

An underwater photograph showing the dark hull of a ship on the left. Two divers are visible: one in the foreground on the right, holding a clipboard and looking towards the ship, and another further back on the left. Two propellers are visible on the right side of the ship's hull. The water is clear blue.

# Hawaii Ballast Water and Biofouling Program

December 10, 2019

WGA Biosecurity and Invasive  
Species Initiative

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DLNR/DAR, UH/PCSU - Ballast Water  
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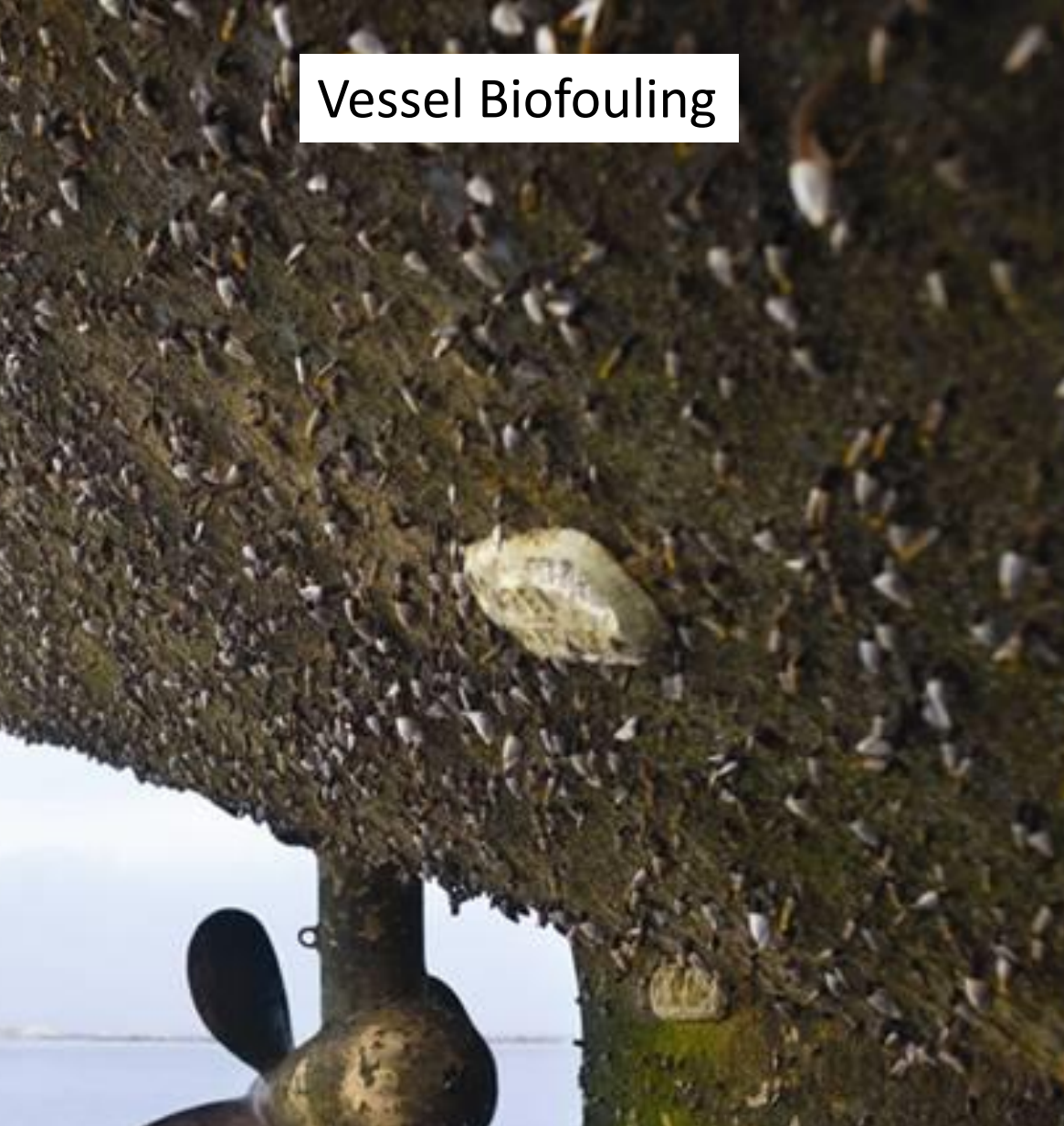
# How many aquatic non-indigenous species (NIS) are currently established in Hawaii?

