

M.L. 2021 Minnesota Aquatic Invasive Species Research Center Subproject Abstract

For the Period Ending June 30, 2024

SUBPROJECT TITLE: MAISRC Subproject 21.3: Multibeam sonar zebra mussel mapping, method development

SUBPROJECT MANAGER: Dr. Jessica Kozarek

ORGANIZATION: St. Anthony Falls Laboratory

COLLEGE/DEPARTMENT/DIVISION: University of Minnesota

MAILING ADDRESS: 2 Southeast 3rd Ave

CITY/STATE/ZIP: Minneapolis, MN 55414

PHONE: 612-624-4679

E-MAIL: jkozarek@umn.edu

WEBSITE: <https://maisrc.umn.edu/zm-sonar>

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

LEGAL CITATION: M.L. 2021, First Special Session, Chp. 6, Art. 6, Sec. 2, Subd. 06e

SUBPROJECT BUDGET AMOUNT: \$184,167

AMOUNT SPENT: \$182,358

AMOUNT REMAINING: \$1,809

Sound bite of Project Outcomes and Results

This project explored the use of cutting-edge multibeam sonar tools to map invasive and native mussel habitat and distribution. The ability to map habitat and distribution of mussels within a waterbody will greatly assist in control efforts for invasive mussels and conservation efforts for native mussels.

Overall Subproject Outcome and Results

Current methods for invasive zebra mussel detection give an incomplete picture of distribution in a waterbody. Diving surveys, larval sampling and colonization plates are all spatially limited. Video or photographic surveys are challenged by visibility. To overcome these challenges, this study evaluated the potential for utilizing advanced acoustic techniques, specifically multibeam sonar, to enhance mussel monitoring by developing and validating methods to map habitat (sediment type) and relative mussel density at a large scale. This project is the third phase of a three-phase project. Phase I consisted of controlled feasibility experiments in a laboratory setting. Phase II tested and further refined these methods in the field, and Phase III consisted of a full-scale evaluation of methods. Field work was conducted in two sites, a lake site with zebra mussels and a river site with high densities of native freshwater mussels and zebra mussels. At each site, multibeam sonar data were collected with varying acoustic settings and a dive team was deployed to record relative mussel density and sediment type. This detailed dataset across a range of sediment types and mussel densities provided the basis for the evaluation of classification models to relate acoustic backscatter to substrate type and relative mussel density. While results from Phases I and II indicated high accuracy of classification, Phase III highlighted some challenges to surveying such as vegetation and the need for adequate ground truth data. In Phase III, researchers mapped large areas in both waterbodies, developed protocols and publications for dissemination, and compared multibeam sonar to other monitoring methods. As acoustic mapping methods continue to be both more accessible and more sophisticated, it is expected that this study will provide a basis for continued efforts to map invasive mussel habitat and distribution providing a valuable tool for managers and researchers to track invasion extents.

Subproject Results Use and Dissemination

Dissemination activities for this project through all phases include scientific publications (one published and open access and one in preparation), presentations to a variety of audiences including the MAISRC annual Showcase and scientific audiences, the development of a guidance document detailing methods and protocols to be published via the UMN Digital Conservancy (<https://conservancy.umn.edu/home>) once approved through USGS (required by USGS collaboration) and the publication of all data collected through the Data Repository for the University of Minnesota (DRUM). In addition, the research team worked with MAISRC during Phase II to create a video summarizing the project for a general audience and conducted a dockside meet and great to demonstrate the project objectives and methods.

Peer-Reviewed Publications

- Hornbach, D. J., Kozarek, J. L., Blinick, N., Hove, M. C., Grams, P., Kaplinski, M., ... Riesgraf, A. T. (2023). Distribution pattern of the Zebra Mussel (*Dreissena polymorpha*) in White Bear Lake, Minnesota: a spatial scale analysis. *Journal of Freshwater Ecology*, 38(1).
<https://doi.org/10.1080/02705060.2023.2202700>
Data: <https://doi.org/10.13020/NCDT-J687>

Select Presentations/Videos

- Kozarek, J.L., D. Hornbach, P. Grams, M. Kaplinski, K. MacGregor, M. Hove, N. Blinick, C. Milliren, and A. Riesgraf (2022) Mapping Zebra Mussels Using Multibeam Sonar, Joint Aquatic Sciences Meeting, May 14-20, 2022, Grand Rapids, MI. – Approximate attendees (Virtual and in person): 50
- Kozarek, J.L., (2022) Mapping Zebra Mussels Using Multibeam Sonar (poster), Minnesota Aquatic Invasive Species Research Center (MAISRC) Annual Showcase, September 21, 2022, University of Minnesota, (Virtual).
- 2023 MAISRC Research & Management Showcase: Multibeam sonar zebra mussel mapping: Method development
<https://z.umn.edu/2023ShowcaseSonar>