Collecting, Spawning, and Raising the Orangefin Darter, *Etheostoma bellum*

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by

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The orangefin is a stout little riffle dweller found only in the Barren and Green River drainages of south central Kentucky and north central Tennessee. It is one of four fishes native to the region which make a very attractive habitat group in a riffle tank. The other three are: splendid darter (*Etheostoma barrense*), teardrop darter (*E. barbouri*) and blackfin sucker (*Moxostoma atripinne*). All of these fishes are protected in Tennessee, which is why we collected in nearby Kentucky.

As the name implies, in the male orangefin darter all the fins are orange (Fig. 1). The dorsal, caudal, and anal fins are bordered by a thin black line over a thin cream line—much like the bluebreast darter (*E. camurum*), of which this species was once considered a local race. Both sexes feature a prominent dark sub-orbital bar and about ten dark pinstripes on each flank (typical of many darters in the subgenus *Nothonotus*). The pinstripes are overlain by several indistinct vertical bars of which the first is much darker, giving the orangefin somewhat the appearance of the yoke darter (*E. juliae*), a *Nothonotus* from the Ozark region. The female is basically brownish with darker bars and clear fins. The males retain their bright colors year-round. Plate 44 in the Peterson *Field Guide to Freshwater Fishes North of Mexico* provides a good illustration to use for identifying them.

Unlike the bluebreast darter and most other members of the *Nothonotus* subgenus, the orangefin occurs in small streams. In fact, we collected ours in the company of many orangethroat darters (*E. spectabile*).

I obtained all my specimens of the orangefin darter—five males and eight females—on May 17, 1997, from a single riffle in Line Creek, Monroe County, Kentucky, a tributary of the Barren River. The riffle was about 12 feet wide by about 100 feet long, by about 18 inches deep, with typical yellowish chert gravel and slab rocks found throughout the Highland Rim zone of Tennessee and Kentucky. NANFA member Ray Wolff and I also found numerous other species at this location:

- greenside darter, *Etheostoma blennoides*
- banded darter, *Etheostoma zonale*
- rainbow darter, *Etheostoma caeruleum*
- orangethroat darter, *Etheostoma spectabile*
- splendid darter, *Etheostoma barrenense*
- fantail darter, *Etheostoma flabellare*
- logperch, *Percina caprodes*
- banded sculpin, *Cottus carolinae*
- northern hog sucker, *Hypentelium nigricans*

Nearby pools contained:

- northern studfish, *Fundulus catenatus*
- rosefin shiner, *Lythurus ardens*
- spotfin shiner, *Cyprinella spiloptera*
- steelcolor shiner, *Cyprinella whiplei* (one stray)
- green sunfish, *Lepomis cyanellus*
- longear sunfish, *Lepomis megalotis*

Ray and I had hoped to take the other two Baffen River natives: the teardrop darter and blackfin sucker. But due to lack of time, we were only able to sample two sites on Line Creek before leaving for the Red River drainage.

Upon returning to Upper Michigan (where there are only seven species of darters within 100 miles) I placed most of my Line Creek (Kentucky) fishes into one of my 40-gallon long riffle tanks. I had previously set this tank up with yellowish rocks and gravel in an approximation of the picture of Little Salt Lick Creek on page eight of
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The Fishes of Tennessee. We've got a lot of glacial till where I live, so I can often find local rocks of about the right color for my regional habitat tanks. I have a pretty mellow community of the following fishes:

• orangefin darter	5 each (2 male, 3 female)
• splendid darter	5 each (3 male, 2 female)
• spotfin shiner	5 each
• northern hog sucker	1 each (I'd have preferred 3 each at about 3")

I was concerned that the orangefin darter might be aggressive towards the other, smaller species, but this proved not to be a problem in a 40-gallon long tank. I placed several pairs of each species of darter in a 50-gallon tank in the basement as spares and then went on to other projects, thinking I had plenty of specimens and no need to worry about breeding a new generation until after the usual wintering period in November and December. *Wrong!* After a couple of weeks fluttering up and down with their partners, looking like pairs of grasshoppers spawning vertically on the sponge prefilter of their Whisper 4 power filter, the male splendid darters all went into a rapid decline, with the last one dead by June 27. Ironically, this left me with all the females fat, happy, and looking great in the same tank. Fearing a similar disaster with my orangefins I quickly set up my four-jug brine shrimp hatchery (see *American Currents*, Summer 1998, pp. 17-18) and a 20-gallon long spawning tank on the bedroom dresser (Fig. 2).

