Assessing Compliance with California's Ballast Water Management Laws: From Exchange to Performance Standards

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Prevention First
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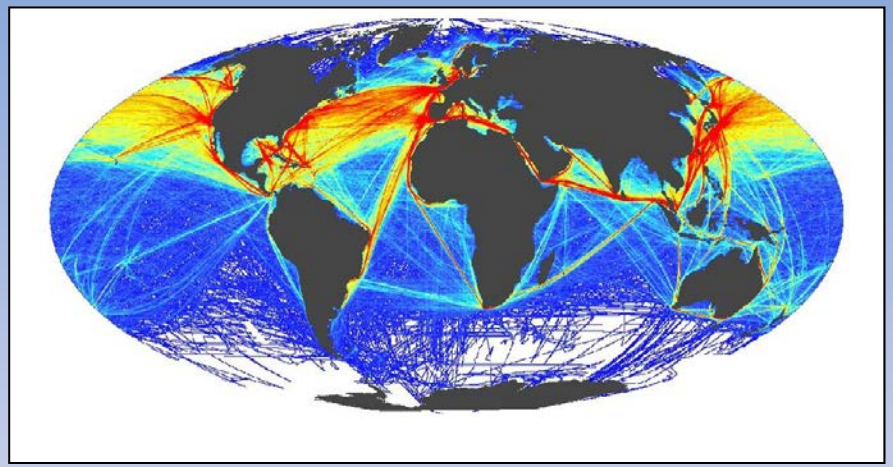
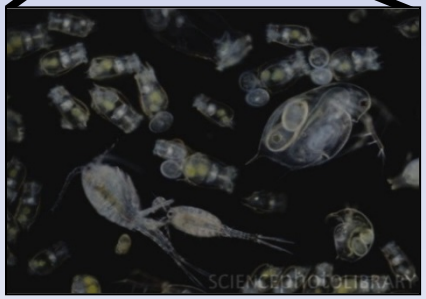
October 8, 2014

Why Manage Ballast Water?

- Roughly **7000** species are moved around the world in ballast on a daily basis (Carlton 1999).
- Each ballast water discharge event has the potential to release over **21.2** million individual organisms (Minton et al. 2005).



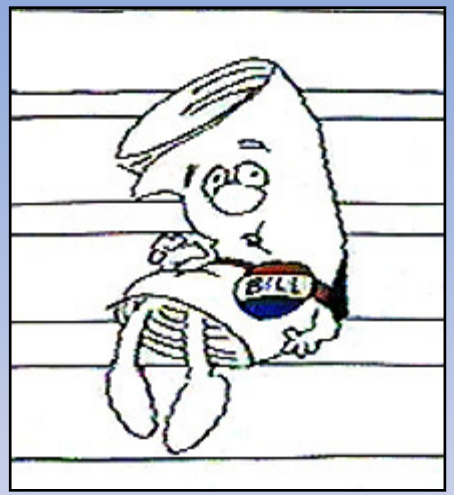


$120,000,000,000 in losses and damages **<u>per year</u>** in U.S.

(Pimental et al. 2005)

- CA's Ocean-based economy (2009)
  - 1st in ocean-based employment in U.S.
  - 2nd largest ocean-based GDP in U.S.
  - Tourism and recreational boating ~ $15 Billion
- Many vectors for NIS into CA, but shipping most significant.

Marine Invasive Species Program - Authority and Origins



1999 Ballast Water Management Control for Nonindigenous Species Act

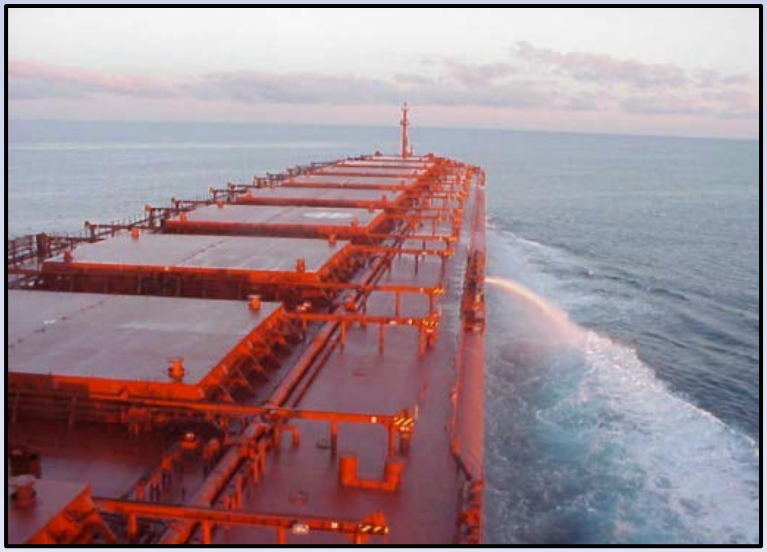
- Authority: Vessels over 300 GRT capable of carrying ballast water
- Only Foreign Ballast Water Managed

2003 Marine Invasive Species Act (Reauthorization & Expansion)

- Required Management of Coastal Ballast Water
- Analyze the role other potential vectors associated with shipping (i.e. biofouling)
- Recommend Ballast Water Discharge Performance Standards to the CA Legislature

