



Alida M. Johnson, Elaine A. Ewigman, Hae H. Kim, and Quinton E. Phelps
 Department of Biology, Missouri State University, Springfield, MO
 amj0123@live.missouristate.edu

Introduction

Throughout the Mississippi River human alterations to the river have occurred for numerous reasons including flood control, navigation or hydropower. These manmade changes in the river have altered flow, depth, temperature, sedimentation, vegetation and substrate (Alexander et al., 2012). River alterations may potentially impact filter-feeding fishes (e.g., Gizzard Shad *Dorosoma cepedianum*, Bigmouth Buffalo *Ictiobus cyprinellus*). Gizzard Shad are important links to higher trophic levels in riverine ecosystems. Prey density alterations can have profound effects on the entire community (Giam and Olden 2016). Given the potential impacts Gizzard Shad can have on the fish community, they can be used as an indicator species. The objective of this study is to provide managers knowledge of Gizzard Shad macrohabitat and mesohabitat use in the Upper Mississippi River. As an indicator species, quantifying habitat use can inform management decisions on river restoration.

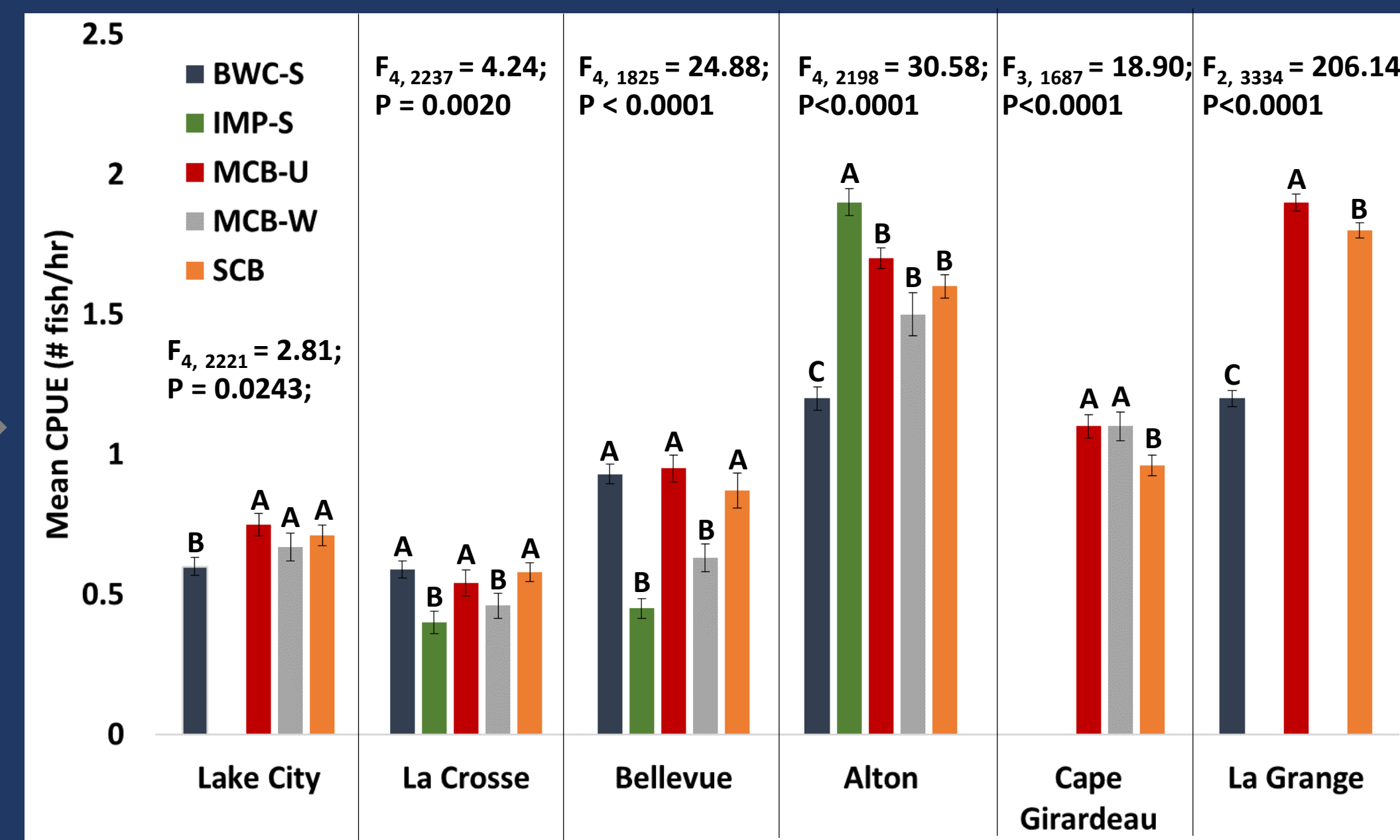


Methods

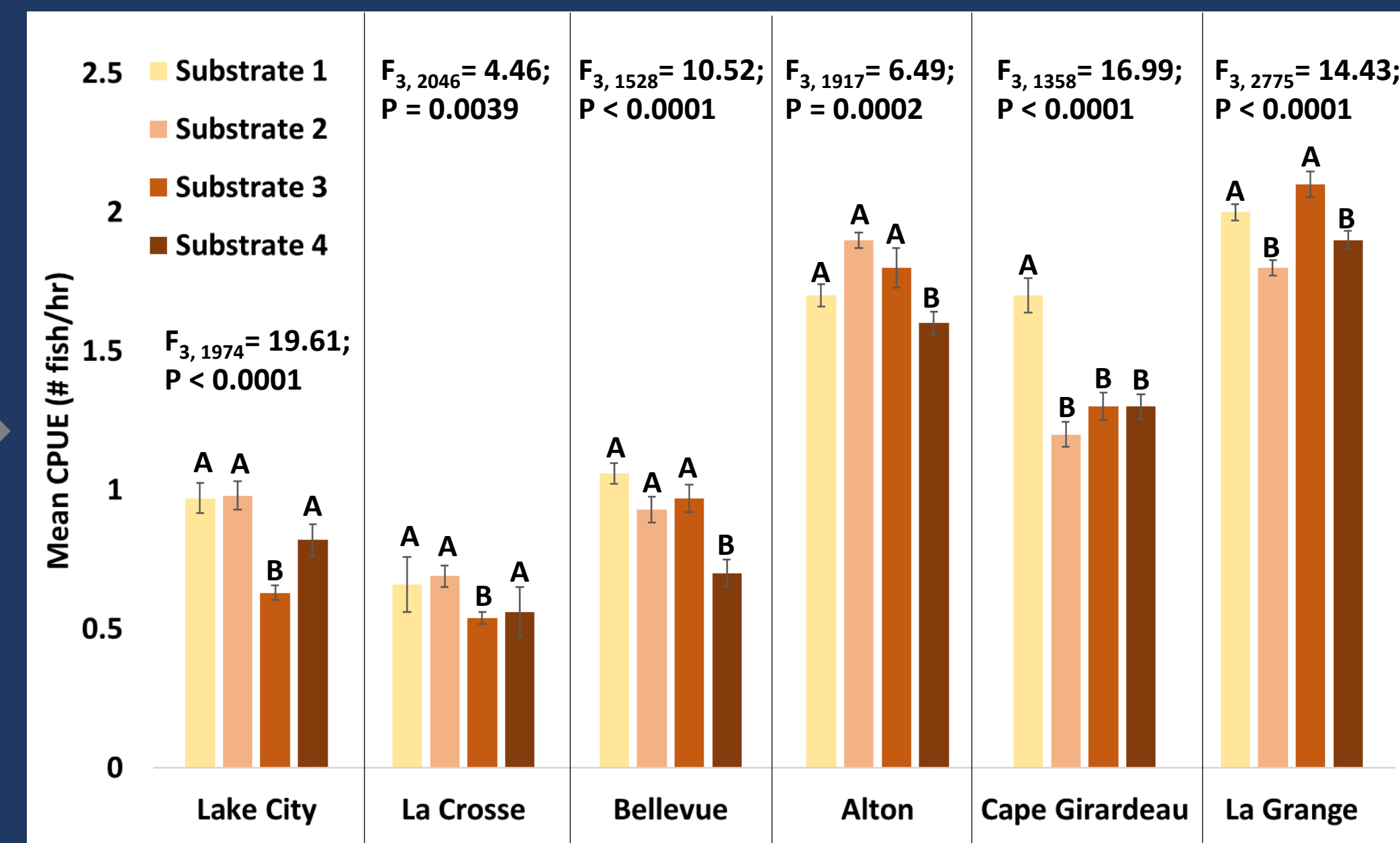
Gizzard Shad were collected via daytime electrofishing carried out by United States Army Corps of Engineers' Long-Term Resource Monitoring (LTRM) element across six field stations in the Mississippi and Illinois rivers. LTRM sampling is designed to estimate relative abundance as estimated by catch-per-unit-effort (CPUE). We calculated CPUE as fish per hour and we log transformed CPUE for statistical analyses. Gizzard Shad macrohabitat and mesohabitat use were analyzed using analysis of variance (ANOVA) and pairwise comparisons were made using Tukey's HSD. Specifically, Gizzard Shad catch rates were related to stratum (i.e., large-scale river features), substrate, depth and velocity to quantify Gizzard Shad habitat use.