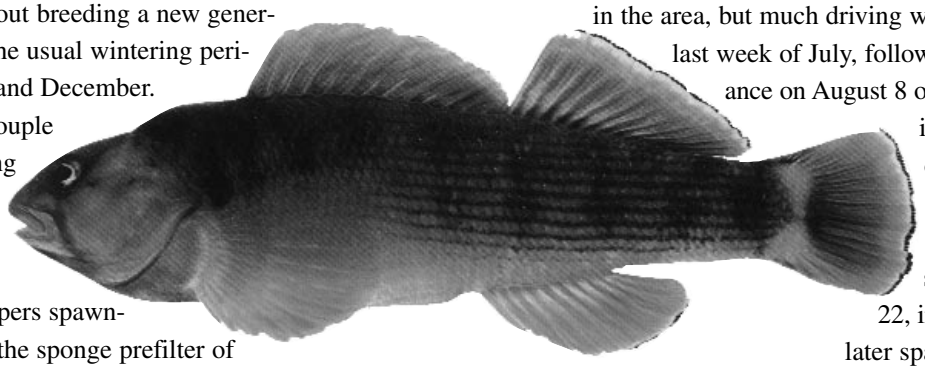

Fig. 1. *Etheostoma bellum*, orangefin darter, male, 70 mm SL, Barren River system, Tennessee. Photo by Richard T. Bryant; used with permission.

For the latter, I used the same equipment that I use for all my riffle tanks: a Whisper power filter modified so that the water outflow is reduced to the left quarter of the filter outflow, to generate current, as described in my article "Setting up a Riffle Tank," which appeared in the Summer 1997 issue of *American Currents*. For spawning attempts, I use a Tetra Super Brilliant™ sponge filter over the intake strainer, to exclude fry.

The orangefin is a gravel spawner, but I included two caves in the tank decor because a safe retreat helps build confidence in fish that have recently been netted out and moved to the spawning tank. For this, the substrate was 2-1/2" medium gravel. Using gravel that's too small will prevent the fry from wriggling their way to the surface. No one would mistake the current velocity provided by the modified filter for a real riffle, but the minnows face into it and the darters spawn in it.

In hopes that the constant, somewhat lower temperature and constant 12 hour photoperiod in the basement tank had kept the orangefins from losing their spawning hormones, I transferred one male and three females to the bedroom tank on July 12, 1997. With about a seven degree increase in water temperature (to 75°F) and a four hour increase in day length to jump start their flagging desires, they soon commenced the hoped for driving behaviors. I included three females in hopes of spreading the stress around so that no single female would be severely damaged. The breeders' activities were somewhat inhibited by traffic in the area, but much driving was observed in the last week of July, followed by the appearance on August 8 of 12 fry swimming in the upper third of the tank. I then removed the adults. Another 15 fry swam up on August 22, indicating a second, later spawning before the adults were removed. The fry were very small, but I didn't have too much trouble getting them to eat brine shrimp nauplii served *immediately* after hatching. For the first three weeks, I started a new culture with hot water every six hours, monitored hatching with a shot glass, and served the nauplii when 50 percent were fully hatched, so the fry could get them when the legs were not fully deployed. It's also possible that the shells of the newly hatched nauplii harden after hatching, so newly hatched nauplii may be easier for the fry to consume. The fact that I was using cysts from the Great Salt Lake strain of brine may have helped as well, since I've read that they are slightly smaller at hatching than the San Francisco strain.

Nevertheless, it was very hard to tell if the fry were eating them for the first two weeks. Several of the fry developed a cottony whiteness on the mouth similar to that described by Ray Katula in his *American Currents* article on this species (July-Aug-Sep-Oct 1988). Having been forewarned, I had on hand a Jungle Labs product called "Small Fish Saver," intended to treat *Saprolegnia* fungus. This item cleared the whiteness right up.