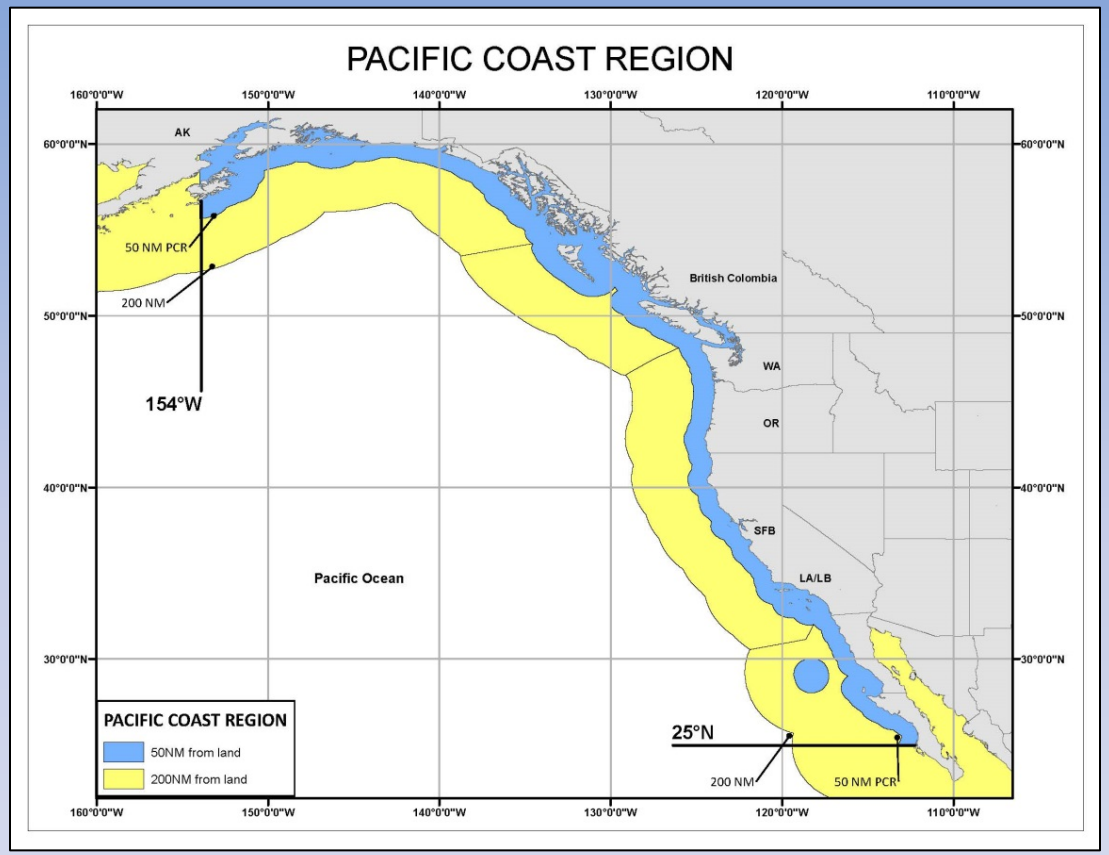
Ballast Water Management Options

- Retain all ballast on board/no discharge (~84%)
- Discharge to a shore–based reception facility (none currently exist)
- Use of approved alternative ballast water management
- Ballast water exchange (BWE)



California Ballast Water Exchange Requirements

- ***Ballast Water Exchange Requirements***:
  - Vessels needing to discharge exchanged ballast in CA must do so in accordance with the rules of the Pacific Coast Region (PCR)



- Arrivals from within PCR, ballast water from within: Exchange >50 nautical miles (NM)
- Arrivals from within PCR, ballast water from outside: Exchange >200 NM
- Arrivals from outside PCR: Exchange >200 NM

There are no exempted commercial vessels (e.g. Domestic oil tankers)

Assessing Compliance

Ballast water reporting forms: Database

- Forms contain information on source, exchange location and type, and discharge port
- Quality controlled database extending back to 2002

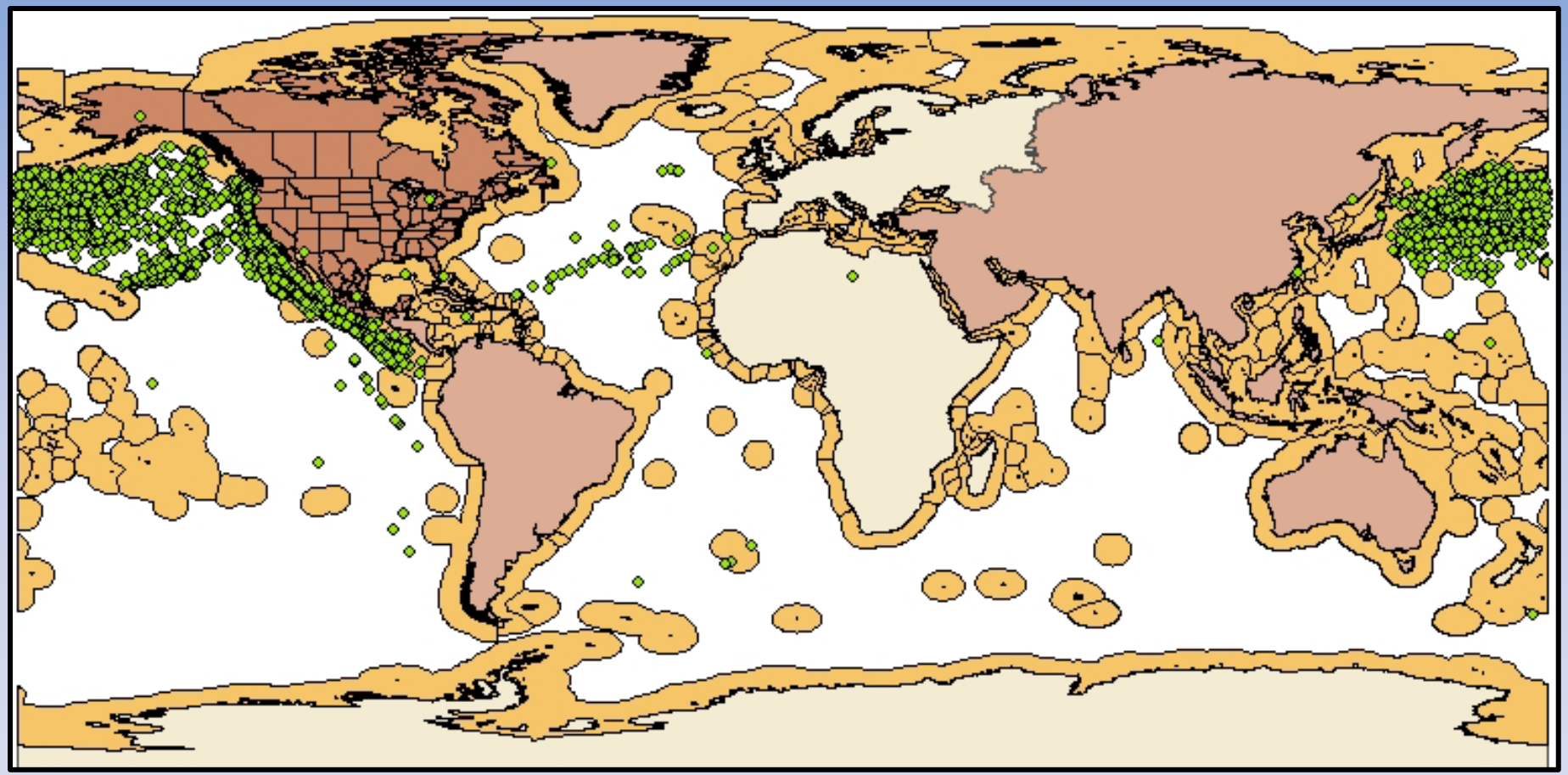
On board ship inspections:

- Marine Safety Personnel from SLC's Marine Facilities Division are mandated to board and inspect <u>at least</u> 25% of all CA arrivals
- Check Ballast Water Logs/Management Plan, verify exchange locations, test ballast salinity, perform outreach

