

GREAT SHIPS INITIATIVE UPDATE

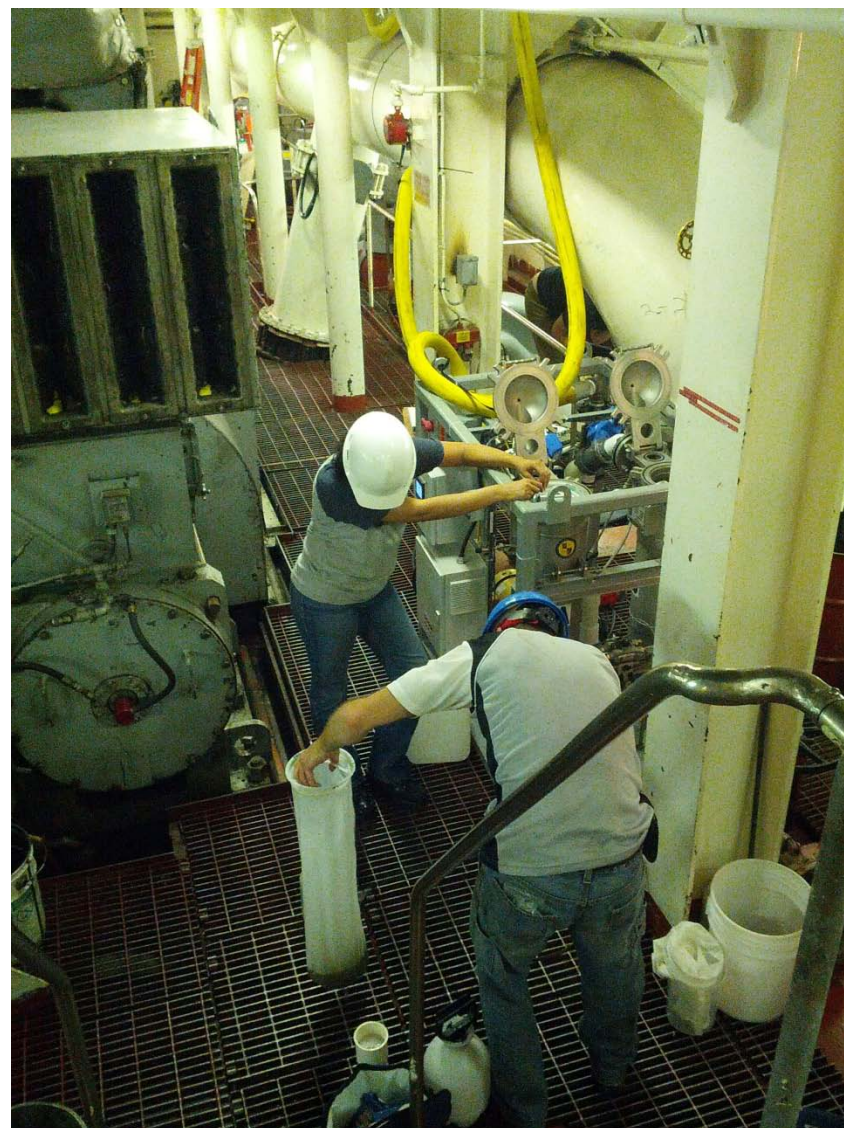
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(On behalf of Allegra Cangelosi)

Primary GSI Activities

- 2013 Accomplishments
 - ✓ Validation of the Draft ETV Shipboard Protocol
 - ✓ Filter System Round Robin Test
 - ✓ GSI Ship Sampling Methods Validation
 - ✓ Risk-Release Investigations – Methods Development: How Clean is Clean?
 - ✓ Global Harbor Water Quality Literature Review
- 2014 Outlook
 - US Type Approval Cert Testing!!!
 - Bench UV Dose Effectiveness Tests
 - Pre-Type Approval Land-Based Status Tests
 - Risk-Release Investigations – How Clean is Clean?

