

Spawning the Rare Pygmy Madtom, *Noturus stanauli*

J. R. Shute

Conservation Fisheries, Inc., 3709 N. Broadway, Knoxville, TN 37917
noturus@aol.com

For the past several years Conservation Fisheries, Inc. (CFI) has been working to develop techniques to induce spawning in captive madtoms. In the past, we have been successful propagating madtoms from wild collected eggs. While this has worked well for a couple of species in which the situation allowed us to collect wild nests, we could foresee cases in which collecting nests would not be possible. Such a scenario would involve species that are so rare that even if we were able to locate nests, they should not be collected for fear of further endangering the population. This is exactly the case for the pygmy madtom.

Noturus stanauli (Fig. 1) is known from only two widely separated localities in the Clinch and Duck rivers of the Tennessee Drainage. A search of the literature and museum records revealed that only about 25 museum specimens existed, and probably fewer than 50 individuals have ever been collected—despite extensive collection efforts by many fish folks at both known localities and other nearby sites. *Noturus stanauli* is easily one of the rarest fishes in North America.

The pygmy madtom is the smallest member of the genus *Noturus*. Adults are less than 50 mm total length (TL). They are dark brown dorsally and nearly white ventrally. This contrast of dark and light is quite striking. Almost nothing is known of the biology of this rare madtom. Most specimens have been collected over shallow, fine gravel shoals with moderate to swift flow, usually near the stream bank.

For years we have wondered about the possibility of propagating pygmy madtoms. It was clear that the species was too rare to think we would find nests to collect and rear. We have had limited success spawning other madtoms in our hatchery, mostly as a result of injecting hormones. Clearly, madtoms could be spawned in aquaria, but because of the rarity of this fish, and our reluctance to handle them, we

would hope to find a natural trigger to induce spawning in these miniature catfish.

Our chance came this past spring. On 25 March 2000, Dr. Rick Mayden and crew were in our area collecting fish to photograph for his upcoming book on the freshwater fishes of Alabama. The day before we had been out helping them collect snail darters (*Percina tanasi*) in the Holston River. The next day they made a collection in the upper Clinch River. Later that day we got a call from Rick. They had managed to collect two pygmy madtoms! They were aware of our efforts to propagate madtoms and told us that they would turn the specimens over to CFI. (CFI is covered under the necessary federal and state permits to handle these federally protected species.)

We quarantined the two madtoms in a 55-gallon aquarium. One of them was considerably smaller than the other (the smaller was approximately 30 mm and the larger was around 35 mm TL). Since pygmy madtoms are thought to have a short, one-year life span, we hoped that the size difference was a gender difference rather than an age difference.

The aquarium was filtered with a large, air-driven sponge filter. A natural gravel and sand substrate was provided along with flat rocks and other cover items. The fish were fed heavily with live blackworms, *Daphnia*, mosquito larvae, and frozen bloodworms (chironomid larvae). Both individuals adapted well and slowly increased in size.

By early July 2000, the larger specimen was becoming obviously gravid. The smaller one showed no signs of filling out. Also, for the first time since they were placed into the aquarium, they began to spend time under the same cover objects. At this point, we provided more cover, including empty mussel shells and a 6" x 6" unglazed ceramic floor tile. More current was added to the tank, using a small submersible water pump.



Fig. 1. The pygmy madtom is an extremely rare member of the catfish genus *Noturus*. They are known from only two localities in the world, one locality is in the upper Clinch River, and one in the Duck River, both in Tennessee. Fewer than 50 specimens have ever been collected. CFI has recently been able to spawn these rare catfishes in our facility and hope to aid in the recovery of this rare species.

Within a couple of days, the pair (at least we hoped they were a pair!) took up residence under the floor tile. Based on our other aquarium experiences, we had discovered that freshly laid madtom eggs are difficult to handle and are much more likely to develop problems than ones that are several days old. Because of this, we chose to leave the fish undisturbed for about a week in hopes that if they did spawn, the eggs would stand a better chance of survival.

On 11 July 2000, we checked under the floor tile and found the male guarding a small clutch of eggs! The female was under an adjacent rock. The eggs were removed from the custody of the male and transferred to a plastic incubation tray filled with water from the parents' tank. There were 10 live eggs and three empty chorions. The eggs measured approximately 3.8 mm in total diameter. Despite the small size of the pygmy madtom, the eggs are nearly as large as other madtoms with which we've had experience. The eggs appeared to have been laid at least a couple of days earlier, and some showed distinct embryonic development.

After examining and measuring the eggs, we placed them into a hatching platform, dubbed a "madtom egg wagon" by Pat Rakes. The "wagon" was constructed using plastic mesh (3 mm x 4 mm) and PVC tubing (Fig. 2). The platform was constructed to provide water movement all around the eggs, even from below. Water movement was facilitated using a small air stone placed near the eggs.

Over the next few days several of the eggs turned opaque and died. Leaving dead eggs in the clutch invites fungal infection of the good eggs, so these were carefully removed by

pipette, or by inserting the needle from a syringe into the egg and removing the contents. We were careful not to damage adjacent eggs.