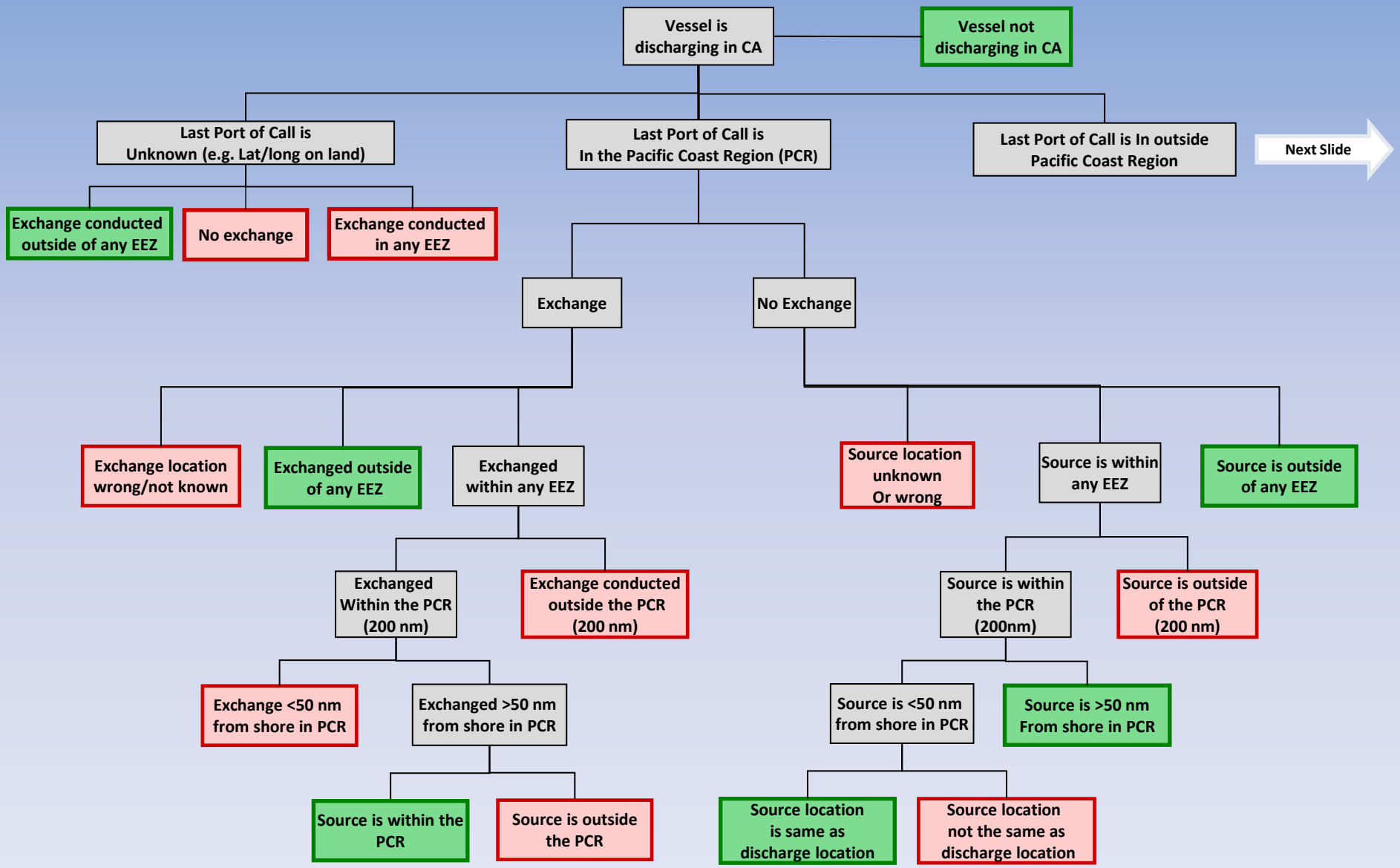
Analysis using Geographic Information System software:

- Evaluates compliance with legal exchange distances
- Helps identify potential underlying reasons for violations
- Allows for the analysis of very large datasets

