

# Hicks in the Tricks:

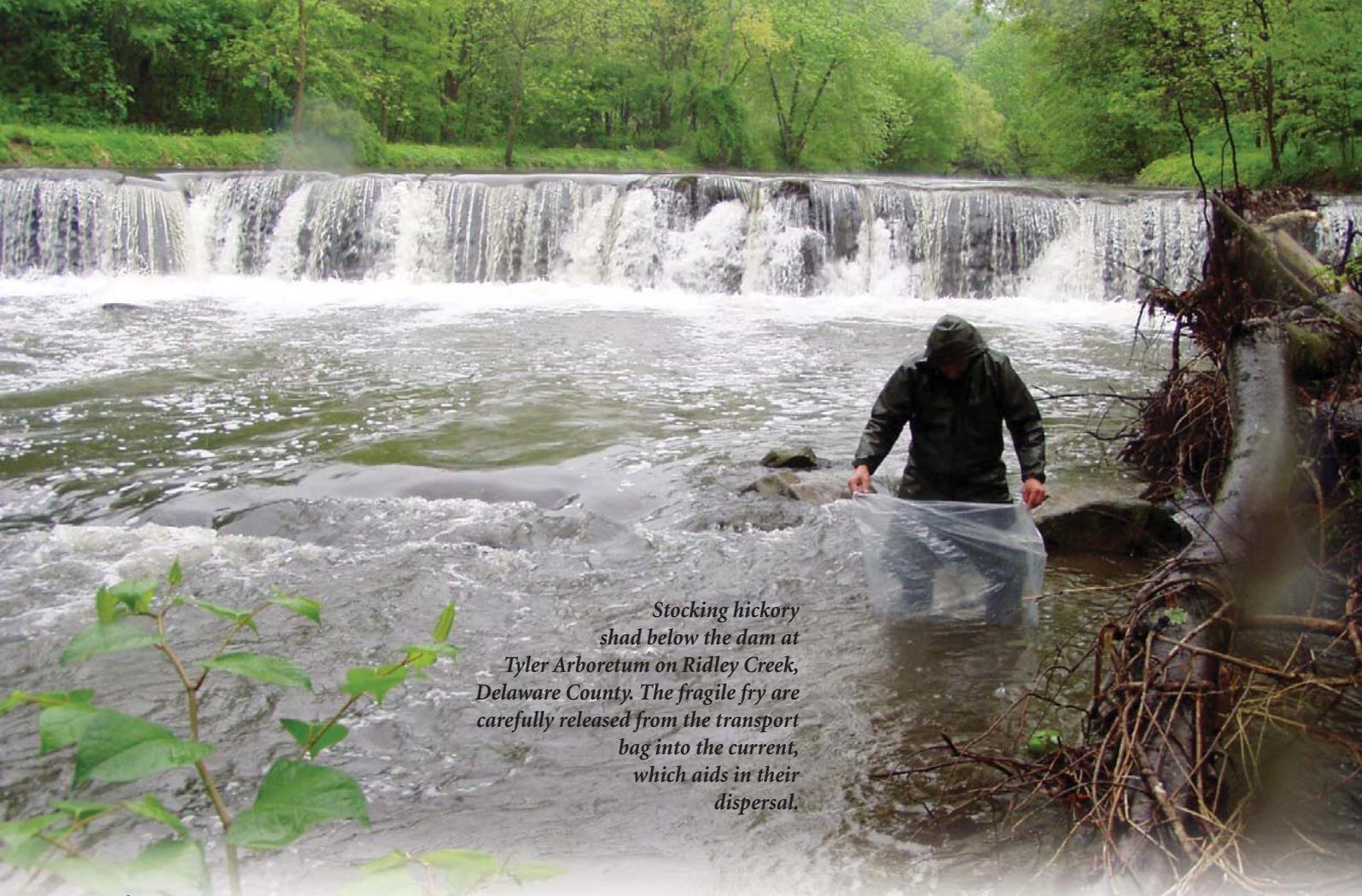
## Restoration of Hickory Shad in Pennsylvania

by Andrew L. Shiels, Manager, Fish Production Services

**Hickory shad (*Alosa mediocris*)** are a smaller relative of the better-known American shad (*Alosa sapidissima*). Although most Pennsylvania anglers have never seen one, these feisty migratory sportfish are known affectionately to anglers and biologists in several East Coast states as “hicks.” Hickory shad are superb sportfish. They strike flies and lures readily, possess the hard-fighting qualities typical of migratory fish, and often leap out of the water when hooked. Caught on a 6-pound-test spinning outfit or a 6-weight fly rod, these fish are a lot of fun! In Pennsylvania, hickory shad are currently listed as an endangered species. That’s because until recently, they had not been documented as occurring in Pennsylvania’s Delaware River or its tributaries for many years. However, recent sightings and a new Fish & Boat Commission restoration effort have brightened the once gloomy outlook for hickory shad.



*Freshly hatched hickory shad fry are very small. Their small size requires their stocking just as they absorb the yolk sac and before they begin external feeding.*



*Stocking hickory shad below the dam at Tyler Arboretum on Ridley Creek, Delaware County. The fragile fry are carefully released from the transport bag into the current, which aids in their dispersal.*

## History

The Fish & Boat Commission has been involved in the restoration of American shad in the Susquehanna, Schuylkill and Lehigh rivers since the early 1970s. Along the way, Commission biologists have developed and refined many techniques leading to a large-scale hatching, rearing and stocking program

at the Van Dyke Anadromous Fish Hatchery. Anadromous fish live most of their lives in a marine environment and enter fresh water to spawn. For nearly 30 years, the “anadromous” portion of the hatchery name referred only to American shad. However, in 2003, the hickory shad, another anadromous species, made its first appearance at Van

Dyke in the form of eggs to be hatched in a pilot culture project. Mike Hendricks, leader of the Anadromous Fish Restoration Unit, suspected that American shad culture techniques may be transferable to hickories. However, it didn't take long to realize that these species have different life histories.

## Ecology, hatchery production

There are several notable differences in the biology and ecology of American and hickory shad. Their size is the most obvious difference. American shad are the larger species. Adult male American shad average between 16 and 21 inches long, while females reach lengths up to 23 inches or so. Physically, American shad have a deeper body profile, and their upper and lower jaws are the same length. Hickory shad are smaller at adulthood. Males average between 11 and 16 inches. Females are slightly larger, reaching lengths of around 17 inches. Hickory shad have a noticeably longer



*Stocking hickory shad fry into the Delaware River at the Commission launch ramp at Yardley, Bucks County. Fry are transported from the hatchery in large plastic bags filled with water and oxygen.*

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lower jaw. American shad are primarily plankton eaters, and hickory shad prefer a more well-rounded diet that most notably includes small fish. Both species enter tributaries along the eastern seaboard of North America from Florida to the Bay of Fundy. Juvenile American shad typically spend their first summer feeding in freshwater rivers well upstream of the ocean. Commission netting surveys reveal that juvenile American shad migrate toward the ocean from August through November. Hickory shad tend to spend their juvenile stage in the intertidal areas using freshwater, brackish and even salt-water bays and estuaries.

The first waves of American shad tend to enter tributaries in Maryland and Pennsylvania between late March and early April. A typical adult female American shad produces some 200,000 to 250,000 eggs measuring only 1/8-inch in diameter. Hickory shad arrive at the spawning grounds several weeks earlier. Their runs usually taper off just as the American shad run begins to strengthen. This usually occurs in the lower Susquehanna River around the middle of April. Hickory shad eggs are very small with typical diameters around 1/16-inch. Thus, they are only half the size of American shad eggs. Hickory shad eggs are small, but they more than

make up for their size in numbers. An adult female hickory shad can produce more than 300,000 eggs. Of course, the small eggs eventually hatch into small fry.

The differences between American shad and hickory shad extend to their treatment in the hatchery. American shad are hatched and reared in large tanks until they are around 21 days old. In that time they have absorbed their yolk sac, begun to feed on brine shrimp and dry feed, and have been immersed in a Food and Drug Administration-approved tetracycline bath to mark their otoliths (ear stones) for future identification.

On the other hand, hickory shad fry average a quarter-inch in length and are too small to eat brine shrimp, which are so useful in converting American shad to external feeding. As a result, hickory shad are kept in hatchery tanks just long enough to immerse them in tetracycline to apply an identifying mark. Since they can't be fed, they must be stocked just before or soon after they have used up the built-in nutrition of their yolk sacs. At that time they are carefully loaded into plastic shipping bags filled with

water and pure oxygen for the ride to Susquehanna River and Delaware River tributaries.

The Commission is in the early phases of hickory shad restoration, but the Maryland Department of Natural Resources (DNR) Fisheries Service has been actively engaged in these activities for several years. Adult hickory shad used for egg collection come from the lower Susquehanna River, and they are collected either from willing anglers or via boat electrofishing. Since 2003, Fish & Boat Commission biologists, with Maryland's permission and cooperation, have also been collecting pre-spawned hickory shad with the same methods.

After collection, the Commission's shad are transferred to spawning tanks at the base of Conowingo Dam. Fisheries biologists employed by Normandeau Associates, Inc., RMC Environmental Services Division, and under contract with the Susquehanna Electric Company, then inject the hickory shad with luteinizing hormone-releasing hormone analogue (LHRHa) hormone pellets. These hormones speed up the spawning process, ensuring that most shad in the tank spawn at around the same time.



*Average-sized hickory shad*



*Anadromous Fish Restoration Unit Leader Mike Hendricks forms injectable hormone pellets. The hormones speed up the spawning process, ensuring that most shad in the tanks spawn at around the same time.*

Fertilized eggs are collected from an overflow device outside the tanks and are shipped to Van Dyke, where Commission biologists take over.

In another example of interagency cooperation, the Susquehanna River coordinator for the United States Fish & Wildlife Service, Richard St. Pierre, purchases the hormone ingredients and provides them to Commission biologist Mike Hendricks, who makes the injectable pellets.

## Restoring the runs

Historic records show that hickory shad once occurred in several Pennsylvania streams and rivers. Dam-building and water pollution led to the decline of this species and other migratory fishes. However, during the last several decades, more stringent water-quality regulations and clean-up programs have resulted in improved water quality. Similarly, agencies are making great efforts to help migratory fish reach their ancestral spawning grounds. Fish & Boat Commission Research Division biologist R. Scott Carney works with the Department of Environmental Protection's Bureau of Dam Safety and many other partners such as American

Rivers, Inc., Trout Unlimited, the National Oceanic and Atmospheric Administration, and the National Fish and Wildlife Foundation to assist willing landowners in removing blockages to fish migration. Scott secures funding, coordinates the design of fish-passage devices or dam removals, ensures habitat restoration following removal, and follows up with fish and/or habitat monitoring. In many cases, river and stream sections that have been impounded for a century or more have recently been re-opened to fish migrations.

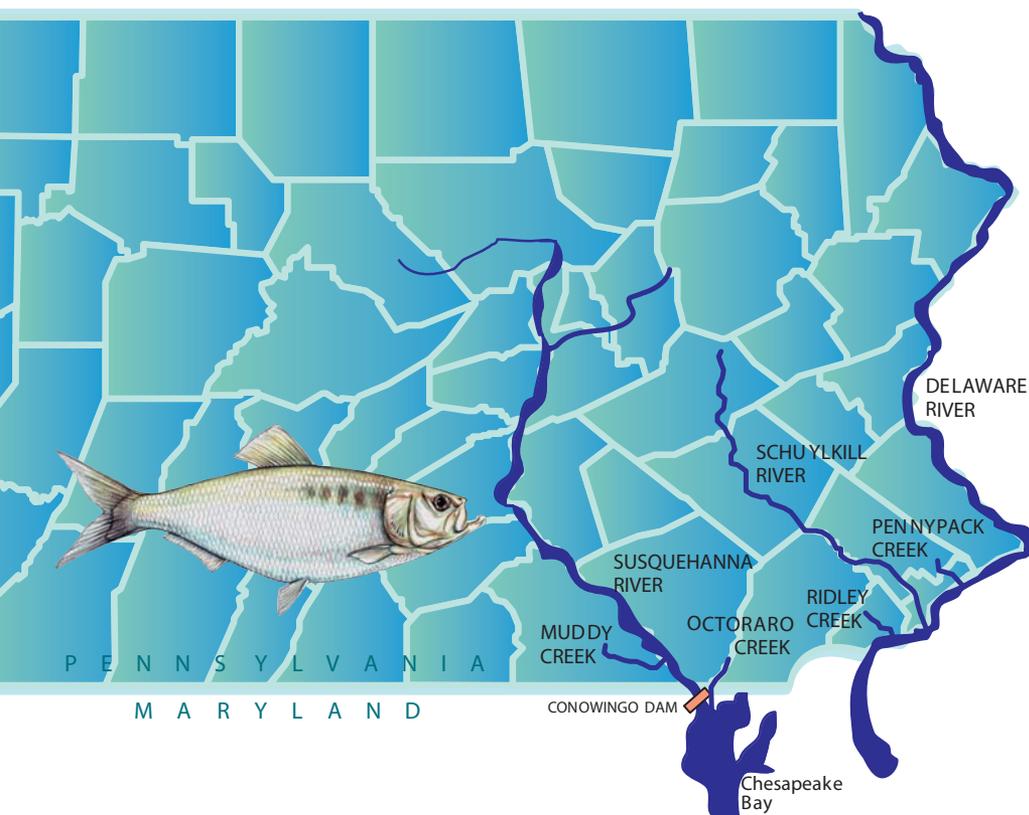
Meanwhile, runs of hickory shad into Maryland's Deer Creek and the Maryland portion of the lower Susquehanna River have been increasing, and they have been receiving significant attention from anglers, including Pennsylvanians. Sportfishing interest in this species is gaining annually around the mid-Atlantic states as news of this fishery spreads.

