TECHNICAL CONSIDERATIONS FOR SAMPLING BALLAST WATER FOR COMPLIANCE ASSESSMENT

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CALIFORNIA STATE LANDS COMMISSION

CAL MARITIME

California State Lands Commission

BALLAST WATER SAMPLING FOR COMPLIANCE ASSESSMENT

- CA adopted and implemented BWDPS in 2022
- BWDPS = federal
- Developed scientifically defendable protocols
- Direct counts -Detailed Analysis (not indicative)
- Focused on 10-50 and >50

Size class	CA and Federal Standards
Organisms greater than or equal to 50 micrometers in minimum dimension	Fewer than 10 organisms per cubic meter
Organisms less than 50 micrometers and greater than or equal to 10 micrometers	Fewer than 10 organisms per milliliter (mL)
Escherichia coli	Must not exceed a concentration fewer than 250 colony forming units (cfu) per 100 mL
intestinal enterococci	Must not exceed concentration fewer than100 cfu per 100 mL
toxicogenic *Vibrio cholerae* (serotypes O1 and O139)	Must not exceed a concentration of more than 1 cfu per 100 mL

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Frontiers Policy Brief – Technical considerations for compliance assessment

Objectives:

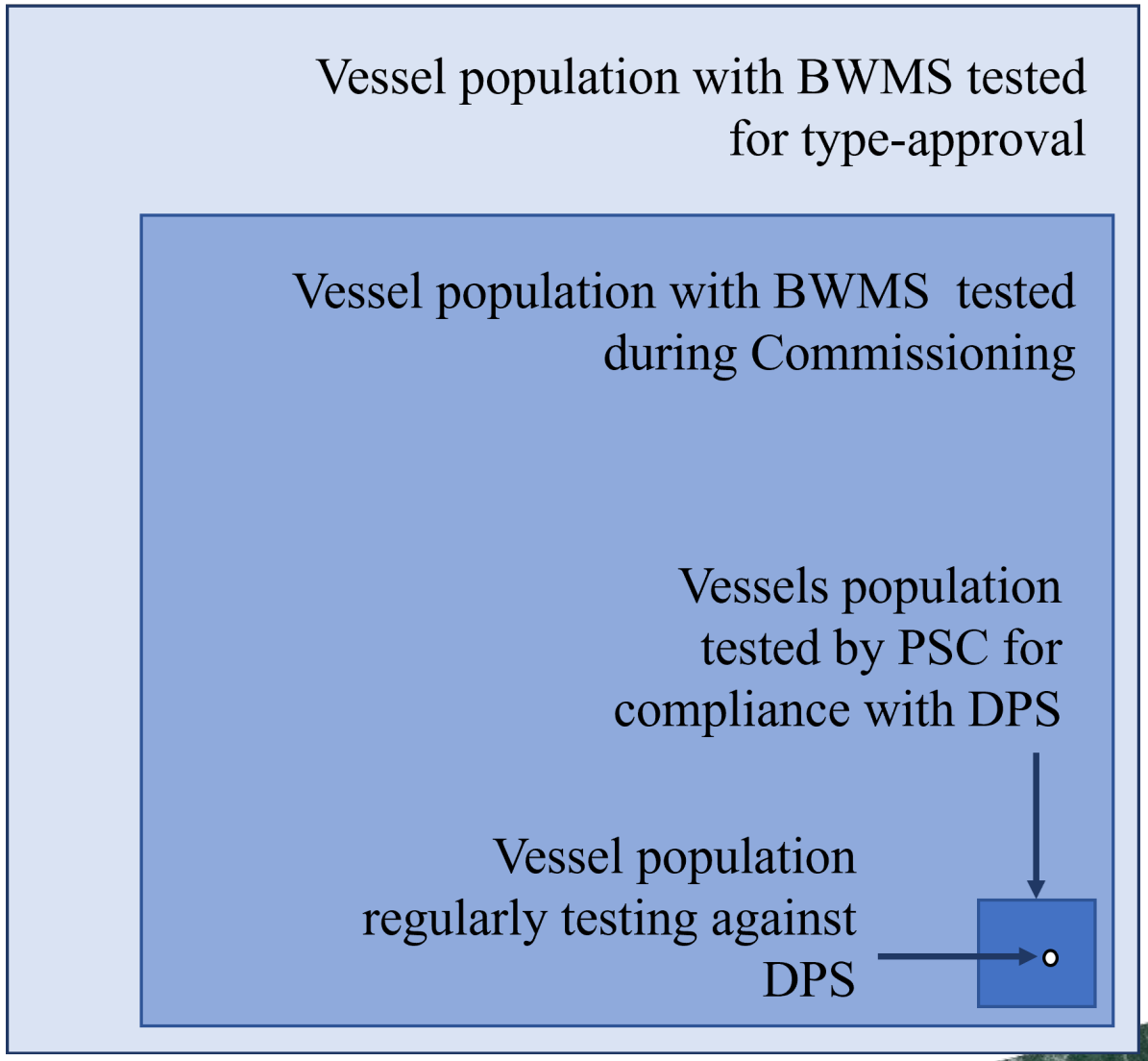
1. Highlight the importance of **routine collection** and analysis of treated ballast water discharges
2. Assess compliance during normal operations
3. Highlight **good practices** for sample collection and analysis and advising of **potential obstacles**