The first egg hatched on 18 July; by the next day the rest had hatched. At this point, we were down to four larvae. It was not clear if development was progressing normally in the eggs that died, or if they were even fertile. Our reluctance to disturb the developing eggs prevented us from close observation.

Over the next couple of days, the baby madtoms looked great. Because the larvae have large yolk sacs (as all madtoms do), feeding was not necessary until the larvae began actively swimming (Fig. 3).

By 24 July, one of the four larvae had died. This was right at the stage where the larvae were beginning their

Fig. 2.
Pygmy madtom
eggs in the
"madtom egg wagon."

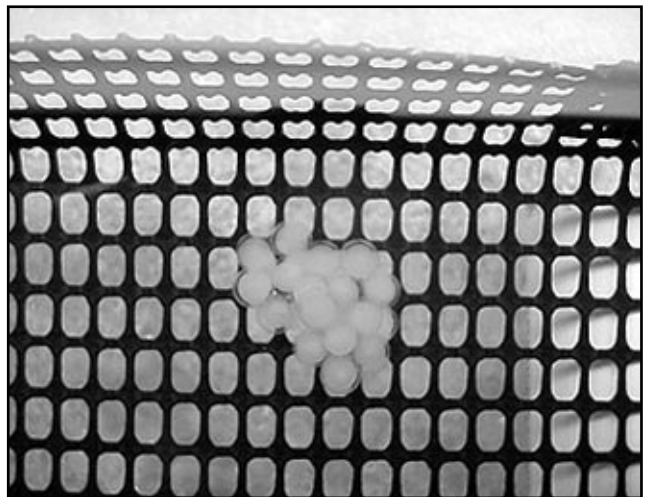




Fig. 3.

Young pygmy madtoms in an incubation tray.

The “blobs” on the underside of these fishes are yolk sacs.

The madtoms will live off of the food stored in these yolk sacs until they are large enough to eat food on their own.

transition from reliance on their yolk to feeding on their own. The remaining three looked fine and were now accepting newly hatched *Artemia* nauplii.

On 29 July, a second nest was discovered, being guarded by the male pygmy madtom. We had noticed the female still appeared to be somewhat gravid after the first spawn and were hopeful that a second spawn was possible. This nest was somewhat larger than the first, consisting of 19 eggs. At the

time we discovered the nest, these eggs were probably at about the same stage of development as the first clutch.

The second clutch of eggs was treated much the same as the first clutch. Again, there were some egg losses over the next couple of days, but this time we managed to bring 10 eggs to hatching! The first eggs hatched on 8 Aug., 10 days after collection. The spawning adults and incubated eggs were held at approximately 73°F. At this point, the babies from the first spawn measured 18 mm TL.

As the young madtoms grew, they were put together in a single 20-gallon aquarium which is part of a much larger aquarium system, and that is where we currently keep them. The young madtoms have adapted well to chopped, live blackworms. While the madtoms are rarely seen out from under cover, they do tend to be most active shortly after the lights go out in the early evening. For this reason, we believe that pygmy madtoms may be crepuscular.

At the time of this writing, all 13 madtoms are doing great. They now measure 35 mm TL, which is as large, or larger, than the adults we received from the Clinch River in March. In October, one of the parents died (it’s not clear which one at this point). The remaining adult still looks good and is probably the oldest living pygmy madtom in the world!

Our experience here opens up the possibility for reintroduction work with this and other rare madtoms. Already, we are able to look at several big river sites and hope that some day they might serve as potential homes to this rare fish that almost certainly inhabited much of the upper Tennessee River in the past. 🐟

The North American Native Fish Keeper’s Bookshelf

Two Recently Published Titles

Fish enthusiasts from the Keystone State may enjoy **Pennsylvania Fishes** by Linda Steiner (2000, \$9.43, Pennsylvania Fish & Boat Commission, 170 p., softcover). This attractive and inexpensive book doesn’t cover all of Pennsylvania’s 140 fishes (137 species and three hybrids), but it does provide a concise and excellent overview of the most popular or commonly encountered ones. A list of all Pennsylvania species by watershed, along with their conservation status, should help collectors. References to angling are made throughout; no mention is made of aquarium care.

Catfish 2000: Proceedings of the International Ictalurid Symposium, edited by Elise R. Irwin, Wayne A. Hubert, Charles F. Rabeni, Harold L. Schramm, Jr., and Thomas Coon (1999, \$54, American Fisheries

Society, 516 p., hardcover), is the published version of a symposium held in Davenport, Iowa, in June 1998. Most of the 47 papers deal with either the biology of larger ictalurid catfishes (blue, channel, flathead) or fisheries management issues (e.g., sampling methods, stocking rates, angler surveys). However, two papers, both authored by Brooks M. Burr and Joseph N. Stoeckel, are required reading for any aquarist who is seriously working with catfishes, particularly madtoms. The first paper provides as thorough a summary as you’re ever going to get on the natural history of the 25 described species of *Noturus*. The second paper reviews the reproductive traits and captive spawning methods of 16 ictalurid species, including nine madtoms (but not the pygmy madtom, as recently reported above). *Christopher Scharpf*