# Great Lakes Ships Monitoring Project 2016-2017


GREAT WATERS RESEARCH COLLABORATIVE

UWS LAKE SUPERIOR RESEARCH INSTITUTE, UMD NATURAL RESOURCES RESEARCH INSTITUTE, AMI CONSULTING ENGINEERS

ALLEGRA CANGELOSI, SENIOR SCIENTIST, UWS LSRI

# Goal »

Help resolve unknowns so we can move on to appropriate solutions

- Sample Laker Ballast Uptake/Discharge & Relevant Harbors for:

  »Types and densities of zooplankton, protists;

  »Transit-alterations in organism densities and community composition during voyage;

  »Presence/absence of target organism (i.e., *Hemimysis anomala*, the “bloody red shrimp”)


# Cooperating Ship Companies

# Cooperating Ship Companies

Central Marine Logistics, Griffith, Indiana, USA

Interlake Steamship Company, Middleburg Heights, Ohio, USA

Grand River Navigation, Traverse City, Michigan, USA

Great Lakes Fleet/Key Lakes Inc., Duluth, Minnesota, USA

American Steamship Company, Williamsville, New York, USA

Lower Lakes Towing/Grand River Navigation, Port Dover, Ontario, Canada

Canada Steamship Lines, Montreal, Quebec, Canada

Algoma Central Corporation, St. Catharines, Ontario, Canada

# Research Design

**DISCHARGE ONLY SAMPLING:**

>Minimum of four discharge only events over the course of the project.

>Vessels of opportunity that arrive in WLS harbors from any other GLSSS ports.

**PAIRED UPTAKE AND DISCHARGE SAMPLING:**

>Minimum 4 paired uptake and discharge events

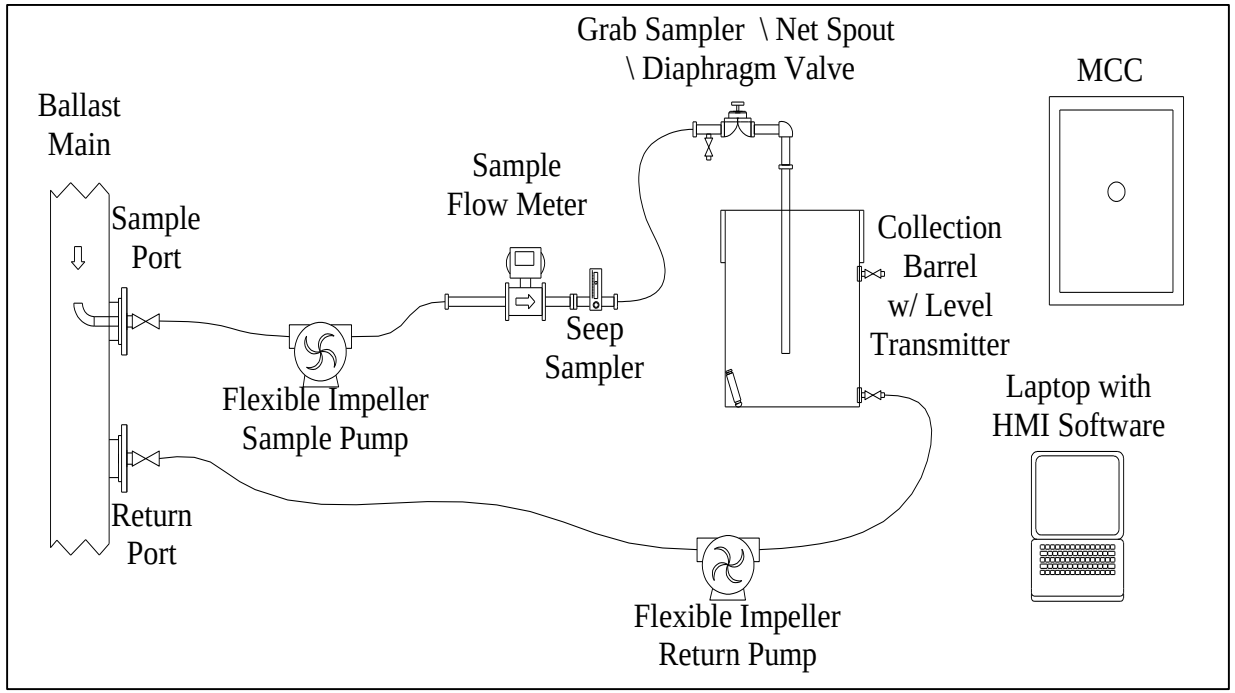
>Targeted voyage routes:

- Uptake harbors in Lower Lakes with known distribution of AIS (Bloody red shrimp)
- Discharge to any WLS port (ballast discharge).

>Harbor water from the uptake and discharge ports also assessed.

