was a different story though as COVID and changes in global transportation brought the price down to around \$520/pound.

Fisheries for the yellow phase of eels still exist in many states. The eels are caught using baited eel pots and are used primarily for fishing bait (striped bass), and for food in limited amounts. The silver eel fisheries have been closed in all states except for one river in New York State. Silver eels were used for food and eel skin products.



How does DMR catch eels?

It depends on what life stage of eel we are trying to catch. In the late winter, there are some specially designed ramps and boxes installed under the bridge at the outlet of the pond to catch the glass eels coming in from the ocean. You likely won't see them as they are attached to the dam, but the solar panel on the fishway is visible. The panel helps operate a pump, which supplies water flow over the ramps. The glass eels climb the ramps on the ocean side and collect in boxes located on the lake side. They are then weighed/counted and released into the pond.

The larger, yellow phase eels are captured in baited eel pots. These are traps made from wire mesh and resemble lobster traps in design. White buoys mark the traps along the shoreline of West Harbor Pond in summer. Eels captured in the pots are measured, tagged, and released.

Silver phase eels leaving the pond in the fall (usually starting in early October) are captured in a large net set just above the bridge at the outlet of the pond. The wings of the net direct eels through several cone-shaped sections before they enter the end of the net and can be removed. The eels are counted, measured, checked to see if they have been tagged before, and released in the ocean to continue their journey to the Sargasso Sea. Since West Harbor Pond is the location of the study, it is closed to all commercial fishing for eels.

Eel Questions

How many eels are in West Harbor Pond? The short answer is A LOT! The number of glass eels that come into the pond varies from year to year, and counts have ranged from 988 to over 340,000. A separate glass eel count, which is now included in the life-cycle study, was started on West Harbor Pond about 20 years ago. Keep in mind that these little eels are at the mercy of the ocean currents, so the range in counts is to be expected. In the past two years, the DMR has

tagged over 500 yellow phase eels living in the pond and captured over 2,200 silver phase eels leaving the pond in the fall.



How long do eels live? Females can live as long as 30 years, but 15-20 years is more realistic. Males, which don't grow as large as females, average 8-10 years. To age an eel the otoliths (ear bones) must be removed. After the otoliths are processed, they can be aged under a microscope by counting the rings, similar to ageing a tree.

How big do eels grow? The largest eel we have caught in West Harbor Pond is 36" long. There are few of this size in the pond and there may be a bigger one swimming around. Eels over 15 ¾" are considered female while smaller ones are either small females or males.



What do eels eat? Eels are opportunistic and feed on a variety of foods. Fish (including other eels) are a big part of their diet. Crustaceans, insects, snails, and other meaty items make up the rest of their food selection. We use frozen alewives to bait the eel pots.

Why are eels so slippery? All fish have a slime layer that covers their body. This layer acts a protection against some parasites and infections. The reason eels seem extra slippery is because they lack scales. Fish with scales are rougher to the touch. The lack of scales also allows eels to get into tight places to hide or search for food.

Do eels bite? Yes, they do bite but likely won't bite you. I have only been bitten once after handling several thousand eels. They have multiple rows of small teeth designed to grasp and hold onto prey.

Where in West Harbor Pond do eels live? They can live about anywhere in the pond, as long as they avoid the zone below 12-14' where there is no oxygen. We catch them in our pots along the shore in all areas of the pond. With the new siphon in operation, we hope the "dead zone" will be reduced in size and area, allowing for more suitable habitat for eels and the other fishes in the pond.

Do eels swim up to Knickerbocker Pond? Yes, eels do swim upstream to Knickerbocker Pond. I have fished the eel pots in Knickerbocker, on a small scale, for two years and have only caught a few.

I hope this provides some insight into the mysterious life of the American eel. Please contact me through email or catch me on the water if you have any questions.

Jason Bartlett

Maine Department of Marine Resources

Jason.bartlett@maine.gov

The Maine Eel and Elver Fishery

The American eel (*Anguilla rostrata*) has a catadromous life cycle, that is, it spawns in the ocean and migrates to fresh water to grow to adult size. As adult eels mature, they leave the brackish/freshwater growing areas in the fall (August to November), migrate to the Sargasso Sea and spawn during the late winter. The Sargasso Sea is a large area of the western North Atlantic located east of the Bahamas and south of Bermuda. After spawning, the adult eels die. The eggs hatch after several days and develop into a larval stage (leptocephalus) which is shaped like a willow leaf. The larvae drift in the ocean for several months and then enter the Gulf Stream current to be carried north toward the North American continent. As they approach the continental shelf, the larvae transform into miniature transparent eels called “glass eels”. As glass eels leave the open ocean to enter estuaries and ascend rivers they are known as elvers. This migration occurs in late winter, early spring, and throughout the summer months. Some elvers may remain in brackish waters while others ascend rivers far inland. Eels may stay in growing areas from 8-25 years before migrating back to sea to spawn.

There are three distinct fisheries for eels in Maine which relate to three different life stages. The glass eel/elver fishery harvests small eels returning to rivers from their ocean spawning areas. This fishery utilizes fine mesh fyke nets (a funnel shaped net) or dip nets to collect elvers as they ascend to fresh water. The yellow eel fishery occurs for eels which are growing in brackish and fresh waters. These eels are typically more than 2-3 years old, but not yet mature. Harvesting gear in this fishery includes baited eel pots and fyke nets. The silver eel fishery occurs in late summer and fall and consists of weirs across streams and rivers to collect out migrating sexually mature eels that are moving downstream to go to the Sargasso Sea to spawn.

Fisheries for yellow and silver eels have a long history in Maine, having occurred since the earliest colonial settlements. The elver fishery is relatively recent, having begun in the early 1970's to 1978 and recommenced in the early 1990's. The fishery was nonexistent from 1979 to the early 1990's due to a collapse in market demand for elvers. In recent years, market demand has increased dramatically. Elvers are highly valued in the far east (Japan, China, Taiwan, and Korea) where they are cultured and reared to adult size for the food fish market. Due to recent intense market demand, elvers have now become the most valuable marine resource in terms of price per pound which varies from \$25 to \$350. The fishing season for elvers is restricted to March 22 through May 31. Harvest methods are restricted to hand dip net and fyke nets with no more than two fyke nets allowed per license holder, depending on the license holder's history. Concerns about elver fishing relate to impacts of fyke nets on other species migrating and spawning (smelt, alewives, trout and salmon) in Maine rivers, potential over harvest of eels, and the significance of eels to the ecosystem. Legislation passed in 2006 eliminated new entry into the fishery via the elver lottery. Currently an elver fishing license may be issued only to an individual who possessed an elver fishing license in the previous calendar year

Dr. Gail Wippelhauser and George Zink Jr. are monitoring the Maine elver fishery to collect information on the harvest and fishing effort, bycatch of other species in elver nets, and the impact of this fishery on adult eel abundance in Maine waters. In addition, DMR has funded a number of eel research projects with the University of Maine at Orono to investigate various life history aspects of the American eel.

For more information on the eel and elver fishery and monitoring, visit our [Sea Run Fish Programs page](#), or contact [Dr. Gail Wippelhauser](#).

Credits

Copyright © 2016
All rights reserved.