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AFS 2011 Student Writing Contest—Honorable Mention Winner:

Filth, Flows, and Family: Pressures Mount on a Rare Stream Catfish

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Slow, dark creeks cut through the agricultural checkerboard of eastern North Carolina. Bands of tobacco, soybeans, and subdivisions divide the wide-open space—not unlike the light and dark stripes that adorn one of this area's elusive and endemic stream fish, the Carolina madtom. Jordan and Meek first described this stout, 5-inch catfish in 1889, when it was found hiding under rocks in only two North Carolina watersheds. They called it *Noturus furiosus*—furious for its powerful, envenomating sting, and perhaps a description of the first sampling trip. Over the past 120 years, the species has fought water pollution, altered flow, and family—the newly arrived and ravenous flathead catfish, its epigenetic cousin. Though the Carolina madtom is still holed up in parts of North Carolina, recent work has clearly demonstrated the species' contracting range. A rigorous investigation into habitat use and availability would be critical to mapping out a future for this declining species.

Once considered abundant in both the Tar and Neuse watersheds—the entire species range—little hope and only a few isolated individuals remain in the now heavily urbanized Neuse Basin. But the Tar Basin has fared better. Populations can still reliably be found and there is hope that with knowledge and stewardship we can alleviate the pressure on this cryptic, imperiled fish. This all begged the question that initiated my master's work at North Carolina State University: How do you go about protecting a species that you know virtually nothing about, much less a species without commercial importance?

You start from scratch; you find the fish.

This means night snorkeling, underwater snake spotting, and a grin when every one out of a hundred rocks you've nudged reveals this prison-clad catfish standing its ground. For two summers I lived in 3 feet of tannin-stained water, measuring everything I could get my hands on. When I found a Carolina madtom, I noted its position in the stream, the water velocity, and what it used as cover. I also surveyed every square meter of several stream reaches of known habitat, in order to compare what the fish used with what was available. Finally, I deployed small, upside-down clay flowerpot bottoms (quickly known around the office as "madtom condos") to explore the use of artificial cover for these shelter-obligate fish.

In the Tar watershed—the basin with stronger populations—I reliably found these fish, often using my artificial cover design. In fact, they used it almost exclusively; only a few other transient species were ever detected inside. Much to my surprise, however, the Neuse watershed—the more urban basin with fewer madtom populations—contained plenty of excellent physical habitat in places where the fish was no longer

Carolina madtom were commonly sampled using artificial clay cover structures, which they used at a much higher rate than any other stream fish. Photo credit: Steve Midway

found—a veritable ghost town. Clean, cobbled streams—once hotbeds for this cryptic catfish—held no Carolina madtoms and few other fish species.

If the habitat is there and the fish aren't, what happened?

Likely, these biologically scant streams are recovering from a multitude of previous problems. Water quality in these streams has undoubtedly improved, which makes it plausible that flows in previous decades washed over them a lethal solution of urban molecules too powerful for a small fish to handle. Dams also punctuated the riverscape to a greater degree than they do today, and Carolina madtom wouldn't be the first species to suffer from habitat fragmentation as a result of impoundments and disrupted flows. We also know that maps of flathead catfish expansion strongly correlate with Carolina madtom extirpation. These biological vacuums have demonstrated that they eat more in introduced areas, and bite-sized, benthic catfish have shown up in their diet. Hooper could have been talking about flathead catfish in the movie *Jaws*: "What we are dealing with here is a perfect engine, an eating machine. It's really a miracle of evolution. All this machine does is swim and eat and make little [catfish], and that's all."

Some Carolina madtom may have made it through historical water quality problems, and the good news is that there remains plenty of suitable habitat for reexpansion. The bad news is that flathead catfish are here to stay and are spreading like wildfire deeper and deeper into tributaries. We now have the critical habitat information to manage this endemic species, yet it could be too late; the interactive and long-term effects of poor water quality, artificial flows, and a biological bulldozer might be too much to overcome. Or, they could hunker down and put up a fight in hopes that conditions stabilize.

Time to get furious.

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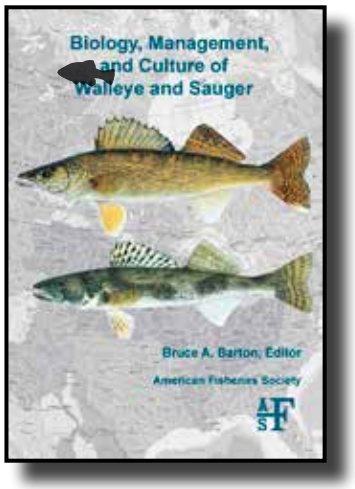
Biology, Management, and Culture of Walleye and Sauger



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This new compendium serves as a single comprehensive source of information on the biology, ecology, management, and culture of walleye and sauger in North America. Early chapters cover *Sander* systematics, including osteological evidence and molecular and population genetics and recent advancements in stock identification. Extensive information is documented on habitat requirements for various life history stages and how these stages can be influenced by environmental perturbations. Other chapters describe environmental biology and feeding energetics, and provide details on walleye and sauger life histories, walleye population and community dynamics in lakes that reflect the influence of lake size, fishing methods, and various management techniques using case histories, and exploitation from recreational, commercial, aboriginal, and mixed fisheries.