# 1. Sample Port Design and Installation

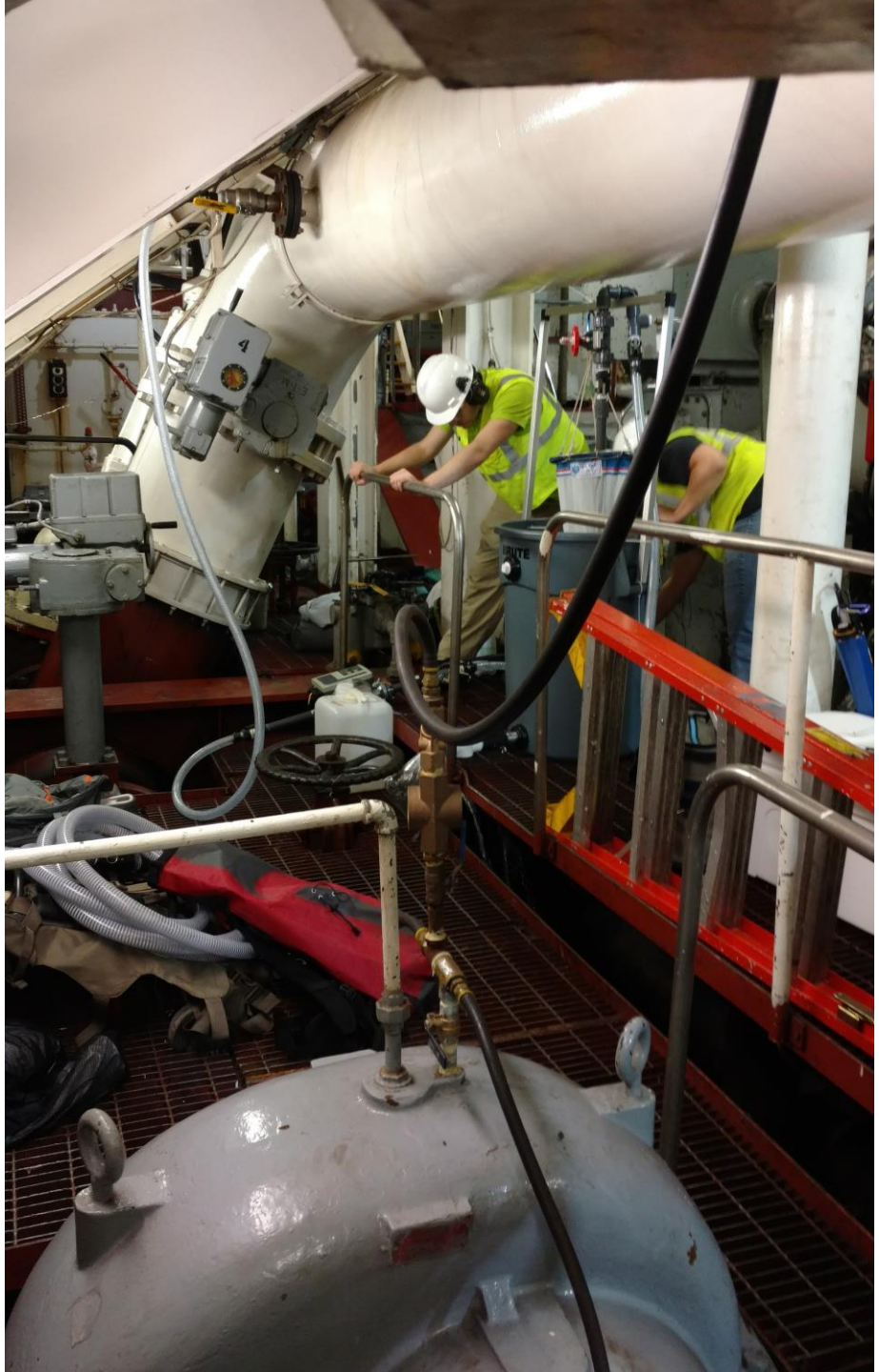
- Project staff inspected vessel piping, analyzed fluid dynamics, and recommended a position for sample intake and discharge ports.
- Ship owner installed sample ports with blind flanges consistent with design.
- Project supplied sample pitot.
- Much of this stage took place under NEMWI GSI auspices.



