GIS Assessment of Ballast Water Management Compliance in California: 2004-2014

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Evaluating Compliance

**Ballast water reporting forms:**
- Forms contain information on source, exchange and discharge locations whether in port or open ocean
- Quality controlled database extending back to 2002

**On board ship inspections:**
- 25% of arrivals are mandated to be inspected by SLC inspectors
- Perform outreach, check ballast logs/management plan, verify exchange locations, test ballast salinity

**GIS analysis:**
- Evaluates compliance in open ocean
- Identifies potential underlying reasons for violations
- Great toolbox for analyzing trends and patterns of very large datasets
• Quarterly GIS compliance analyses are run using ArcGIS 10.2

• Results are used both for informational and enforcement purposes
  • Violation letters are sent to owners and agents of noncompliant vessels

• CA is currently the only state using GIS in this way
In 2014:

- 1,510 vessel arrivals discharged a total of 9,875 separate ballast water tanks
Compliance Evaluation Flowchart

- **Vessel is discharging in CA**
  - Last Port of Call is Unknown (e.g. Lat/long on land)
    - Exchange conducted outside of any EEZ
    - No exchange
    - Exchange conducted in any EEZ
  - Last Port of Call is In the Pacific Coast Region (PCR)
    - Exchange
    - No Exchange
      - Exchange location wrong/not known
      - Exchanged outside of any EEZ
      - Exchanged within any EEZ
        - Exchanged Within the PCR (200 nm)
        - Exchange conducted outside the PCR (200 nm)
          - Exchange <50 nm from shore in PCR
          - Exchanged >50 nm from shore in PCR
            - Source is within the PCR
            - Source is outside the PCR
  - Last Port of Call is In outside Pacific Coast Region
    - Source location unknown Or wrong
    - Source is within any EEZ
    - Source is outside of any EEZ
      - Source is within the PCR (200 nm)
      - Source is outside the PCR (200 nm)
        - Source is <50 nm from shore in PCR
        - Source is >50 nm from shore in PCR
          - Source location same as discharge location
          - Source location not the same as discharge location

- **Vessel not discharging in CA**
  - Last Port of Call is Unknown (e.g. Lat/long on land)
    - Exchange conducted outside of any EEZ
    - No exchange
    - Exchange conducted in any EEZ
  - Last Port of Call is In the Pacific Coast Region (PCR)
    - Exchange
    - No Exchange
      - Exchange location wrong/not known
      - Exchanged outside of any EEZ
      - Exchanged within any EEZ
        - Exchanged Within the PCR (200 nm)
        - Exchange conducted outside the PCR (200 nm)
          - Exchange <50 nm from shore in PCR
          - Exchanged >50 nm from shore in PCR
            - Source is within the PCR
            - Source is outside the PCR
  - Last Port of Call is In outside Pacific Coast Region
    - Source location unknown Or wrong
    - Source is within any EEZ
    - Source is outside of any EEZ
      - Source is within the PCR (200 nm)
      - Source is outside the PCR (200 nm)
        - Source is <50 nm from shore in PCR
        - Source is >50 nm from shore in PCR
          - Source location same as discharge location
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Compliance Evaluation Flowchart

- Last port of call is outside of the Pacific Coast Region (PCR)
  - Exchange conducted
    - Exchange location is outside of any EEZ
    - Exchange location is unknown
    - Exchange location is within any EEZ
  - Exchange not conducted
    - Source location is outside of any EEZ
    - Source location is unknown
    - Source location is within any EEZ
      - Source location is the same as discharge location
      - Source location is not the same as discharge location
Compliance Data
Ballast Water Management Options

• Retain all ballast on board/no discharge

• Discharge to a shore or barge-based reception facility (none currently exist)

• On board ballast water treatment systems

• Ballast water exchange (BWE)
  • 200 NM from land (non-PCR arrivals)
  • 50 NM from land (PCR arrivals)
• Average discharge of 10.5 MMT per year
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• Volume is increasing over time
• 3 out of last 4 years have seen highest reported discharge amounts since the inception of MISP
- Tankers and bulk vessels account for 88.7% of the ballast water discharge volume.
Compliant vs. Noncompliant

- Compliant
- Noncompliant
- Unmanaged Barges

Volume Discharged MMT

Discharge by Vessel Type

![Bar chart showing discharge by vessel type with volume in MMT.](chart.png)
Since 2009, average compliance rate of 89%
Current California BWE Requirements

- **Ballast Water Exchange Requirements:**
  - As of 2006, vessels discharging ballast in CA must manage in accordance with the rules of the Pacific Coast Region (PCR)
  - Arrivals from within PCR, ballast water from within: Exchange >50 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)*
Noncompliant Ballast Water Exchange: Geography

Where are illegal exchanges concentrated/clustered?

What vessels are responsible?

ESRI ArcGIS/ArcMap 10.1

- Kernel Density Function (Spatial Analyst) - Calculates density of “events” per unit area
- Inputs:
  - Point locations of illegal exchanges
  - Search radius: 2 degrees
  - Cell Size: 0.2 degrees
  - Weighted by ballast water discharge volumes
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.

We have recently increased outreach efforts to vessel crews and shipping agents regarding exchange requirements near islands.
Unexchanged Ballast Water - Source

- Cold Temperate East Pacific: 43%
- Warm Temperate East Pacific: 47%
- Tropical East Pacific: 2%
- Cold Temperate West Pacific: 4%
- Warm Temperate West Pacific: 2%
- Western Indo-Pacific: 4%
Unexchanged Ballast Water - Source
Enforcement Regulations
2014 Enforcement Numbers:

- Total Arrivals – 9,345
- Discharged – 1,510
- Vessels with “Operational” Violations - 129
  - Field Inspections - 21
  - GIS – 108
- Vessel responses to date – 121 (94%)
- Amended forms/clerical error/safety - 27
2014 Enforcement Numbers:

- Total number of noncompliant tanks - 557
  - < 200 NM – 388
  - < 50 NM – 51
  - Within 10% - 76
  - Unexchanged – 118
  - Vessels with multiple violations – 13
  - Accounted for 31 occasions and 164 separate tanks
CA Public Resources Code section 71216:

...a person who intentionally or negligently fails to comply with the requirements of this division may be liable for an administrative civil penalty in an amount that shall not exceed twenty-seven thousand five hundred dollars ($27,500) for each violation. Each day of a continuing violation constitutes a separate violation.
ARTICLE 4.9: MARINE INVASIVE SPECIES ACT ENFORCEMENT AND HEARING PROCESS

Purpose: To classify violations and penalties of MISA and establish policies and procedures CSLC shall undertake in assessing and commencing administrative enforcement actions pursuant to CA PRC section 71216

1. Class 1 (operational)
   - **Minor** – a vessel incorrectly exchanges ballast water within 10% of the limits
   - **Moderate** – a vessel incorrectly exchanges ballast water between 10-50% of the limits
   - **Major (I)** – a vessel incorrectly exchanges ballast water more than 50% of the limits
   - **Major (II)** – a vessel does not exchange water before discharging at receiving port
ARTICLE 4.9: MARINE INVASIVE SPECIES ACT ENFORCEMENT AND HEARING PROCESS

2. Class 2 (administrative)
   • Occurs as a result of a vessel failing to properly maintain required documents (e.g. ballast water management plan) on board.

3. Class 3
   • Occurs as a result of a vessel failing to submit required form (e.g. Ballast Water Reporting Form) in the given time period after receiving official notification

• Rulemaking anticipated to begin summer 2015
Thank you!

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