Abstract

*Etheostoma lynceum*, or the brighteye darter, is one of the more colorful darters that can be found in Mississippi. This species can be found in most tributaries and drainages of the Mississippi River as well as in one location in eastern Asia. The goal was to review literature pertaining to this species in order to discover more information regarding topics such as ecology, reproduction, and conservation. The finding was that *Etheostoma lynceum* lives in slow moving rocky riffles near debris and prefers gravel or sand as a substrate. The brighteye darter can spawn multiple times in a breeding season and may contribute parental investment to their offspring. Conservation of this species is not a current concern as the brighteye darter has a population that is quite stable.

Introduction and Distribution

*Etheostoma lynceum* is one of the many fish species native to the state of Mississippi. This particular species has been located in such areas as the tributaries of the Mississippi River on the Former Mississippi Embayment in western Kentucky, western Tennessee, Mississippi, and Louisiana. *Etheostoma lynceum* have also been reported being seen in the Gulf coast drainages from Escatawpa River in Alabama to the Mississippi River in Louisiana. The species also inhabits an area in eastern Asia (FishBase, 2010). In general, this species is found in most river systems and drainages in Mississippi, the exception being the Tombigbee and Tennessee drainages (Ross, 2001).
Figure 1.1: *Etheostoma lynceum* distribution in the United States (bio.slu.edu).
Figure 1.2: Distribution of *Etheostoma lynceum* (FishBase, 2010).

**Context and Content**

**Table 1.1** (Itis Report, 2011)

<table>
<thead>
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<th>Osteichthyes</th>
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<td>Species</td>
<td><em>Etheostoma lynceum</em></td>
<td>Brighteye Darter</td>
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Order

The brighteye darter is in the order Perciformes, which is the largest and most diverse order not only of fishes but of vertebrates ("Ray-finned fish," 2011). In all there are about seven thousand species making up the Perciforms and they vary from gobies and darters to marlins and swordfishes (“Physical Characteristics,” 2011). Body shape can be long and thin, short and round, or most commonly, the typical “fish” shape associated with bluegill and tuna (“Basses Perches and Relatives,” 2011). There are usually spines at the beginning of the dorsal and anal fins, pelvic fins with a spine and five rays or rods, and a lateral line. In addition, Perciforms are covered by rough scales and have a placement of pelvic fins similar to the location of the rear legs of a four-footed animal. Fish belonging to this order can be found all over the world in freshwater as well as in salt water. Some species in Perciformes thrive in open water, while others prefer taking on the role as bottom dwellers. Habitat ranges from rock or coral reefs to plants and sea grasses. Most Perciforms prefer to inhabit warm or cool water, but there are others who thrive in cold water. Diet includes algae, plankton, and other fish.

Family

In addition to being in the order Perciformes, the brighteye darter is in the family percidae, which includes the perches and true perches. This family of fish is prey to many other families such as Esocidae and Salmonidae as well as within its own family. A typical diet for fish belonging to this family includes other Percids, zooplankton, fry of same or different species, and various kinds of insects and insect larva (“Percidae,” 2011). The perch family is one of the most diverse groups, with approximately 153 species in North America. The major sport and food fish in this family are the yellow
perch, sauger, and walleye (Helfrich, Newcomb, Hallerman, & Stein, 2005). The remaining 150 fish species in this family are darters and they occupy streams and lakes throughout the country. Many darters are drab, but some are extremely colorful. In particular, males in the breeding season are as colorful as tropical reef fishes. Just as the name implies, darters dart around on the bottom, which is primarily a result of the fact that they lack a swim bladder. Fish in this family have a spiny dorsal fin followed by a smooth dorsal fin. These two fins may be separate or even slightly joined.

**General Characteristics**

The darters have many similar characteristics, which make some species more difficult to distinguish. For example, most darters have five branchiostegal rays and many have similar colorations, especially in breeding males. Many factors have to be taken into consideration when determining the species of a given specimen.

The common name for *Etheostoma lynceum* is brighteye darter. The word “lynceum” in latin means “sharp sighted” (Ross, 2001). This species is characterized as having large pectoral fins, a horizontal mouth, a fairly blunt snout, and a wide pre-maxillary frenum. With exception to *Etheostoma zonale*, *Etheostoma lynceum* is the only other member of the subgenus *Etheostoma* containing five branchiostegal rays instead of six. In relation to the complete and straight lateral line, 4-5 scale rows are present above and 5-7 scale rows are present below. The nape and the opercle are fully covered in scales, while the belly, cheek, and breast can range from scaled to unscaled. 2 anal rays, 10-11 (7-13) dorsal spines, 14-15 (10-16) pectoral rays, 7-8 (6-9) anal rays, and 10-12 (8-13) dorsal rays are the norm for this fish species. The largest documented fish in this species is 65 mm (2.6 in.).
In regards to coloration, breeding males usually display more intense pigments than other members of the species. They may contain dark green bands and fins along with red basal bands occurring on the dorsal fins. The mouth and chest also appear green in color. Generally, fish in this species have a brown back with six or seven dark blotches forming irregular saddles. Encircling the body are between nine and twelve dark vertical stripes. Spots may be present on the sides of the body as well as underneath the head and body. Especially prominent in males are the two cream-colored spots located at the base of the caudal fin. On the other hand, females have dark oval or rectangular spots displayed on the fins as well as three to four irregular bands present on the caudal fin.

