

SUSQUEHANNA RIVER

AGAINST THE CURRENT



Joanna Berry, an environmental intern with the Susquehanna River Basin Commission, works with other conservationists to look for eels in the Conewago Creek outside Elizabethtown. Photos by Joe Hermiti, PennLive

Eels were once a common part of life on the river, but they nearly disappeared. Now they're back.

Nick Malawskey For PennLive

There was a time when the American eel was a common sight on the Susquehanna River, when eel was proudly served to travelers along the river's banks and when a family could make money packing and salting the snakelike fish into barrels for shipment to Baltimore and New York.

In the pools of the river, the eels, which can grow up to 4 feet in length, were a common sight. Enough so that, like bass, musky and shad, they were often the subject of fishing stories told along the river.

Born in the Atlantic Ocean far out in the Sargasso Sea, baby eels (called elvers) float with the tides and currents toward the eastern seaboard. From there they migrate inland, using rivers and their tributaries as natural highways into the interior. Here, in fresh water, they live for up to 20 years, growing into mature fish before once again returning to the ocean to spawn the next generation of travelers.

For as long as man lived along the river, he lived with, and took advantage of, the neighboring eels. Swatara, the name of the creek and local municipalities alike, is said to be derived from a Native American term meaning "where we fed on eels."

At the turn of the 20th century, eels remained an important part of life for those along the river. State estimates at the time put the eel catch along the Susquehanna River at more than 150,000 pounds annually, with a value of more than \$100,000.

But life along the Susquehanna was changing. The pastoral nature of the valley was shifting, as factories rose along the banks. Electricity came to Harrisburg along with sanitation, hospital services, the automobile and paved roads.

Harrisburg, which in 1900 had a population of 50,000, by 1920 had reached 75,000. In York and Lancaster, similar population booms occurred. As the river cities and industries grew, hydroelectric dams were constructed across the

SEE FILE A8



These two American eels were collected from the Conewago Creek.

Facts about eels

125,000

The number of eels that were transported into the Susquehanna River basin and stocked at Harrisburg's City Island, along the West Shore and at Fort Hunter in Susquehanna Township in 2017.

800,000

Eels were captured, transported and released by the U.S. Fish and Wildlife Service into the Susquehanna or its tributaries between 2007 and 2016.

20 years

The amount of time it takes for eels to grow and mature in fresh water before returning to the ocean to spawn the next generation.

U.S. Fish and Wildlife Service

American eel part of Pa.'s heritage

The following excerpts from journals and reports in the 19th and early 20th centuries highlight the American eel as part of Pennsylvania's heritage:

EEL FISHING IN THE SUSQUEHANNA

"According to the Lancaster (Pa.) Herald, the riparian residents on the Susquehanna enjoy in the early autumn of every year a season of piscatorial sport, and, what is of more importance, obtain a considerable amount of food.

"By September, the water in the stream is generally very low — but a few feet deep in the channel — leaving the stony bottom for a wide space on either side, in some places nearly bare, with occasional deep furrows. Previous to the advent of cold weather the fish instinctively descend the river, and the shallowness of the water renders their capture easy. For many miles of the river's length the owners of the shoreline erect fish dams and gins, by deepening the channel somewhat and building an elongated V-shaped wall, at the lower point of which is fixed a box, from which the fish, when once caught, cannot extricate themselves.

"Fishermen secure and salt down five or ten barrels of eels during the season, besides living almost entirely upon them during the catch. ... The eels are packed in barrels, and many of them sent to Baltimore, where quantities are purchased by seas-going vessels whose skippers are aware of the delicious flavor of this rather anomalous article of provision."

— *The Maine Farmer*, Jan. 20, 1859

IN DAUPHIN COUNTY

"The inhabitants of the Stony Creek Valley, which lies in the Blue Mountains, five miles above Harrisburg are great eel catchers. The fish of Stony Creek Dam are completely dominated by the eels, which grow to an unusual size.

