

---

# Examination of the Current State Record River Carpsucker in Oklahoma

**Jory B. Bartnicki**

Oklahoma Department of Wildlife Conservation, Oklahoma Fishery Research Laboratory, Norman, OK 73072

**Richard A. Snow**

Oklahoma Department of Wildlife Conservation, Oklahoma Fishery Research Laboratory, Norman, OK 73072

---

**Abstract:** River Carpsucker (*Carpionodes carpio*) are found throughout Oklahoma and are recognized as a non-game species by the Oklahoma Department of Wildlife Conservation, which allows the species to be pursued by anglers using any method and without limits. The current state record River Carpsucker was harvested with bowfishing on May 30, 2021 from Fort Cobb Reservoir, Oklahoma, which we examined to estimate age, back calculate length-at-age (growth rates), and back calculate spawning year. Based on those analyses, we estimated this fish to be 14 years old with rapid growth (52.8% of total length) within the first 4 years, and then growth slowed with increasing age. Based on the estimated age of this fish, the state record River Carpsucker was spawned in 2007. This hatch year corresponds with flooding events that occurred across the state, and signifies the importance of river flow for successful spawning of this species. Even though this study is limited to a single specimen, it provides insight and adds knowledge to this understudied species in Oklahoma.

---

## Introduction

The River Carpsucker (*Carpionodes carpio*) is one of three species of carpsuckers, including Quillback (*Carpionodes Cyprinus*) and Highfin Carpsucker (*Carpionodes velifer*), that are found in Oklahoma (Miller and Robison 2004). This species is widely distributed and abundant throughout Oklahoma's reservoirs, rivers, and streams. The native range of River Carpsucker includes the Great Plains from Texas to Montana, throughout the Mississippi drainage, and extends into northeastern Ohio (Miller and Robison 2004).

The River Carpsucker has received comparatively little attention by fisheries managers throughout its range compared to other fish species. This is driven by a negative connotation from anglers, and perceived as having little economic importance (Rypel et

al. 2021). For example, in the 2019 Oklahoma angler survey, "carp" ranked 15 out of 18 for species most often targeted when fishing (York 2019). Further complicating the management of River Carpsucker is the limited and outdated literature for the species. For example, age and growth characteristics of this species is based on scales and fin rays (Buchholz 1957; Purkett 1958; Morris 1965; Stucky and Klaassen 1971; Hesse et al. 1978), which generally underestimate age when compared to otoliths (Quist et al. 2007, Muir et al. 2008, Grabowski et al. 2012). Authors who have studied River Carpsuckers have considered the species to be long-lived (Sandheinrich and Atchison 1986; Braaten and Berry 1997).

On May 30, 2021, a new Oklahoma state record (612 mm TL, 4.3 kg) River Carpsucker was harvested by an angler at Fort Cobb Reservoir, Oklahoma. This fish exceeded the weight of the previous River Carpsucker record by 272 g. The Oklahoma Department of Wildlife

Conservation (ODWC) requested to obtain this fish for examination because of the increase in popularity from anglers taking non-game fish coupled with previous literature claims that this species is long-lived. Our objective was to examine the new state record River Carpsucker to estimate age, evaluate growth rate through back calculated length-at-age, and estimate hatch year (i.e., back calculated) so that we can better understand the environmental conditions that contributed to production of this fish. We realize that this assessment is limited to a single individual but considered the opportunity to examine a large specimen would benefit future elucidation of this species' life-history.

## Methods

On May 30, 2021, ODWC Oklahoma City region fisheries staff weighed (using a certified scale, A&D SK-20KZ, A&D Store, Inc., Wood Dale, IL) and measured (TL and girth; mm) the potential state record River Carpsucker. Meristic counts of lateral line scales, dorsal fin rays, anal rays, pectoral rays, pelvic rays, and gill rakers were taken to verify the species' identification (Pflieger 1997, Miller and Robison 2004). Following inspection, this fish was confirmed as the new state record River Carpsucker for Oklahoma.

Once certified, the fish was donated to the Oklahoma Fishery Research Laboratory (OFRL) in Norman, Oklahoma. The fish was dissected to determine sex, and to examine stomach contents. The ovaries were removed to determine number of eggs, and lapilli otoliths were removed for age estimation. We estimated egg abundance in both ovaries by taking 10 subsamples of 50 eggs (500 total), and then weighed and averaged the samples (0.80 g total weight; 0.08 g per sample). Then, using those metrics, we took the total weight of the egg mass (g), dividing by the mean subsampled weight (0.08 g), and multiplying by 50 eggs to get total eggs.

