Evaluating Gizzard Shad *Dorosoma cepedianum P*opulations in two Kentucky Reservoirs Recently Invaded with Silver Carp *Hypopthalmichthys molitrix*

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INTRODUCTION

Gizzard Shad *Dorosoma cepedianum* are an ecologically important fish species found in many reservoirs throughout the southeastern United States [1,2]. Kentucky Lake and Lake Barkley are two reservoirs where Gizzard Shad and Silver Carp *Hypopthalmichthys molitrix* are present and possibly competing. The presence of Silver Carp has been shown to negatively impact Gizzard Shad in other waterbodies [3,4]. Previous research done at Murray State has shown evidence of competition between Silver Carp and Gizzard Shad in Kentucky Lake for a limited food resource [5], showing the possibility of Silver Carp having an impact on Gizzard Shad populations. However, the overall impact of the invasive Silver Carp on Gizzard Shad can not be fully quantified for these lakes due to limited baseline population data.

OBJECTIVES

- Describe size structure, condition, age, growth, mortality, and reproduction of Gizzard Shad populations in Kentucky Lake and Lake Barkley.

METHODS

- Gizzard Shad were collected during nighttime shoreline electrofishing surveys from June 2021 - October 2021.
- Two cove and two main channel sites were sampled for 15 minutes every survey.
- Total length and weight was recorded for all Gizzard Shad. For sexable Gizzard Shad, gonad weight and sex was also recorded.
- Sagittal otoliths were collected from fish sampled in late October 2021.

Aging

- Two independent readers estimated Gizzard Shad ages using images of whole and sectioned otoliths [6].

Figure 1. Whole view of Gizzard Shad sagittal otolith (left) and cross section of Gizzard Shad sagittal otolith (right).

Table 1. Precision of two readers estimating the age of Gizzard Shad otoliths. ACV is the average coefficient of variation.

	Agreement	±1	±2	ACV	SD	N
Kentucky Lake	92.9%	6.1%	1.0%	1.6	6.0	98
Lake Barkley	90.7%	9.3%	0.0%	1.5	5.4	108

Results

- Kentucky Lake was sampled via electrofishing 13 times during the 2021 growing season. A total of 605 Gizzard Shad were captured, average CPUE was 48 fish/hour (SD = 16.4, N = 13).
- Lake Barkley was sampled seven times via electrofishing during the 2021 growing season. A total of 2,882 Gizzard Shad were collected, average CPUE was 412 fish/hour (SD = 337, N = 7)

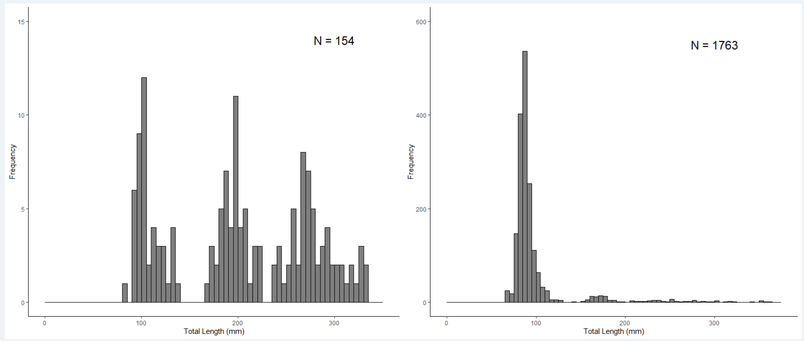

Figure 2. Length frequency histograms of Gizzard Shad captured by shoreline electrofishing during late October 2021. Kentucky Lake (left) and Lake Barkley (Right).

