The Susquehanna River once supported tremendous numbers of a long-lived and highly migratory fish that looked more like a snake than a fish. The American Eel (*Anguilla rostrata*) with its slimy, slender, elongated body, slithering movements, and reclusive and nocturnal lifestyle can conjure up feelings of fright and disgust to the unsuspecting angler. However, the misunderstood American Eel has a complex and fascinating life history with environmental importance that has gained appreciation, understanding and a refreshed restoration focus in recent years.

The American Eel is a catadromous fish that requires access to both freshwater and marine environments to complete its life cycle. The entire population, which ranges from Greenland to northern South America, spawns in the Sargasso Sea. Young eels are then transported by ocean currents to the Atlantic Coast, where the eels move into estuaries and freshwater rivers to grow and mature. Juvenile eels are around 2- to 3-years-old and 4- to 6-inches in length when migration into the Susquehanna River begins. However, when mature, adult eels may be 7- to 40-years-old and 3- to 5-feet in length.

Historically, American Eels occupied most of the Susquehanna River basin and supported commercial fisheries in New York, Pennsylvania and Maryland. The remnants of eel weirs, which are downstream pointing, v-shaped formations of hand-placed rocks, still exist in the Juniata, Susquehanna and Delaware rivers and can be seen on aerial photos. Estimates of historical abundance suggest that eels made up 25 percent of all fish biomass in the Susquehanna River basin.

Unfortunately, historical abundance was severely impacted by human activities, mainly dam building. Since the early 1900s, the lower Susquehanna River has been harnessed by four large hydroelectric dams. While providing electricity to many communities, the dams effectively closed the river to migratory fishes, including the American Eel. Without young eels migrating into the river, the population subsequently declined and was nearly extirpated from the Susquehanna River basin.

Initial efforts to return eels to the Susquehanna River basin began in 1936. The Pennsylvania Fish Commission periodically transplanted juvenile eels into the Susquehanna River, which were captured in Maryland. In total, some 17.25 million eels were released between 1936 and 1980. Fish
lifts at Conowingo Dam (the first dam on the Susquehanna River) collected and passed several thousand juvenile eels between 1976 and today. The U.S. Fish and Wildlife Service operated a temporary eel trap at the base of Conowingo Dam between 2005 and 2016, capturing and transplanting some 839,000 juvenile eels. Recently, American Eel restoration in the Susquehanna River has taken on a more permanent approach.

In 2015, the eel trap at Conowingo Dam was expanded into a permanent facility and a temporary trap was added to a site on Octoraro Creek, a tributary to the lower Susquehanna River. Both facilities are operated by Exelon Generation (owner and operator of a few hydroelectric facilities on the Susquehanna River) with guidance and oversight from state and federal resource agencies. Unlike American Shad and most other species of fish, eels do not require a fishway with chambers and a lot of water flow to migrate upstream. On the contrary, an eel way (for passage or trapping) can be as simple as a half-section of plastic pipe lined with artificial grass or carpeting with a small amount of water passing over it. Incredibly, eels can ascend near vertical rock faces as long as the surface is wet. The current eel traps are operated 24 hours a day, 7 days a week, May through September. Captured eels are counted daily and transported to release sites upstream of the four mainstem dams. Biologists use a specialized transport truck equipped with insulated tanks, aeration and water quality monitoring equipment. To date, some 185,000 juvenile eels have been relocated upstream by Exelon Generation. The current restoration approach will continue until 2030, at which time permanent upstream eel passage facilities will be considered.

In the interim, when sufficient numbers of adult eels are documented leaving the river, the hydroelectric dam owners will evaluate eel passage at their respective facilities, and if needed, implement passage practices to ensure 85 percent survival of downstream migrating eels.

Besides the loss of one of the most abundant fish in the watershed, the absence of the American Eel has also had an ecological impact on another species. The Eastern Elliptio (Elliptio complanata) is one of the most common freshwater mussels in the mid-Atlantic region, yet its abundance in the Susquehanna River basin is lower than other regional watersheds. Freshwater mussels require a host to complete its reproductive cycle, and researchers at the United States Geological Survey and the U.S. Fish and Wildlife Service recently identified American Eels as an important host species for the parasitic larvae of the Eastern Elliptio. The parasitic larvae attach to the gills of eels, which then transport the larvae wherever the eels happen to swim in the watershed before dropping off and maturing into mussels. The loss of American Eels from the Susquehanna River basin likely played a significant role in the decline of the Eastern Elliptio. Further, freshwater mussels are long-lived and filter large quantities of water throughout its lifetime. It is anticipated that robust populations of Eastern Elliptio mussels will improve water quality within the Susquehanna River. Thus, the reintroduction of American Eels to the Susquehanna River basin may concurrently benefit the river’s health by supporting the reproductive success of Eastern Elliptio mussels.

Success of trapping and transplanting American Eels has been evident for the past decade. Numerous eels have been recaptured by biologists and anglers alike, and reports are becoming more frequent. Some eels have been recaptured as far as 140 river miles from the nearest release location. The number of recaptures and distances that eels are traveling from release locations demonstrates survival and recolonization of the many miles of habitat the Susquehanna River basin has to offer. Additionally, researchers monitoring tributaries that were stocked with eels have noted the presence of young Eastern Elliptio mussels where these mussels were previously absent.

The restoration and management of migratory fishes with complex life histories is a long-term process that may take decades, or longer, to see positive environmental outcomes. Yet, continued cooperation, research and adaptive management will be key factors in achieving restoration success.

photo-Josh Newhard, Maryland Fishery Resources Office, USFWS

This immature American Eel (yellow phase) is nearly 20 inches long.
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