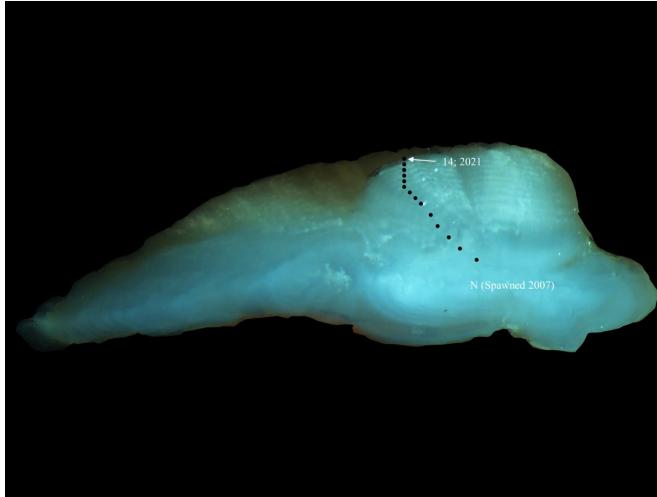
After removal, lapilli otoliths were cleaned of organic material and placed into an envelope to dry for a period > 24 hrs. After drying, lapilli otoliths were embedded in epoxy resin and cut in

the sagittal plane (Secor et al. 1992). The otolith was then sanded wet with 2000 grit sandpaper and viewed in cross section under a dissecting microscope capable of 130X magnification. We estimated age by placing the otolith, polished side up, in a dish containing modeling clay and immersed the otolith in water (to reduce glare). We then illuminated the otolith by using a fiber-optic filament attached to an external light source, which enables the reader to manipulate the light angle to better enhance annuli marks. The annuli appeared as dark rings on a light background and were counted to assign an age estimate. Two independent readers evaluated both otoliths. If the estimate was not agreed on, then a concert reading was conducted to finalize an age estimate (Hoff et al. 1997). After age estimates were finalized, we used the Dahl-Lea method to back-calculate length-at-age to describe growth (mm; Quist et al. 2012). We then subtracted the final age estimate from the capture year to estimate hatch year.

## Results and Discussion

The new state record River Carpsucker was a female that measured 612 mm TL, had a girth of 515 mm, and weighed 4.3 kg. The two independent readers estimated the age of this fish to be 13 and 14 years-old, respectively. The agreed consensus age of this fish was 14 years old (Figure 1), which is older than prior studies age estimates ranging from 8-9 years old. However age estimates for the previous studies were based on dorsal fin rays, age 9 (Braaten et al. 1999), and scales, age 8 (Stucky and Klaassen 1971).

During the necropsy, we found that the stomach was empty, and that the specimen likely had not spawned. The egg mass from both ovaries weighed 750.5 g and accounted for 17.5% of the total weight of the fish. We estimated the total number of eggs contained by this River Carpsucker to be 469,063. Based on an equation developed by Behmer (1969), our estimate was 161,642 eggs higher than expected. However, Behmer (1969) suggested that any estimates derived from this equation would be conservative because River Carpsucker have



**Figure 1. Photograph of a sectioned lapilli otolith from the current state record River Carpsucker (age 14) caught on 30 May 2021. ● = indicate annuli that reflect the age and year (age; year) on photograph.**

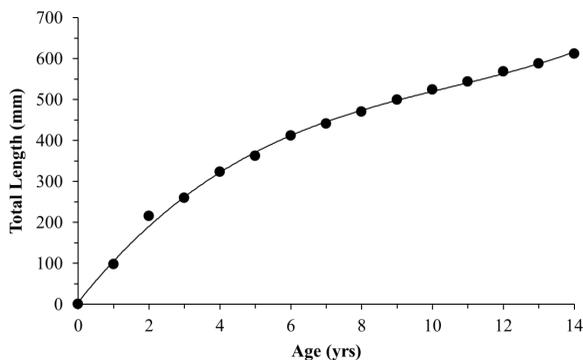
multiple spawning events in a season (Behmer 1967).

Our evaluation is one of few to present growth information for River Carpsucker using otoliths. River Carpsucker have been found to grow rapidly during their first 3-4 years of life based on scale derived age estimates (Stucky and Klaassen 1971; Hesse et al. 1978). Similarly, back-calculated lengths-at-age in this study suggest that this River Carpsucker grew 52.8% of its TL during the first 4 years of life and 81.6% of TL by age 9. Even though growth slowed with age it never plateaued (Figure 2), suggesting this species can live longer than 14 years, as has been reported for other species in the family Catostomidae. For example, Bigmouth Buffalo (*Ictiobus cyprinellus*), have been observed to reach 112 years old (Lackmann et al. 2019), Blue Sucker *Cycleptus elongates*, to 42 (Radford et al. 2021), Quillback (*Carpoides Cyprinus*) to 52 years; (Lackmann et al. 2019), Razorback Sucker (*Xyrauchen texanus*) to 44 (McCarthy and Minckley 1987), and Smallmouth Buffalo (*Ictiobus bubalus*) to 62 years of age (Snow et al. 2020).