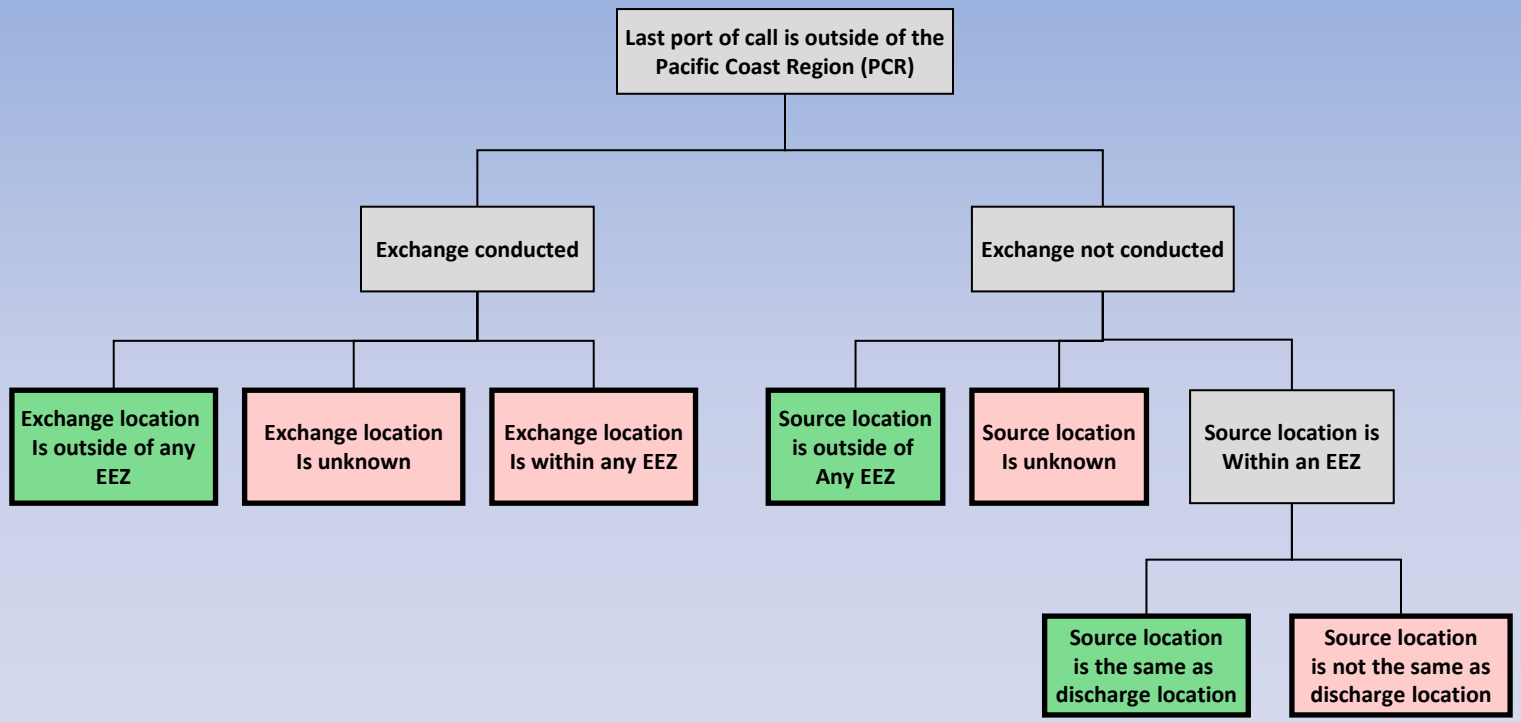
Using GIS to Assess Compliance



GIS Compliance Assessment Flowchart

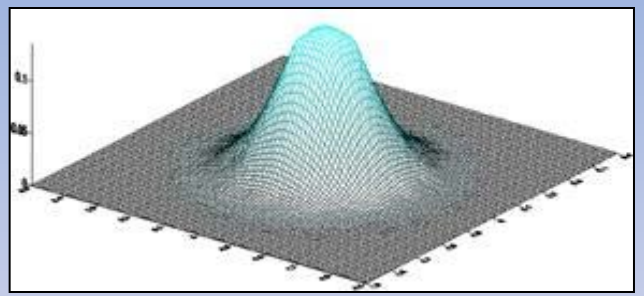


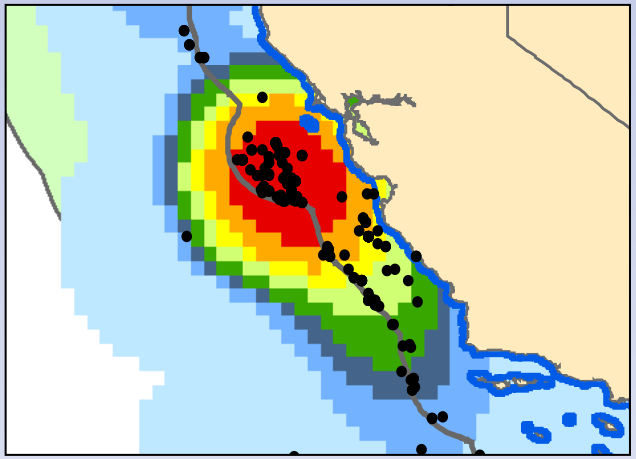
GIS Compliance Assessment Flowchart



Using GIS to Assess Compliance

Where are exchanges conducted in the wrong location occurring and are there any patterns?

