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Cover Page Footnote

We thank the numerous students in Ichthyology classes at Henderson State University who collected many of the specimens used in this study.

Distribution of the Highland Stoneroller (*Campostoma spadiceum*) in Southern Arkansas

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Running Title: Distribution of *Campostoma spadiceum* in Arkansas

Under the name *Dionda spadicea*, Girard (1856) first described a form of stoneroller based on specimens collected in western Arkansas during an 1853 railroad survey. Variable morphologies of stonerollers created a complex taxonomic history, likely related to their genetic variability. Cladistic analysis of mitochondrial DNA data (cytochrome *b* gene) suggested the population in the Ouachita Mountains region of Arkansas and Oklahoma should be considered a distinct species (Blum *et al*. 2008). Molecular data currently are being examined by Blum and colleagues in further attempts to resolve the phylogeny of this group. Attempting to resolve the confusing nomenclatorial history of this fish from the Ouachitas, Cashner *et al*. (2010) soon redescribed it in morphological terms and renamed it *Campostoma spadiceum*.

Both male and female *C. spadiceum* present obvious red to red-orange coloration in median fins and often also in paired fins, which lasts year-round but is most intense during the summer. Even smaller individuals usually present this coloration, which is not found in contiguous populations of any other species of *Campostoma* (Cashner *et al*. 2010). We find this coloration to be less intense in the more southern part of its range in Arkansas compared to the illustrations in Cashner *et al*. (2010), although the coloration still is present to some degree in young and quite evident in adult females.

The appearance of nuptial tubercles also allows clear species identification for males in breeding condition (Fig. 1). Males of *C. spadiceum* have a single small tubercle on almost all dorso-lateral scales (forming rows of tubercles) whereas males of *C. anomalum* have larger tubercles not present on most scales and not forming rows.

Cashner *et al*. (2010) documented specimens of *C. spadiceum* in tributaries of the Arkansas and Red Rivers, and in the upper reaches of the Caddo, Ouachita, Saline, and Little Missouri drainages, all well above the fall line in the Ouachita Mountains regions of Arkansas and Oklahoma. These upland flowing-stream conditions provide the preferred habitat of clear water over gravel, rubble, and exposed bedrock substrates.

Tributaries of the Red River flowing from the Ouachita Mountains in Arkansas and Oklahoma have *C. spadiceum*, but tributaries of the Red River in western Oklahoma have *C. anomalum* (Cashner *et al*. 2010). Based on habitat preferences of the 2 species, it may be unlikely that both species would occur in sympatry. However, Cashner *et al*. (2010) shows one specimen of *C. spadiceum* in what appears to be Clear Boggy Creek in Oklahoma, though all other specimens shown

Figure 1. Comparison of tuberculation on adult males of *C. spadiceum* (left, with small tubercles in rows) and *C. anomalum* (right, with larger tubercles not in rows) from Arkansas.

from that stream were *C. anomalum*. Sympatry, or at least co-occurrence within the same drainage, seems possible.

Reaches of the same stream that flow through different geological regions may provide appropriate habitats for closely related species. Collections of *Campostoma* sp. in Arkansas (Robison and Buchanan 1988) have been made well downstream of the published collections of *C. spadiceum*, and well below the Fall Line of the Interior Highlands, into the West Gulf Coastal Plain (WGCP) in Arkansas (Foti 1974).

The map of known specimen localities in Arkansas provided by Cashner *et al*. (2010) represented mostly the headwater regions of the sampled streams, and left a large gap in the eastern part of the Ouachita Mountains in Arkansas. The one specimen located farther downstream in the Ouachita River (Clark Co., near Arkadelphia) was based on a photograph of a male specimen taken by RT. Further, *Campostoma* collections from farther downstream below the Fall Line (Robison and Buchanan 1988) have not been evaluated. We examined museum specimens from the Ouachita River drainage to determine whether *Campostoma* sp. in streams flowing southerly from their headwater reaches in the Ouachita Mountains in Arkansas (i.e., streams south of the Fourche Lafave River) were consistent with *C. spadiceum*.

Examination of preserved specimens of stonerollers from the Ouachita Mountains and southward, housed in the Henderson State University collection of fishes, allowed positive identifications based on the nature of nuptial tubercles in male specimens. In all cases, those specimens were *C. spadiceum*. Collection localities of juveniles and females were within the range of the verified males, so identification of these was assumed by location. Fin coloration fades after preservation, so this character was not useful in identification of preserved specimens of females and juveniles. Thus, the possibility of sympatric presence of *C. anomalum* in the lower part of the Ouachita Mountains region cannot be excluded. We used separate map characters to plot known localities based on males and presumed localities based on females and juveniles to produce a detailed map of distribution of *C. spadiceum* in southern Arkansas below the Fourche Lafave River (Fig. 2).

Most locations presented by Cashner *et al*. (2010) represented headwater locations of several stream systems. For example, they documented this stoneroller at 1 location in the upper Saline River drainage (eastern Arkansas), 3 locations in the upper reaches of the Caddo River, 3 locations in the extreme upper Ouachita River drainage, 1 location in the extreme upper Little Missouri River drainage, 2 locations in the upper Cossatot River drainage, and 1 location in the extreme upper portion of the Rolling Fork tributary to Little River.

We are able to document occurrence of *C. spadiceum* in numerous tributaries in the upper Saline River, throughout the Caddo River to its confluence with the Ouachita River, throughout the Ouachita and many of its tributaries down close to the confluence of the Little Missouri River, in the upper reaches of the Little Missouri River drainage, throughout the Cossatot River, and down the Rolling Fork River and Little River to near the mouth of the Cossatot. Historical records (Robison and Buchanan 1988) indicate occurrence of *Campostoma* specimens of unverified identification far down the Saline, throughout the lower Little Missouri drainage, and even farther down the Ouachita drainage well into the WGCP ecoregion (Fig. 2).