Results

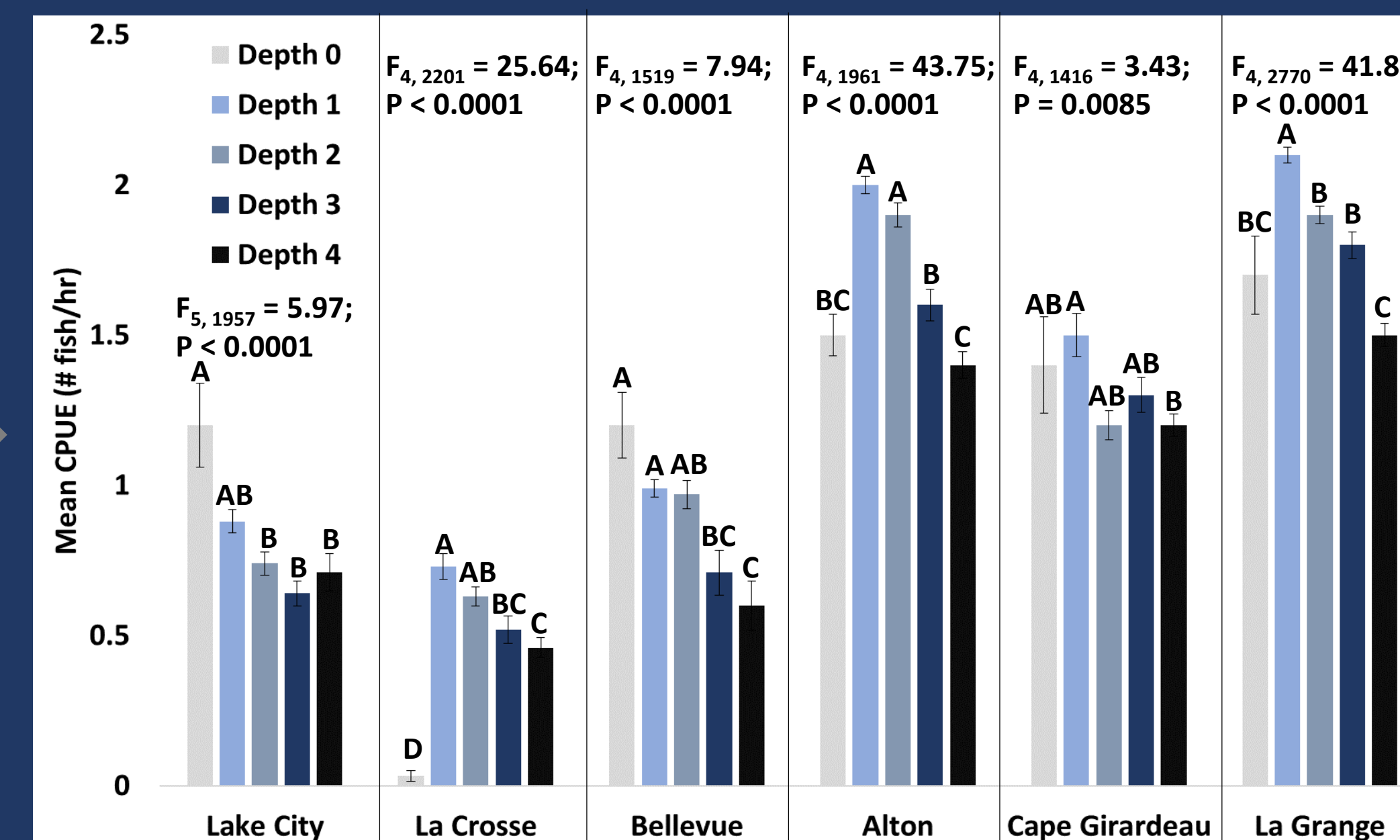
Gizzard Shad catch rates followed no apparent trend among macrohabitat type.



