

Where Have All the Shiners Gone?

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In the late 1800s they were “everywhere abundant” and “abundant in tributaries to the Delaware River,” according to reports penned by noted ichthyologists of the day Edward Drinker Cope and Tarleton H. Bean. Through the mid-1900s they were collected at nearly 100 locations in the Delaware River Watershed in southeastern Pennsylvania. In the 1970s it was not unusual for biologists working in Bucks County to collect and release hundreds at a single site. The finny creatures were widely distributed in 13 counties.

Then the bottom fell out. In 1962, Joseph Mihursky, a researcher from Lehigh University studying the fishes of the middle portion of the watershed, noted that if the early reports were true, “this species has undergone a considerable reduction in the study area, for nowhere was it found to be numerous.”

Something had gone wrong! By the mid 1980s, in less than a decade, those thriving Bucks County populations were gone, along with those in most of the rest of the Delaware system. In the 1990s, in spite of concerted efforts to find them, only one individual was captured in the entire Commonwealth outside of Monroe County! Today, only a single known population in Pennsylvania remains.

The victim of this calamity is the bridle shiner (*Notropis bifrenatus*, front cover, top), a diminutive, obscure minnow fond of sluggish current and dense vegetation. Its precipitous decline is unprecedented among Pennsylvania’s non-migratory fish species. None of the state’s other native fishes has plunged in numbers from such abundance to its present rarity, and it may soon be a footnote in Pennsylvania ichthyology.

Surviving with the bridle shiner, and with a status no less precarious, is its lookalike, the ironcolor shiner (*Notropis*

chalybeus, front cover, bottom). This minnow was always rare in Pennsylvania, having been collected from only a handful of sites. It was thought to be extinct in the state until its “rediscovery” in the Brodhead Creek Watershed in 1995.

These handsome shiners are two of Pennsylvania’s smallest fishes, seldom stretching the tape at more than two inches when fully grown. Their subdued yet attractively colored straw and silver bodies are accented by a wide, contrasting black lateral stripe running from snout to tail. Although very similar in appearance, the ironcolor’s stripe continues past the snout and onto the tip of the lower jaw (and even into its mouth), while the bridle’s stripe stops on its nose. Where this stripe encircles the snout it lends a mustached, or “bridled,” appearance to both species. Each scale on the bridle shiner’s back is emphasized with a border of dark pigment, while its cousin’s is not. Both are easily confused with some other Pennsylvania minnows.

Blackline Shiners

Three other closely related species also ply Keystone State waters, and collectively the five are sometimes referred to as the “blackline shiners.” Two, the blackchin shiner (*Notropis heterodon*, Fig. 1) and the blacknose shiner (*N. heterolepis*, Fig. 2), are confined to the Ohio River Watershed. They are also scarce. The blackchin shiner hangs on in two glacial Erie County lakes, and the blacknose has not been found in the state since the 1930s, when it was collected four times in Crawford and Erie counties.

The only blackline shiner that could be considered common in Pennsylvania is the swallowtail shiner (*N. procerne*), which is widely distributed in both the Delaware and Susquehanna River watersheds. It is slightly larger than the

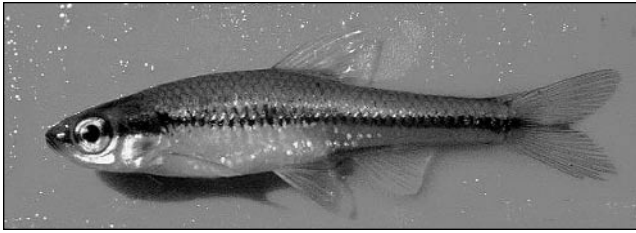


Fig. 1.
Blackchin shiner, *Notropis heterodon*.
Photograph by John Lyons. © Wisconsin DNR.

bridle or ironcolor, sometimes reaching nearly three inches, and is more streamlined. Its black stripe does not usually continue to the tip of its snout, and it ends just before the tail. Then it continues as a black split at the base of that fin.