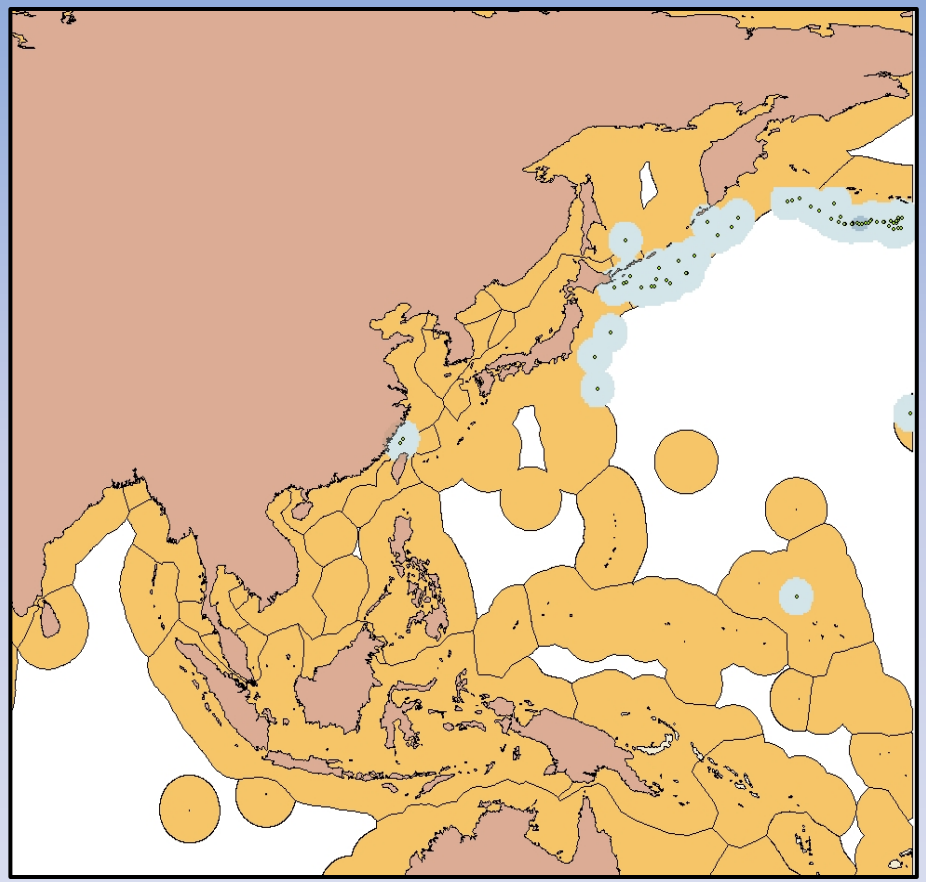


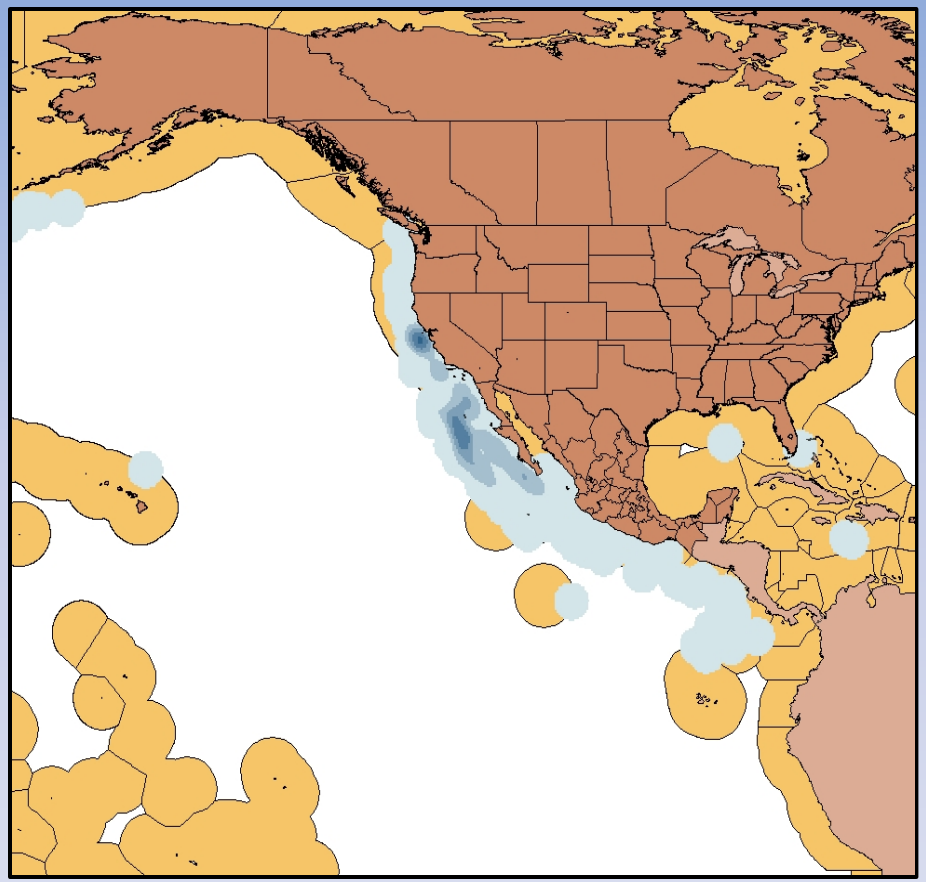


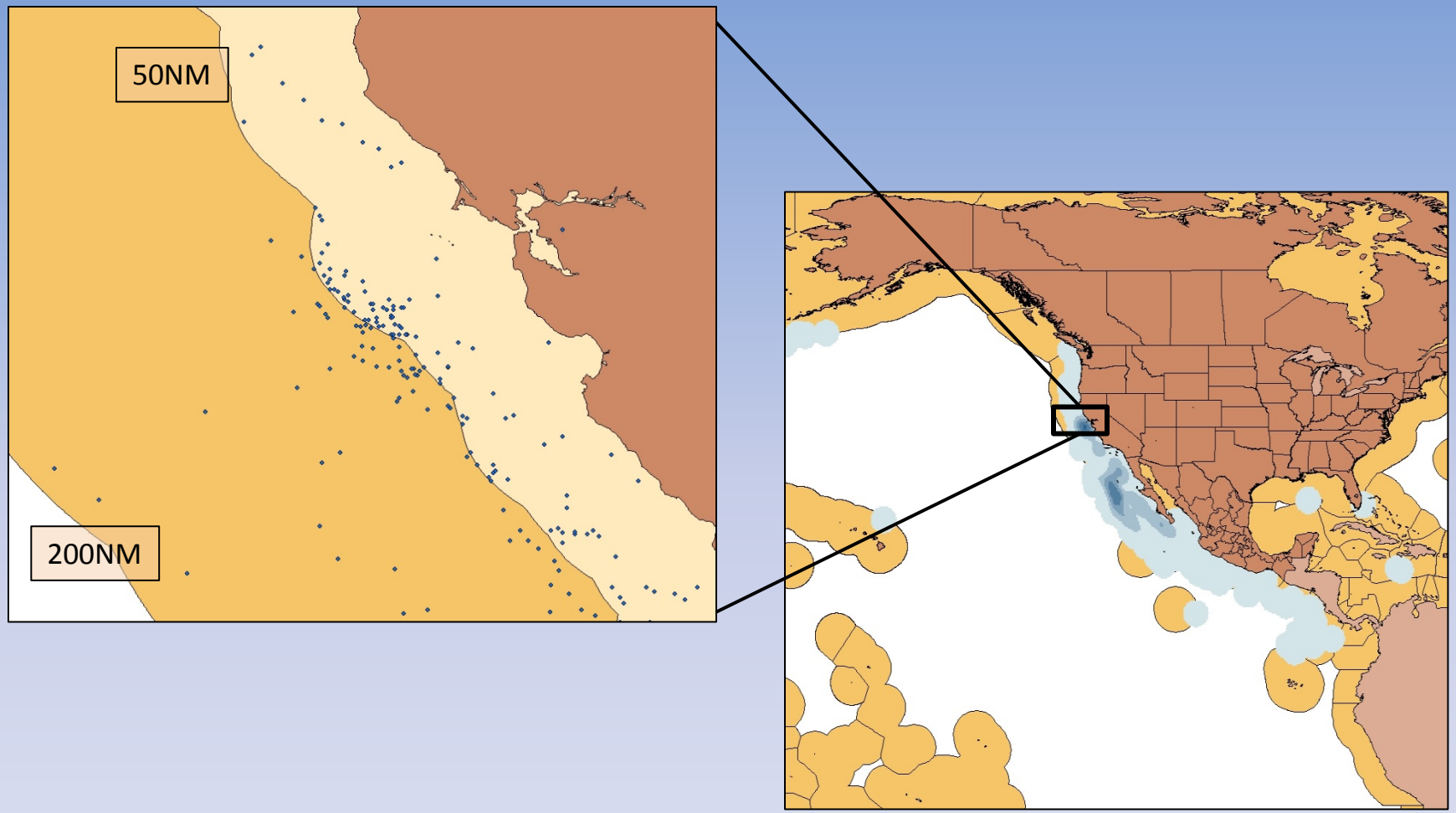
ESRI ArcMap 10.2

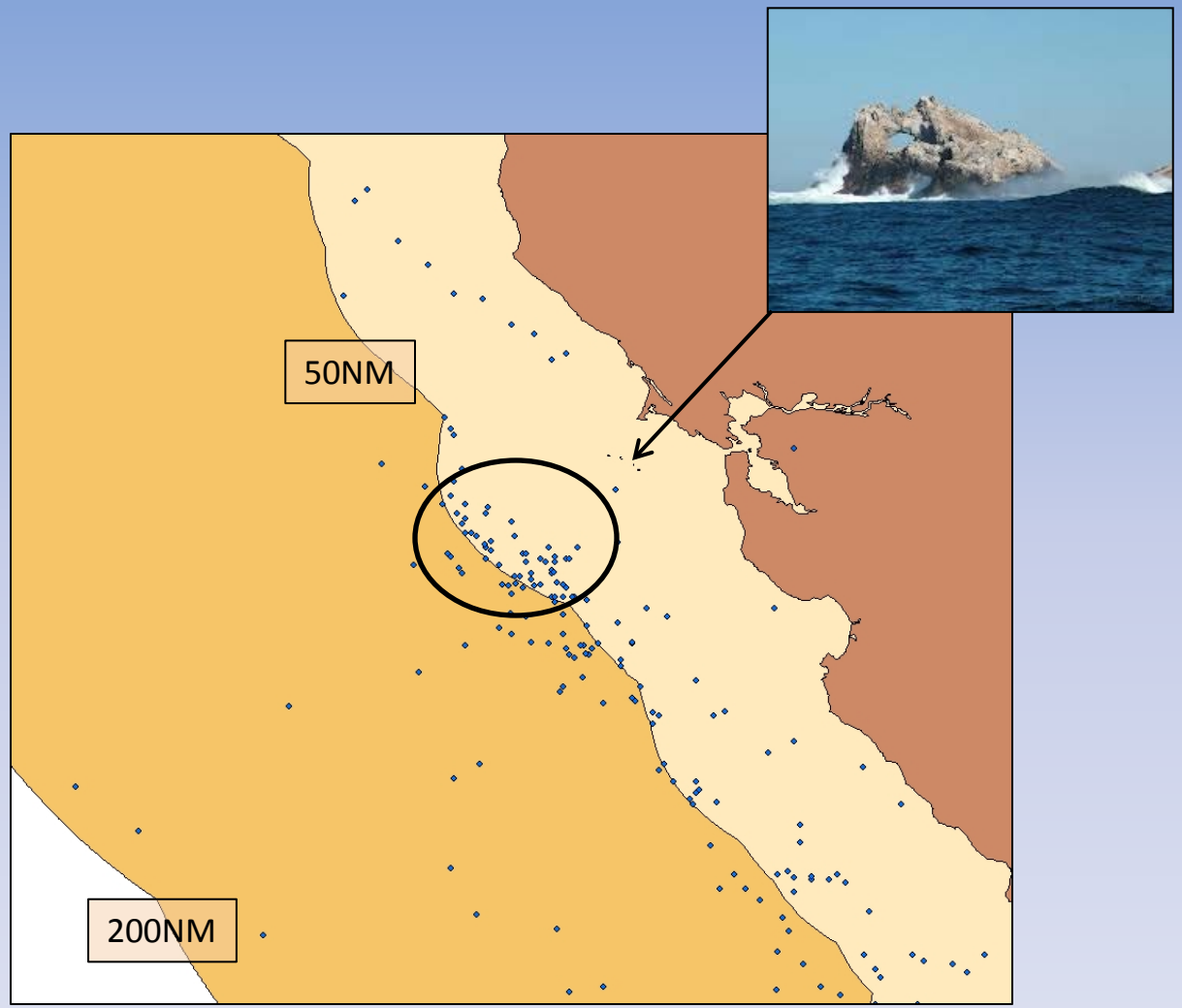
- Spatial Analyst Tool - Kernel Density Function
  - Calculates density of "events" per unit area
- Inputs:
  - Point locations of illegal exchanges
  - Weighted by ballast water discharge volumes

Exchanges in Wrong Location – 2013






50NM
200NM

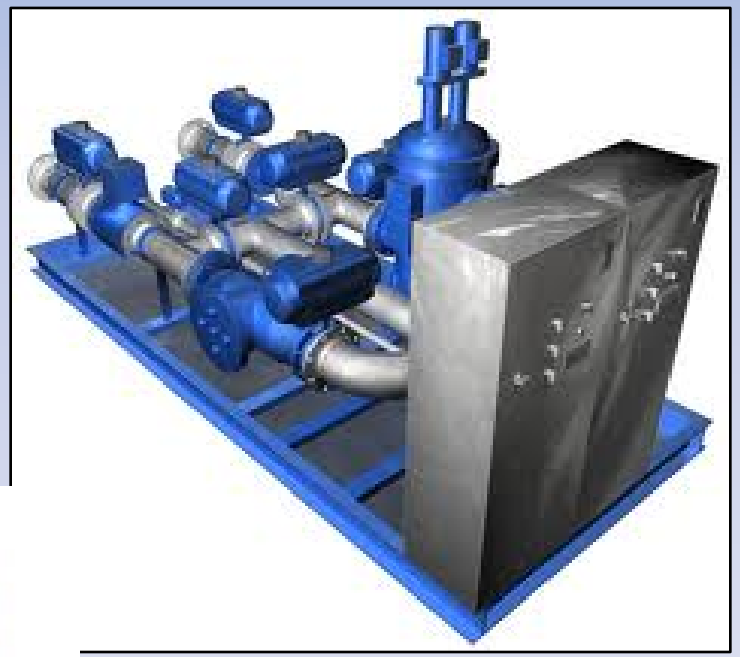


- Incorrect exchange violations are often due to ships being too close to islands
- Legal exchange must occur at the proper distance from ANY land
- Often misinterpreted as distance from mainland coast

Ballast Water Discharge Performance Standards

2006 Coastal Ecosystems Protection Act

- Implement Performance Standards for the discharge of ballast water passed by the CA Legislature
- Assess currently available ballast water technologies



Compliance Testing

- Types of Testing