We were able to back-calculate the hatch year to 2007 (Figure 1). In that year, heavy precipitation and severe flooding impacted Oklahoma during late spring and again in the

summer when the remnants of Tropical Storm Erin affected the state (Dong et al. 2011). A total of 87.12 cm of rain fell at the Ft. Cobb Mesonet station from May through August, 8.2 cm above the average amount that the region typically receives over an entire year (Mesonet.org). Also, the top of conservation pool elevation of Ft. Cobb lake is 409 m and during the period of June-August the lake maintained an average elevation of 411.1 m meaning the lake was 2.03 m higher than normal (US Army Corps of Engineers 2007). River Carpsuckers journey up rivers and streams in large schools to spawn over soft substrata (Etnier and Starnes, 1993) during flooding events in late spring/early summer (May through June; Miller and Robison 2004, Catalano and Bozek 2015). Presumably, the extreme floods during the summer months of 2007, allowed young-of-year to utilize inundated floodplain habitat for nursery cover, resulting in high juvenile survival and successful recruitment.

Although this study is limited to one specimen, it adds to the growing knowledge of this species based on the largest individuals available for study. Additionally, it provides a need to better understand the basic ecology of this species throughout Oklahoma's reservoirs, rivers, and streams. Currently ODWC allows unlimited take and any method on River



**Figure 2. Back-calculated total length-at-age (mm) for the state record Smallmouth Buffalo captured at Fort Cobb Reservoir in Oklahoma.**

Carpsucker, however future changes may be needed to further protect this species. We hope this information will support a better understanding of River Carpsuckers natural history and assist with future conservation and management of this species.

### Acknowledgments

The authors thank Jaci Williams for her willingness to donate the state record River Carpsucker to ODWC. A special thanks to the Oklahoma City Regional office for collection of information and storage of the specimen. We thank Kurt Kuklinski (ODWC) and Dr. James Long (OSU) for reviewing an earlier draft of this manuscript and providing comments that greatly improved this manuscript. We also thank Dr. Mostafa Elshahed and anonymous reviewers for providing edits that improved this manuscript. Financial support was provided by the U.S. Fish and Wildlife Service Sportfish Restoration Grant F-86-D-1 and F-66-D-8 to the Oklahoma Department of Wildlife Conservation.

### References

- Braaten, P. J., and C. R. Berry, Jr. 1997. Fish association with four habitat types in a South Dakota prairie stream. *Journal of Freshwater Ecology* 12:477–489.
- Behmer, D. J. 1969. A Method of estimating fecundity: with Data on River Carpsuckers, *Carpiodes carpio*. *Transactions of the American Fisheries Society* 98:523-524.
- Behmer, D. J. 1967. Spawning periodicity of River Carpsuckers, *Carpiodes carpio*. *Proceedings of the Iowa Academy of Science* 72:252-262.
- Buchholz, M. 1957. Age and growth of river carpsucker in the Des Moines River, Iowa. *Proceedings of the Iowa Academy of Science* 64:589–600.
- Catalano, M. J., and M. A. Bozek. 2015. Influence of environmental variables on catostomid spawning phenology in a warmwater river. *The American Midland Naturalist Journal* 173:1-16.
- Dong, X., B. Xi, A. Kennedy, Z. Feng, J. K. Entin, P. R. Houser, R. A. Schiffer, T. L'Ecuyer, W. S. Olson, K. Hsu, W. T. Liu, B. Lin, Y. Deng, and T. Jiang. 2011. Investigation of the 2006 drought and 2007 flood extremes at the Southern Great Plains through an integrative analysis of observation. *Journal of Geophysical Research* 116:1-18.
- Etnier, D.A., and W.C. Starnes. 1993. *The fishes of Tennessee*. University of Tennessee Press, Knoxville, TN.
- Grabowski T. B., S. P. Young, J. J. Isely, and P. C. Ely. 2012. Age, growth, and reproductive biology of three catostomids from the Apalachicola River, Florida. *Journal of Fish and Wildlife Management* 3:223–237.
- Hesse, L. W., C. R. Wallace, and L. Lehman. 1978. *Fishes of the channelized Missouri River: age-growth, length-frequency, length-weight, coefficient of condition, catch curves, and mortality of 25 species of channelized Missouri River fishes*. Nebraska Game and Parks Commission, Nebraska Technical Series 4, Lincoln.

