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Eyeless "Ghost Fish" Haunts Ozark Caves

Brian Handwerk
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"It's almost translucent. It has a whitish look, but really almost no color," said David Hendrix. "It has no eyes whatsoever. It does come across as sort of ghost-like."

The creature of which Hendrix, manager of the United States Fish and Wildlife Service Neosho National Fish Hatchery, in Neosho, Missouri, speaks is no poltergeist. Rather, it's the Ozark cavefish (*Amblyopsis rosae*).

Known as a "ghost fish" to some, the colorless, two-inch-long (five-centimeter-long) blind fish inhabits scattered underground sites in Missouri, Arkansas, and Oklahoma.

One place the fish is found is within a cave pool on the property of Neosho, Missouri's Neosho National Fish Hatchery.

While the bigger business of Neosho lies in rainbow trout and sturgeon, Ozark cavefish were discovered there by chance in 1989. A staffer found them while checking on water quality in one of the four cave-fed springs that supply the hatchery water.

Today the cavefish is listed as endangered by the Missouri Department of Conservation. The United States Fish and Wildlife Service (FWS) lists them as threatened.

"Someday we hope to try to propagate them," Hendrix explained. "But for now, we just protect the population here—and also seek to educate the public."

At the spring pool where the fish live, an underground camera allows the hatchery's nearly 45,000 annual visitors to observe the fish inside their native cave.

Amazing Adaptations

In the sparse environment of the cave ecosystem, life for its inhabitants is lived on the edge. Resources are in short supply. So creatures like the Ozark cavefish must be highly adapted to their unusual environment.

"Because they have evolved in near-total darkness, they have no eyes or need for them," Amy Salveter, a biologist with the FWS in Columbia, Missouri, said of the sightless fish. "They have sensory organs located on the tail fin, in either two or three rows, and also on the head—all over them essentially. They can detect movement and chemical changes in the water and respond to those as an indicator of a food source."

Food choices are slim in the cave environment. Ninety percent of the time, the Ozark cavefish dines on copepods, a type of tiny aquatic invertebrate. But the fish is also known to eat larval salamanders, tiny crayfish, and even other juvenile Ozark cavefish.

The fish are closely associated with colonies of gray bats, another endangered species in Missouri. It is thought guano from the bats feeds the small invertebrates that in turn provide a ready food source to the cavefish.

Food competition may also have led Ozark cavefish to evolve an interesting reproductive strategy. "All evidence so far shows us that when the females lay their eggs they actually put them in their mouths and brood them in their gills," Salveter said.

If so, that would mean females would hold fertilized eggs in their gill chamber for four to five months. While unproven, Salveter notes that the shape of the fish's mouth and the fact that biologists have never been able to locate a "ghost fish" nest in the cave, suggests this to be the case. "We think that their eggs would be gobbled up by something if they didn't basically hide them in the gill chamber," she said.

Early Warning

While some early settlers may have referred to the fish as a ghost fish, it was also generally called a "well watcher."

"Settlers knew intuitively that their well water was safe to drink if those fish were present," Salveter said.

The belief has some truth to it. Because underground cave systems tend to be very stable, their inhabitants are highly adapted to their environment. They do not adjust easily when faced with rapid environmental change.

That role makes it easy to see why such a tiny, reclusive animal can be important even in today's modern society. The Ozarks region is a karst region, a limestone geology of thousands of underground caves, streams and sinkholes.

In much of the area, humans literally live above cave systems that can extend up to 100 miles (160 kilometers) or more. Rain water, pollutants, and other runoff from these aboveground "recharge" areas ultimately end up in the underground water system. It's creating a direct connection to the groundwater source, which happens to be where the Ozark cavefish live.

"It's kind of the canary-in-the-coal-mine thing," said Rick Horton, a fisheries management biologist with the Missouri Department of Conservation. "If the ground water quality gets so that it won't support the cavefish, well, lots of people are dependent on that water for their drinking supply. A pollutant that's affecting the cavefish is going to be affecting you."

This crucial link makes the shaky status of the fish a cause for even greater concern. "The population decline seems to suggest that the underground water supply isn't safe to drink in some places," Amy Salveter noted.

The culprits of diminishing water quality are varied. Chemical pollution can be a problem, but so can nutrient runoff and other products of erosion driven by agricultural operations and development. Ozark cavefish country is a booming region, encompassing growth spots in Missouri, like Springfield and Branson, and Fayetteville, Arkansas.

The majority of known Ozark cavefish sites are on privately owned land, so Horton and his colleagues know that to protect the fish they must reach out to people.

They seek to educate the public about steps to limit soil erosion, maintain vegetation, and keep or establish natural buffer zones near water access points like streams, sinkholes, and cave entrances to help improve water quality. They also ask people not to block or otherwise alter cave mouths and sinkholes.

Horton describes the response as "hit and miss." "A lot of people who have these fish know that they're there, but they are a bit ambivalent," he said. "Some are very protective of them and glad that they've got them. Others, well, anytime that you talk about threatened or endangered species they become a little ill-at-ease."

For Horton, that's when the message of education is most important to the future of this unusual animal. He said when talking to the public "we stress [that] it's your property, and you can do what you want. But if you'd like to help this critter, we can show you some things that you can do that will help."

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