Natural Resources Research Institute
University of Minnesota Duluth
Driven to Discover

Morphological and Molecular Techniques to Support Detection and Management of Ballast-Borne AIS

Abigail Latanich, Courtney Larson, Meagan Aliff, Euan Reavie

Background

Aquatic invasive species (AIS) released from ship ballast water threaten aquatic ecosystems. A unique opportunity to couple molecular and microscopic techniques is investigated to understand risk-release relationships in a controlled setting using mesocosms and surrogate protist species. This research aims to:

- Evaluate the relationship between release density and establishment using a wider variety of protist surrogates;
- Track surrogate and ambient community species using morphological and molecular techniques;
- Initiate a framework to support on-ship compliance testing methods using eDNA.

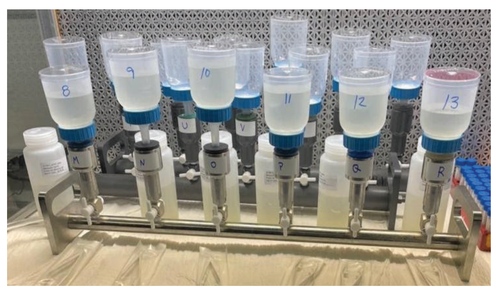
Methods



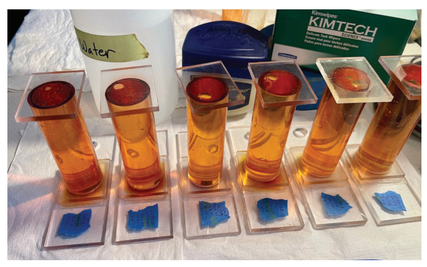
Fill mesocosms with Duluth-Superior Harbor water, inoculate with surrogate protists



Several, one month long experiments with intermittent sampling

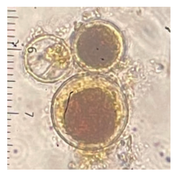


Filter for qPCR, 18S metabarcoding



Microscopy
Utermöhl method

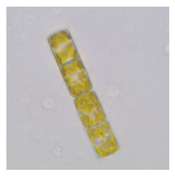
Target Organisms



Haematococcus pluvialis



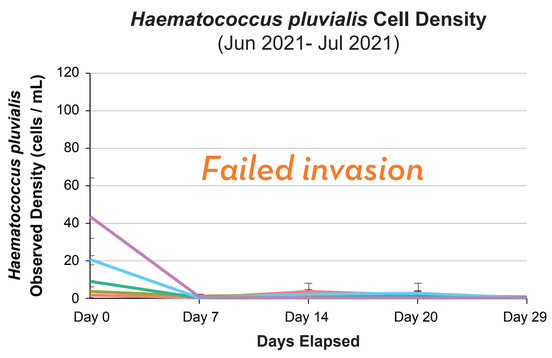
Trachelomonas abrupta

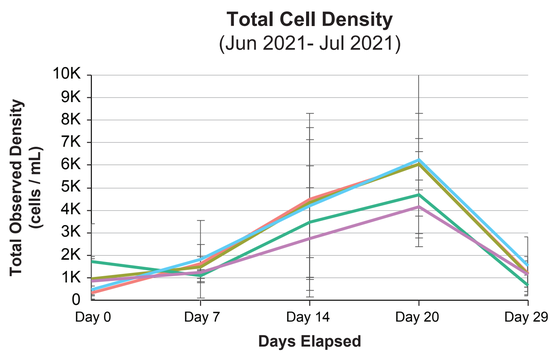


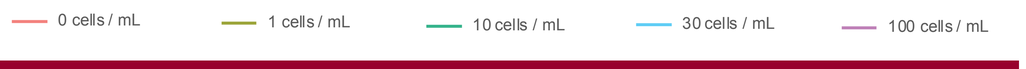
Melosira varians

Haematococcus pluvialis

(Jun 2021 - Jul 2021)