- Hoff, G. R., D. J. Logen, and M. F. Douglas. 1997. Otolith morphology and increment validation in young Lost River and Shortnose Suckers. *Transactions of the American Fisheries Society* 126:488-494.
- Lackmann, A. R., A. H. Andrews, M. G. Butler, E. S. Bielak-Lackmann, and M. E. Clark. 2019. Bigmouth Buffalo *Ictiobus cyprinellus* sets freshwater teleost record as improved age analysis reveals centenarian longevity. *Communications Biology*. doi.org/10.1038/s42003-019-0452-0
- McCarthy, M. S. and W. L. Minckley. 1987. Age estimation for razorback sucker (Pisces: Catostomidae) from Lake Mohave, Arizona, and Nevada. *Journal of the Arizona-Nevada Academy of Science* 21:87-97.
- Miller, R. J., and H. W. Robison. 2004 *Fishes of Oklahoma*. University of Oklahoma Press, Norman, Oklahoma.
- Morris, L. A. 1965. Age and growth of the river carp-sucker, *Carpododes carpio*, in the Missouri River. *American Midland Naturalist* 73:423-429.
- Muir, A. M., M. P. Ebener, J. X. He, and J. E. Johnson. 2008. A Comparison of the scale and otolith methods of age estimation for Lake Whitefish in Lake Huron. *North American Journal of Fisheries Management* 28:625-635.
- Oklahoma Climatological Survey. 2007. Mesonet Climatological Data Summary (FTCB) Fort Cobb. Retrieved from <https://www.mesonet.org/common/db/library/functions/mcd/mcd.php?ver=2&year=8&format=pdf&stid=FTCB>
- Pfieger, W. L., 1997. *The Fishes of Missouri* Conservation Commission of the State of Missouri, Jefferson City, Missouri.
- Purkett, C. A., Jr. 1958. Growth of fishes in the Salt River, Missouri. *Transactions of the American Fisheries Society* 87:116-131.
- Quist, M. C. and J. R. Spiegel. 2012. Population demographics of catostomids in large river ecosystems: Effects of discharge and temperature on recruitment dynamics and growth. *River Research and Applications* 28:1567-1586.
- Quist, M. C., M. A. Pegg, and D. R. Devries. 2012. Age and growth. pp. 677-731, in Zale, A.V., Parrish, D.L. and Sutton, T.M. (eds.), *Fisheries Techniques*, third edition. American Fisheries Society, Bethesda, Maryland.
- Quist, M. C., Z. J. Jackson, M. R. Bower, and W. A. Hubert. 2007. Precision of hard structures used to estimate age of riverine catostomids and cyprinids in the Upper Colorado River Basin. *North American Journal of Fisheries Management* 27:643-649.
- Radford, D. S., A. R. Lackmann, C. J. Moody-Carpenter, and R. E. Colombo. 2021. Comparison of hard structures including otoliths for estimating age in Blue Sucker. *Transactions of the American Fisheries Society* 150:514-527.
- Rypel, A. L., P. Saffarinia, C. C. Vaughn, L. Nesper, K. O'Reilly, C. A. Parisek, M. L. Miller, P. B. Moyle, N. A. Fanguie, M. Bell-Tilcock, D. Ayers, S. R. David. 2021. Goodbye to "rough fish": Paradigm shift in the conservation of native fishes. *Fisheries*. DOI: 10.1002/fsh.10660
- Sandheinrich, M. B., and G. J. Atchison. 1986. Fish associated with dikes, revetments, and abandoned channels in the middle Missouri River. *Proceedings of the Iowa Academy of Science* 93:188-191.
- Secor, D. H., J. M. Dean, and E. H. Laban. 1992. Otolith removal and preparation for microstructural examination. pp. 19-57, in Stevenson DK, Campana SE, (ed.). *Otolith microstructure examination and analysis*. Canadian Special Publication of Fisheries and Aquatic Sciences 117.
- Snow, R. A., M. J. Porta, and D. M. Bogner. 2020. Examination of the Current Oklahoma State Record Smallmouth Buffalo. *Proceedings of the Oklahoma Academy of Science* 100:16-21.
- Stucky, N. P., and H. E. Klaassen. 1971. Growth and condition of carp and the river carpsucker in an altered environment in western Kansas. *Transactions of the American Fisheries Society* 100:276-282.
- US Army Corps of Engineers. 2007. Ft. Cobb Lake, OK Monthly Lake Report. Retrieved from <https://www.swt-wc.usace.army.mil/charts/?monthly&proj=FCOB>
- York, B. 2019. Oklahoma Department of Wildlife conservation 2019 Oklahoma angler survey, pp 13-15. Oklahoma Department of Wildlife Conservation, Oklahoma City, OK.