Migratory Fish Restoration

by Carl Richardson

CONSERVE 2000
PROTECT PENNSYLVANIA'S WATERS

This article is the third in a series of articles on the major topics of concern in the Commission's theme, "Conserve 2000." This feature explains the history, decline and restoration of migratory fish in the Susquehanna and Delaware River watersheds.

If you live in central or eastern Pennsylvania, you have likely heard or read a lot about American shad restoration efforts. Maybe you've heard or read about efforts to restore striped bass, too. Millions of dollars and thousands of hours of scientists' time have been spent on these efforts. Many non-anglers (and a few anglers, too) ask the question, "Why restore these fish?" Some people have even said it can't be done, or it will be too expensive, especially with American shad restoration.

Unfortunately, the problems that have plagued shad, stripers and other migratory fish date back at least 200 years, maybe more. The problems are complex and depend on many variables. That's why many critics believe the abuses of the past can't be reversed. If you have tangled with one of these fish, you will agree, though, that it's worth it to restore these magnificent fish!

Thousands of anglers head to the Delaware River and the lower Susquehanna River just below the Pennsylvania state line each spring to fish for American shad. Unfortunately, the problems that have plagued shad, stripers and other migratory fish date back at least 200 years, maybe more.

The fish

Even though the American shad gets most of the press, there are other anadromous fish migrating back to Pennsylvania's waters. These Atlantic Coast fish make their way back to the Susquehanna and Delaware rivers. They include herring, striped bass and Atlantic sturgeon.

While they spawn in different sections of our rivers, their life cycles are very similar. Eggs are laid in fresh water, and young spend time in our rivers eating and growing. Immature fish migrate to the open ocean, where they make seasonal migrations along the coast. They spend several years moving north in the spring and south in the fall. Each species spends several years in this migration pattern until mature. When mature, they make their way back to the river of their birth.

Over the course of a lifetime, these fish will have covered thousands of miles, swimming as far north as Maine and Canada, and as far south as

photo-Andrew Shiels

Florida. So they aren't really "Pennsylvania" fish, because they call the waters of the Susquehanna and Delaware rivers home only for a few months.

Food source for generations

Just as we count on the annual migrations of these fish, so did Native Americans and settlers. The fish were abundant, and the supply appeared never-ending. It was this abundance that so impressed European explorers and, later, settlers. In 1608, Captain John Smith wrote of the abundant fish and meetings with the Susquehannock Indians.

The writings of Smith and others did not go unnoticed by those wishing to settle the New World. Other explorers also wrote of the abundant shad and herring. Fishing equipment was listed among the essential items for Europeans wanting to settle in the New World.

Before the early 1700s, most of the fish were caught and consumed by families—they were subsistence anglers. With the growing population came a growing market for shad. This demand created an opportunity for commercial fishing operations.

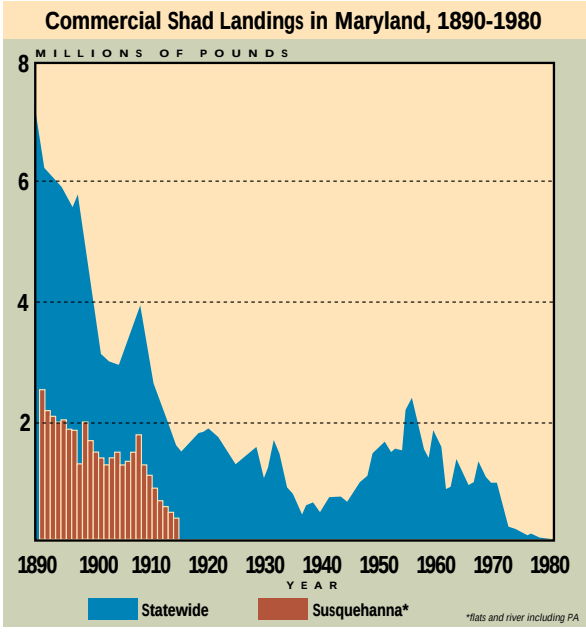
Not only would the increasing demand affect the fishery, but fishing technology changed things forever. Larger seines, some 400 feet, were brought to the Susquehanna by Connecticut Yankees settling in what is now known as Luzerne County. Gill nets would also be later used by commercial anglers. This gear could be used to gather hundreds, if not thousands, of shad in one day.

photo-courtesy of U.S. Fish & Wildlife Service

Susquehanna Flats, Maryland, around 1890. In 1608, Captain John Smith wrote of the abundant fish. Fishing equipment was listed among the essential items for Europeans wanting to settle in the New World.