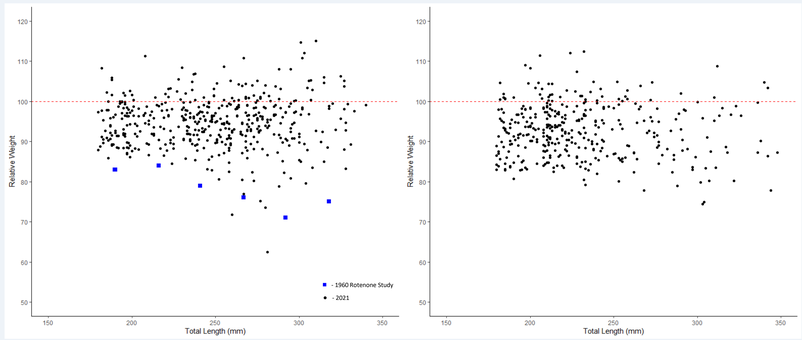

Figure 3. Scatterplot of relative weight and total length (mm) of Gizzard Shad in Kentucky Lake (left) and Lake Barkley (right). Dashed red line represents a relative weight of 100. The blue squares on the left scatterplot represent average relative lengths for inch length groups from the 1960 Kentucky Lake rotenone study [7].

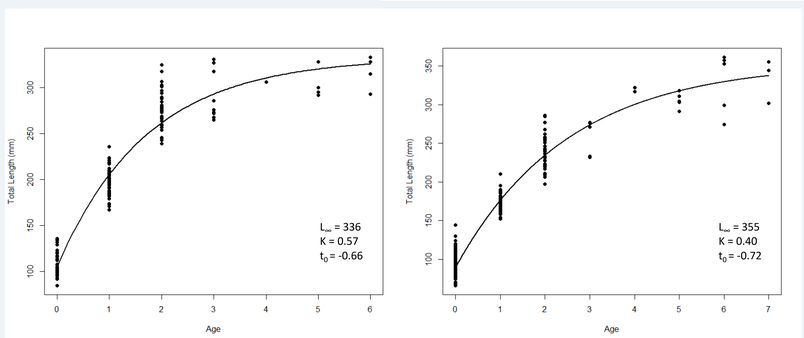

Figure 4. Von Bertalanffy growth curves calculated from otolith age estimates for Gizzard Shad collected from Kentucky Lake (left) and Lake Barkley (right) during October 2021 [8]. L_{∞} = predicted maximum total length, K = growth coefficient and t_0 = theoretical age when total length is zero.

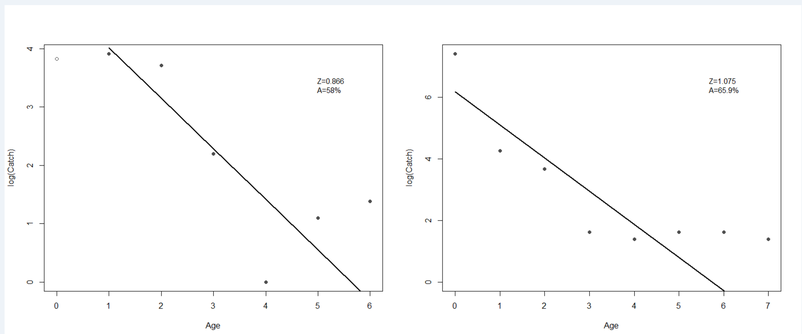

Figure 5. Weighted catch curve regressions for Gizzard Shad collected from Kentucky Lake (left) and Lake Barkley (right) during October 2021 [8]. Z = instantaneous total mortality rate and A = annual mortality rate. Filled circles represent age classes which have fully recruited to the gear and thus were used in the calculations.

DISCUSSION

Results suggest that population characteristics of Gizzard Shad in Kentucky Lake and Lake Barkley are different despite the reservoirs' proximity to each other. Gizzard Shad in Lake Barkley are more abundant and have higher mortality when compared to Kentucky Lake Gizzard Shad. Gizzard Shad have higher growth rates in Kentucky Lake but have a smaller maximum size. Gizzard Shad recruitment appears to be better in Lake Barkley than Kentucky Lake. Both populations of Gizzard Shad are in relatively good condition and exhibit similar average relative weights. However, the impact of Silver Carp on Gizzard Shad in these two reservoirs is still unknown, without comparable pre-carp data. But, based off the 1960 Kentucky Lake Rotenone study, Gizzard Shad appear to be in similar if not better condition than historical data shows.

Plans for 2022

- Resume electrofishing and surface trawling for Gizzard Shad in the spring and continue throughout the growing season.

Figure 6. Large Gizzard Shad collected from Lake Barkley, June 2021.

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