Policy Brief

Different types of testing

Type of testing	Main purpose	Current jurisdictions with regulations/requirements and vessel population applied to
Type-approval (Prior to installation)	To test if the BWMS can meet the BWDS, perform as it is specified by the manufacturer, and identify specific system design limitations. Tests designed and performed under controlled conditions.	International: All vessels discharging ballast waters in countries signatory to the IMO Convention, and vessels flagged in those countries, are required to have an IMO type-approved BWMS. US: All vessels discharging ballast water in U.S. are required to have a USCG type-approved BWMS California: Type-approved BWMS are not required
Commissioning testing (After installation)	To ensure proper installation and functionality of the BWMS on board the vessel. Biological efficacy is one component of commissioning tests. Test is performed under controlled conditions, not reflective of normal vessel operations. Indicative tools are often used instead of detailed analysis	International: IMO requires commissioning testing for all vessels flagged in countries signatory of the convention or that will discharge in those countries. The test does not require detailed analysis of all size categories (the use of indicative tools is accepted). US (including California): Does not require commissioning testing
Regular testing against BWDS to monitor performance	To assess the continuing functionality of the system, and its ability to satisfy BWDS, after installation. Test performed by an independent party as part of regular monitoring protocols.	International: Not required **US**: EPA requires an annual biological testing, but only for indicator microbes. California: Not required because California does not require the use of specific technologies to meet BWDS
Compliance testing to assess compliance with BWDS (during normal operations)	To assess if a vessel is compliant with the BWDS during discharge. Test performed by port control entities during regular inspections to assess compliance.	International: Not performed **US**: Not performed at federal level (to the best of our knowledge California: Opportunistic assessment based on resources availability.

Types of BWTS testing applied to relative vessel populations



Detailed Analysis for Compliance Assessment

1. PRE-ARRIVAL COORDINATION AND ASSESSMENT

- Vessel selection:
  - Opportunistic
  - Risk based (e.g. high risk due to malfunction)
- Pre-arrival questionnaire

2. SAMPLING:
Samples are collected by CSLC and sent to an independent lab

- Follow pre-established scientifically defendable SOPs
- Chain of Custody

Fail

3. ENFORCEMENT ACTIONS:

- Schedule subsequent sampling event if possible.
- Inform the vessel and USCG
- Issue violation
- Start enforcement process

Actionable recommendations

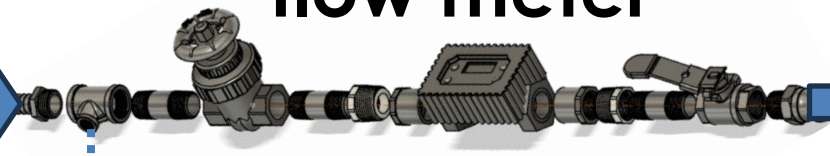
TABLE 2 Summary of actionable recommendations to sample ballast water for compliance assessment.