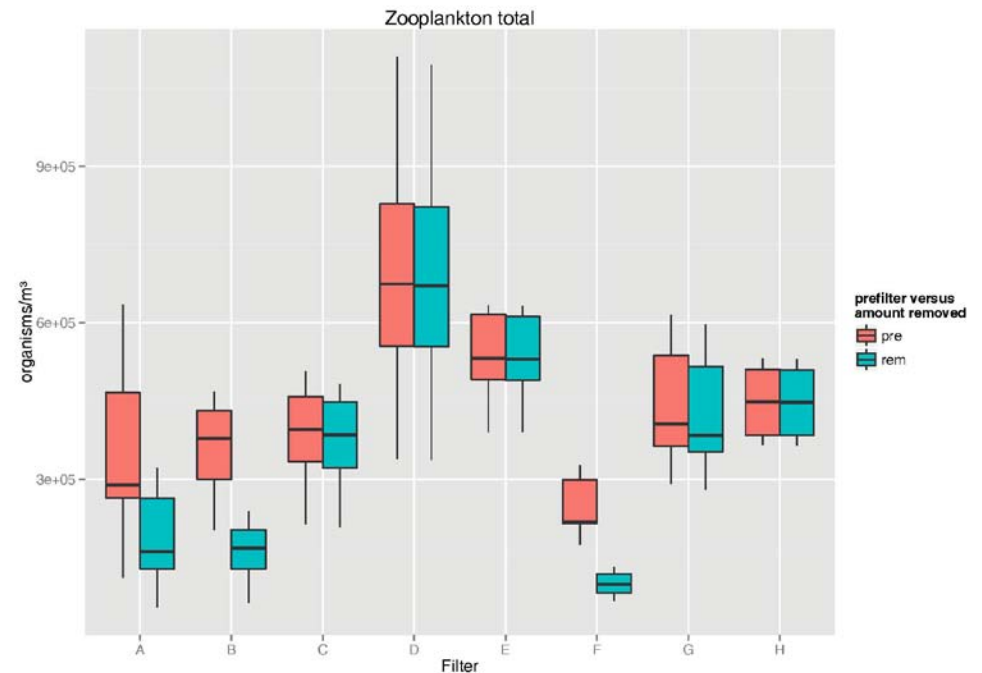
2013: Validation of ETV Draft Shipboard Protocol (Including NRL Sampling Skid)

- For US Coast Guard Research and Development Center;
- GLRI Funds via U.S. Maritime Administration
- Partial BWMS Installation on M/V Indiana Harbor
- Four Voyages-Test Cycles; Intake and Discharge
- Recommendations for Improvement of ETV DSP and NRL Skid



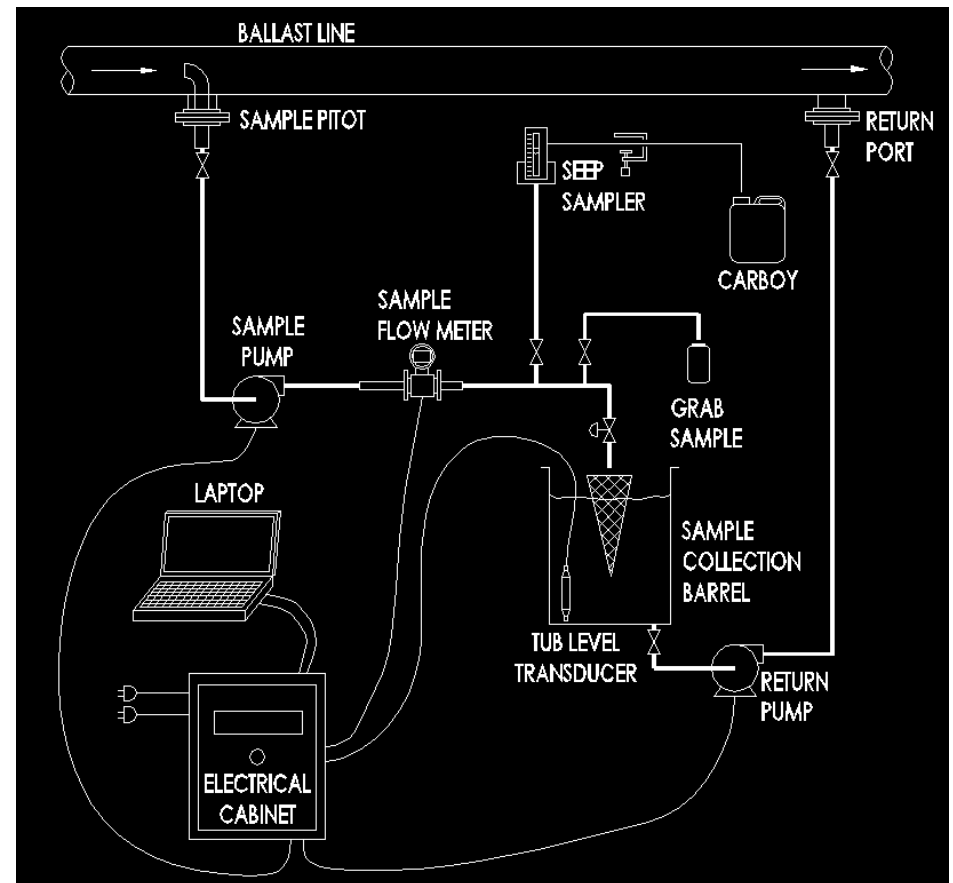
2013: Filter System “Round Robin” Test

- For Multiple Audiences
 - Ship Owners
 - 2-Step BWMS Designers
- 8 Commercially Available FS
 - Various FS Types and Pores Sizes
 - CSA Selected
- Tested 2/Week; N=4 Per FS
 - With/Without Added Solids
 - Vendor-Specified Flow Rate and Pressure
- Measured in terms of:
 - Operational Performance
 - Biological Performance (Plankton only)
- Results
 - Out for Review by Vendors
 - Publically Available Spring 2014