Between the Deer Creek fishery in Maryland and the Pennsylvania waters of the Susquehanna River lies Conowingo Dam. Conowingo Dam is the first of four hydroelectric dams on the Susquehanna River. As a result of legal agreements with the states and regulatory agencies, fish lifts or fishways

were constructed at each of these blockages. Two lifts, the original west lift and the more recently built east lift, are in place at Conowingo. It is not known if hickory shad will use the east fish lift at Conowingo Dam because there is currently no remaining natural spawning stock upstream of the dam.

To improve the odds of re-establishing a hickory shad run, in 2003 and 2004, the Commission stocked hickory shad fry at the mouth of Muddy Creek in York County, Pennsylvania. The goal is to develop a spawning population that will return to Pennsylvania's portion of the Susquehanna River upstream of the Conowingo Dam. If they survive a trip to the ocean and return in two to four years, the fish stocked at Muddy Creek will have a homing instinct to return there. Fish-passage monitoring at Conowingo Dam in future years will document if and when hickory shad begin to show up at the fish lift viewing window.

Similarly, there is a run of hickory shad in Octoraro Creek, which empties into the Susquehanna River about 8 miles downstream of the Pennsylvania-Maryland border. Maryland officials are working toward the removal of a dam



located near the town of Conowingo Sun, Maryland, about a mile from the confluence with the Susquehanna River. Removing this blockage, anticipated to occur in 2005, will again allow hickory shad to swim in the Pennsylvania waters of Octoraro Creek and open a total of 21 miles of Octoraro Creek from the mouth to the dam at Octoraro Reservoir. Monitoring in future years will determine how well the hickories respond to the newly available stream habitat. Pending a review of their status as an endangered species, a unique angling opportunity may soon be restored in southern Chester and Lancaster counties.

In addition to the hickory shad restoration in the Susquehanna River Basin, in 2002 the first hickory shad fry were stocked in Ridley Creek, a tributary to the Delaware River in Delaware County. That first stocking consisted of fry obtained directly from the Maryland DNR Manning Fish Hatchery. In 2003 and 2004, fry were stocked again in Ridley Creek, this time from the Commission's Van Dyke Hatchery. Ridley Creek contains some suitable habitat, but dams blocking the runs may limit their success.

In 2004, Pennypack Creek and the Delaware River at Yardley were added as stocking locations. The habitat in

Pennypack Creek appears to be suitable for hickory shad compared to other locations along the East Coast where they still occur. There are three dams in the lower reaches of Pennypack Creek that are impediments to fish movement. Commission staff is working cooperatively with dam owners along both Pennypack and Ridley creeks to improve fish passage opportunities.

These streams are located in urban settings with their typical water quality challenges, so it remains to be seen how successful these stockings may be. However, there is reason for optimism. The Delaware River may offer the best opportunity for restoring a run. Greater numbers of fry stocked there would certainly increase the chances of success for this effort. However, at this point, the hickory shad effort is secondary to the American shad stocking and restoration goals. Thus, hatchery space and time limitations may necessitate a limited stocking effort.

## The future

Hickory shad typically return to the waters of their birth to spawn in their third year, although returning at age two has been observed. Therefore, the first fish returning from the 2002 stocking

could have returned to Ridley Creek as early as the spring of 2004, although none was reported. The first stocked hickories would not be expected to arrive at Pennypack Creek or the lower Delaware River until 2006 or later.

In May 2004, an angler contacted the Commission and reported catching hickory shad in the lower Schuylkill River. Commission and Philadelphia Water Company biologists were able to collect several adult hickory shad and confirm the angler's report, which was the first documented record of hickories in the Schuylkill River in many years. Hickory shad fry stocked by the Commission contain chemical tags that allow them to be identified as hatchery-produced when they are recaptured years later. Six hickory shad collected from the Schuylkill River in May 2004 were analyzed by biologists. Viewing their otoliths under fluorescent light revealed that none of the shad was of hatchery origin. This confirms that wild, non-stocked fish were present in the Schuylkill River in 2004. Hatchery or wild, the documented return of hickory shad to the Schuylkill River is exciting news that makes us optimistic about our chances for success there and in the other rivers.

The Commission and its partners are involved in many efforts to culture, stock and make way for hickory shad runs in Pennsylvania. It's hard to know if the streams we've chosen will ultimately support modern-day shad runs since we don't know exactly what those habitats were like before the runs were cut off many decades ago. Certainly, the surrounding landscapes, habitat and water quality of the streams have undergone significant changes. Some of these efforts may work and some may not. However, we are cautiously optimistic that in a few years this unique fish will become much more common in southeast Pennsylvania, and that eventually, fishable populations will develop. Phones will ring then, emails will be sent, and the Internet will buzz with the message that again the "hicks are in the cricks." ☐