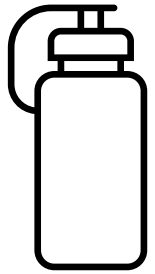
Prior to sampling event	Vessel selection	Based on risk: BWMS malfunctions, BWMS alarms, failure to provide maintenance records.
		Opportunistic: based on logistics (vessel's schedule, discharging operations, qualified personnel availability, resources).
	Vessel details, communications, and logistics	Contact the vessel as early as possible to discuss sampling details • Ballast water discharging operations schedule. • Sampling point specifications. • Access and layout of the sampling location • Volume requirements and sampled water disposal options.
During sampling collection	Pre-established protocols	Use a sample collection device that allows for collecting a representative sample in a short period of time without compromising the organisms collected.
		Apply scientifically defendable protocols.
		Ensure proper sample storage and transportation conditions.
		Follow chain of custody protocols
Sample analysis	Pre-established protocols	Apply scientifically defendable protocols.
		Trained personnel and proper laboratory practices
		Follow chain of custody protocols
Defendable results and recordkeeping	Non-compliant vessels	• Prepare legal documentation in case of enforcement action. • Visual evidence (videos and photos) • Inform the vessel and other interested parties (e.g., owner, agent)

Samples collected during normal operations and when BWTS is working at a steady rate

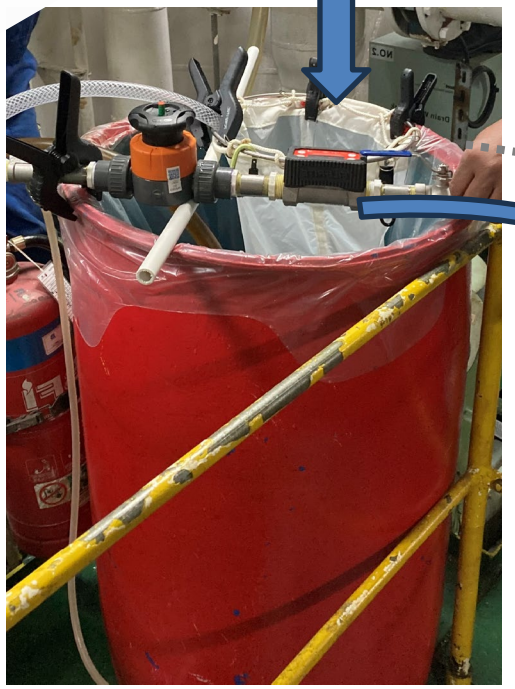
Sampling port

Sampling tool with flow meter



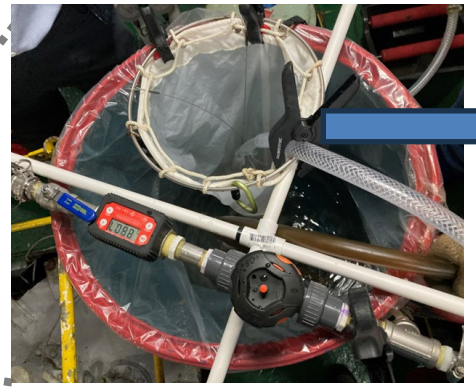


10-50um:
Unfiltered BW sample (1L) dripping into sample bottle



Waste filtered water overflow into bilge or pumped out (~1000 L)