2013: Ship Sampling Methods Validation

- Side-By-Side
 - GSI Ship Discharge Monitoring System; and
 - GSI Land Based Sampling Station
- Multiple Trials
- Zooplankton and Phytoplankton Endpoints
- Equivalent Findings



2013: Risk-Release Relationship Investigation

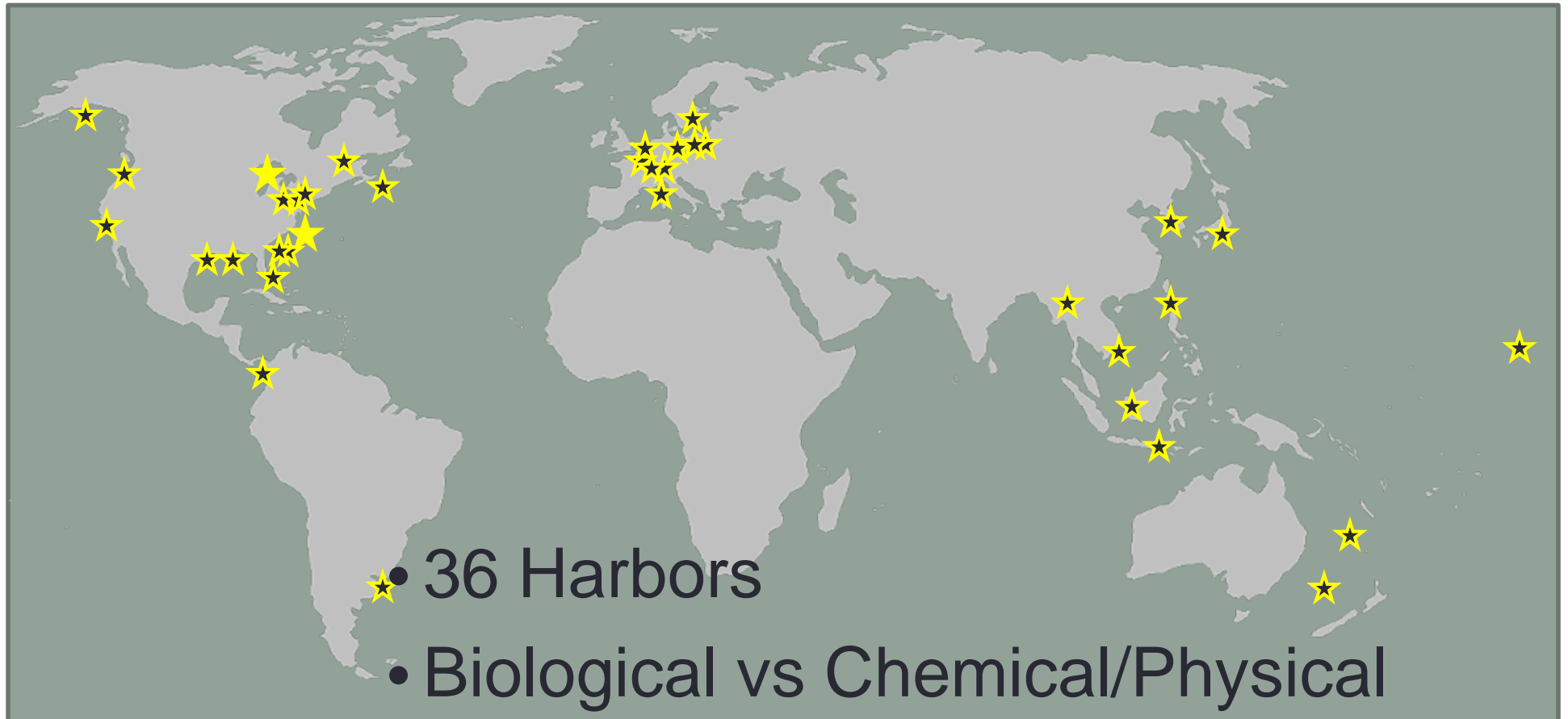
Field Surveys

- Target Harbors =
 - Duluth Superior Harbor
 - Two Harbors, MN
- Targeted Sampling Method for:
 - Ship Discharge (Release)
 - Harbor Sites (Risk of Establishment)
- Goal
 - Feasible Method for Long Term Monitoring

Mesocosm Experiments

- Target Organism = Spiny Water Flea
- Target Harbor = DSH
- (20) 1M³ Mesocosms
- Replicate inoculations of 1, 10, 30, 100 orgs.
- “Dose-Response”-Like Analysis