Region	Aquatic NIS spp	Reference
<b>Hawaii</b>	<b>&gt;348</b>	<b>Eldredge &amp; Carlton, 2009</b>
<b>Continental US</b>	450	Ruiz et al., 2014
<b>Australia</b>	160	Hewitt et al., 2004

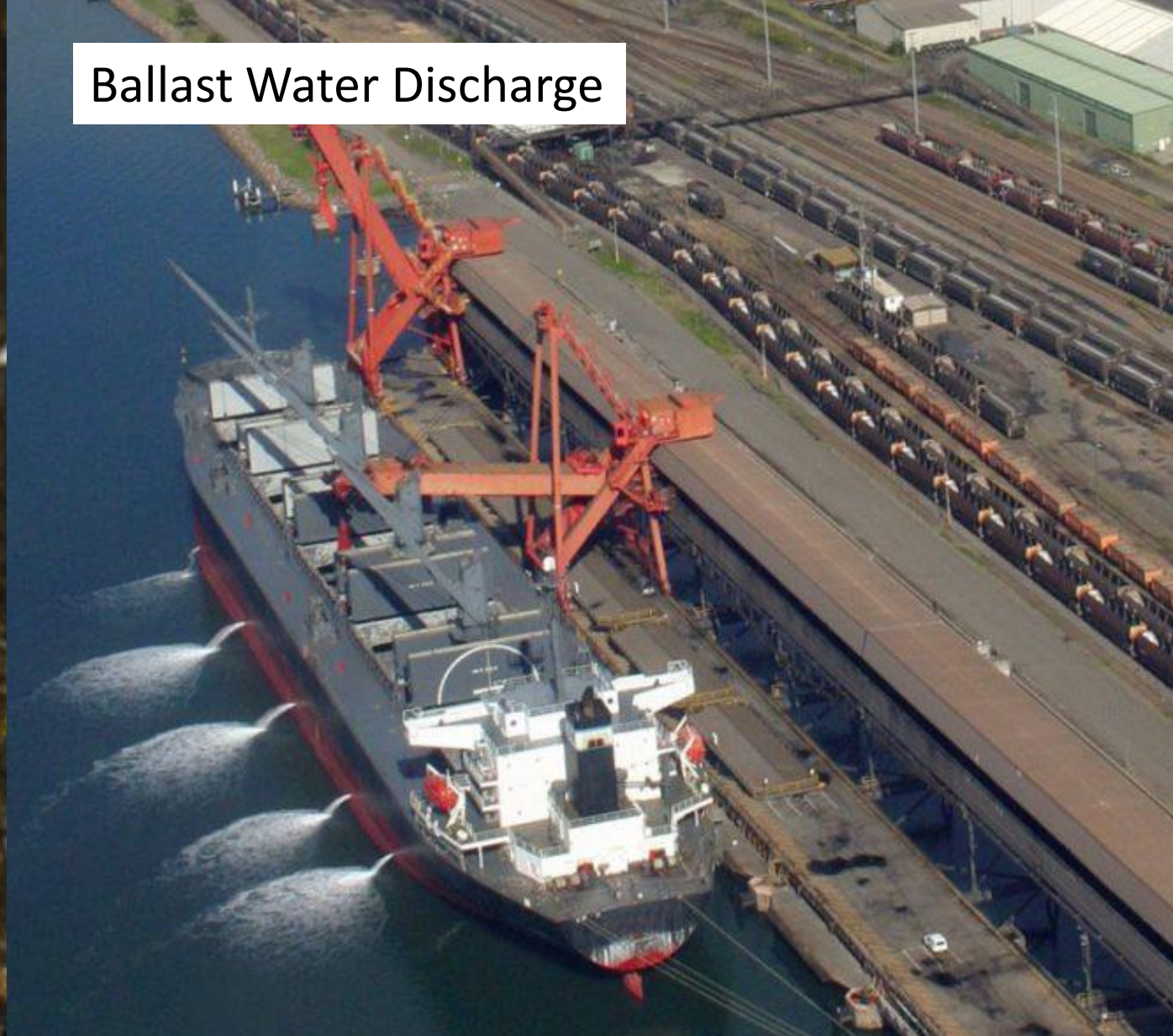




Vessel Biofouling



Ballast Water Discharge



**Ballast water and vessel biofouling responsible for ~78% of aquatic alien species introductions into Hawai'i (Davidson et al, 2014)**