Bridle and ironcolor shiners are gregarious, slow-swimming fishes. They are most at home in sluggish runs and backwaters of streams, and favored habitat sometimes looks “marshy” or “swampy.” In Pennsylvania they are strongly associated with clear water and dense cover. Submerged beds of aquatic vegetation provide the best security, and large schools frequently move back and forth between these watery jungles and the small openings within them. During colder months, when the “weeds” aren’t growing, the shiners seek refuge among the remains of pickerelweed and other near-shore plants, and they hide in undercut banks and among snarls of exposed roots and downed trees and branches. Because they are slow swimmers and small, easy targets for predators, an abundance of escape cover is essential to their survival.

Breeding

Both shiners spawn between late May and mid-July. The males’ colors intensify during the breeding season, with the lower sides of the bridle shiner changing from silver to light yellow or gold and those of the ironcolor shiner to rosy or orange. They also develop tubercles on the head and some fins. Tubercles are small fleshy or hard protuberances that develop, usually in male fish of several species, during breeding seasons. Tubercles aid in disputes with other males and they stimulate and maintain contact with females during spawning.

Females may drop up to 20 eggs at one time and 2,000 or more during a single season. The eggs drop onto vegetation or the bottom to develop.

Life is short if you’re a small shiner. Some studies have concluded that these two species live only a little over two years in the wild, although they have been held considerably longer in captivity. They are considered adults, and able to

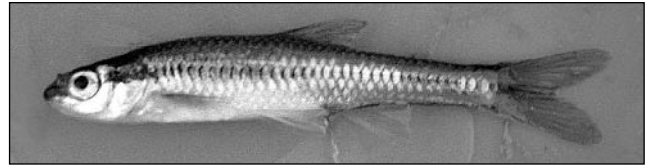


Fig. 2.
Blacknose shiner, *Notropis heterolepis*.
Photograph by John Lyons. © Wisconsin DNR.

spawn, after one year, even though they may be a little more than one inch long.

Range

Although they seem content to co-exist in the same stream in Pennsylvania, the ranges of these two fish outside the state overlap only from southern New York to northern South Carolina. The bridle shiner inhabits the Atlantic Coastal Plain and Piedmont all the way to Maine, with many gaps along the way. It can also be found away from the coast across upstate New York to southern Québec and eastern Ontario. There are old records from the Susquehanna Watershed as far upstream as Lewisburg, but these are believed by some to be misidentifications. The ironcolor shiner sticks to the lowlands in a U-shaped distribution from New York to Florida, and then along the Gulf Coast to Louisiana and up the Mississippi River corridor to the Great Lakes states. The remaining Pennsylvania population represents one of the few incursions this species makes from the flatlands.

Decline

The bridle shiner’s plunge from abundance has been both sudden and puzzling. This trend is not limited to Pennsylvania, but instead seems to be a rangewide phenomenon. The decline was only recently recognized, so little study has been devoted to what may have caused the crash.

Loss of suitable habitat is the most likely culprit. At several historic sites, some of which now appear to be suitable for the bridle shiner, there is evidence of human activity that would have increased siltation and sedimentation, such as reverting pastures and fields, and logged-over woodlands.

Both shiners are sight feeders, and silty and muddy water may have prevented them from feeding efficiently. Silty conditions also tend to reduce the light available to stimulate aquatic plant growth. One researcher described the bridle as a “frail” fish, and it may be much less tolerant of disturbances than other species.

Saving the shiners.

Portions of a 5-mile section of a Monroe County tributary to Brodhead Creek appear to have escaped the changes that occurred throughout the remainder of the region that spelled disaster for many other shiner communities. Even though everything is business as usual for now for these fish, significant changes loom on the horizon.

The last refuge for Pennsylvania's two rarest fishes will soon witness the Marshalls Creek Bypass Project, an effort that will alleviate chronic traffic congestion in and around the village at the intersections of U.S. Route 209, Business Route 209 and State Route 402. Although project designers have selected an alignment they think will have the least affect on this irreplaceable aquatic resource, there is much concern that sediment and silt generated during construction may affect these shiners, both of which are extremely sensitive to muddy waters. It is also feared that post-construction expansion in the area, part of one of the state's most rapidly growing regions, may increase sedimentation and other non-point pollution that would degrade the shiners' habitat.