"For the past five years there have been two eels in the dam that have refused all hooks, but have lived so sumptuously the delicacies of the dam that Stony Creekers believed them to have attained prodigious proportions. ...

"Jeremiah Hogentogler is one of the leading and highly respected inhabitants of Stony Creek Valley. He makes a frugal living by selling kindling wood, pine knots, mountain tea berries, and Christmas trees in the city on Wednesdays and Saturdays.

"He has now become a hero, for on last Thursday he captured the two great eels.

"As Mr. Hogentogler tells the incident himself, he had started his mule and wagon on a wood chopping expedition the mountain side that borders the dam. A Stony Creeker always carries a hook and line with him and when he of chopping wood or digging for sassafras he invariably a little recreation by bobbing for eels in the dam.

"Last Thursday Mr. Hogentogler baited his hook with some corned beef and landed both of the famous eels much to his surprise and after a tough struggle. One eel was within two inches of four feet in length, and the other measured a trifle over three feet. He skinned his prizes at once, and, to prevent the hides from shrinking stuffed each with green walnuts and tufts of dried grass."

— *The American Angler*, 1887

IN PENNSYLVANIA WATERS

"Anglers fairly reveled in their favorite sport during the month of October in Pennsylvania. In nearly every portion of the state the waters were in good condition, and fish of all kinds seemed eager to be caught. Bass, wall-eyed pike and



State estimates at the turn of the 20th century put the eel catch along the Susquehanna River at more than 150,000 pounds per year. *Joe Hermitt, PennLive*

pickereel fishing was much better even than in September.

"In addition, the sinuous eel began his annual journey to the sea, and tons were caught by hook and line, and in fish baskets in the Susquehanna River to satisfy the eel hunger of the human dwellers along the Susquehanna valley. Daily and weekly newspapers in that territory declare that the run of eels this year in the Susquehanna river greatly exceeds previous autumns'.

"From 1,500 to 2,000 pounds have been taken from a single basket in one night, and boys and men have frequently been seen at the close of a day's outing carrying home from thirty to fifty of these snake like fish."

— *Forest and Stream*, Nov. 3, 1906

EEL INDUSTRY

"The value of the eel industry in Pennsylvania can scarcely even be estimated. A faint idea however may be obtained when it is stated that in 1905 the returns made to the Department from the licensed baskets were 158,729 pounds with a value of \$18,687. ...

"In addition to the fish which are sold, a great quantity of those captured are taken and consumed directly by the families of the men who caught them or sold to individuals by the fishermen without their putting them through the markets. ...

"The Lancaster, Harrisburg, York, Williamsport, Wilkes-Barre and Scranton markets are very important markets for eels and, while I cannot substantiate it, I believe I am safe in saying that the towns mentioned themselves consumed more than the 158,729 pounds.

"I am convinced that if there were faithful reports of all the eels caught in 1905 it would be found that the industry in this fish would be worth at least \$100,000."

— *Report of the Pennsylvania fish commissioner*, 1908

EELS

FROM A1

river to generate the power needed to fuel the state's industrialization.

But there cannot be progress without a price, and on the Susquehanna, the price of industrialization and electrification was paid by the river's native wildlife: the shad and the eels, which require an unobstructed pathway for their migrations.

The eel, cut off from its native habitat, all but disappeared, leaving only the remains of old weirs, or enclosures for catching fish, in the river, marked by their distinctive V shapes.

By the turn of this century, the eel was a rarity. Regular anglers along the river might encounter one every once in a great while, but the annual runs of eels down the river in their thousands were a distant memory — or forgotten altogether.

The great life cycle of the eel in the Susquehanna was broken. Now, almost 100 years later that circle is finally being closed, and the eel, in all its ugly glory, is once making a return to its ancestral waters.

SURVEYING SPECIES

Standing amid the turbid chocolate-colored waters of the Conewago Creek outside Elizabethtown, Aaron Henning is hunting for eels.

