



Organization for the Assabet River

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The Secret Lives of Eels

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In May of 1858, Henry David Thoreau traveled up the Assabet River, engaging in conversation with the people he met along the way about the flora and fauna in and around the river. One topic of discussion was the mystery of how eels reproduced. Nobody had ever seen young eels. There was no sign of eel eggs or females with eggs. There was even talk that they bred with clams. This was an epic mystery, dating back to Aristotle (who speculated that they simply came forth from the mud) and it wouldn't be solved for another 34 years. And the answer is almost as fantastic as the wild theories that have surrounded eels throughout the ages.

Eels aren't what you would call "conversation starters." In this part of the planet eels aren't held in very high regard by most people. In Europe and Japan, they are considered delicacies — a situation that is actually threatening the species a bit. Yet here we are at the beginning of the 21st century, satellites spinning overhead, science at the top of its game — and we still don't know the full life cycle of the eel. To this day, there are several mysteries surrounding this slippery creature that inhabits our river.

First, a little "eel primer." Eel — *Anguilla rostrata*. There are two major families of eels: the American Eel and the European Eel. If you read a little of Thoreau, you'll see mention of "lamprey eels", but despite a similar appearance, lampreys aren't eels. The differences between the American and European eels are pretty minor and boil down to a handful fewer vertebrae in the American species.

Eels can be up to four feet in length and weigh up to 16 pounds, but the average size is between one and three feet — the females are larger, and most male eels don't grow past two feet long. Eels grow very slowly and in proportion to the availability of food — on the order of 2-3 inches per year. The eels we find in



American eel (US Fish and Wildlife Service).

our rivers are probably five years old, but they can easily live a decade or two (the record for an eel in captivity was over 80 years). During the winter, eels will become dormant, taking shelter just below the riverbed.

The color of eels varies with the surface they are dwelling on, usually a muddy brown. They can change color from dark to a pale yellow in a little as 90 minutes. Scavengers, they are nocturnal and feed on just about anything that moves: crayfish, invertebrates, and small fish.

However, it is the lifecycle of the eel that is both mysterious and astounding. Over the years, many myths grew around why nobody had ever seen breeding eels. In 1922, Danish scientist Johannes Schmidt was able to track the eels and uncover a part of their secret.

The first revelation was that the lifecycle of eels is just the reverse of the salmon. Fish such as salmon and alewives are called anadromous; they breed and are born in fresh water, live out their adult lives in salt water, and then return to their spawning grounds. Eels (and some species of crab) are catadromous, spawning in the sea and living their adult lives in fresh or brackish water.

What Schmidt discovered, after 18 years of research, is that all eels (American and European) breed and are born in the Sargasso Sea, a featureless part of the Atlantic Ocean located off the coast of Cuba stretching from the West Indies to the Azores.

Eels begin their lives as beings so different from their adult form that until the 1950's they were thought to be a different species. Called leptocephalus larvae, they are leaf-shaped, transparent, and drift out of the Sargasso Sea, carried by the Gulf Stream to North America and eventually Europe — a trip that takes nearly one year to three years, respectively. (How the American Eels know to "get off the train" is not known.)

While they are drifting, the eel larvae feed on plankton and ultimately transform themselves into worm-like creatures called "glass eels" or "elvers." They grow to about 2 inches long, start to get some color, and finally take on the appearance of what we would call eels.

At this point the male and female eels follow separate paths.

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They will spend the next five to fifteen years feeding and growing. The males hang out along the coastline, in estuaries and salt marshes. The females begin long journeys up North American rivers, settling as far inland as the Great Lakes and South Dakota.

You might wonder how a fish can get that far inland, especially considering the many obstacles, both natural and man-made along the way. Undeterred by dams and waterfalls, these miniature eels can travel out of water for short distances as they make their way to their new homes, although they are more likely to make their way upstream through miles of underground waterways. Why they stop where they stop is still a mystery, but when the right place is found the young eel buries herself in the mud and begins the life of a scavenger, slowly growing and building up reserves for what is to come next.

After a few years, in the fall, the eels begin yet another metamorphosis. They stop feeding and begin to travel downstream at night. The male eels change color to black and their eyes double in size. As the eels' bodies adjust to life in salt water, their digestive systems all but vanish and their gas bladders allow them



Sargasso Sea

to dive to greater depths. It is assumed at this point that the sex organs of the eels develop. We don't know this for sure, because at this point the eels vanish.

What we do know is that they spend the next couple of months traveling back to the Sargasso Sea. Somewhere in the midst of winter, deep below the surface of that unmarked section of the Atlantic Ocean, the eels breed. From captive eels we know that the females lay five to ten million eggs apiece. And these eggs will eventually hatch and form the larvae mentioned above. The adult eels are never seen again. It is assumed that they die and then simply disintegrate in the ocean depths.

Oh yes, there's more! It had been assumed that since the American and European eels all headed back to the Sargasso Sea, the breeding was intermixed. However, recent genetic studies have shown there is less intermixing than previously thought and that eels from different parts of the planet arrive in the Sargasso Sea at different times, and breed with other, regional, eels. There seems to be a "genetic clock" which goes off at different times for eels from different locations.

Presumably this genetic timer also plays a role in the young eels' development, since each of these local populations manages to return to the same areas as their parent — even though it is the first time they have ever been there.

So now you know a little bit about this strange fish that inhabits the bottom of our river. The eel's role in the ecosystem is no less important than other, more "likeable" fish, and its survival depends on a long chain of seemingly impossible events — all occurring in lock step. As we look for ways to make the Assabet passable for former native fish such as alewives, other species such as the eels will also benefit — they'll just be heading in the other directions.❖