

**Project Performance Report to
United States Fish and Wildlife Service**

**Delineate distribution and magnitude of Asian carp
reproduction in the UMR**

Submitted By

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Reproductive ecology of Bigheaded Carp in Southeastern Iowa rivers

Progress:

Egg and larval fishes have been sampled from 2014–2019 at the mouths of three major UMR tributaries (Des Moines, Skunk, and Iowa rivers), at Keosauqua on the Des Moines River, as well as the mouths of two additional tributaries (Rock and Wapsipinicon rivers), UMR P17, and UMR P15 from 2016 – 2018. Genetic identification of eggs captured from 2014 – 2016 and yolk-sac larvae collected from 2014 – 2017 revealed successful spawning of Bigheaded Carp in the Mississippi, Des Moines, Skunk, and Iowa rivers. However, age-0 Bigheaded Carp post yolk-sac absorption were absent from our samples from 2014 – 2017. In 2018, we captured 200 juvenile Silver Carp (~120 mm) and one juvenile Bighead Carp in a backwater of the Skunk River. Juvenile hatch dates matched larval Bigheaded Carp capture dates, indicating that our ichthyoplankton sampling did a good job of detecting reproductive events and that there was no differential survival of Bigheaded Carp between the yolk-sac to juvenile stages. No Bigheaded Carp larvae were collected during 2019, likely due to flooding that limited sampling. Additional details of Bigheaded Carp larval phenology can be found in Camacho et al. (in press).

No sampling was conducted during 2020 due to COVID-19. Instead, we focused work on laboratory analysis, data entry, and statistical analysis. Sampling is anticipated to begin again in May 2021. Nathan Tillotson (MS student) has been conducting three analyses evaluating 1) zooplankton communities along the invasion edge in the Upper Mississippi River 2) growth of native larval fish in association with bigheaded carp abundance and other environmental conditions and 3) diet analysis of native larval fish in association with bigheaded carp abundance. We also completed two projects 1) validating the use of a random forest model for identifying bigheaded carp eggs and 2) evaluating conditions associated with bigheaded carp reproduction in the Upper Mississippi River. Both of these manuscripts are in review with peer-reviewed Journals. Finally, we published five peer-reviewed manuscripts during this project period, with several others in review.

Camacho, CA, CJ Sullivan, MJ Weber, and CL Pierce. In press. Suitability of an Upper Mississippi River Tributary for Asian carp reproduction. *North American Journal of Fisheries Management*.

Sullivan, CJ, MJ Weber, CL Pierce, DH Wahl, Q Phelps and R Columbo. In press. Spatial variation in Silver Carp populations across their existing distribution in North America. *Ecology of Freshwater Fish*.

Camacho, CA, †CJ Sullivan, MJ Weber, and CL Pierce. In press. Invasive Carp reproduction phenology in tributaries of the Upper Mississippi River. *North American Journal of Fisheries Management*.

Sullivan, CJ, CA Camacho, MJ Weber, and CL Pierce. 2020. A comparison of Grass Carp population characteristics upstream and downstream of Lock and Dam 19 of the Upper Mississippi River. *Journal of Fish and Wildlife Management* 11: 99-111.

Camacho, CA, CJ Sullivan, MJ Weber, and CL Pierce. 2019. Morphological identification of Bighead Carp, Silver Carp, and Grass Carp eggs using random forests machine learning classification. *North American Journal of Fisheries Management* 39: 1373-1384.