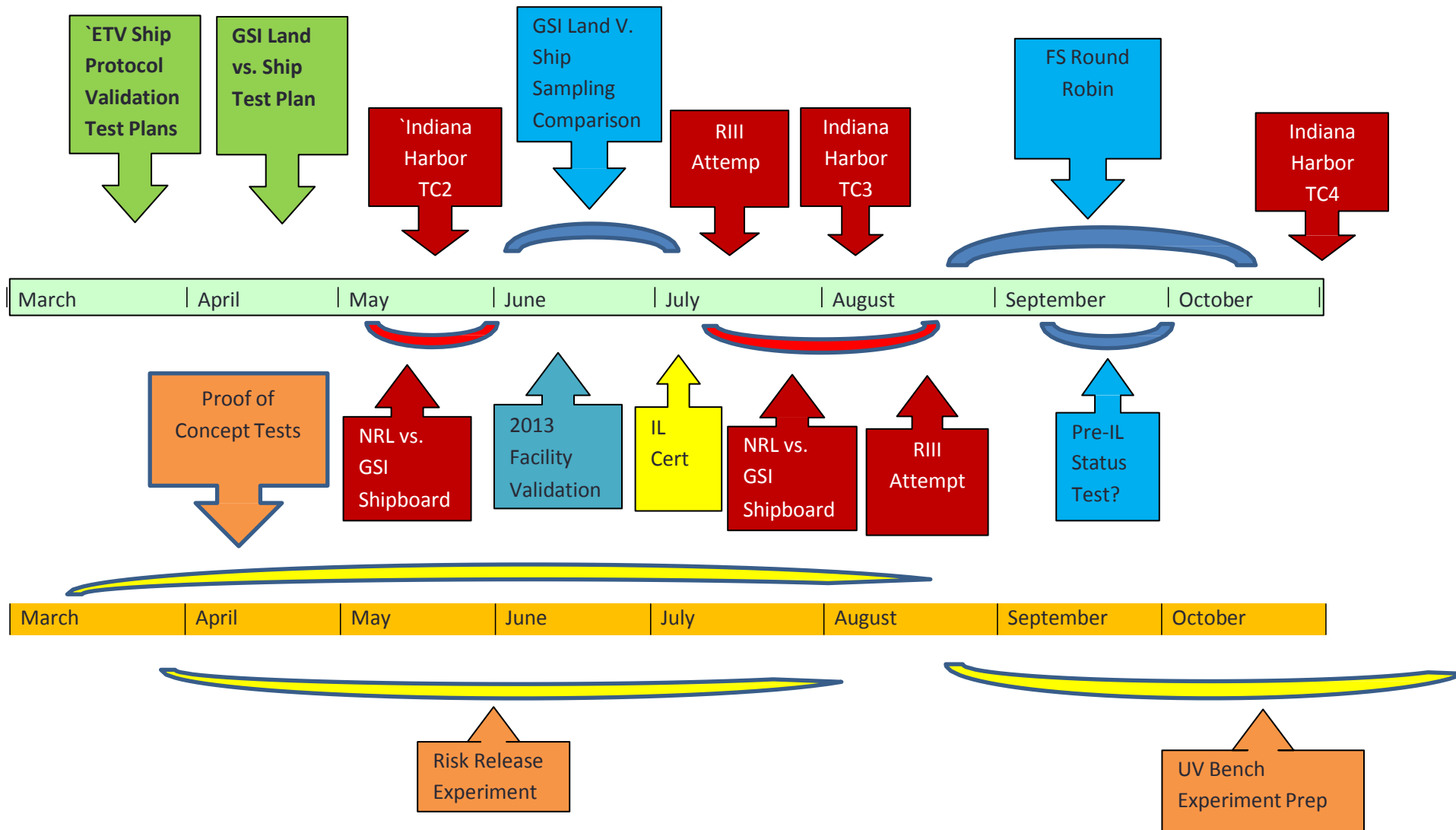
Harbor Quality Classification



- 36 Harbors
- Biological vs Chemical/Physical
- Draft report under review
- Next phase: what other data needed?

GSI 2013

Research and Test Activity Timeline



Primary 2014 GSI Activities

- 2014 Outlook
 - US Type Approval Cert Testing!!!
 - Electrolytic Chlorination System
 - Filtration/UV System
 - Bench UV Dose Effectiveness Tests
 - Lethal and Sublethal Effects
 - Zoop and Phyto Cultured Orgs
 - Pre-Type Approval Land-Based Status Tests
 - Filtration/Electrolytic Chlorination
 - Risk-Release Investigations – How Clean is Clean?
 - Mesocosm Experiments
 - Detailed Harbor Survey Design

GSI 2014 Projected Test Activity Timeline

