Back Into Saddleds: A Review of the Saddled Darters of North America

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The saddled darters of North America represent one of the most (in my opinion, *the* most) colorful group of fishes in North America and, arguably, the world. In the aquarium, saddled darters can be hardy and long-lived if provided with a few special conditions. Their colors make the slightly extra work it takes to meet these conditions well worth the effort.

Diversity and Classification

Saddled darters are members of the genus and subgenus *Etheostoma*, which is in the family Percidae (perches and darters). Depending upon which account one follows, the subgenus *Etheostoma* contains 14-16 species (Page, 1981; Etnier and Starnes, 1993; Kuehne and Barbour, 1983). These species can be divided by general characteristics into four groups: (1) the saddled group (the subject of this article), which contains five species distributed throughout much of eastern North America, the Ozarks of Missouri and Arkansas, and the upper Ohio River basin: Arkansas Saddled Darter, *E. euzonum*, Kanawha Darter, *E. kanawhae*, Candy Darter, *E. osburni*, Missouri Saddled Darter, *E. tetrazonum*, and Variegate Darter, *E. variatum*; (2) a two-species group consisting of the presumably extinct Maryland Darter, *E. sellare*,[1] and Blenny Darter, *E. blennius* (the latter with two subspecies); (3) the greenside group with 3-5 species (depending on which scientist you go with); and (4) the seagreen group, which contains three species endemic to the lower Appalachian region of eastern Tennessee, the western Carolinas, and some areas of northern Georgia.

The saddled darter group is very distinctive, particularly in color and may constitute its own subgenus (L. M. Page, pers comm.). A similar subgenus, *Litocara*, contains the colorful Niangua Darter, *E. nianguae*, and Arrow Darter, *E. sagitta*. Coloration is remarkably similar, but *Litocara* differs from saddled darters in tending to be more slender with a much more prominent snout. Also, dorsal saddles in *Litocara* are less pronounced.[2]

Distinguishing Characters, Habitat and Diet

Saddled darters may be characterized by the following: a cylindrical body, broad blunt head, large pectoral fins, green and red coloration on adult males, and a complete lateral line. Females often display subtle green and red colors not usually found on females among other darter species. Both sexes exhibit tubercles when spawning. As suggested by the group's vernacular name, saddled darters possess 4-6 distinct dorsal saddles which, when viewed from above, allows them to cryptically blend into the cobblestone habitat they frequent.

Based on personal observations, communications with fellow collectors and the literature I've read, saddled darters strongly prefer fast flowing riffles of medium to large streams. Riffles containing numerous rocks and cobblestones and few aquatic plants (aside from moss-covered rocks) are the most frequented habitat.

[1] Baily and Etnier (1988) placed the Maryland Darter within its own enigmatic group due to its distinctive morphology.

[2] Saddled darters should not be confused with the Saddleback Darter, *Percina ouachitae*, which is in a different genus and is not referenced here except to state that it is a drab species whose range overlaps slightly with the Arkansas Saddled Darter, *Etheostoma euzonum*, in extreme southeastern Missouri and northeastern Arkansas.

In the wild, their diet consist of mayflies, caddisflies, midges and mites.

Collecting and Transporting

Collecting saddled darters can be strenuous work and somewhat unsafe; collecting should therefore be done with care and, whenever possible, with a partner. Collecting in swift currents means sure footing is a must. If in doubt, don't do it. A life vest is always a good idea when collecting.

Minnow traps securely positioned can catch a few swiftwater darters, but it's a slow way to catch them and you won't catch many. If you reside outside of saddled darter range, seining or dipnetting will likely be more productive. The best method of capturing specimens (after legal prerequisites are met) is with a 4-8' seine. Please note, though, that in fast current bigger is not better since the current's drag on the net can make a large seine obsolete even when two or more people are holding it.

You can seine for saddled darters by yourself. Firmly plant the poles of the seine into the rocky substrate just downstream of yourself. (Some collectors like to cross the tops of the poles together, which tends to make the net easier to lift.) With the poles planted it's time to do the "riffle shuffle." Gently shuffle or kick the substrate and rocks with your feet and then pull the bottom of the net up towards yourself and up and out of the water. With luck, you will have dislodged some specimens from the rocks into your net.

Having one or two seining partners works better. With two collectors working the seine, plant your respective poles into the substrate. Position yourselves upstream and somewhat inside the flow of water into the seine. Do the riffle shuffle then pull up the seine in unison.