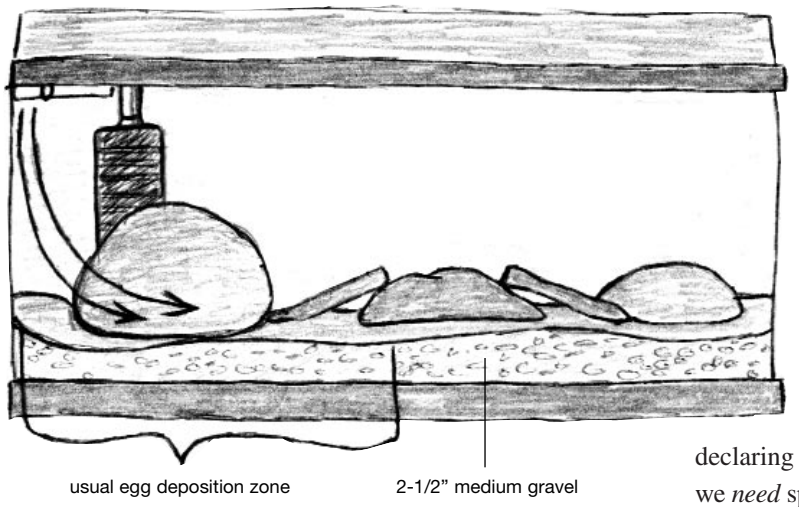

Fig. 2. 20-gallon long riffle tank set-up for spawning the orangefin darter. Illustration by Clifford Zoller.

One major problem I encountered with this species was fry mortality resulting from stress after water changes. This can be avoided by vacuuming only half of the tank substrate with each water change so you only have to chase them one way. After completing the 50 percent water change (with water of the same temperature and pH), give the fry about five minutes of normal water flow to regain their bearings, then *turn off the lights until the next morning*. After I adopted this system I never lost another fish to water change stress.

Another stress-related factor to remember is that if you net baby darters out of a tank before they're about one inch long they are very likely to *all* stress out and die in their new tank. I usually dedicate a 20-gallon long tank to each species for at least six months after hatching.

As is typical of darters in the subgenus *Nothonotus*, the fry of the orangefin swim pelagically in the upper half of the tank for three to four weeks before they go benthic. Be forewarned, though, that the fry seem to disappear two or three times before they go fully benthic. If your fry seem to have died out but you can't find the bodies, keep feeding anyway, as they might still be in there. (This applies to *Fundulus* topminnows as well.)

I had some trouble with slow growth at 66°F, but got much better growth after I raised the water temperature to 75°F. When they reached a length of about one inch, I was able to wean the young off nauplii and start them on frozen adult brine shrimp. This process was aided by the fact that I had taught them to associate my tapping on the glass with the arrival of food. When the fish reached a length of about one-and-a-half inches, I was able to feed them San Francisco Bay brand frozen bloodworms. Using a single-edged razor blade, I chop half-inch-wide by one-inch-long squares of frozen bloodworms into half-inch cubes by making three vertical slices along the side and one horizontal slice along the length of the cube.

In the interest of genetic diversity, I spawned a second lot, using different breeders, in the spring of 1998. I employed my normal wintering method of reducing day length to about six hours of light per day for the months of November-December and temperatures of 45-50°F and then declaring spring on January 1. (Here in Upper Michigan we *need* spring in January!) I let the temperature rise slowly to about 70°F and increase the light by three hours per day, each week, until reaching a day length of 16 hours.

Generally speaking, all darter species I've kept on this schedule color up and start spawning by the end of February. The orangefins did, and because of the lessons I learned, I've now got more than 50 young, with no visible losses (so far, knock on wood). Regarding the water values, Line Creek (Kentucky) has a pH of 7.2 and a hardness of 150 ppm, and Marquette, Michigan has a pH of 7.0 and a hardness 45 ppm. In addition to the frozen brine shrimp and frozen blood worms, I also feed them Wardley's shrimp pellets.

A Note on Collecting the Orangefin Darter You can't miss the males—they have the orange fins! The females are brown and somewhat barred and have two large cream colored spots at the base of the caudal fin (they resemble female red line darters, *E. rufilineatum*, which, luckily, don't occur in the Barren River drainage).

Another Note on Collecting I like to bring along my copy of *The Fishes of Tennessee* and copies of the state protected list, so that if I encounter a conservation officer I can positively identify my specimens for him or her and show that they're not listed. Beats spending the day at headquarters while they look for someone who knows the darters.

References

Etnier, D.A. and W.C. Starnes. 1993. *The Fishes of Tennessee*. University of Tennessee Press, Knoxville. 681 pp.

Katula, R. 1988. "The Orangefin Darter." *American Currents*. July-Aug.-Sept.-Oct., 18-20.