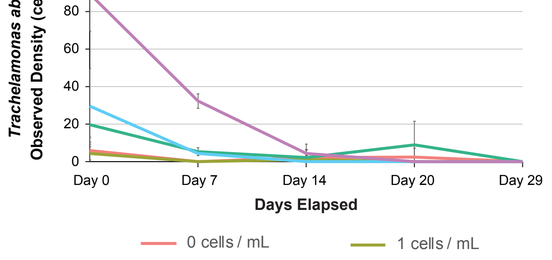


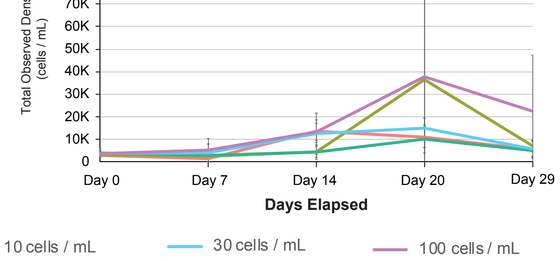




Trachelomonas abrupta

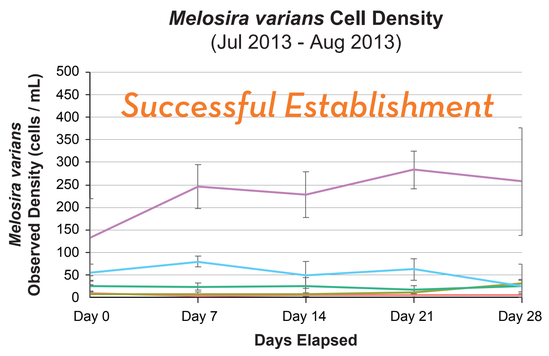
(Sept 2021 - Oct 2021)

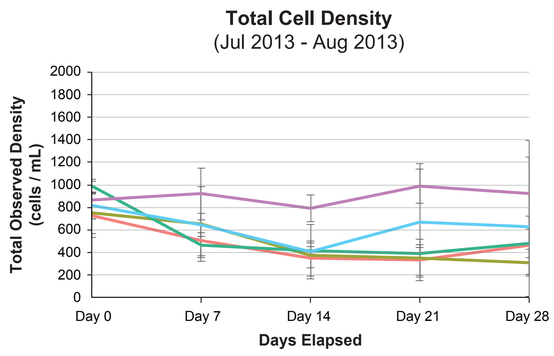


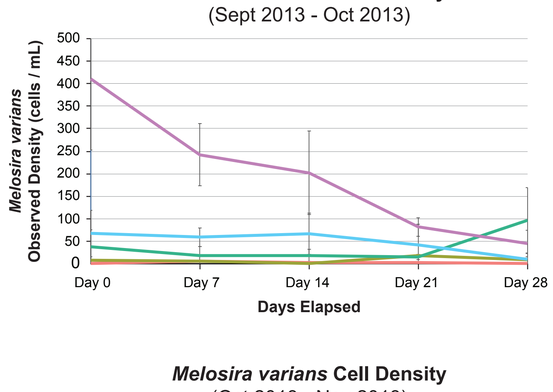


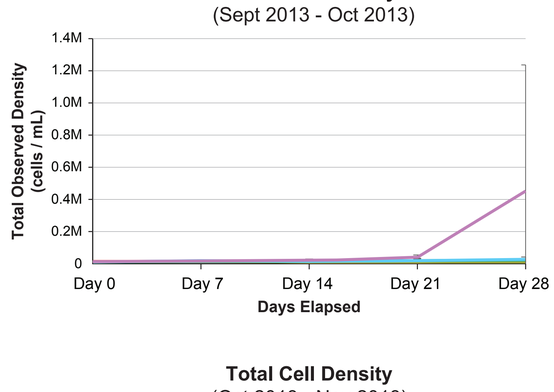
Melosira varians

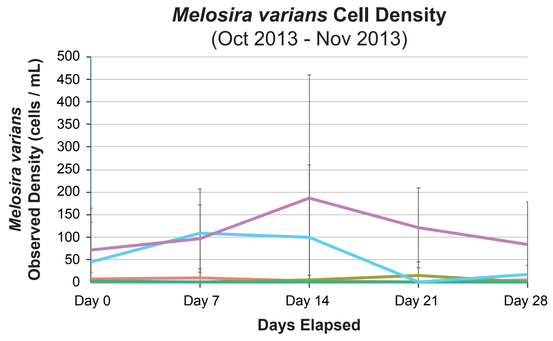
(Jul 2013 - Nov 2013)

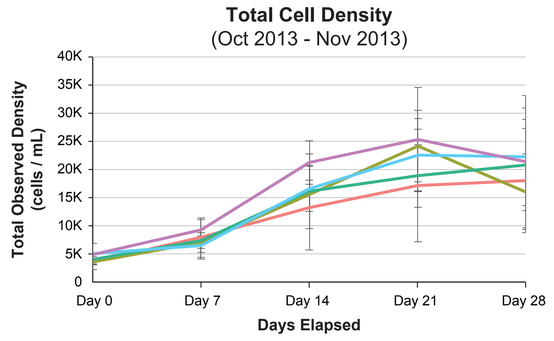












Effects of time and initial target organism (*Haematococcus pluvialis* and *Trachelomonas abrupta* in panel at left, *Melosira varians* in panel at right) inoculum on cell densities over 4 weeks. Note that density scales (y-axis) vary across trials. Values represent mean ± SD.

Next Steps

Morphological analysis of additional experiments

Analyze eDNA and metabarcoding results

2022 field season: 3 new protist surrogates!

2022 morphological and molecular analysis

UNIVERSITY of WISCONSIN Superior

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