If you're lucky enough to have a third person, then two of you should hold the poles while the third person stands just upstream of the seine. All three of you should do the riffle shuffle, with the third person shuffling towards the seine.

Dipnetting requires a large, high-quality dipnet. The ideal net has a flat front edge, a very deep sock, and a sturdy handle. (Most of the larger dipnets that are sold often have thin aluminum handles that will not last long in strong, fast current.) Plant the dipnet firmly into the substrate downstream of yourself, kick the rocks in front of the opening, and lift. Be careful not to kick too many rocks into the dipnet (or into the seine) or else you may crush your quarry.

Collecting saddled darters at night may be more productive than collecting during the day. Once again, think safety first. Collecting at night means you likely won't see obstructions or deep holes. It's a good idea to scout the layout of your collecting area ahead of time during the day and, whenever possible, to bring a fellow collector along.

Transport your catch in as cool and lightly packed conditions as possible. As riffle inhabitants, saddled darters require plenty of oxygen. Compared to other darters, they transport well if it's done right. They also handle shipping fairly well.

Aquarium Set-Up

Aquarium set-up should be typical of what you might set up for most darters from fast-flowing riffles. One way to simulate a riffle is to use powerheads. Point one up towards the water's surface. Point another low so that it flows just over the rocks. Airstones are useful in providing additional aeration but are not necessary. The substrate can be gravel (especially if you're using undergravel filtration). Adding rocks and hiding places will help the darters feel more comfortable in their surroundings.

A few dither fish will help bring extremely shy darters out of hiding. Two good dither fishes are Longnose Dace, *Rhinichthys cataractae*, and Blacknose Dace, *R. atratulus*. These are active fishes that will share the swift currents saddled darters prefer and help clean up any leftovers the darters miss in feeding. Saddled darters eat most live or frozen foods (brine shrimp, bloodworms, glassworms). Blackworms and white worms are relished as well. Saddled darters do not accept dried foods, or at least not any that I have tried.

Summertime temperatures into the upper 70s will be tolerated, but at upper temperature extremes crowding and clean water parameters are paramount. A refrigeration unit is not necessary unless you expect extremely high temperatures. Considering that most people rely on air conditioning when the weather gets hot, saddled darters should acclimate to most homes well.

Under these conditions, I've routinely kept *E. variatum* alive for six years at a time. (Longevity in the wild is 3-4 years.) Other saddled darter species also show good longevity within their domestic domains.

Candy Darter, *Etheostoma osburni* (Hubbs & Trautman 1932)

Larry Page and Brooks Burr, who authored the Peterson *Field Guide to Freshwater Fishes of North America*, wrote that the male *E. osburni* is likely the most vivid of any North

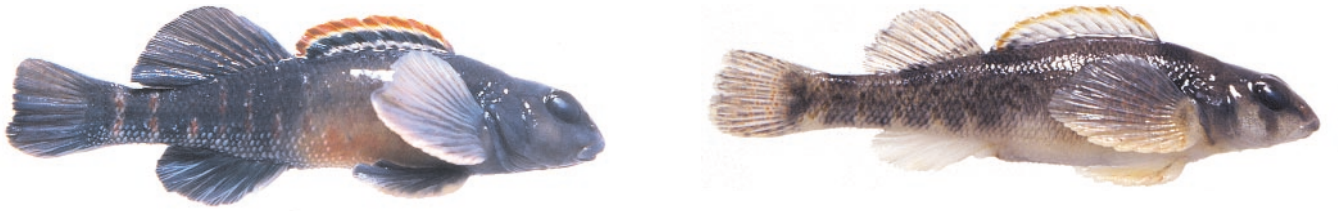

Fig. 1.
Variegate Darter, *Etheostoma variatum*. Left: male, 77 mm SL. Right: female, 60 mm SL.
Both collected from Red Bird Creek, Clay Co., KY, 22 March 1978. Photographs by Lawrence M. Page.

Fig. 2.
Missouri Saddled Darter, *Etheostoma tetrazonum*. Left: male, 55 mm SL. Right: female, 48 mm SL.
Both collected from Mills Creek, Laclede Co., MO, 24 April 1978. Photographs by Lawrence M. Page.

