M.L. 2013 Minnesota Aquatic Invasive Species Research Center Subproject Abstract
For the Period Ending June 30, 2019

SUBPROJECT TITLE: MAISRC Subproject 7.2: Developing eradication tools for invasive species Phase II: Virus Discovery and evaluation for use as potential biocontrol agents
SUBPROJECT MANAGER: Dr. Nicholas Phelps
AFFILIATION: University of Minnesota Department of Fisheries, Wildlife and Conservation Biology
MAILING ADDRESS: 2003 Upper Bufford Circle
CITY/STATE/ZIP: St. Paul, MN 55108
PHONE: 612-624-7450
E-MAIL: phelp083@umn.edu
WEBSITE: http://www.maisrc.umn.edu
FUNDING SOURCE: Environment and Natural Resources Trust Fund (ENRTF)
LEGAL CITATION: M.L. 2013, Chp. 52, Sec. 2, Subd. 06a

SUBPROJECT BUDGET AMOUNT: $445,210
AMOUNT SPENT: $422,667
AMOUNT REMAINING: $22,543

Sound bite of Subproject Outcomes and Results
Researchers identified many new and important viruses in Minnesota fish populations, including Koi Herpes Virus, which caused high mortality in common carp and was not detected in native fish species. This virus will be evaluated as a potential biocontrol agent for common carp in the next phase of the project.

Overall Subproject Outcome and Results
One possible component to an effective integrated pest management plan for aquatic invasive species would be through the introduction or promotion of species-specific pathogens. This high-risk, high-reward approach must be carefully assessed with thorough investigation and scientifically justified risk assessment. In Phase II of this long-term effort, we characterized the virome invasive and native fish species and zebra mussels. *We achieved our ultimate goal of this project and identified a candidate virus (koi herpes virus) that caused high mortality in common carp and was not detected in native fish species – this virus will be the focus of Phase III.* We also identified many other novel and undescribed viruses in health and dead fish, however the implications of these results are unknown and warrant additional research to better understand the threat to native species and/or potential as biocontrol agents. The virome of zebra mussels was also interesting with lower viral diversity than the fish species investigated; however, no viruses emerged as potential zebra mussel biocontrol candidates from field samples or laboratory trials.

This study emphasized the value of advanced molecular approaches to unbiased viral discovery and diagnostics. The methods we developed and optimized for sample collection, processing, and sequence analysis (all together called a 'pipeline'), have informed testing protocols at the Minnesota Veterinary Diagnostic Laboratory. We have also elevated awareness among managers that viral diversity is much higher than currently known and deserves more attention as early indicators of potential threats.

The project team spent considerable time during Phase II engaging with managers, scientists, and the public in multiple formats. It is important that this type of research is transparent and understandable to all stakeholders. To that end, we held formal in person meetings, attended local-national-international scientific conferences, published a peer-review manuscript, networked with internationally-renowned experts, produced two videos, and provided interviews for print, radio and TV media.

Subproject Results Use and Dissemination

We had learned during Phase 1 of this project (MAISRC Sub Project 7.1) that communication, outreach and transparency were very important for this type of project. To that end, the project team has spent considerable time engaging with managers, scientists, and the public in multiple formats. This has included formal in person meetings, local-national-international scientific conferences, peer-review publication, networking with internationally-renowned experts, video production, and print, radio and TV media. A summary of this is listed below:

Formal in-person meetings: Great Lakes Fish Health Committee, MN DNR Koi Herpes Virus Working Group.

Scientific conferences: American Fisheries Society – Fish Health Section, Eastern Fish Health Workshop, MAISRC showcase (x3), International Conference on Aquatic Invasive Species, Minnesota Veterinary Diagnostic Laboratory, Aquatic Invaders Summit III, Freshwater Mollusk Conservation Society, International Symposium on Aquatic Animal Health. NOTE: Most of these conferences were supported by non-LCCMR funding.

Peer-review publication: Padhi, S. K., I. E. Tolo, M. McEachran, A. Primus, S. K. Mor, N. B. D. Phelps. In press. Koi herpesvirus and carp edema virus: Infections and coinfections during mortality events of wild common carp in the United States. Journal of Fish Disease. Several other publications are in progress.

Networking with experts: Dr. Ken McColl, Dr. Tom Waltzek, Dr. Mikolaj Ademek, and others.

Video production: Video 1 (viewed 822 times as of 8/8/19), Video 2 (viewed 96 times as of 8/8/19).

Media: New York Times, KSTP 5, KARE 11, Star Tribune, Minnesota Daily, MN DNR Press release, MAISRC newsletters.