

## **M.L. 2013 Minnesota Aquatic Invasive Species Research Center Subproject Abstract**

For the Period Ending June 30, 2019

**SUBPROJECT TITLE:** MAISRC Subproject 4.2: Common carp management using biocontrol and toxins: Phase II

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**FUNDING SOURCE:** Environment and Natural Resources Trust Fund (ENRTF)

**LEGAL CITATION:** M.L. 2013, Chp. 52, Sec. 2, Subd. 06a

**SUBPROJECT BUDGET AMOUNT:** \$406,000

**AMOUNT SPENT:** \$348,913

**AMOUNT REMAINING:** \$57,087

### **Sound bite of Project Outcomes and Results**

This project found that bluegill sunfish can reduce production of carp fry by 8-fold in shallow lakes. It also found that corn-based food pellets that contain a toxin might be used to selectively target carp with little risk to native fish. Both of these are promising strategies for carp control.

### **Overall Subproject Outcome and Results**

This project aimed to test new management tools for the common carp, Minnesota's most abundant invasive fish. We used a whole lake experiment to test if bluegill sunfish can reduce production of carp fry in shallow lakes (Activity 1). We also used a series of lab, pond and lake experiments to test if corn-based food pellets that contain a toxin can be used to selectively target carp without harming native fish (Activities 2, 3, 4). Activity 1 (bluegill experiment in 6 small lakes) showed that bluegills can suppress the production of carp fry in shallow lakes by 8-fold. Thus, maintaining healthy bluegill populations in lakes would serve as an important biocontrol strategy for carp in Minnesota.

Activities 2, 3, and 4 showed that common carp readily consume corn pellets that contain a toxin (Antimycin-A, ANTA) and cannot distinguish between pellets with or without the toxin. Further, in a pond experiment with carp and three native species (white sucker, bluegill, yellow perch), only carp ate the toxic pellets and perished. Finally, in a natural lake experiment where we tagged nearly 500 carp and 900 native fish, only carp were attracted to corn-based pellets (we did not use toxin in the lake experiment). This was further verified using underwater cameras. Overall, corn-based food pellets appear to be very powerful and relatively species-specific attractant for carp. Toxins, such as ANTA, could be incorporated into such pellets to target carp. Our work also showed that corn (without toxin) can be used as bait to train carp to form large feeding aggregations that could be targeted using simpler and safer means than toxins, such as nets.

Future directions might include: 1) Focusing on risks and costs associated with using corn-based pellets that contain ANTA or other toxins to control common carp, 2) Focusing on how baiting with corn can be used to induce large feeding aggregations of carp than could be removed with nets. This is being addressed in Phase III.

### **Subproject Results Use and Dissemination**

Two manuscripts have been published:

Poole, J. R., Sauey, B. W., Amberg, J. J., & Bajer, P. G. (2018). Assessing the efficacy of corn-based bait containing antimycin-a to control common carp populations using laboratory and pond experiments. *Biological Invasions*, 20(7), 1809-1820.

Poole, J. R., & Bajer, P. G. (2019). A small native predator reduces reproductive success of a large invasive fish as revealed by whole-lake experiments. *PLoS one*, 14(4), e0214009.

One manuscript has been submitted for publication:

Hundt, P. J., Amberg, J. J., Sauey, B. W., & Bajer, P. G. 2019. Toward a new Common Carp (*Cyprinus carpio*) management tool: Laboratory and mesocosm experiments testing a species-specific corn-based bait containing a toxin. Submitted to Management of Biological Invasions

One manuscript is in preparation:

Hundt, P.J, Bajer, P. G. Can corn-based food pellets be used to selectively induce feeding aggregation of invasive fish, Common Carp (*Cyprinus carpio*), in a natural lake? To be submitted for Fisheries Management and Ecology

Presentations:

Poole, J.R., B.W. Sauey, J.J. Amberg, and P.G. Bajer. (2017). Controlling common carp through biocontrol and species-specific toxin delivery. Contributed paper presented at annual meeting of the Minnesota Chapter of the American Fisheries Society. Saint Cloud, MN. February 22, 2017.

Poole, J.R., B.W. Sauey, J.J. Amberg, and P.G. Bajer. (2017). Exploiting Dietary Differences to Develop Species-Specific Control of Common Carp Using Toxic Food Pellets. Contributed paper presented at annual National meeting of the American Fisheries Society. Tampa, FL. August 22, 2017.

Poole, J.R., B.W. Sauey, J.J. Amberg, and P.G. Bajer. (2017). Exploiting Dietary Differences to Develop Species-Specific Control of Common Carp Using Toxic Food Pellets. Contributed paper to be presented at annual International Conference for Aquatic Invasive Species. Fort Lauderdale, FL. October 23, 2017.

Poole, J.R., B.W. Sauey, J.J. Amberg, and P.G. Bajer. (2017). Control of common carp through species-specific toxin delivery. Poster presented at the Minnesota Aquatic Invasive Species Research Center Showcase. Saint Paul, MN. September 13, 2017.

Poole, J.R. and P.G. Bajer. (2017) Control of common carp through biocontrol and species-specific toxin delivery. Friday Noon Seminar Presentation at the University of Minnesota, Twin Cities. Saint Paul, MN. November 11, 2017.

Hundt PJ and Bajer PG. Toward a new common carp management tool: Testing species-specific corn-based toxic bait. UMISC - NAISMA Joint Conference, October 2018, Rochester, Minnesota

Hundt PJ and Bajer PG. New common carp management techniques: Selective toxins and Whooshh. 2018 MAISRC showcase. St. Paul, MN. PowerPoint available:  
<https://www.maisrc.umn.edu/files/maisrcshowcasesept2018publicpptx>