>50um:
~1000L of BW concentrated in a 500mL sample



Plankton net with sample collector

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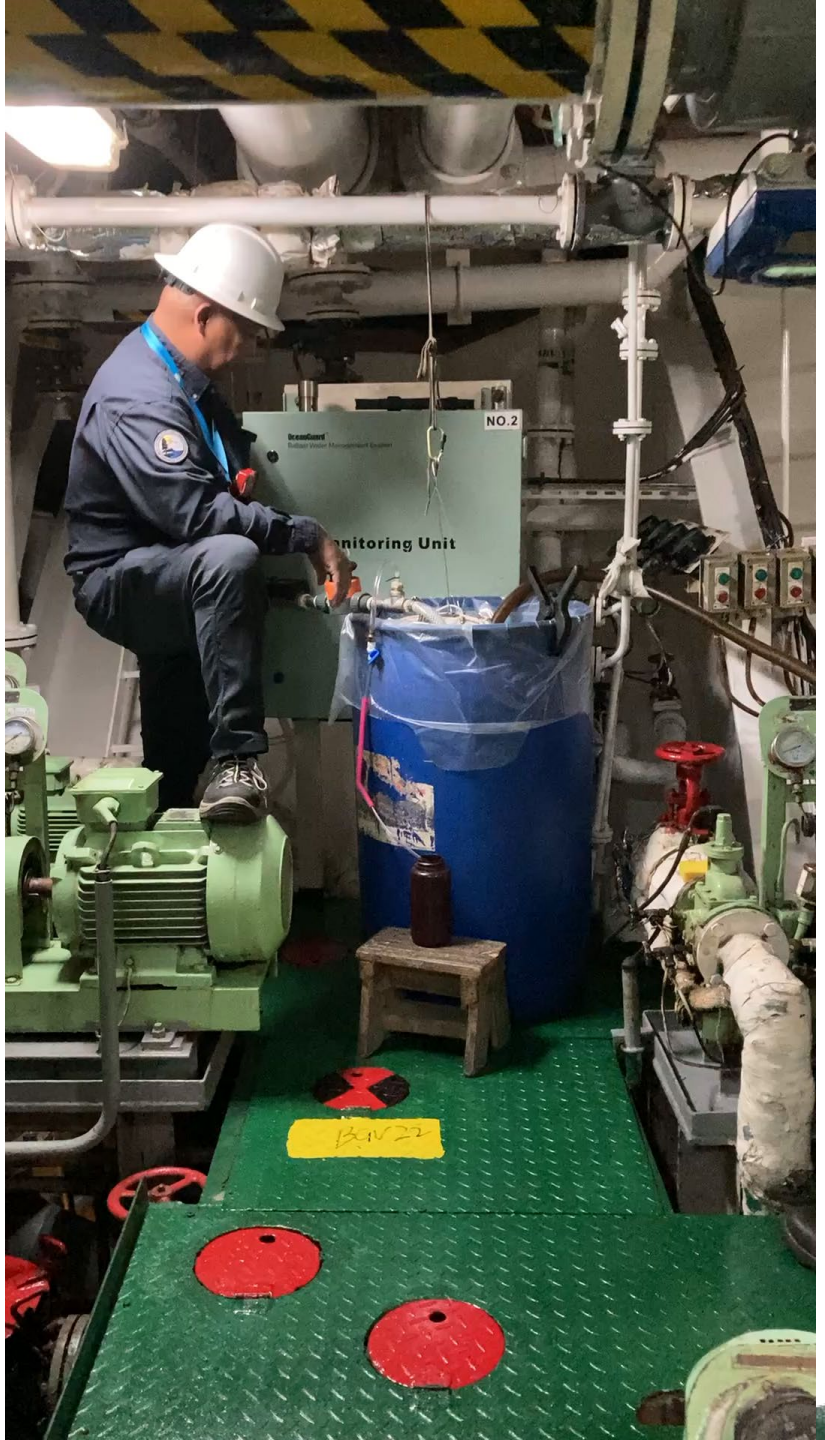

NO.2
nitoring Unit

SAMPLING ANALYSIS

Samples are collected by CSLC and sent to an independent lab, results within a few hours

≥10 <50 µm
Enumeration of living organisms through Epifluorecent microscopy FDA/CMFDA dye