Aleutian Is

Japan

North Pacific  
Ocean

Ryukyu Is

Ogasawara Is

Hawaiian Islands

Tropic of Cancer

Taiwan

Philippines

Palau

Northern  
Mariana Islands

Guam

Marshall Islands

Federated States  
of Micronesia

Christmas Is

Equator

Galapagos Is

Brunei

Malaysia

Indonesia

Timor-Leste

Papua  
New  
Guinea

Nauru

Solomon  
Islands

Kiribati

Tuvalu

Tokelau

Samoa

American  
Samoa

Niue

Cook Is

South Pacific  
Ocean

French Polynesia

Easter Is

Pitcairn Is

Tropic of Capricorn

Vanuatu

Fiji

Tonga

New  
Caledonia

Norfolk I

JCKUO\_DLNR c/o PCSU

Australia

New Zealand



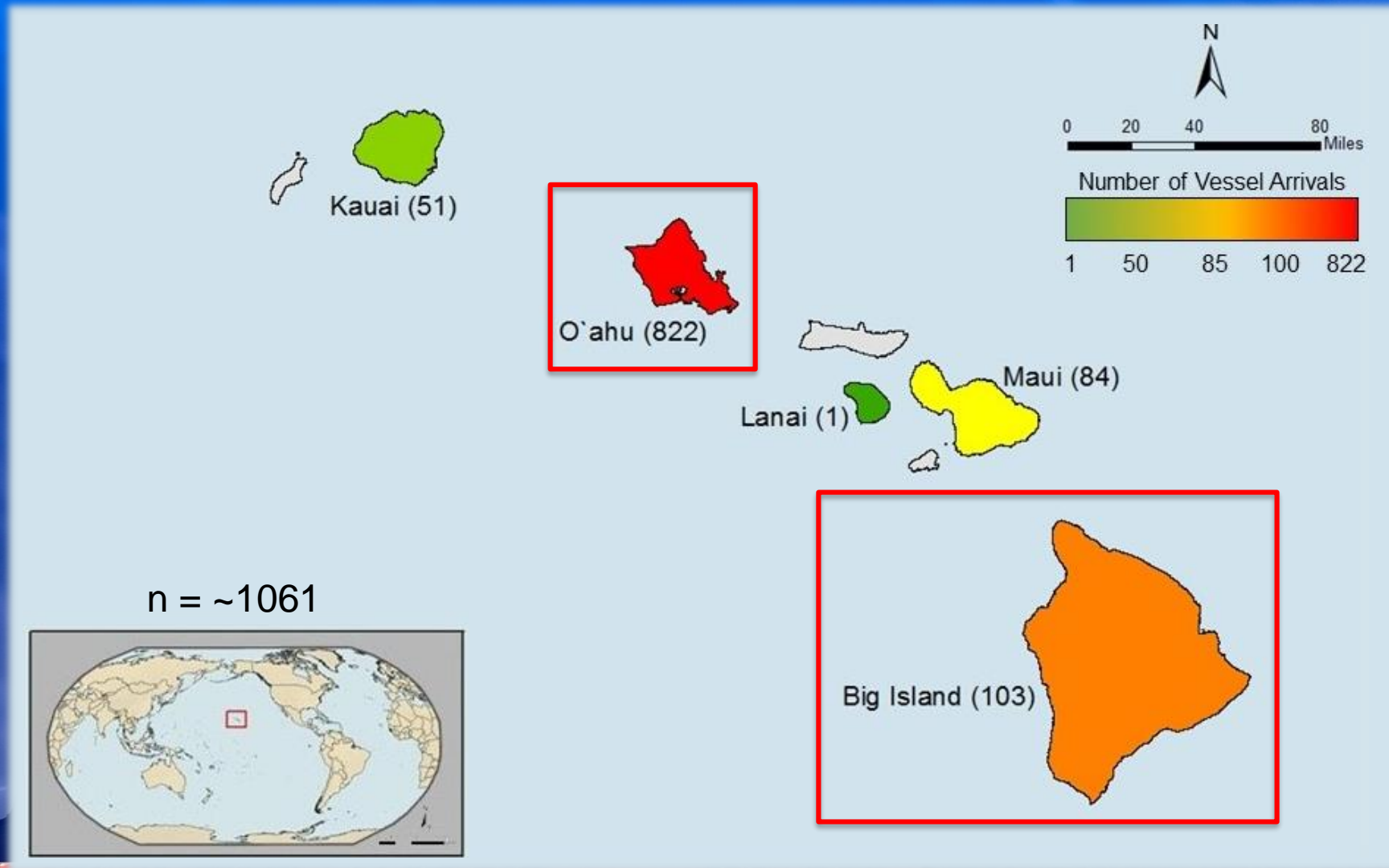


**>80% consumer goods are shipped into Hawaii**

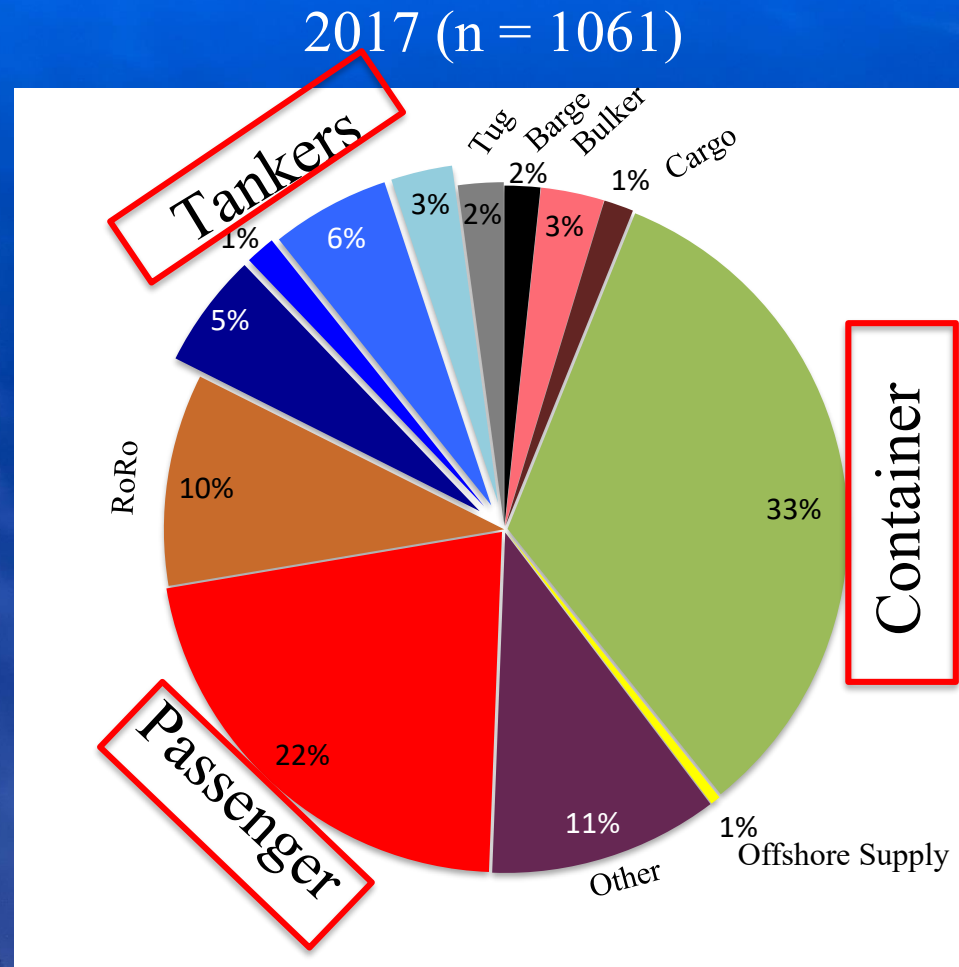




# Where are vessels arriving in Hawaii (2017)?