Form & Function

The species most closely relating to the brighteye darter is the harlequin darter, *Etheostoma histrio*. This species displays a rust-colored marginal spot or band at the base of the spinous dorsal fin, while the brighteye darter instead displays a red band at this location and also lacks distinct pigmentation under the head (Ross, 2001). *Etheostoma lynceum* was once considered synonymous with *Etheostoma zonale*. Questions arose, however, due to the differences in appearance and the differences in habitat and meristic characters between the species. In addition, allopatric distributions in the absence of physical barriers preventing the possibility of sympathy gave sufficient evidence that these taxa required separation (Etnier, & Starnes, 1986).
Figure 1.3: *Etheostoma lynceum* (brighteye darter, male)

Figure 1.4: *Etheostoma lynceum* (brighteye darter, female)

Figure 1.5: *Etheostoma histrio* (harlequin darter, male) (bio.txstate.edu)
Ecology

The brighteye darter normally occurs in rocky riffles of creeks, small rivers, and streams, as well as near debris in sand and gravel runs (FishBase, 2010). Etheostoma lyncceum usually inhabits depths between 10 and 30 cm with exception to occupying deeper water in the colder months (Ross, 2001). A diet of midge and blackfly larvae as well as mayfly nymphs can be expected (FishBase, 2010).

Behavior

Spawning ranges from late February or the beginning of March to mid-May with water temperatures averaging between 12 and 22 degrees Celsius. The size of the fish determines the size of the clutch size. In other words, the larger the female, the more eggs she produces. The average number of eggs varies and in general is around 29 in March and 41 in April (Ross, 2001). In addition, intraseasonal trends in clutch-size and egg-size showed that in the early periods of the spawning season, there were shown to be smaller clutch sizes and larger eggs (Heins, Baker, & Guill, 2004). Furthermore, the clutch-size increases as the spawning season goes on and the egg size decreases. These two traits demonstrate a slight negative correlation. Changes in egg and clutch-size may be the product of adaptive phenotypic plasticity wherein females are able to produce larger eggs that will become competitively superior offspring at the beginning of spawning. One explanation for doing so may be the low supply of food for the offspring or adults. This is explained by the parental investment hypothesis. Another explanation may be that the female produces larger eggs at the beginning of spawning to make sure that the eggs have adequate resources in case there is a chance that nutrients may be low at that time. This is known as the bet-hedging hypothesis. Although egg-size and clutch size both vary, there
is less phenotypic variation in egg-size when compared to clutch-size.

**Egg Storage**

Accurately measuring the size of eggs is very important when studying a species. This measurement provides insight into how much parental investment is exerted with each offspring (McEdward & Coulter, 1987; Heins et al. 1992). Because of this, observation of egg storage as means of studying the life history of species in the lab is a vital practice. In general, dry masses of mature oocytes and ripe eggs stored in a 10% formalin solution were shown to retain their original weight better than eggs and mature oocytes stored in varying isopropyl alcohol solutions (Heins, & Baker, 1999).

One of the largest sources of error in fish reproductive biology studies is the conflicting evaluation of egg-maturity stage. Because of this, additional studies have been done dealing with the specific temperatures required for drying oocytes and eggs. Temperature plays a huge role in the accurate preservation of egg weight. However, due to a possible range of temperatures that may be used, there is a maximum error of 8.5% for the assessment of *Etheostoma lynceum* eggs. In order to eliminate error, methodologies must be standardized and data acquisition techniques need to be developed and verified (Johnston, 1994).

**Conservation**

A decline in the *Etheostoma lynceum* population was observed in the Pearl River in 2004 and was thought to be contributed to channel changes and loss of gravel substrate (Bart, Piller, & Tipton, 2004). A study was done observing the effects of hurricanes on fish populations in different sized streams. *Etheostoma lynceum* was not found in the large stream samples, but was present in Black Creek along with other small streams. No
major impacts were found regarding hurricanes and their effect on fish populations in the smaller streams that the brighteye darter was found to inhabit (Schaefer et al, 2006).

Fortunately, brighteye darters in Mississippi currently maintain a stable population and therefore, the species is considered secure (Ross, 2001).

Works Cited


The Virtual Aquarium. Informally published manuscript, The Department of Fisheries and Wildlife Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA. Retrieved from http://cnre.vt.edu/efish/families/percidae.html.