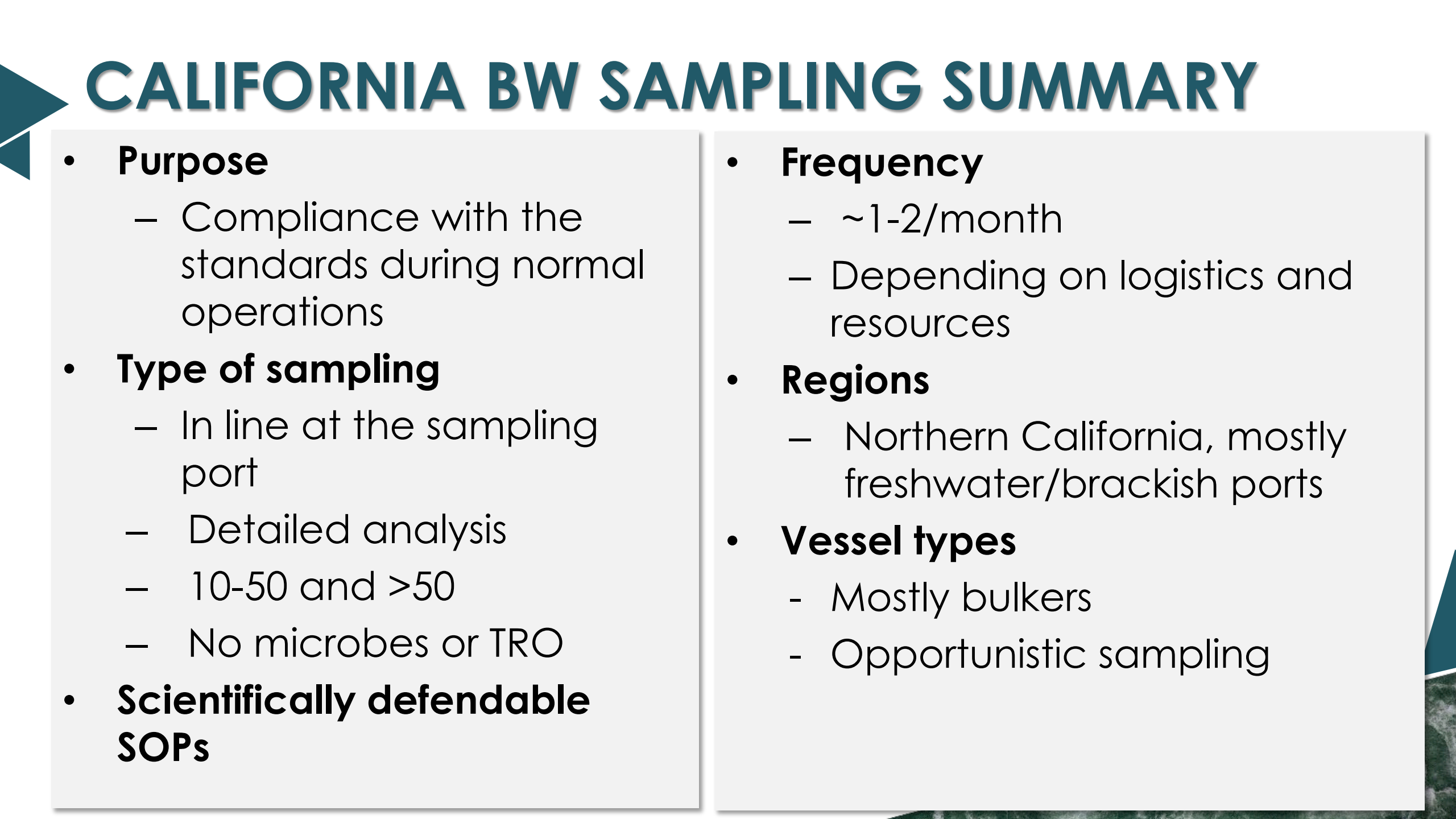
>50 µm
Enumeration of living organisms using a stereoscope

Currently not analyzing indicator microbes or other parameters

CALIFORNIA BW SAMPLING SUMMARY

- **Purpose**
  - Compliance with the standards during normal operations
- **Type of sampling**
  - In line at the sampling port
  - Detailed analysis
  - 10-50 and >50
  - No microbes or TRO
- **Scientifically defendable SOPs**

- **Frequency**
  - ~1-2/month
  - Depending on logistics and resources
- **Regions**
  - Northern California, mostly freshwater/brackish ports
- **Vessel types**
  - Mostly bulkers
  - Opportunistic sampling



LESSONS LEARNED AND TECHNICAL CONSIDERATIONS

- Communication with the vessel pre-sampling is key
- Schedule flexibility (Sampling personnel, analysis lab)
- Proximity to analysis lab
- Understanding of BWD processes and BWTS functionality