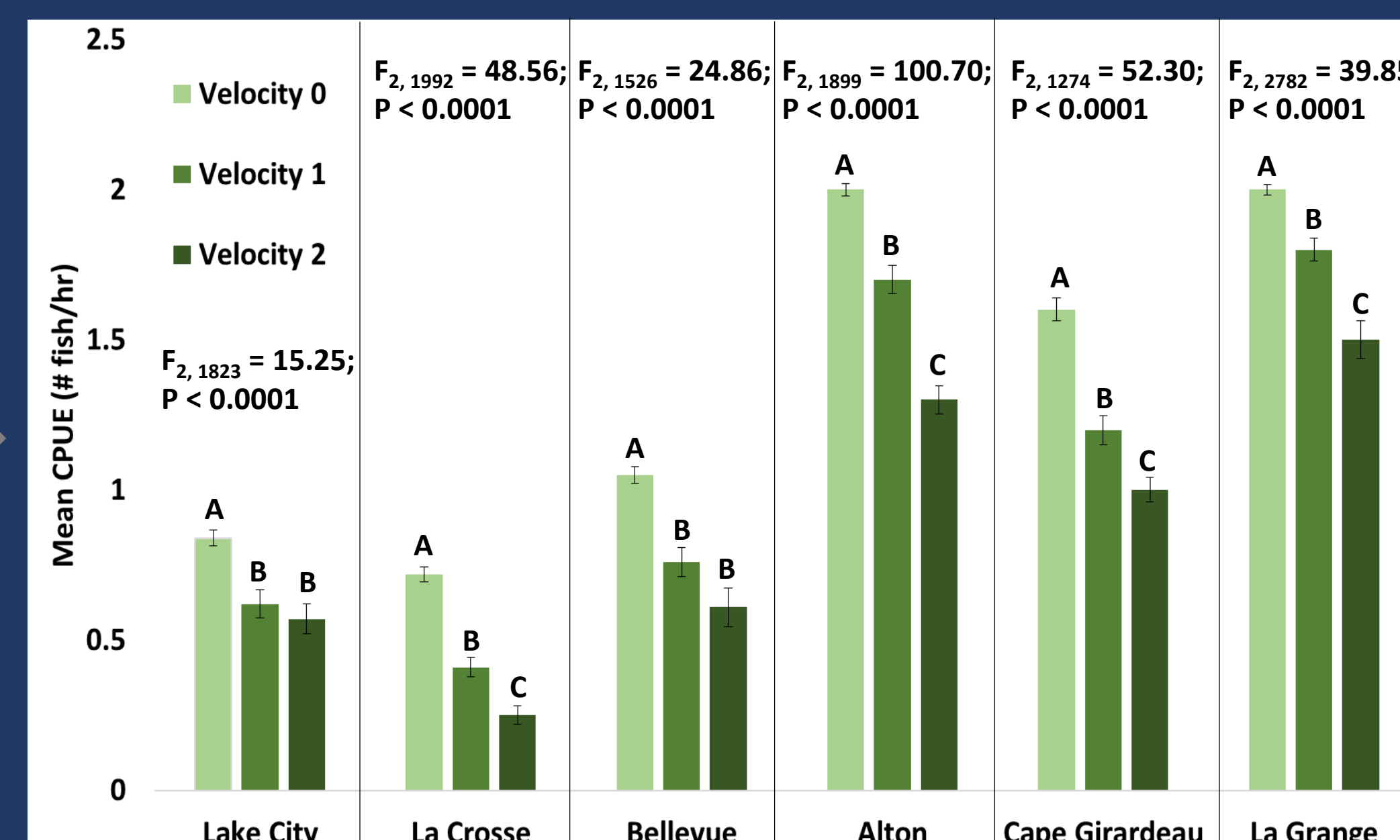
Generally finer substrates (e.g., silt and sand) were more commonly used by Gizzard Shad than larger substrate.



Gizzard Shad catch rates varied by depth. Generally as depth increased catch rates decreased.



Gizzard Shad catch rates were higher among slower velocity sites.



Discussion

Large-scale river features (e.g., MCB-U) are not driving Gizzard Shad habitat use in the Upper Mississippi River (UMR). Rather, our findings suggests fine-scale river features (e.g., depth) are influencing Gizzard Shad habitat use in the UMR. Overall, catch rates were higher in finer substrates, shallower waters, and slower velocities. Gizzard Shad in the UMR are utilizing similar habitats to other off-channel habitat specialists (Miller 1960).

Given the importance of Gizzard Shad, river restoration efforts should focus on replicating these fine-scale river features. Ultimately, restoring these habitats can benefit Gizzard Shad in the UMR. Conversely, benefitting Gizzard Shad improves other economically important fish species in the UMR.



References

- Alexander, J.S., R. C Wilson, and W. R. Green. 2012. A Brief History and Summary of the Effects of River Engineering and Dams on the Mississippi River System and Delta. U.S. Department of the Interior U.S. Geological Survey Circular 1375: 53-55
- Giam, X., and J. D. Olden. 2016. Environment and predation govern fish community assembly in temperate streams. *Global Ecology and Biogeography* 10: 1194-1205
- Miller, R.R. 1960. Systematics and biology of the Gizzard Shad (*Dorosoma cepedianum*) and related fishes. U.S. Fish and Wildlife Service, Washington, D.C.

Acknowledgements

This study was conducted by the U.S. Army Corps of Engineers' Upper Mississippi River Restoration Program Long Term Resource Monitoring (LTRM) element. The LTRM is a cooperative effort between the U.S. Army Corps of Engineers, U.S. Geological Survey, U.S. Fish and Wildlife Service, and the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin.