

Background

- Little is known about microhabitat use of Highland Darter *Etheostoma teddyroosevelt* (Fig. 1) throughout its range, specifically in Arkansas, where it is listed as a species of greatest conservation need (Fowler 2015; Robison and Buchanan 2020).
- Previous research in Kansas found that Highland Darters most commonly occur in larger streams with moderate gradients, and prefers pools below riffles, at depths > 0.6 m (Cross and Collins, 1995).
- Another study found that in the Ozarks of Missouri, Highland Darters are restricted to moderate sized rivers (Pflieger 1997).
- A new study is needed to understand the microhabitat use of the Highland Darter in Arkansas. Understanding Microhabitat Use of species is important for understanding their methods for foraging, spawning, and seeking refugia.

Objectives of Study

- **Objective 1:** Determine the microhabitat use of Highland Darters in the Illinois Bayou Watershed.
- **Objective 2:** Determine spatial variation in microhabitat use of the Highland Darter.



FIGURE 1: A Highland Darter (*Etheostoma teddyroosevelt*).

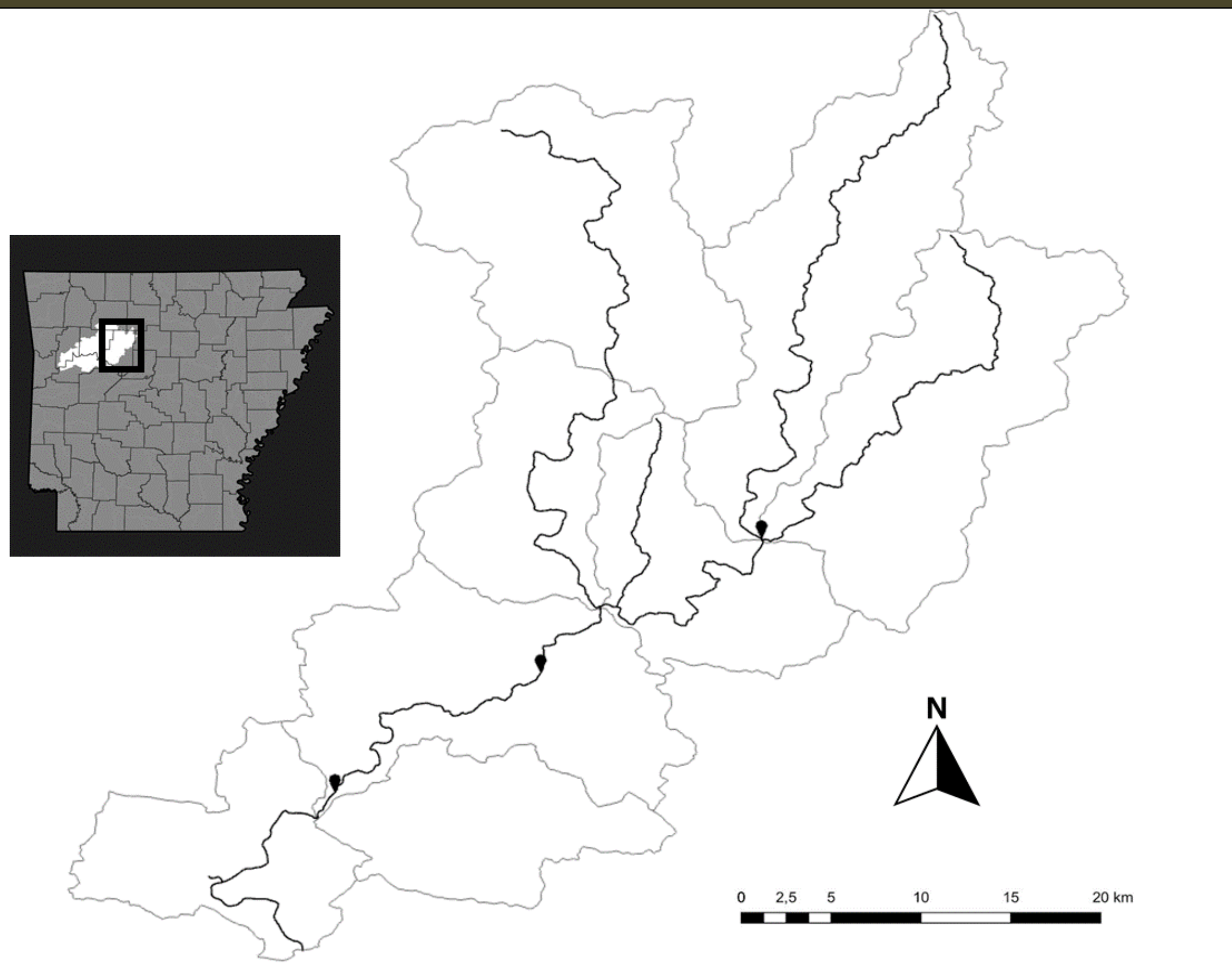


FIGURE 2: Map of the three sites (black markers) in the Illinois Bayou watershed where Highland Darters were observed.

Methods