In one hand, the fish biologist with the Susquehanna River Basin Commission has a net. In the other, he holds an electric "wand," which he slowly sweeps back and forth through the muddy run. Attached by a power cable to a backpack, carried by another wader, the wand sends shocks through the water, stunning fish. Once stunned, the fish surface, and Henning's net darts out to capture them.

He is working with a group — Penn State extensioners, basin commission biologists and interns, local conservation district employees and the Tri-County Conewago Creek Association — to survey the fish species present in the creek, a tributary of the Susquehanna River.

Like the river it flows to, the Conewago was once in dire straits after decades of runoff and pollution caused it to be placed on the state's impaired-waterway list in 1998. It was found to be too polluted to support typical fish and other aquatic wildlife that called the creek home.

Since then, there have been a number of restoration projects along the creek, funded by state and federal grants and led by the Conewago Creek association. One of the largest of those projects was along the Conewago Recreational Trail, where in 2007 workers and volunteers restored 15 acres of wetlands and 20 acres of forest along the creek's banks.

Now volunteers and professionals have returned to the creek to document the number of fish species living there, part of ongoing monitoring efforts to track the health of the creek and the efficacy of the restoration work.

They work up the small creek in a line across, two backpacks and four "fishers," wading at a slow, steady pace punctuated by the dart of a net. The stunned fish are transferred from the nets to waiting buckets. Once the fishing is completed, the fish will be identified and their species recorded (a DNA sample will also be collected, part of another ongoing research project that hopes to allow fish species surveying to be completed through water sampling and not fishing) before being returned to the stream.

In all, they will identify 25 species of fish along this stretch of creek, a marked improvement from years before the restoration work, the surveyors said. But for now, they wade through the stream with their waving wands and darting nets before them.

SEE EELS, A9



Electric "wands" send shock waves through the water, stunning fish and bringing them to the surface. Once the fish are identified, they are returned to the stream.

EELS
FROM AS

A few meters up the creek, Henning lets out a triumphant whoop: There is an eel in his net, which he will later estimate is a 3-year-old juvenile. The elver — and others caught by the survey teams that day — offer proof that nearly 100 years after it all but disappeared from the Susquehanna, the species is again making inroads, and a home in this chocolate-colored tributary of the Susquehanna River.

STOCKING THE RIVER

Ten miles from the mouth of the Susquehanna, U.S. Route 1 crosses the river across the Conowing Dam, the first hydroelectric dam on the river and one of the primary impediments to fish migrations. Built at the end of the 1920s and today owned and operated by Exelon Corp., the dam must periodically undergo recertification, a process that includes assessing its ecological impacts and how they can be mitigated.

Previous negotiations had led to the construction

of a fish lift for shad in the early 1990s, but not eels. The thinking at the time was, according to Steve Minniken, a researcher with the U.S. Fish and Wildlife Service, that if eels were not getting caught in the fish lifts, they must not be present in the area.

But Minniken wasn't so sure about that.

So in 2004, he started looking for eels at the downstream base of the dam using an Irish elver trap, by appearance a floating box contraption. He and his fellow researchers' goals were to gather basic data on American eels in the river, how many there were, when they appeared and, critically, how easy they would be to catch. That summer, they caught 42 elvers in the trap, hardly a bountiful harvest. The next year, only 19.

But the team refined its collection efforts and in 2007 collected more than 3,800 eels at the dam. The following year, it expanded the program and number of elvers the team



A group of watershed conservationists surveys the fish species in the Conewago Creek, a tributary of the Susquehanna River near Elizabethtown. Photos by Joe Hermit, PennLive

caught soared to more than 40,000.

The captured eels were measured, counted and shipped north where they were released into Deer and Conestoga creeks. Over the next eight years, Fish and Wildlife captured, transported and released more than 800,000 eels into the Susquehanna River or its tributaries.

With proof that the eels were attempting (unsuccessfully) to swim up the river, state and federal agencies were able to negotiate with Exelon to assume control of the eel capture, transportation and stocking efforts as of 2016 and run it through 2030.