Fig. 3.
Arkansas Saddled Darter, *Etheostoma euzonum*. Left: male, 80 mm SL, South Fork Little Red River, Van Buren Co., AR, 29 May 1983.
Right: female, 62 mm SL, Current River, Randolph Co., AR, 17 Aug. 1979. Photographs by Lawrence M. Page.

American fish. I concur and further consider it to be the most colorful fish in the world (a point of considerable conjecture but obviously a spectacular fish). Page and Burr (1991) refer to *E. osburni* as Finescaled Saddled Darter, but the name was changed to Candy Darter, a name more befitting its beauty.

E. osburni is the most delicate member of the saddled darter group. It occupies trout streams whereas other saddled darters occur in streams only rarely when trout are present. It is more slender then most other saddled darters, reaching a size of about four inches. Adults display about 10 bright orange vertical bands along the body interspaced with evergreen shades. Cheeks are bright red. Red and green horizontal bands adorn the dorsal fins. Pectoral and anal fins also display red and/or green banding. Females show similar but subdued colorations with red being particularly less evident.

The range of *E. osburni* is limited to the New River in Virginia and West Virginia. I bred this species in the late 1980s (Katula, 1991), but never reared any fry. In late spring 1999, NANFA member Patrick Johnson was gracious enough to send me about half a dozen specimens (albeit the three females were evidently spent when I received them that late in the year). One especially colorful male was old and looked famished, although I did fatten him up and managed to keep him going for one more year. Two other males were robust and healthy.

After a year of waiting, I finally had another opportunity in the spring of 2000 to spawn this beautiful fish. I set up a 26-gallon aquarium with regular gravel substrate atop an undergravel filter and a powerhead mounted atop the uplift tube providing vigorous current. The old buck and the better of the two remaining males were introduced with the conditioned females for potential spawning. Fish were conditioned on live glassworms and white worms.

On 11 April, during a routine gravel siphoning, I discovered about 60 eggs buried in the gravel. I moved the eggs to a 30-gallon nursery aquarium and moved the males to another tank to help the females condition for more spawning. (I often move males during the spawning process since females, which may not get the respite they can get in nature, often take a beating within the confines of an aquarium.

Moving the males also seems to help in the egg count as well.) Water temperature was 55°F.

After the females returned to spawning condition, I added just the old buck male to their tank since he sported the brightest colors. He attempted to spawn with the females and I caught some of it on film. Problem was, his age may have rendered him sterile; even though he went through all the proper motions, the eggs were apparently not fertilized and turned white. I added another male who helped produce more young until mid-May when the females were apparently spent for the year.

On 17 April, the initial ova began hatching. The fry swam pelagically (common amongst primitive darter groups) and began eating newly hatched brine shrimp nauplii on 21 April. Over the course of 18 days the aquarium temperature gradually rose to 68°F and the 40 fry still were consuming brine shrimp twice a day. After a month the fry were still swimming midwater and would not assume a benthic swimming behavior typical of adults until 13 June, 54 days later (behavior that's typical of other saddled darter species fry). In six months the darters were 1-1/2" long and began sporting some of the green and red that would not fully develop for another three months.

Variegate Darter, *Etheostoma variatum* Kirtland 1840

As indicated by its name, *E. variatum* is extremely varied in coloration within its range and even within individuals of the same population. It inhabits the widest range among saddled darters. Endemic to the large Ohio River system of the eastern United States, they range from southwestern New York to eastern Virginia, west to eastern Kentucky and north to southern Indiana. *E. variatum* occupy small- to medium-sized rivers with rubble and/or gravel substrates. Due to siltation, pollution and, likely, dams, *E. variatum* has been eliminated from portions of its range. It is reported to be relatively common in areas where it persists.

Due to its broad range, the Variegate Darter is one of the better-studied darters. Trautman (1981) noted that it moves downstream into riffles with reduced current for the winter and then returns to swifter riffles in the spring. May (1969) noted that fin-marked specimens moved up to 5 km from their original location from summer to winter; 40% of his marked population stayed on the riffle until the temperature reached 2°C, when specimens moved immediately below the riffle to overwintering habitat, deep riffles and pools. May also observed the return of specimens to these riffles in spring. Males arrived first with the females following a month later for the start of spawning.

May also saw how *E. variatum* are aggressive towards the Rainbow Darter, *E. caeruleum*. I've seen the same aggression in the aquarium. *E. variatum* will push *E. caeruleum* and other darter species from the best hiding spots in the aquarium. Other than that, they get along with other darters fairly well and coexist nicely in the aquarium.