Demand was also placed on other fish. Records of commercial fishing for Atlantic sturgeon date back to 1849. As the gear and boats improved, the catches of migrating fish increased. By 1890, more than seven million pounds of Atlantic sturgeon were landed commercially on the coast. Biologists refer to what was occurring to the Atlantic sturgeon stocks as "clear cutting." Fish were harvested before they could reproduce. It wasn't long before the entire population crashed.

In that same year, 1890, nearly eight million pounds of American shad were harvested in the Chesapeake Bay alone! Susquehanna River fishing operations accounted for some 2.3 million pounds. Commercial shad landings of shad plummeted the following year.



Overfishing was not the only force affecting the stocks of migrating fish. As early as the mid-1700s, dams began blocking their migrations. Most were small dams that powered mills or provided water for canal systems. Large hydroelectric dams were constructed on the Susquehanna from 1904 to 1932. These dams prevented migrating fish from reaching their historic spawning sites.

photo-PECO Energy

Conowingo Dam spans the Susquehanna River about six miles below the Pennsylvania-Maryland border and 10 miles above the mouth of the Susquehanna River at the head of Chesapeake Bay. PECO Energy built the river's first fish lift at Conowingo in 1972 and a second lift in 1991.

photo-Lou Kaufman

Over the course of a lifetime, migratory fish, like this hickory shad caught below Conowingo Dam in Maryland, will have covered thousands of miles, swimming as far north as Maine and Canada, and as far south as Florida.

As the economy boomed, so did the population. Communities along the Susquehanna and Delaware rivers flourished in the mid-1800s. Larger populations produced more wastes. Often, these wastes were diverted into the nearest waterway. Eventually it all ended up in the larger river systems.

So bad was this pollution on the lower Delaware that it formed a barrier to fish migration. This slug of bad water consumed the oxygen dissolved in the water. It formed a barrier through which no fish could migrate. There are records of this block dating back to the late 1700s.

Restoration efforts

Efforts to restore migratory fish were initiated as early as the mid-1800s. The Pennsylvania Commission of Fisheries, now known as the Pennsylvania Fish & Boat Commission, was formed in 1866. Governor Andrew Curtin appointed Colonel James T. Worrall as the first commissioner. Commissioner Worrall had one year and no budget to formulate a plan to restore runs of migratory fish to the Susquehanna River.

Early efforts concentrated on three strategies: Fishing regulations, stocking of young fish and fish passage. Fish ladders had been required on dams by Pennsylvania law since 1835. When the Holtwood hyrdoelectric dam was constructed in 1910, two ladders were constructed. The ladders were crude and ineffective, because little was known about shad, their habits and needs. Later, dams were not required to construct ladders, because it had not been shown that shad would use them. However, payments were made to the Fish & Boat Commission by the owners of these dams each year in lieu of fishway construction.

Fishing was regulated, but regulations were difficult to enforce. Millions of young shad were stocked from the Columbia hatchery in the late 1800s. Despite these efforts, shad runs on the Susquehanna River and Chesapeake Bay continued to decline.

Delaware River runs

American shad runs in the Delaware River were poor or nonexistent for most of the 19th and early 20th century. The water quality block prevented most of the fish from entering the non-tidal portion of the river. Runs would get infrequent breaks, when water flows and temperatures resulted in the block forming after the runs.

However, in the 1970s new water quality laws and regulations were put in place. This change in water quality signaled the turnaround for the Delaware. The construction of sewage treatment plants is credited with a large part of the cleanup. Once water quality improved, runs of migratory fish returned to the Delaware and its tributaries.

Revival of shad restoration efforts

American shad restoration efforts increased in the 1960s. American shad stocked in the Pacific Coast's Columbia River a few years earlier began using ladders at Columbia River dams. If shad were passing these dams, couldn't they pass those on the Susquehanna River?