  - Indicative Testing (red light/green light)
    - Allow vessels/ship owners to self-check for compliance
    - Detection of gross exceedance
    - IMO recommends using as a first step in assessing compliance
  - Full-scale Testing
    - Accurate counts of organisms

Indicative Compliance Testing

Pros

- Fast
- Measures gross exceedence
- Relatively simple
- Can be used by existing inspection personnel

Cons

- Confidence in numeric correlations
- Definition of gross exceedence
- Enforceability
- Grey areas – “Medium risk” or “yellow light”
- Only measuring one organism type

Ballast Water Good

(Safe to de-ballast)

Ballast Water Bad

(Please see local authorities)

Types of Indicative Tests

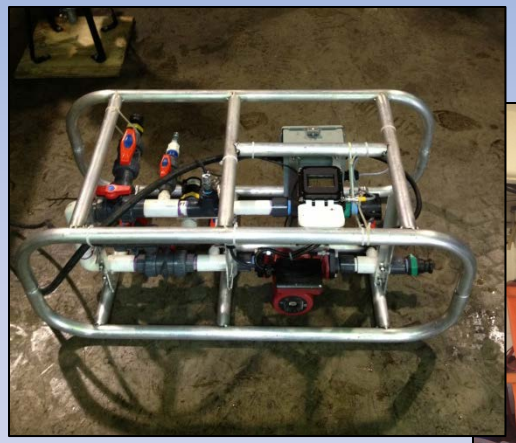
- In-Line – Good for monitoring while vessel is under way or BWTS is operating. Maybe of limited use to PSC?

- Hand held – Mobile, relatively inexpensive, PSC officers and vessel crew can be easily trained to operate.

