

THE ATLANTIC IN APPALACHIA: SHAD AND EELS ON THE MOVE

Kelly Coffey

In parts of North America the sarviceberry tree is known by the odd name “shadbush.” The early spring blooming of the tree coincided with the annual shad fish migration up east coast rivers from their home in the Atlantic; hence the name. In the past, the yearly shad spawning run reached deep into the continent, in the south as far as the Blue Ridge where they simply ran out of water. It influenced the location of Indian villages and, after European settlement, provided the culinary basis for annual riverside feasts in many communities. The fish’s name- *Alosa sapidissima*- in fact means “most savory.” Fish that were not immediately consumed were preserved by drying or storing in salt. The demise of shad far inland began as soon as those settlers started damming streams for grist mills- preventing shad’s upstream travel- and continued into modern times with the construction of hydroelectric dams.

On their journey to and from the sea, shad share the rivers with another migrating marine fish, the American eel. The range of the eel, however, is not limited to the east coast but includes the Mississippi basin as well. Before the construction of TVA dams, eels reached deep into the western side of the Appalachians, as far as the Clinch and Powell Rivers, for example. In the rivers draining the east side of the mountains, eels were so numerous that they once made-up 25% of all fish in these streams (the eel is a true fish, despite its snake-like form). The life cycle of the eel is a mirror image of the shad; i.e. it spends most of its life in freshwater rivers, and returns to the ocean to spawn. While no obvious relation exists between the two species, their incidental encounters, parallel traits and migrations, and vague- though discernible- similarities are curious indeed. The shad and eel are aquatic equivalents of migrating neotropical birds; connecting the Appalachians to parts of the planet totally unlike our mountains.

Head for the hills

In the spring, five-year-old shad gather along the east coast, cease eating, and move into rivers when the water temperature reaches 40 F. Shad have a tremendous drive not only to spawn upstream but to migrate as close to headwaters as possible, probably because the offspring will have fewer predators there. Some go as far as 400 miles from the ocean. By nature, shad generally avoid risky behavior. They travel in schools, swim in the calmest part of the river, and shy away from bright light. But these characteristics don’t apply on their spawning runs, making their ardent migration all the more amazing as they struggle through rough rapids and seem willing to brave any conditions to reach their objective. Shad usually return to the river of their birth, but spawn at random locations. The larvae have the appearance of tiny eels, and take about a month to grow into a more



fish-like shape. Even when mature, a shad’s movement is reminiscent of an eel because its scales are very loose, giving it an undulating swing. After spawning, life is over for many shad, but not all. Survival rate is governed by latitude; the farther north the river, the more shad live to spawn again.

Young shad stay in the vicinity of their birth until the end of summer when the water temperature falls below 60 F; then they head downstream. Upon reaching the ocean, they join the ones who did

not return to spawn that year. During the four to seven years they remain in the Atlantic, shad travel 12,000 miles, moving between Labrador and Florida in order to stay within a specific temperature range. In the summer, as much as 80% of shad in the Atlantic are located in Canada's Bay of Fundy, and practically all shad spend time there at some point in their lives. Famous for its extreme tides which stir-up much plankton, the Bay of Fundy is a favorite feeding ground. Shad filter-feed on plankton and thus can tolerate muddy water more than other fish. They have an acute sense of hearing- possibly better than any other fish- that enables them to elude dolphins, their primary predator.