E. variatum is attractive with green or blue being its most conspicuous colors. As mentioned above, the species can be extremely variable in pattern. Green is usually its dominant color. Sometimes it's blue. And sometimes green turns to blue when spawning commences. The green/blue is interspaced with thin vertical bands or spots of red or red-orange. A large area on the breast also is red. The first dorsal fin exhibits a bright red-orange exterior band, a median blue or green band, and an interior band that's blue or black. Females show a similar but subdued coloration, with yellow often appearing in areas that are red in males. Like males, females also have a fair amount of green coloration. *E. variatum* reaches 4.5 inches.

E. variatum is the hardiest saddled darter in the aquarium. Breeding it is relatively easy. In 1999, I carefully documented their spawning and how I reared the fry. On 9 April, I set up a 30-gallon breeding aquarium. I used a fine gravel substrate, numerous rocks, and a powerhead to provide a strong warmwater current. On the same day I introduced two females and one male to the spawning tank. The temperature of the water was 57°F. On 17 April, I removed 58 viable eggs and 12 fungused eggs from the gravel. I placed the viable eggs into a 30-gallon nursery aquarium and switched out the males in the breeding tank. Eggs were "eyed up" and apparently had been deposited for quite some time. The eggs hatched shortly after removal from the breeding tank since I saw free-swimming fry on 20 April. Nursery water was 60°F.

On 25 April, I observed spawning activity. Females selected the spawning site, usually a spot with fast-moving water devoid of rocks. When the female was ready she buried herself within the gravel and waited for the male to mount her in a head-to-head formation. The pair vibrated and then paused. During these pauses the male sometimes remounted the female and the pair spawned again. At other times the female swam away and another female would commence spawning. Sometimes spawning would cease altogether for long periods of time. On 27 April, I collected 125 viable eggs and placed them into the nursery aquarium. Breeding temperature was 58°F. The females appeared to be spent.

Fry hatched on 20 April and began feeding on newly hatched brine shrimp (although it could have been much sooner since I offered food two days after I saw the first free-swimming fry). On 8 June, the fry began assuming the benthic swimming pattern of adults. The fry mature in two years and males of aquarium-reared stock are indeed extremely colorful.

Missouri Saddled Darter, *Etheostoma tetrazonum* (Hubbs & Black 1940)

E. tetrazonum likely rates as the second-most colorful of the saddled darters (although some males could possibly compete in terms of color with *E. osburni* males). Some speculation had existed that *E. variatum* and *E. tetrazonum* are the same species, though it now appears that the two are different, with *E. variatum* occurring east of the Mississippi River and *E. tetrazonum* to the west. *E. tetrazonum* is unique to the state of Missouri, where it's located within the Meramac, Gasconade, Osage, Moreau River systems in the Ozark regions of the state. It's found in medium to large rivers in large gravel or stony riffles where the current is particularly fast moving. It is generally quite common where it occurs.

E. tetrazonum males are a vivid yellow-green to emerald-green on their sides, interspaced with vertical stripes of orange to reddish-orange. Sometimes these reddish stripes break up into spots or blotching. The belly is red, the breast is blue, and the anal fin is mostly blue or green. The first dorsal fin has an exterior band of red, a green median band, and the base is black or dusky. Other fins possess rows of faint red dots. As in *E. variatum*, much of the male's green can turn blue during spawning. Pectoral fins can also turn golden-yellow during spawning. Females are subdued with few colors and sometimes a few faint colors in the dorsal fin. The species reaches a length of 3.5 inches.

I've worked with *E. tetrazonum* numerous times during the mid-1980s. They start to spawn any time from late March to mid May. Spawning set-ups were similar to those described above. Breeders were conditioned with live brine shrimp, blackworms, glassworms and white worms. It appears that females are much smaller than males, which is atypical of the saddled darter group. The females also appear to be more vulnerable to the physical degradation that comes with spawning season and the roughness of the males.

Spawning commences when the temperature reaches the upper 50s Fahrenheit. The female finds a suitable spawning site and buries herself in the substrate, whereupon the male mounts her and the pair vibrate together. The process is repeated as necessary until the female is spent or seeks refuge elsewhere until she is ready to spawn again. Typically, females take 3-6 weeks before they are spent, but in the confines of the aquarium many females do not survive for the entire potential spawning period.