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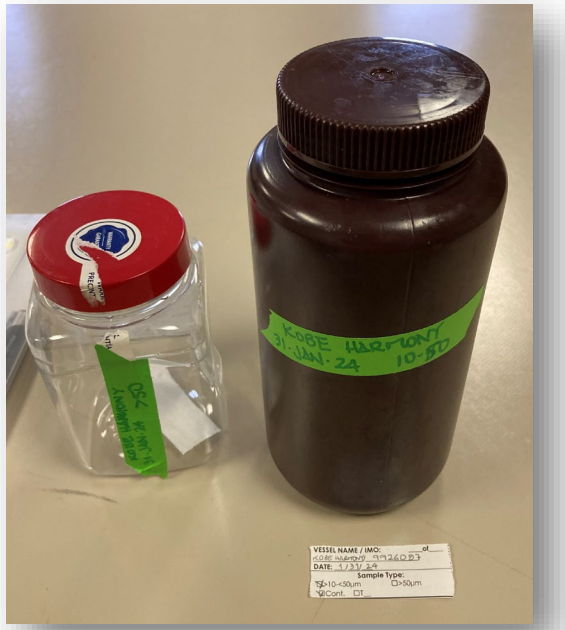
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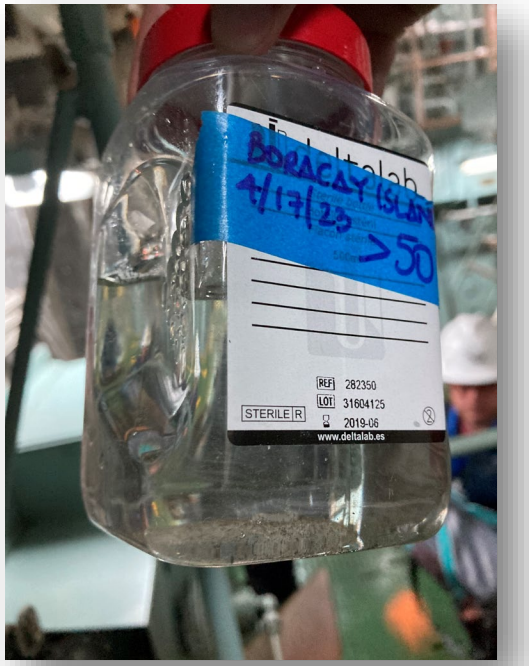
10-50
VESSEL NAME / IMO:
DATE: 1/31/24
Sample Type: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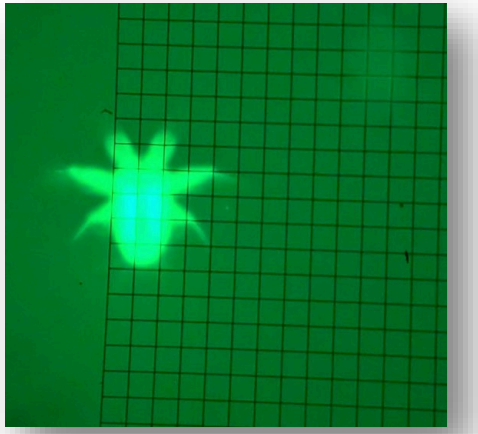