Because of these concerns, state officials and aquatic scientists are taking no chances. They have designed a project whose goal is to reestablish additional populations of both shiners elsewhere in the Brodhead Creek watershed. This effort is proceeding under the direction of Dr. Jay Stauffer, Jr., Professor of Ichthyology at Penn State University (PSU). Stauffer hopes to establish bridle and ironcolor shiners in at least five new locations, and possibly as many as 10, using the offspring of a small number of shiners taken from the wild. He prefers to preserve Pennsylvania's native genetic stock, instead of using shiners from elsewhere, and is certain that the removal of a small number of fish from the existing population will cause no harm. Furthermore, an amount of shiners equal to or exceeding the number removed for brood stock will be replaced with the hatchery-reared offspring.

The project is off to a good start. Leslie Leckvarcik, a PSU graduate student working on her doctorate degree and serving as the project leader, is encouraged by early successes in producing young shiners. Beginning with a core population of 100 adults of each species, PSU is now holding thousands of bridle and ironcolor shiners, with more on the way. Leckvarcik, Stauffer and additional PSU staff evaluated and selected introduction sites in the spring of 2002 and released the first round of shiners in the summer. A second planting is planned for the summer of 2003. Monitoring will continue for several years to evaluate the success of the project.

The project is funded by the PA Fish & Boat Commission using money directed to the states from the federal Wildlife Conservation and Restoration Program, an initiative designed for high-priority, high-profile conservation projects for species that aren't hunted or fished. Andrew Shiels, Commission Nongame & Endangered Species Unit Leader, counts this recovery effort among his unit's highest priorities.

Other project partners include PennDOT, which is also providing funding for the effort, the USGS Biological Resources Lab in Wellsboro, and the Brodhead Creek Watershed Association.—RC

Doug Nieman, a fisheries scientist who studied the East Branch of Perkiomen Creek in Bucks County when bridle shiners were still common, witnessed their demise in that stream. He noted that "through the early to mid-80s the upper watershed began to develop and the stream began to run 'chocolate' after any kind of decent rainfall," and there is now more sediment "in transit." He also observed that base flows of

some tributaries that had either supported the shiners in the past, or could have acted as refuges during the worst times, have been dropping, and some streams have actually gone dry in recent years.

Yet, some old sites that lost their shiners seem to have been relatively unaffected by man. Both species gradually disappeared from a headwaters swamp in Northampton