Eggs hatch in 10-12 days. The fry swim pelagically for 6-8 weeks, after which they assume the bottom-dwelling habits of the adults. After a year the fry start showing some of the green coloration of adults. Sexual maturity takes two years to reach.

Arkansas Saddled Darter, *Etheostoma euzonum* (Hubbs & Black 1940)

Occurring just to the south of *E. tetrazonum* is its cousin the Arkansas Saddled Darter, *E. euzonum*. Scientists have long recognized the Arkansas Saddled Darter as containing two subspecies. *E. e. euzonum* has no scales on its cheeks, a rounded snout, and large eyes. It resides in the White River system of Arkansas and Missouri above Batesville. The other subspecies, *E. e. erizonum*, has one or more scales on its cheeks, a much more pronounced snout, and small eyes. It occurs only in the Current River system of Missouri and Arkansas. Intergrades between the two subspecies are reported from the Spring, Strawberry and Black rivers.

While very similar in appearance to other saddled darters, *E. euzonum* is much more subdued in its coloration. In the literature they are reported to be very colorful, but after keeping them and seeing numerous photographs they seem to be the least colorful of the group—but still a colorful fish no matter how you rate it. The base color is tan with four dominant dorsal saddles. Green and orange spots can be seen on their upper sides. The lower sides are yellowish. Among my specimens the green formed yellow-green bands. The first dorsal fin has a red-orange band, a blue band in the middle, and a dusky green base. Red spots can be seen in the second dorsal fin, caudal fin and pectoral fins. Females are typically much more subdued in color. It's a large saddled darter, reaching 4.75 inches in length.

E. euzonum are reported to reside in smaller rivers (avoiding only very small creeks), but they also occur in medium to large rivers with rubble substrates. They are quite hardy and readily take live and frozen aquarium foods. While still common in many streams, the construction of reservoirs in the western portion of their range has nearly eliminated them from some streams. Since they reside in the Ozarks, *E. euzonum* are not likely to suffer from siltation and pollution,

but compared to most of their cousin species, they have been eliminated from the largest percentage of their range. It is definitely a species worth monitoring closely.

Kanawha Darter, *Etheostoma kanawhae* (Raney 1941)

This is the only saddled darter I've never kept. It's also the one with the most limited range. As its name indicates, *E. kanawhae* comes from the Kanawha River above the falls in Virginia and North Carolina. It is apparently absent from the higher montane reaches of the New River basin, where it is replaced by *E. osburni*. Below Kanawha Falls it is replaced by *E. variatum*. This is an interesting phenomenon—three saddled darters living in close proximity to what used to be the preglacial Teays River, which drained much of the area now drained by the Ohio River.

Raney (1941) described the Kanawha Darter as being similar to the Variegate Darter, but with more orange vertical bars (10) on its sides. Raney also indicated a spring spawning season since ripe females were caught in April. They reach a size of 3.5 inches. Habitat is similar to other saddled darters and the species is said to be common within its small range.

Summary

Saddled darters are for aquarists who do not mind the little bit of extra attention needed to keep these extremely colorful creatures. Once the proper requisites are met—fast-flowing, well-oxygenated water and proper frozen and/or live foods—they can provide many years of enjoyment for the hobbyist. Saddled darters are truly the emeralds of temperate North American fishes and deserve a place in the home aquarium. They are a good indicator species requiring relatively silt-free streams. Dams are likely the cause of most of their habitat loss in the wild. They deserve monitoring to ensure that they will always be available for native fish enthusiasts to enjoy, and to protect the fast-flowing streams where they so efficiently evolved.

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Native Fish Haiku

With a monstrous maw
Stretching and straining wider,
Sculpin swallows prey.

Climbing out of creek,
The game warden yells to me,
"What's in the bucket?"

A madtom stung me
On the ball of my right thumb.
He's dead and sorry.

How was I to know,
Happily seining minnows,
This was a trout stream?

D. Martin Moore

Kanawha Darter, *Etheostoma kanawhae*

Candy Darter, *Etheostoma osburni*

Top: Kanawha Darter, Etheostoma kanawhae nuptialmale, 66 mm, Floyd Co., VA, West Fork Little River, 27 April 1984. Bottom: Candy Darter, E. osburni nuptial male, 86 mm, Giles Co., VA, Big Stony Creek, 26 April 1984. Photographs by Noel M. Burkhead.