

M.L. 2017 Minnesota Aquatic Invasive Species Research Center Subproject Abstract

For the Period Ending June 30, 2022

SUBPROJECT TITLE: MAISRC Subproject 16.2: AIS impacts on walleye populations and mercury concentrations

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SUBPROJECT BUDGET AMOUNT: \$199,853

AMOUNT SPENT: \$199,853

AMOUNT REMAINING: \$0

Sound Bite of Project Outcomes and Results

Invasive zebra mussels impact lakes supporting walleye in Minnesota. Our research demonstrates that zebra mussels are associated with lower recruitment (reproduction and survival) of walleye in their first year. Furthermore, walleye and yellow perch alter their feeding habits in lakes with zebra mussels, which is associated with increased mercury concentrations.

Overall Subproject Outcome and Results

Invasive zebra mussels profoundly affect lake ecosystems, but their impacts on walleye are not well understood. We used a multi-pronged approach to understanding zebra mussel impacts on walleye in Minnesota lakes. First, we evaluated how walleye recruitment (reproduction and survival) to their first fall was affected. We used statistical models applied to data collected by the Minnesota Department of Natural Resources to quantify changes in walleye recruitment. Walleye recruitment declined by ~41% following zebra mussel invasion. Additionally, lakes with zebra mussels supported the highest walleye recruitment prior to invasion, suggesting that zebra mussels invade high quality walleye lakes. Next, we evaluated how zebra mussels influence food webs supporting walleye and yellow perch, and how food web changes influence mercury concentrations in fish tissue. Using stable isotope analysis, we found that walleye and yellow perch in zebra mussel invaded lakes use 36-50% more nearshore food resources compared to those in uninvaded lakes. Mercury concentrations in fish were also influenced by zebra mussels; mercury in fish tissue was 66% higher for adult walleye and 91% higher for adult yellow perch in lakes containing zebra mussels compared to those in uninvaded lakes. On average, mercury concentrations in 16-inch walleye from lakes containing zebra mussels were 0.28 ppm, above the 0.2 ppm threshold triggering human consumption advisories by the Minnesota Department of Health. Zebra mussel-induced changes have important implications for walleye in Minnesota lakes. Lower walleye recruitment in invaded lakes may influence abundance at later life stages, which could influence harvest and stocking plans. Walleye were able to persist on nearshore food resources following zebra mussel invasions, but mercury concentrations were higher in these fish with important implications for human consumption. Given the significance of the impacts of zebra mussels documented in our study, preventing zebra mussel invasions into additional walleye lakes is critical.

Subproject Results Use and Dissemination

We have provided regular updates of our progress to scientists, managers, and the public via oral presentations and posters. PI Hansen and graduate student Kundel are members of the MN DNR Walleye-Zebra Mussel task force, and our research on the effects of zebra mussels on walleye recruitment has been critical for informing their approach to monitoring and managing for zebra mussel invasions. We have presented our results directly to MN DNR fisheries staff, at the MAISRC showcase, and at a national conference, as well as through several public virtual sessions. Progress on each objective was delayed due to the Covid-19 pandemic, and we are in the process of preparing manuscripts describing our results for peer-reviewed publications.

Presentation Recordings

- 2020 MAISRC Research & Management Showcase Presentation
<https://z.umn.edu/2020ShowcaseZMWalleye>

Factsheets/Informational Documents

- Zebra mussel impacts on walleye populations and mercury concentrations: A collaborative project investigating the connections between zebra mussels, changes to lake food webs, and walleye success
<https://z.umn.edu/HansenWalleyeFactsheet>