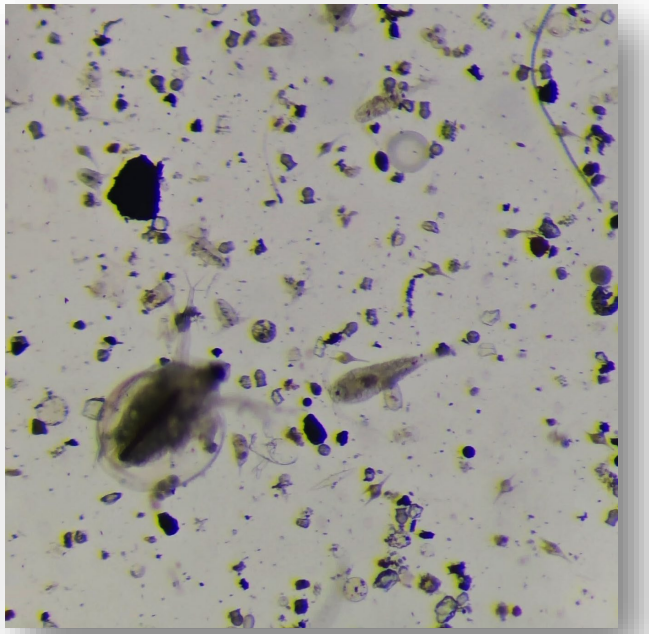

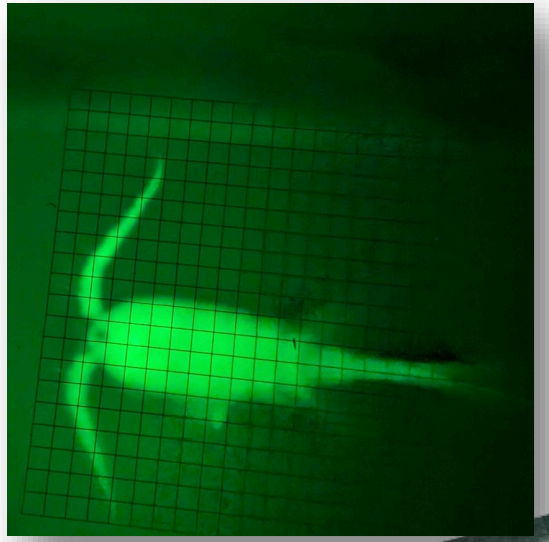

- Arrival Patterns
- Ballast Water Patterns
- Downloadable files

- Vessel type
- Port
- State

PACIFIC STATES DATA SHARING DASHBOARD

PACDASH

THANK YOU & QUESTIONS

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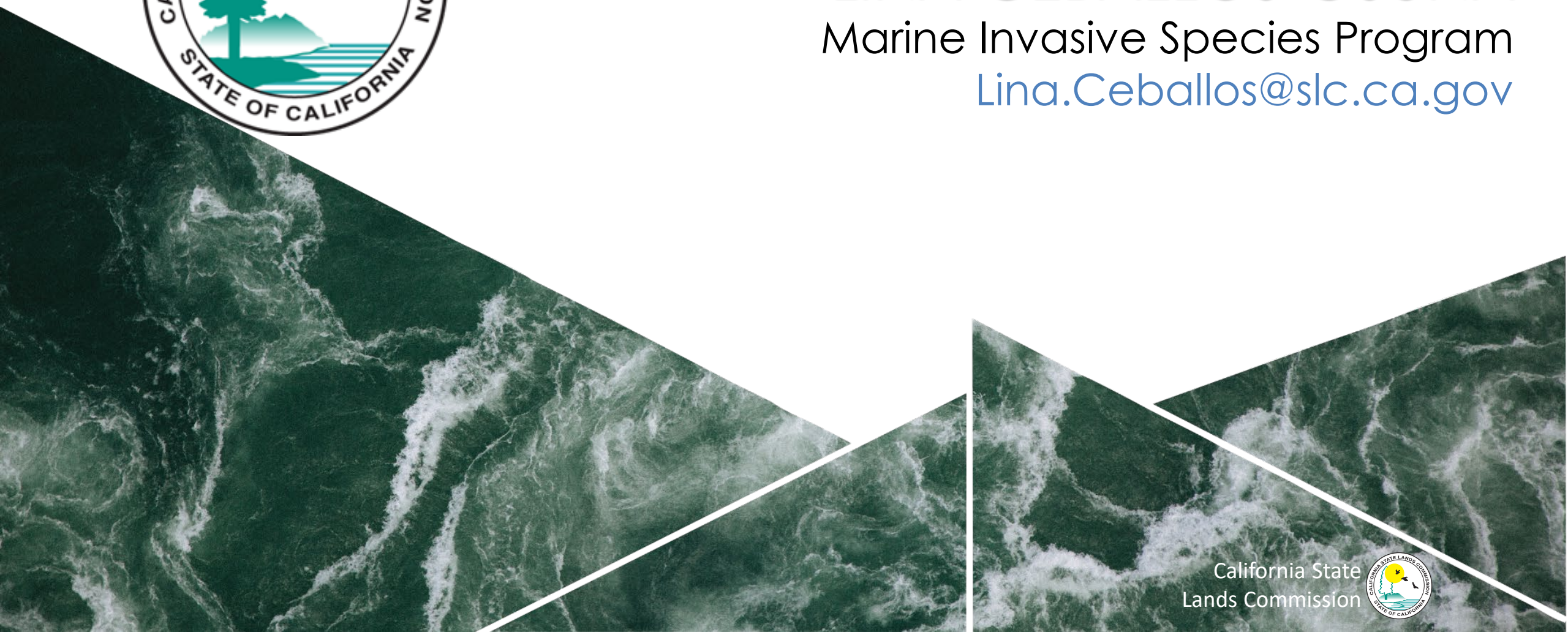

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