Full Scale Compliance Testing

Pros

- Accurate counts of discharge organisms
- Enforceable



Cons

- Time Consuming
- Expensive
- Requires additional personnel with special training

Next Steps

- There's a real need to start sampling vessels that are discharging treated water
  - Current testing of BWTS under normal vessel operation is **extremely limited** and data are difficult to obtain.

Next Steps

- Currently developing specific protocols for the collection, handling, & analysis of ballast water samples
  - Based on
    - ETV protocols
    - IMO G8 shipboard testing protocols

- Provide transparency to the vessel owners, operators, and treatment vendors

- Draft regulations recently underwent peer review. Currently reviewing for updates and necessary revisions. Rulemaking process anticipated to begin in early-2015.

Thank you!

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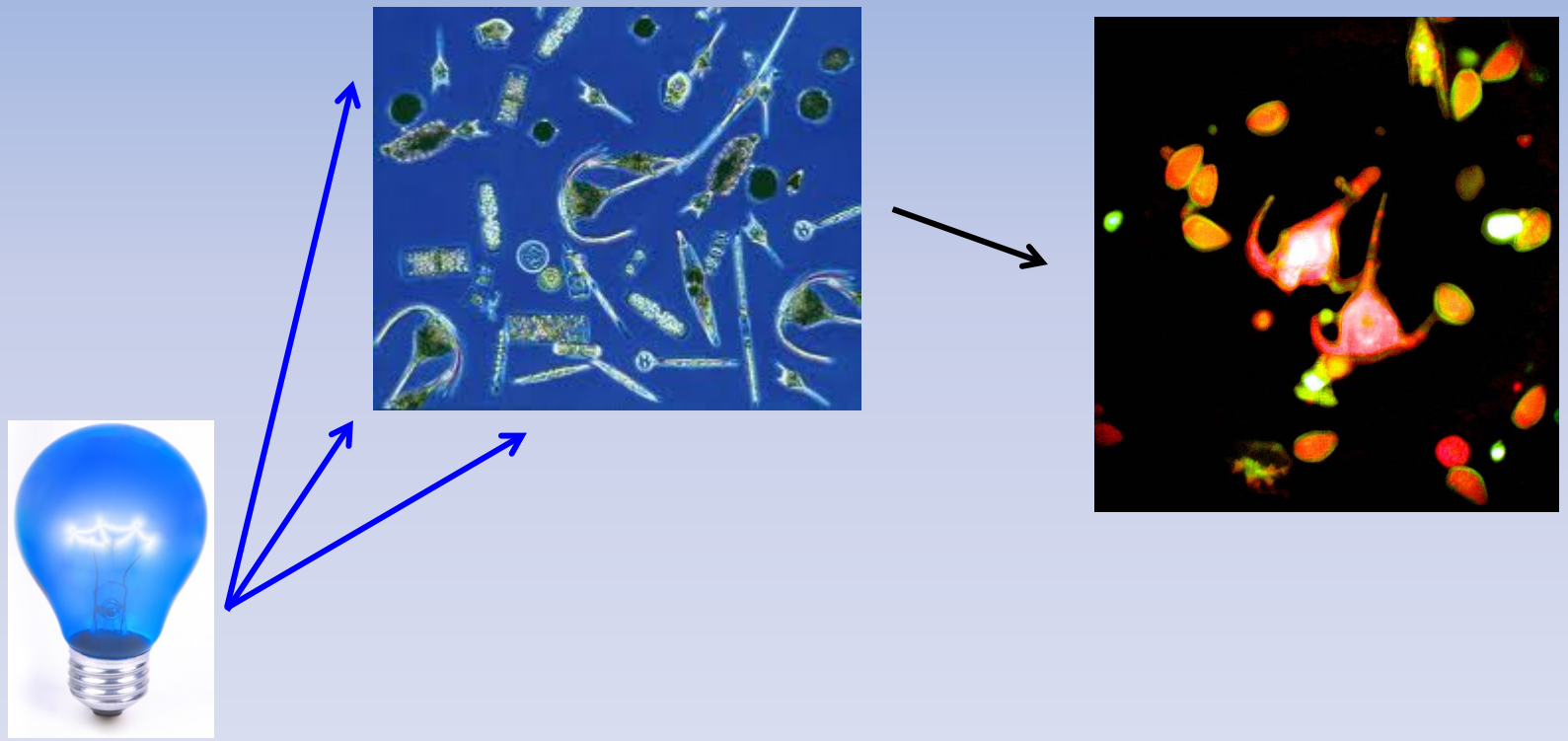
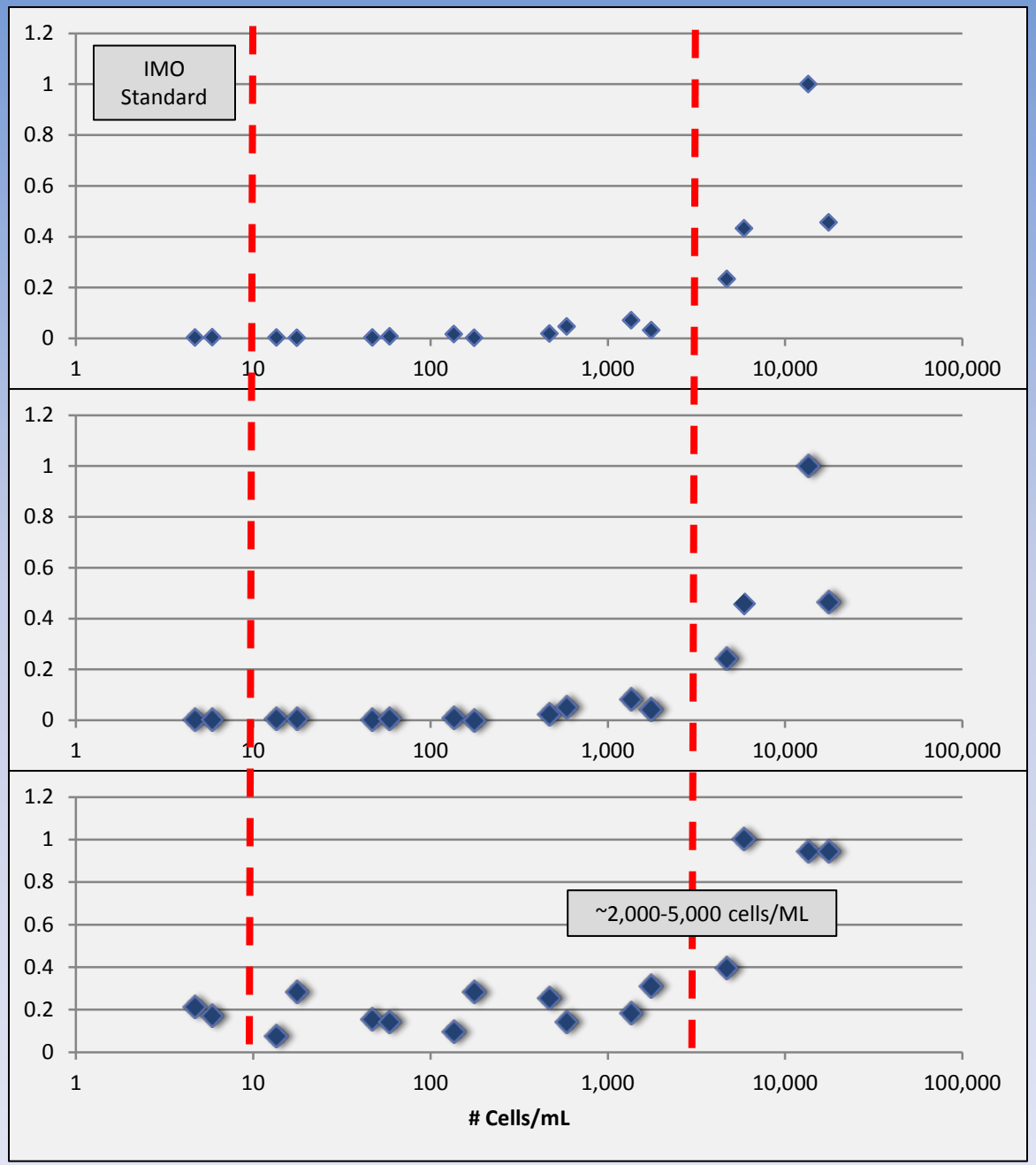
Indicative Compliance Testing

