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First Record of *Chrosomus erythrogaster* (Cypriniformes: Cyprinidae) in the Mobile Basin

C. Keith Ray^{1,*}, Milton Tan¹, and Jonathan W. Armbruster¹

Abstract - We document the discovery of *Chrosomus erythrogaster* (Southern Redbelly Dace) in the Bankhead National Forest, Double Springs, AL. This collection represents the first documented collection of *C. erythrogaster* in the Mobile Basin and adds to the biodiversity found in the Bankhead National Forest. Biogeographically, the discovery of *C. erythrogaster* at this locality leads us to propose the idea of interbasin transfer through subterranean pathways. No evidence exists for stream capture through surface waters, and bait-bucket transfer is unlikely given the isolation of the area due to its wilderness designation.

Introduction. *Chrosomus erythrogaster* (Rafinesque) (Southern Redbelly Dace) is a small minnow that typically inhabits springs or small streams with cool, flowing water (Boschung and Mayden 2004). Localities for *C. erythrogaster* are scattered throughout the Mississippi River basin, portions of the Great Lakes basin, and the extreme upper portions of the Rio Grande in New Mexico (Page and Burr 2011). In Alabama, they are found in the northwest portion of the state within the Tennessee River drainage (Boschung and Mayden 2004).

The Bankhead National Forest (BNF) in northern Alabama lies mostly within the Sipsey Fork system of the Black Warrior River drainage, with the northern portions lying within the extreme headwaters of Tennessee River tributaries. Dycus and Howell (1974), in a survey of the fishes of the BNF, noted that the Sipsey Fork holds more diversity than any other area within the Black Warrior River drainage. They attributed this richness to relatively low anthropogenic disturbance and increased isolation due to the geologic forces that shaped the region. Their survey was the most comprehensive and systematic to date, yet Dycus and Howell (1974) reported that more collections were needed to determine the full distribution of species within the BNF.

Here we document the discovery of Southern Redbelly Dace in the BNF and discuss its significance to the biogeographical patterns in the area. This collection represents the first documented collection of Southern Redbelly Dace in the Mobile Basin and adds to the diversity documented in the BNF.

Field site description. Fish surveys for specimens of *Rhinichthys atratulus* (Hermann) (Blacknose Dace) from the Borden Creek system within the Sipsey Wilderness of the BNF took place in 2011. Braziel Creek is a small, sand- and gravel-bottomed stream, which flows into Borden Creek, a tributary of the Sipsey Fork. Braziel and Hagood creeks originate near the Tennessee Valley Divide and flow south along the Cumberland Plateau (Fig. 1; Dycus and Howell 1974). Braziel Creek splits into two branches ~170–200 m before reaching its confluence with Hagood Creek. The majority of water in the creek travels through Braziel Creek Cave (J.A. Cochran, US Forest Service, Double Springs, AL, pers. comm.; Welker and Howie 1975). During high-water events, Braziel Creek's surface flow enters Hagood Creek approximately 50 m upstream of the lower mouth of Braziel Creek Cave. In drier

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periods, all flow is diverted underground. Braziel Creek Cave is approximately 170 m in length, and is fully accessible in low water conditions (J.A. Cochran, pers. comm.; Welker and Howie 1975). We made a collection at the mouth of the cave on 5 August 2011 (10.2 km NW of Grayson, Lawrence Co., AL, 34.33782, -087.40595; Fig. 1). Although the cave was filled with water to a depth of up to 1 m, there was no water flowing from the mouth of