Even though fishways weren't built when most of the dams were constructed, dam owners could be required to build them to keep their plants generating electricity. Studies were conducted to determine whether shad restoration could be accomplished. Because so much in the basin had changed since shad swam there, detailed analysis of habitats was conducted. In addition, research on fish passage was conducted.

This resulted in the construction of a fish lift at Conowingo hydroelectric dam in 1972. The lift was designed to collect fish that were trucked to a site above all the dams on the lower river. From 1990 to 2000, fishways were constructed at all the hydroelectric dams on the lower Susquehanna River, including another larger fish lift at Conowingo. Fishways were also constructed at dams on the Schuylkill and Lehigh rivers, tributaries to the Delaware River. American shad are the target species for restoration, but other migratory fish use these fishways.

Shad stocking research was also conducted. Young shad fry would be stocked above blockages in the river and then monitored for their return. For years, the majority of American shad returning to Conowingo Dam were stocked three to five years earlier by the Pennsylvania Fish & Boat Commission.

Striper decline

The decline of striped bass stocks is a more recent event. That isn't to say that they benefited at the time shad stocks were declining. Commercial landings of Atlantic Coast striped bass ranged between eight and 14 million pounds from the early 1960s to the mid-1970s. For many commercial and recreational anglers, the 1970s were boom times. The resource appeared endless. But Chesapeake Bay stocks declined steadily in the 1970s. A large portion of the Atlantic striped bass population comes from stripers spawning in the Chesapeake Bay. In response to these declines, the U.S. Congress passed the Atlantic Striped Bass Act in 1981. This act funded extensive studies to learn more about the causes of striper declines on the Atlantic Coast.

Restoration efforts focused on regulating commercial and recreational fishing. Additional studies of movements and population dynamics were also funded. Stocking young striped bass was also an important part of striper restoration in the mid- to late 1980s.

Major decisions on the management of Atlantic Coast striped bass and their restoration are made by the Atlantic States Marine Fisheries Commission (ASMFC). The Pennsylvania Fish & Boat Commission and 14 other coastal states comprise the ASMFC. ASMFC was formed in 1942, through an interstate compact, which was approved by Congress.

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Managing migratory fish is a complicated biological and political feat. A fish that is one day caught and released by an angler fishing near Philadelphia may be caught days later by another angler fishing off Cape Cod, Massachusetts. The importance of state and federal partnerships to protect and manage these resources cannot be emphasized enough.

Two hundred years ago, migratory fish born in Pennsylvania were sold in markets in Philadelphia. Today, they are in demand the world over. Asian markets continue to grow, placing great pressure on eels and other Atlantic Coast fish.

Why restore the fishes?

Migratory fish are important members of the Atlantic Coast ecosystem. They are either important food items for other, larger fish, or they are top predators themselves. Restoring these fish and their important freshwater habitats benefits the entire coastal ecosystem.

Beyond restoring the biological legacy of our rivers, Pennsylvania and other states benefit economically. Sportfishing on the Delaware River generates $3 million in economic benefit. Estimates for the potential economic benefits of fishable runs on the Susquehanna are 10 times higher than that amount.

Commercial fishing for American shad and striped bass is also important to coastal states. According to ASMFC, the commercial landing of American shad in 1997 was valued at more than $1.2 million. Striped bass landings in that same year were valued at more than $8.9 million.

Thousands of hours and millions of dollars have been invested in restoring American shad and other migratory fish to Pennsylvania's waters. We see the return on that investment, but again these fisheries are pressured by forces outside the Keystone State. The future of these fisheries resources (and those that depend on them) depends heavily on our ability to learn from history, and we are doomed if we don't.

By 1890, more than seven million pounds of Atlantic sturgeon were landed commercially on the Atlantic Coast. Fish were harvested before they could reproduce. It wasn't long before the entire population crashed.

For more information

• Pennsylvania Fish & Boat Commission, P.O. Box 67000, Harrisburg, PA 17106-7000; check the Commission's web site at www.fish.state.pa.us for updates on counts at fish passages on the Susquehanna and Delaware rivers.

• *Migratory Fish Restoration and Passage on the Susquehanna River*, a publication detailing restoration efforts, is available free of charge by writing to the Commission address above.

top photo-Dave Miko; bottom photo-Art Michaels