- Living cells in a sample measured using chlorophyll fluorescence



- Is a 200-500 fold increase in cell number acceptable for gross exceedence determination?

0.01/mL



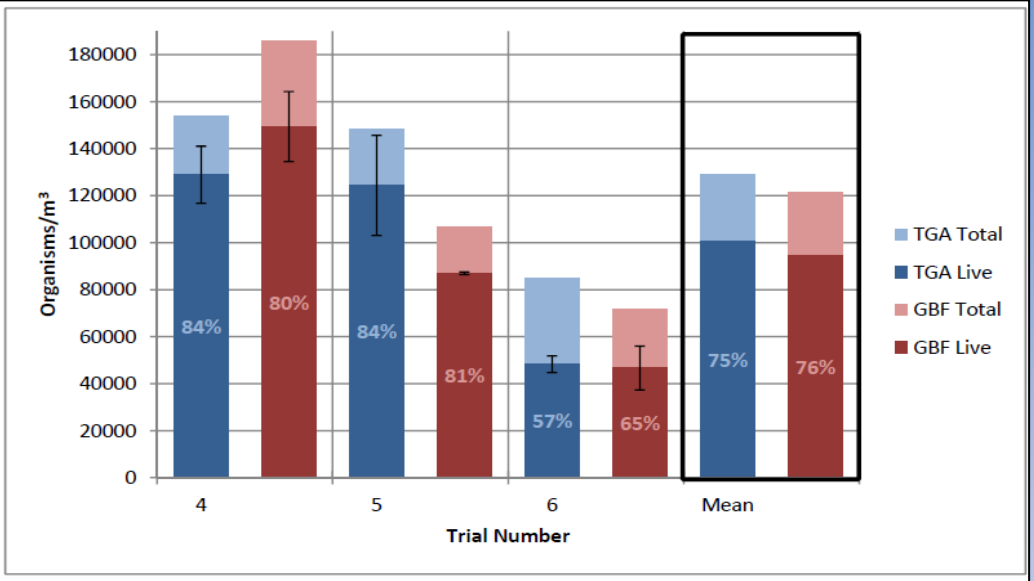


Figure 5 – System Testing Data, True Isokinetic, Zooplankton

Results are promising!

>50µm organism counts

10-50µm organism counts

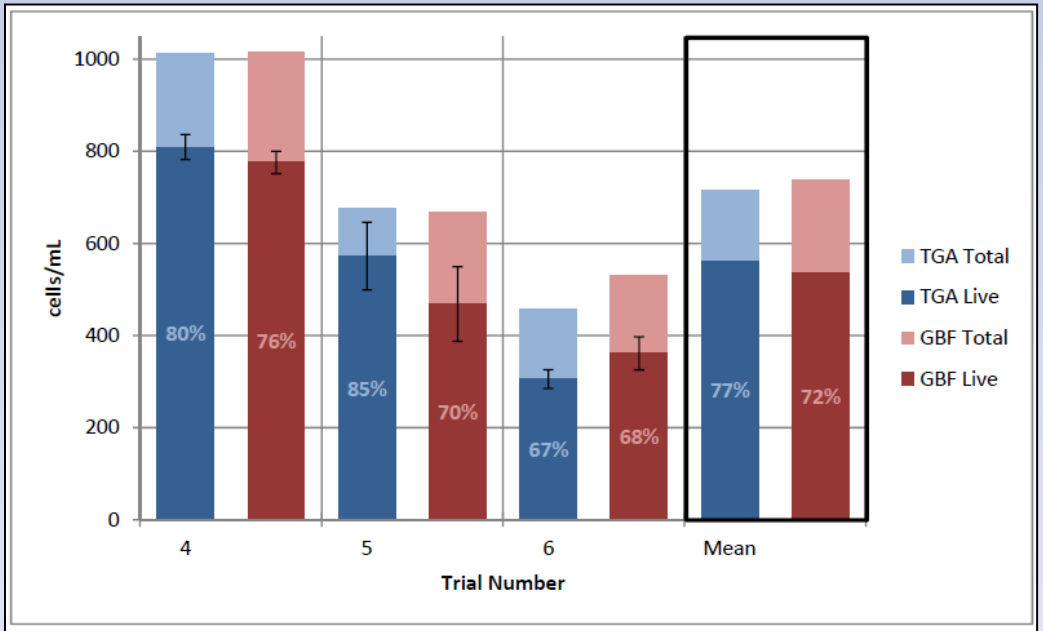


Figure 6 – System Testing Data, True Isokinetic, Phytoplankton

c:

“Prior to testing for compliance with the D-2 standard, it is recommended that, as a first step, an indicative analysis of ballast water discharge may be undertaken to establish whether a ship is potentially compliant or non-compliant. Such a test could help the Party identify immediate mitigation measures, within their existing powers, to avoid any additional impact from a possible non-compliant ballast water discharge from the ship.”

Unfortunately, there is no explicit determination of how an indicative sample is to be taken.