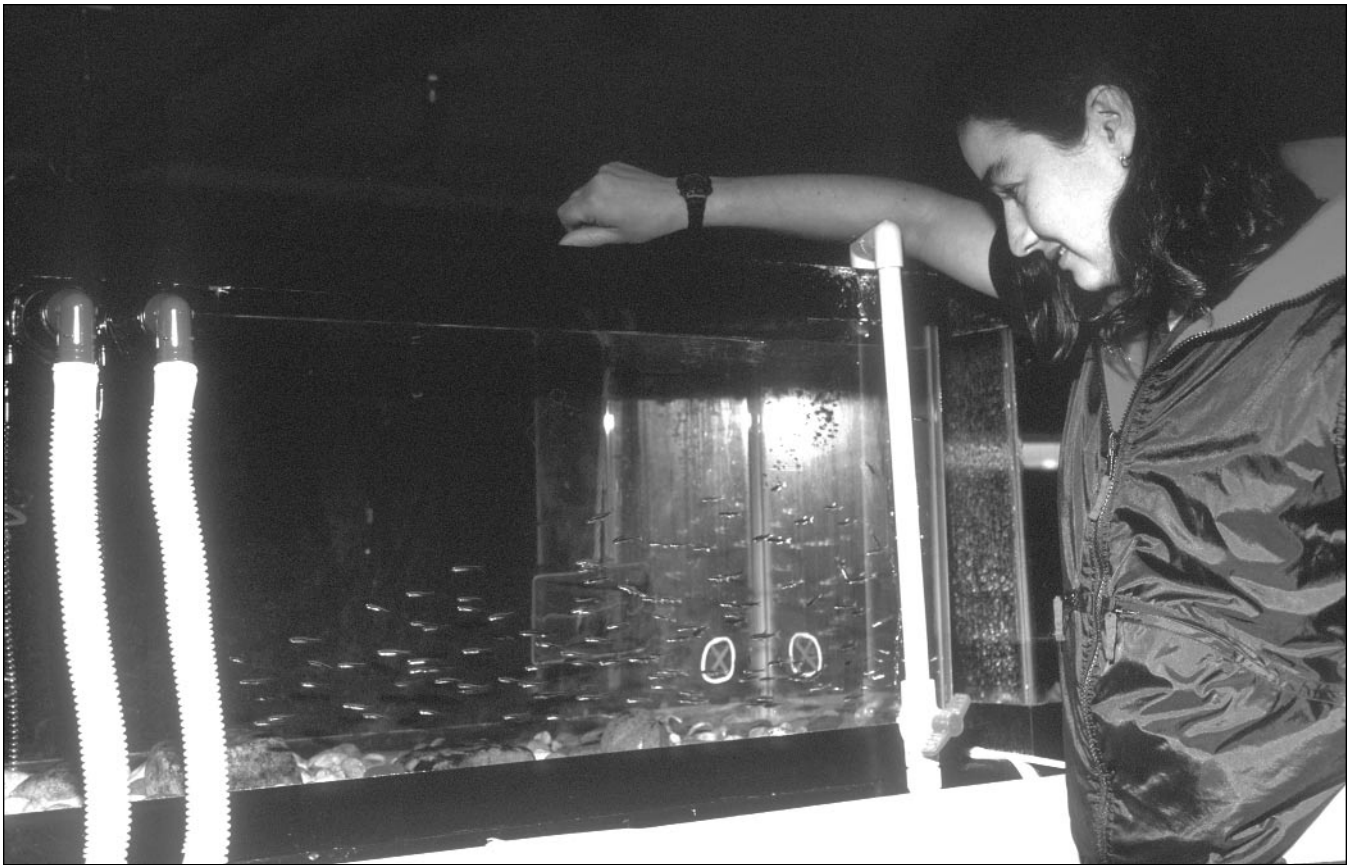


Fig. 3.

Penn State University graduate student Leslie Leckvarcik inspects bridle shiners. She heads the project to breed shiners from wild stock to ensure the species' survival after completion of the Marshalls Creek Bypass Project. Photograph by the author.

County, even though human activity appears to have been limited. The shiners were discovered there in 1916, and were still present during Mihursky's survey in 1960. In 1978 a Penn State University researcher collected a handful of bridle shiners, but no ironcolor shiners, and by 1995 neither could be found.


Some believe the introduction of non-native fishes to the watershed may have hastened the bridle shiner's decline. The green sunfish, a species native to the Ohio River Watershed in Pennsylvania, rapidly expanded its range after introduction into the Delaware system. This voracious invader, implicated in the decline of native minnows in a North Carolina study, has been prevented from entering the Monroe County shiner stream by a waterfall. But the remaining bridle and ironcolor shiners regularly serve as menu items for native pickerel, and have annually weathered trout stockings with no apparent harm, pointing again to habitat as the key factor.

On recognizing their current plight, the PA Fish & Boat Commission officially listed both shiners as "endangered" in 1999. This designation makes it unlawful to catch or possess

these species. But more importantly it ensues that their well-being will be considered when permits are issued for such things as developments, stream crossings and construction projects.

Unfortunately, a highway project looms over the shiners' future. A bypass 3.5 miles in length, currently in the design phase, will be constructed to alleviate traffic congestion around the village of Marshalls Creek, right in the middle of shiner country. Although effort has been made to minimize the project's effect on the stream, there are those who fear the worst.

Even with safeguards in place, it will be difficult to prevent siltation and sedimentation in the shiners' vegetated pools during the construction period. And with improved access, there's little reason to doubt that development similar to that noted by Nieman on the Perkiomen during the 1980s will accelerate in this area as well.

Although Pennsylvania's last known surviving bridle and ironcolor shiners are currently abundant in a 5-mile section of one Monroe County stream, their days in the state could be numbered. 



Top: bridled shiner (*Notropis bifrenatus*) and ironcolor shiner (*N. chalybeus*) are both disappearing from Pennsylvania. Find out why, and what's being done to save them, in the first of several articles to appear in AC by Pennsylvania fish biologist Rob Criswell. Photos by the author.