Campostoma spadiceum is common in streams throughout the highland Ouachita Mountains ecoregion, and below the Fall Line into the lowland WGCP in those same drainages. A separate portion of the WGCP, called the Southwest Arkansas section (Foti 1974; Fig. 2) borders the Ouachita Mountains. It is distinguished from the majority of the WGCP by Cretaceous origins rather than Eocene (which formed the deposits covering most of the WGCP), and tends to be more elevated than the rest of the WGCP. This area encompasses many of the locality records for *C. spadiceum* S of the Fall Line. Still, verified occurrences of *C. spadiceum* exist into the more lowland regions of the WGCP along the Ouachita River. Historical occurrences even farther down the Ouachita, Red, and Saline systems still require validation of species identification. Hypothetically the lowland habitat might be occupied by *C. anomalum*.

Acknowledgments

We thank the numerous students in Ichthyology classes at Henderson State University who collected many of the specimens used in this study.

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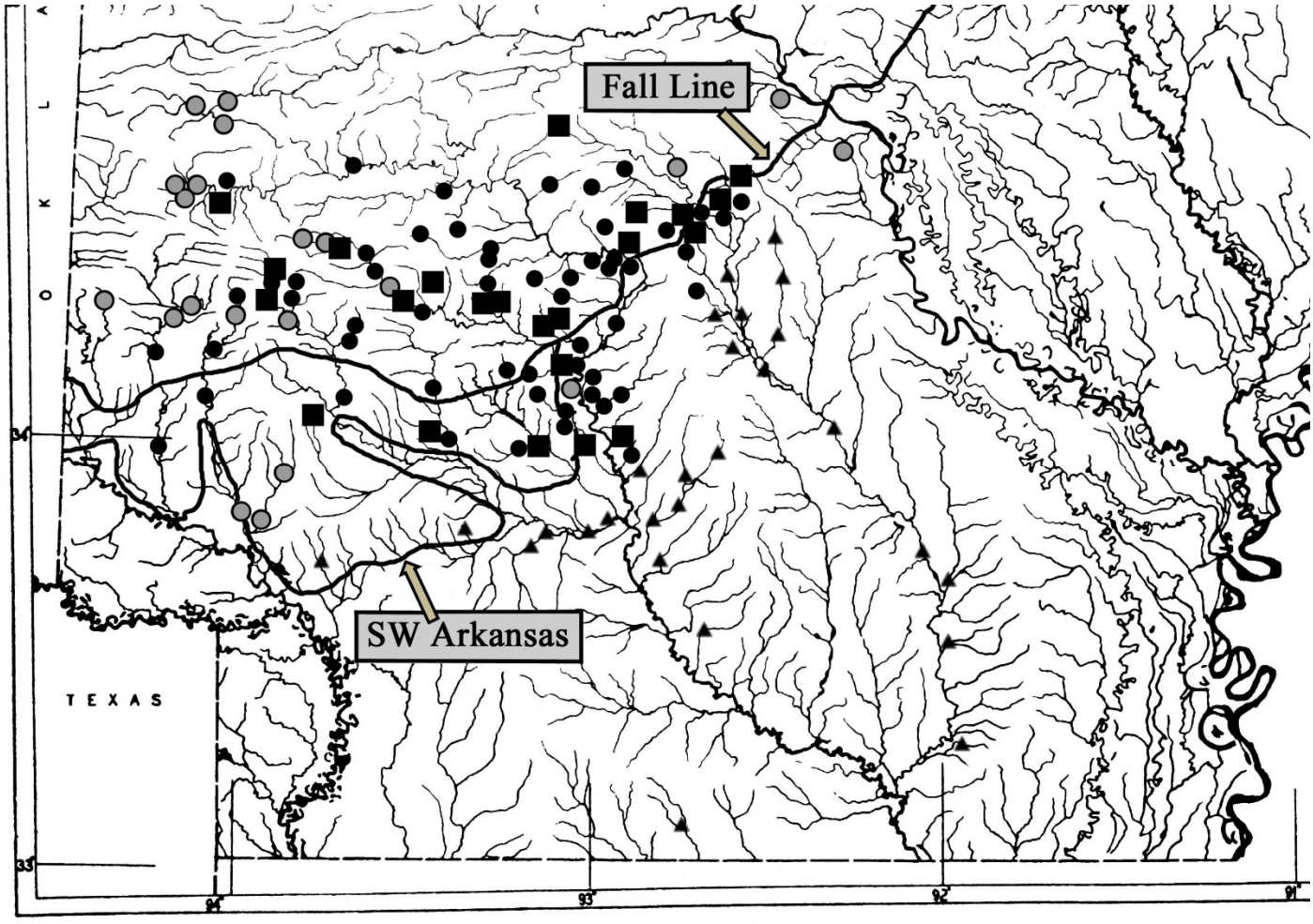

Figure 2. Currently known distribution of the Highland Stoneroller (*Campostoma spadiceum*) in southern Arkansas. Gray-centered circles represent records from the original description (Cashner *et al*. 2010), black squares represent males from the HSU collections positively identified by nuptial tubercles, and black dots represent females and juveniles in the HSU collections. Triangles represent historical records (Robison and Buchanan 1988) found below the Fall Line, which are now of uncertain identification (they hypothetically could be *C. anomalum* based on lowland habitat). The Fall Line is the demarcation separating the Interior Highlands from the southeastern lowlands in Arkansas, and the SW Arkansas section represents a special upland portion of the West Gulf Coastal Plain (Foti 1974).