- Snorkeling was employed to identify Highland Darters in their habitat. It is a simple and effective method for observing a fish within its microhabitat (Zale et al., 2013).
- Weighted markers tied to floats were placed directly in the locations of the Highland Darter observations.
- A 1-m² frame was placed centered on the marker to establish the microhabitat data collection area. Then, various microhabitat data were collected, such as water temperature (°C), canopy cover (%), water flow (m³/sec), depth (m), substrate composition (%), TDS (mg/L), conductivity (mS/m), and distance from bank (m).
- Microhabitat data were analyzed across all sites and by site.

Results

- A total of 12 individuals were observed from 3 sites during August-October 2023 (Fig. 2).
- At the watershed level, mean (±SE) frequency of substrate in Highland Darter microhabitats were 65.4 (±7.3) % cobble, 15.4 (±7.0) % gravel, 0.7 (±0.7) % bedrock, and 10.2 (±3.6) % sand/silt (Fig. 3).
- Further, at the watershed level, mean estimates of other environmental/habitat variables at Highland Darter microhabitats were 25.4 (±7.3) % for canopy cover 0.01 (±0.01) m³/sec for discharge, and 0.4 (±0.7) m for depth.
- There appears to be some spatial variation in the environmental variables within the microhabitat of the Highland Darter (Table 1).