Eel transformation

Another fish congregation takes place far to the southeast. The Sargasso Sea, part of the infamous Devil's Triangle, is an unusually calm area of the central Atlantic created by the pattern of encircling ocean currents and winds; much like the stillness in the eye of a hurricane. Two species of eels, the American and the European, begin their lives in these tranquil waters, hatching as wispy larvae floating freely in the ocean drift. The two species eventually part ways and float to the continental waters as they grow into "glass eels," a few inches long and translucent. In the freshwater rivers their metamorphosis accelerates where in only two days they develop

entirely new respiratory and digestive systems. They lose their transparency, and take on a yellow color, remaining in their freshwater homes for about 15 years (though some as long as 40), and grow up to five feet long. Like shad, the tenacity of eels in moving upstream is amazing. They sometimes even leave the water and wriggle overland, being equipped with an anatomy and a slimy coat of mucous that enables them to survive out of water for up to



two days. Unlike shad, who go upstream to reproduce, eels travel far upstream for no apparent reason other than to seek a place to live for the next decade or two. They don't require special habitat, and presumably could survive and thrive anywhere in a river, but nevertheless they struggle toward the headwaters.

Evidence suggests that eels do not develop gender traits until they enter fresh water; and then environmental conditions influence their sexual development; e.g. more females if there is plenty to eat. Once this development occurs, however, the variation between males and females is considerable. Females grow twice as big and go much farther inland. Males generally stay near the mouths of rivers. An eel found in or near the Appalachians would almost certainly be female. Once an eel settles on a place to call home, she typically stirs only at night, remaining burrowed in the mud during the day, a habit that disqualifies them for aquarium exhibits. Given our colder winters, an eel in the Appalachian region would remain burrowed and hibernating throughout the winter, beginning to eat only when the water warms to 57 F. For all the effort and distance traveled, an eel's home territory encompasses a radius of only a few thousand feet until she returns to the sea years later. Even when captured and released miles away, an eel returns to her home within a short time, possibly using the earth's magnetic field as a guide.

An unusual diet

Eels, if necessary, will eat almost any animal small enough for them to swallow. However, if the chosen victim is too big, they chomp down anyway and spin at an incredible speed of up to 14 spins per second in order to

break their prey into manageable bites. Paradoxically, eels are also picky eaters. The first food eaten by an eel when it reaches fresh water immediately becomes its favorite. So, for example, if an eel's first meal is a crawdad, it will ever after hunt crawdads and eat something else only if they are not available. Other than their first food, eels are especially fond of shad eggs, and have been known to suck them directly from the fish. (They also have a repulsive habit of entering the mouth of a freshly-dead shad and eating-out its insides.) An eel's hunting ability is aided by its incredible sense of smell, which can detect one part in 19 trillion; certainly among the best of any animal and possibly unsurpassed on the planet.

When the mature yellow eels are ready to return to the sea, they again undergo a transformation. As they get closer to the sea, they turn a silver color and their eyes get bigger in order to see deep within the ocean. They no longer need to eat, as they will die after spawning. Here is where another Devil's Triangle mystery begins. No one has ever seen eels spawn; in fact, no one has ever seen adult eels at all in the Sargasso Sea, though their presence can be surmised from the existence of larvae there. Scientists speculate that spawning takes place at depths of 300-900 feet. (Eel's elusive presence at this point in their life cycle has led some observers to hypothesize that the Loch Ness Monster is an unknown giant eel species.) The mystery is heightened by the fact that eels will not reproduce in captivity.

In the past, the eel was a significant food source in America. Europeans were not at all surprised to find Indians eating eels, and had no hesitation at devouring the American species as they did the European one back home. The Pilgrims depended on eels until their first crop came in, and often broke through river ice to spear them.

Both eels and shad have been severely restricted on their inland journey by dams. The thought of finding these part-time ocean creatures in or near the Appalachians seems incomprehensible to most modern inhabitants, though our ancestors found their presence no more noteworthy than trout. Historian Donald Davis writes in his environmental history of southern Appalachia, "The lack of attention given to rivers in discussion about southern Appalachia is an error committed too often by scholars who have associated mountain life only with the mountains and not with the many rivers, creeks, and streams that crisscross the region." The fact that all mountain streams make their way to the sea is obvious, but less recognized is the reverse flow. A dam-free river will siphon life from distant ocean depths to locations within sight of its headwater mountain streams.