In 2017, the company transported another 110,000-plus eels into the river basin and this year has stocked roughly 12,000 eels at Harrisburg's City Island, 3,000 along the West Shore and another thousand at Fort Hunter in Susquehanna Township.

The American eel is back.

ECOLOGICAL IMPACT

In the last several years, numerous eels have been captured in the Harrisburg area and the lower reaches of the river where stocking has been heavy. But there have also been reports of eels from the west branch near Clearfield; on the Juniata River by Lewistown and Huntingdon; and on the north branch around Towanda.

Henning said he even received reports of a pair of eels found way up in the



Aaron Henning, a fish biologist with the Susquehanna River Basin Commission, measures one of the American eels collected from the Conewago Creek.

Susquehanna's headwaters near Oneonta, New York, 20 miles from where the river begins and 189 miles from the nearest stocking point.

"So these things are trying to run upstream as far as possible," Henning said. "We're just trying to get them out there so they can complete the ecological mission they serve."

There are signs that the eels are starting to have an ecological impact, as well. Following the success of their eel stocking experiments, Minniken and the Fish and Wildlife Service researchers began tracking and studying the surviving populations of fresh-

water mussels found in the Susquehanna River system.

The mussels have a symbiotic relationship with fish: They rely on them to reproduce. The mussels "fish" by displaying a piece of tissue that looks like a mayfly or minnow. When a fish approaches for a bite, the mussel responds by spraying the fish with larvae which ride on the fishes gills until they mature into baby mussels.

In the Susquehanna, the mussels' fish of choice was the eel, and when the eels disappeared, the mussels effectively stopped reproducing. The reintroduction of the eels raised the question, would the mussels respond?

Researchers tracked mussel reproduction and found that five years after eels had been reintroduced to Buffalo Creek the number of juvenile mussels in the stream doubled.

There is also hope that as they become re-established the eels, which eat almost anything, could prey on invasive species such as the rusty crayfish.

But getting up the river is only half of the eel's story. To complete their life cycle, they will have to get back down, as well, which can be a treacherous journey even without active eel weirs and hungry river dwellers.

That, Henning said, could be tackled through operational changes at the river's dams as opposed to active transportation methods, such as shutting down the dams' turbines during the downstream run or opening sluice gates.

In a way, researchers have been so focused on getting the eels back into the river that getting them back down has been something of a secondary concern. After all, the eels will mature for as long as two decades before they begin their migration.

LIFE CYCLE

The American eel exists in a cycle, its life journey a great circle. Born in the ocean, it rides the tides to the rivers, where it lives

and matures before once again returning to the sea to spawn and to die.

In a way, the story of the American eel in the Susquehanna mirrors that cycle: Once so prolific that it was a diet staple, man's intervention in the river caused it to all but disappear. And it has only been through man's intervention yet again that the eel has returned, a great turning of the ecological wheel of life.

There is a lot that researchers still don't know about the fish: How and where will the population stabilize over the next decade? Will it lead to a larger resurgence of mussels? What effect will eels (voracious generalist eaters) have on invasive species?

The eel is not a pretty fish, but it is, in some ways, an enigmatic one, which brings with it secrets for researchers to unlock. For example, what causes the variability between annual collections? Is it weather-related? Or is something else affecting how many eels make their way toward the river's mouth?

Even within a season, the numbers of eels captured can fluctuate or pulse almost day to day. Researchers aren't sure if the movement of elvers is more closely related to the cycles of the moon (they move at night) or if it is dependent on water flow (more water would give the eels a better path over impediments).

"It's tough to nail that down because there's so many variables in nature," Henning said. "And there's all these hydro operations that affect those variables."

"There's a lot of mysteries behind the American eel and its life cycles."

But with the reintroduction of the species to the river, he and other biologists will finally have the opportunity to solve those mysteries.

And who knows? If they're successful enough, maybe Susquehanna eel will once again be a savored delicacy along the banks of the river.



Matt Kofroth of the Lancaster County Conservation District and other conservationists take inventory of fish species in the Conewago Creek.

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