# 2. Sampling Events

Three technicians:

- Sample harbor;
- Board vessel;
- Meet with officers and crew;
- Hook up sampling system;
- Commence sampling process, taking operational, biological, and physical/chemical measurements;
- Clean up and depart vessel;



# 3: Samples, Measurements, and Data Analysis

# Samples and Measurements

## BALLAST WATER

Plankton net flow rate and sample volume, Seep Sampler volume, Temperature, Conductivity, Salinity (via algorithm), Turbidity, pH, Dissolved Oxygen, Chlorophyll a, Percent Transmittance, Total Suspended Solids, Particulate Organic Matter, Dissolved Organic Carbon, Organisms ≥ 50 µm (i.e., Zooplankton),Organisms ≥ 10 µm and < 50 µm (i.e., Protists), Microbes – E. coli, Hemimysis Genetic Marker

## HARBOR WATER

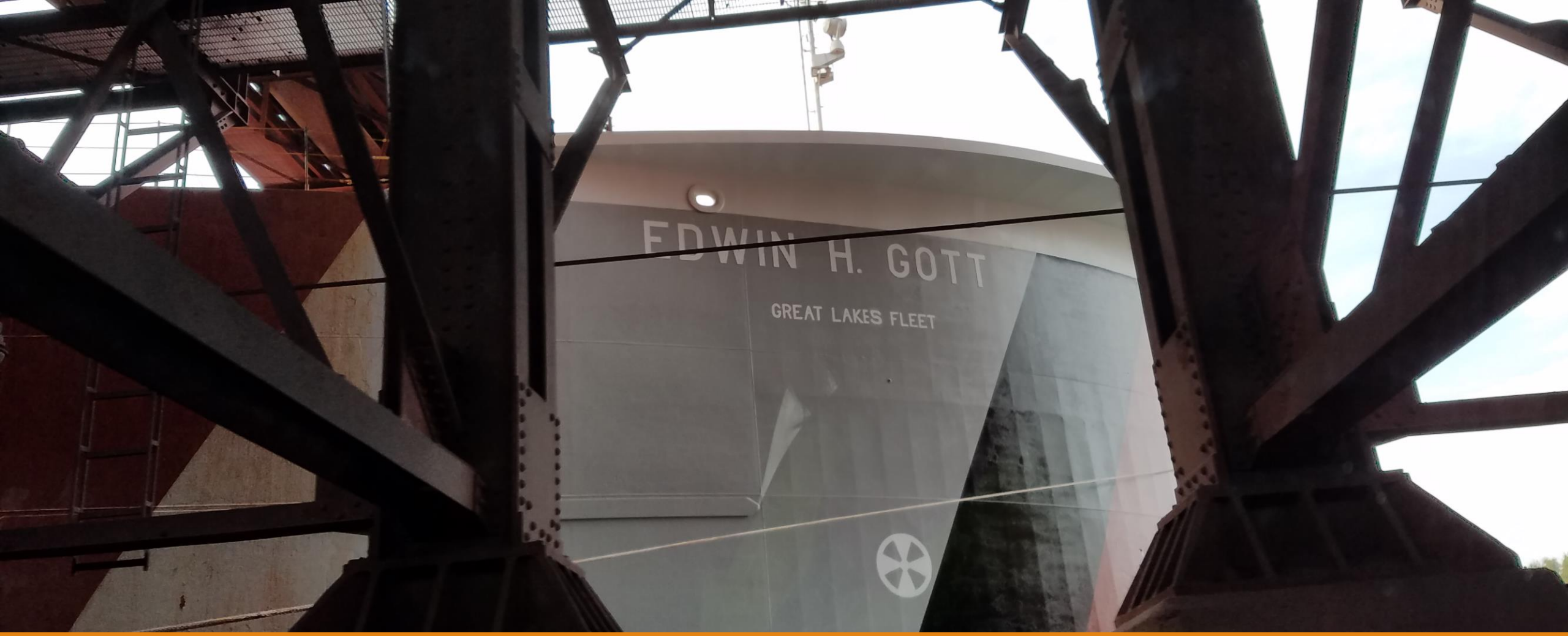
Longitude/Latitude, Distance from ship Water depth, Weather conditions, Temperature, Conductivity, Salinity (via algorithm), Turbidity, pH, Dissolved Oxygen, Chlorophyll a, Percent Transmittance, Total Suspended Solids, Particulate Organic Matter, Dissolved Organic Carbon, Hemimysis Genetic Marker

# 4. Data Analysis

- Numbers and types of organisms taken up and discharged;
- Numbers and types of target and non-target AIS not already detected in WLS;
- Any significant changes in water quality, organism community composition and densities between ballast uptake and discharge samples; and
- The extent to which the target AIS *(Hemimysis*) is detected in source water, ballast uptake and discharge water and also WLS receiving water.
- Ways to estimate a rate of transport of  the target AIS to WLS by ships annually

# 5. Report Out: Due February 2018

DATA PRESENTED IN TERMS OF GENERIC VOYAGES AND SHIPS (NO SHIP NAMES), MONTHLY TIME STAMPS, LOCATIONS REPORTED AS LAKE REGIONS




Funded by the **Great Lakes Restoration Initiative** via the US Maritime Administration

# Thank you!