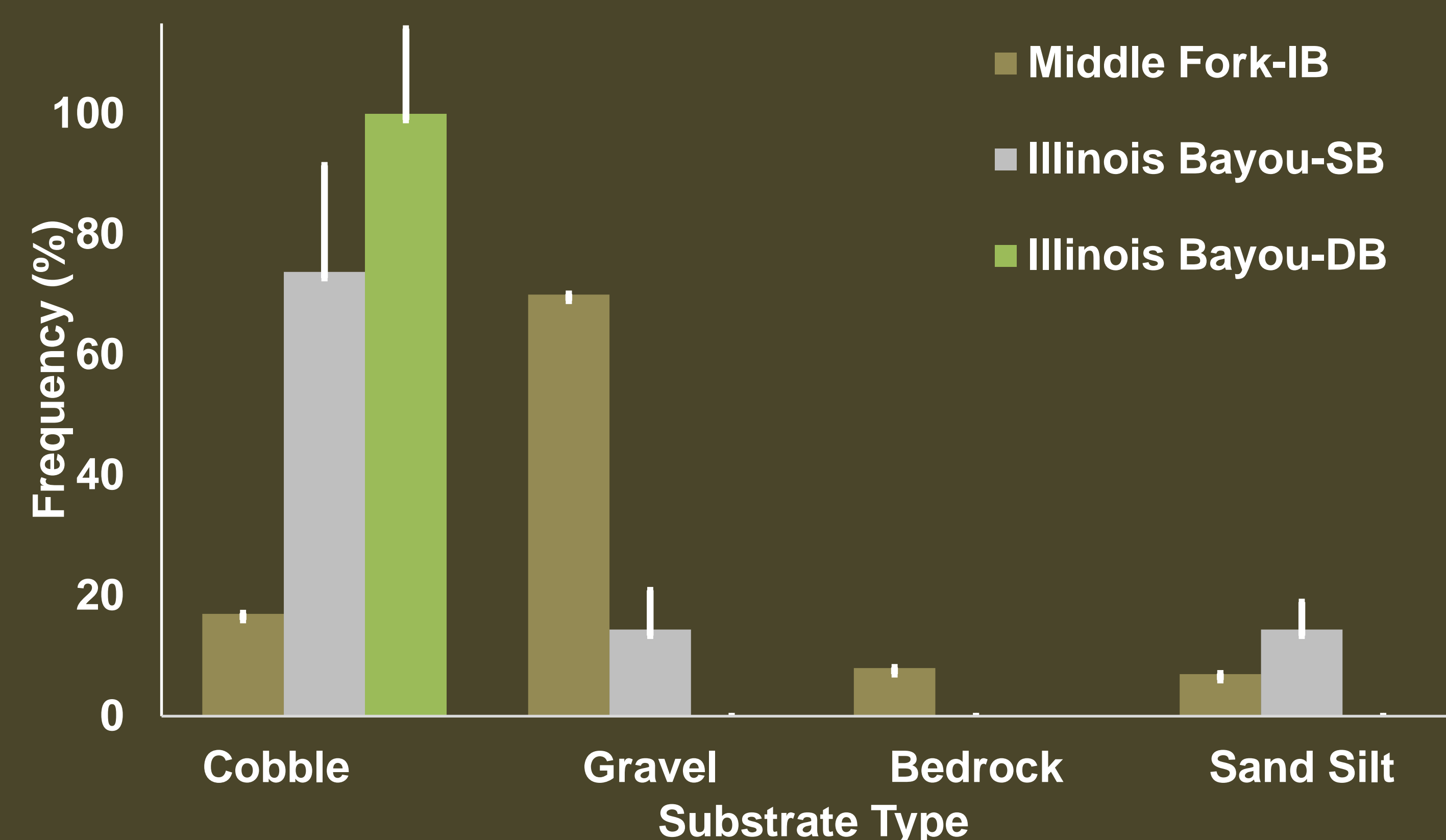


FIGURE 3: Mean (±SE) frequency of habitat use by Highland Darters across the three sites of observations. .

TABLE 1. The median (range) estimates for the environmental variables (canopy cover [CC], total dissolved solids [TDS], discharge, depth and distance from bank [df bank]) measured at the microhabitat of each Highland Darter observed.

Site	CC	TDS	Discharge	Depth	Df bank
MFIB	65 (NA)	33.3 (NA)	0.01 (NA)	0.21 (NA)	0.9 (NA)
IB-SB	0 (0-80)	26.4 (24.1-43.8)	0.01 (0.01-0.03)	0.3 (0.1-0.7)	2.2 (0.8-5.1)
IB-DB	35 (0-70)	34.6 (34.4-34.8)	0.02 (0.01-0.02)	0.55 (0.30-0.80)	5.55 (2.1-9.0)

Discussion

- Spatial relationships appear to exist in the microhabitat of Highland Darters in the Illinois Bayou watershed. However, further data is needed to make strong inferences on these relationships. Differences may exist with a larger sample size, which might reflect the spatial differences of the streams.
- Compared to previous studies, we found varying results on the microhabitat use of the Highland Darter. Our data were more similar to what Pflieger (1997) found from Highland Darters in the Ozarks than what Cross and Collins (1995) found in Kansas.
- This research will aid in the understanding of Highland Darter biology and ecology.

Literature Cited

- Cross, F. B. and J. T. Collins. 1995. Fishes in Kansas. (2nd ed.) Kansas Natural History Museum, Lawrence. 315 pp.
- Fowler, A. (Ed.). 2015. Arkansas Wildlife Action Plan. Arkansas Game and Fish Commission, Little Rock, Arkansas.
- Pflieger, W. L. 1997. The fishes of Missouri. (2nd ed.) Missouri Dept. of Conservation, Jefferson City. 372 pp.
- Robison, H.W. and T.M. Buchanan. 2020. Fishes of Arkansas.(2nd ed.) Fayetteville: University of Arkansas Press, 703-705 pp.
- Zale, A, D. Parrish, and T. Sutton. 2013. Fisheries Techniques. (3rd ed.) American Fisheries Society: 782-783 pp.

Acknowledgements

- Arkansas Tech University - Undergrad Research Scholars Award