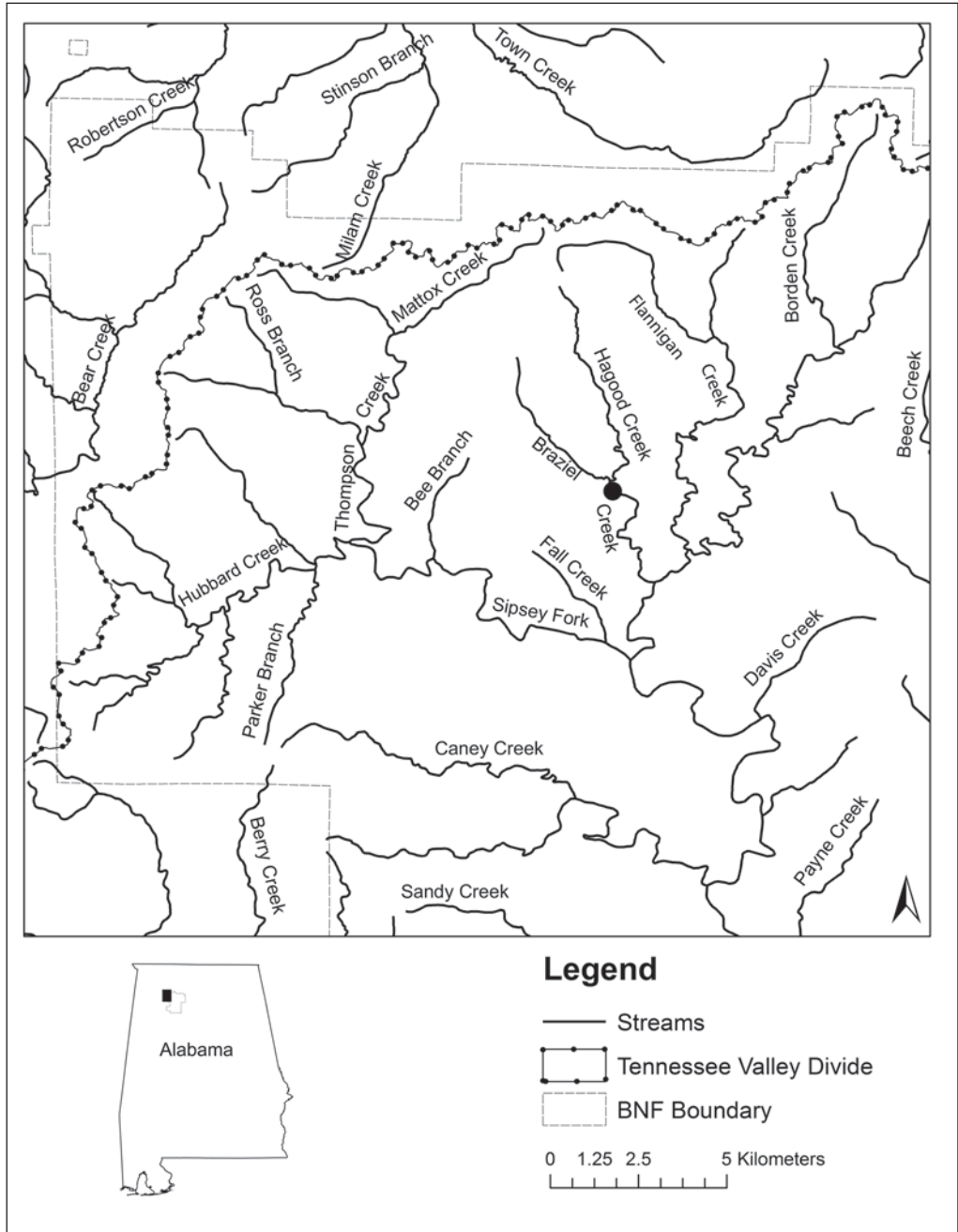


Figure 1. Map of the northwestern corner of the Bankhead National Forest. The dot represents the collection locality for the specimen of *Chrosomus erythrogaster* (Southern Redbelly Dace).

the cave at the time of collection due to severe drought in the area, nor was flow apparent in Hagood Creek.

Methods. We made collections using a 3.05 x 1.83-m seine with 3.17-mm delta mesh following Auburn University collection protocols (IACUC PRN 2010–1844). We anesthetized fish with MS-222 and placed the specimens into 10% formalin for preservation. Later, we transferred all specimens into 70% ethanol, identified, and placed them into the Auburn University Museum of Natural History Fish Collection (AUM; Auburn, AL).

Results and discussion. We collected a single Southern Redbelly Dace specimen (AUM 52984) that was 39.5 mm SL (Fig. 2) as by-catch at this location, along with specimens of *Semotilus atromaculatus* (Mitchell) (Creek Chub) and *Etheostoma artesia* (Hay) (Redspot Darter). This is the first record of Southern Redbelly Dace in the BNF and the Mobile Basin. Previous collections in this area made at high water failed to detect its presence (C.K. Ray, pers. observ.) and Dycus and Howell (1974) did not detect it during their survey. Braziel, Hagood, and Borden Creeks are also the only locations where Blacknose Dace are found in the Sipsey Fork (Boschung and Mayden 2004; Dycus and Howell 1974; C.K. Ray, pers. observ.).

Another fish, the undescribed *Etheostoma* sp. cf. *zonistium* (Blueface Darter), known from in the Sipsey Fork of BNF, has been hypothesized to have originated through stream capture with the adjacent Tennessee River tributary, Bear Creek (Boschung and Mayden 2004, Dycus and Howell 1974), yet no explanation has been given for the presence of Blacknose Dace, and now Southern Redbelly Dace, in Braziel and Hagood creeks. They do not share a similar distributional pattern with the Blueface Darter, and likely did not enter the Sipsey Fork system through the hypothesized Bear Creek connection.

In light of the presence of both Southern Redbelly Dace and Blacknose Dace in such isolated streams within the system, it is likely their distributions are the result of the same process. Neither species has been collected in Town Creek, the closest stream from the adjacent Tennessee River basin. Southern Redbelly Dace and Blacknose Dace are found in both Bear Creek and Flint Creek (Tennessee Basin), but have yet to be detected in other areas of the Sipsey Fork system, and we know of no geologic evidence to support stream capture between those Tennessee streams and Braziel Creek (Dycus and Howell 1974, Jones 2000). BNF is in a karst region (Veni 2002), and small caves are abundant. The cave where Southern Redbelly Dace was collected is a narrow tunnel averaging ~1m wide and 2 m tall, and is one of two caves along Braziel Creek. Given that we found the Southern Redbelly Dace specimen in a cave near its mouth, and Blacknose Dace has been collected within 50 m of the cave's mouth, it is possible that Southern Redbelly Dace and Black-



Figure 2. *Chrosomus erythrogaster* (Southern Redbelly Dace, AUM 52984) collected from Braziel Creek, in the Sipsey Fork system of the Black Warrior River drainage. Scale bar = 1 cm.

nose Dace may have moved through subterranean waters. There are reports of large numbers of both Blacknose Dace and other members of *Chrosomus* (dace) occurring in caves (James Godwin, Alabama Natural Heritage Program, Auburn, AL, and Matthew Niemiller, Illinois Natural History Survey, Champaign, IL, pers. comm.; Rheams et al. 1992). Other fish species, including members of *Lepomis* (sunfish), *Etheostoma* (darters), *Cottus* (Sculpin), *Notropis* (shiners), and *Semotilus* (chubs), have been found in northern Alabama caves (Rheams et al. 1992), providing evidence for between-system fish transfer through caves in the karst, yet this scenario is difficult to observe and has yet to be fully tested.

It is clear that some pattern of dispersal is emerging in this small area of the BNF, which contributes to our understanding of the area's uniqueness. More surveys are warranted in this area to better detect the true diversity of fish in the headwaters of the Sipsey Fork and BNF. Future population genetic studies of aquatic species in this area could better elucidate biogeographical patterns between the Sipsey Fork and Tennessee River.

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