# Types of Vessels Arriving in Hawai'i in 2017









## Vessel Biofouling



**Ballast water and vessel biofouling responsible for ~78% of aquatic alien species introductions into Hawai'i (Davidson et al., 2014)**







BALLASTING



TRANSIT



DE-BALLASTING



Ballast Water Discharge





# Propagules of Aquatic Alien Organisms

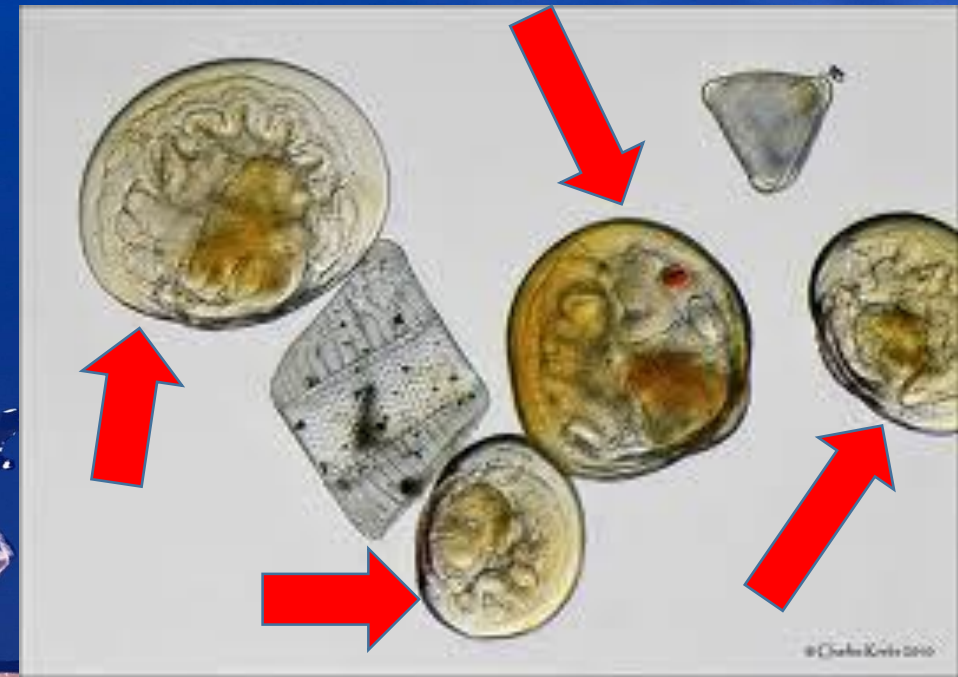
Barnacle



Marine worm



Clam, oyster or mussel

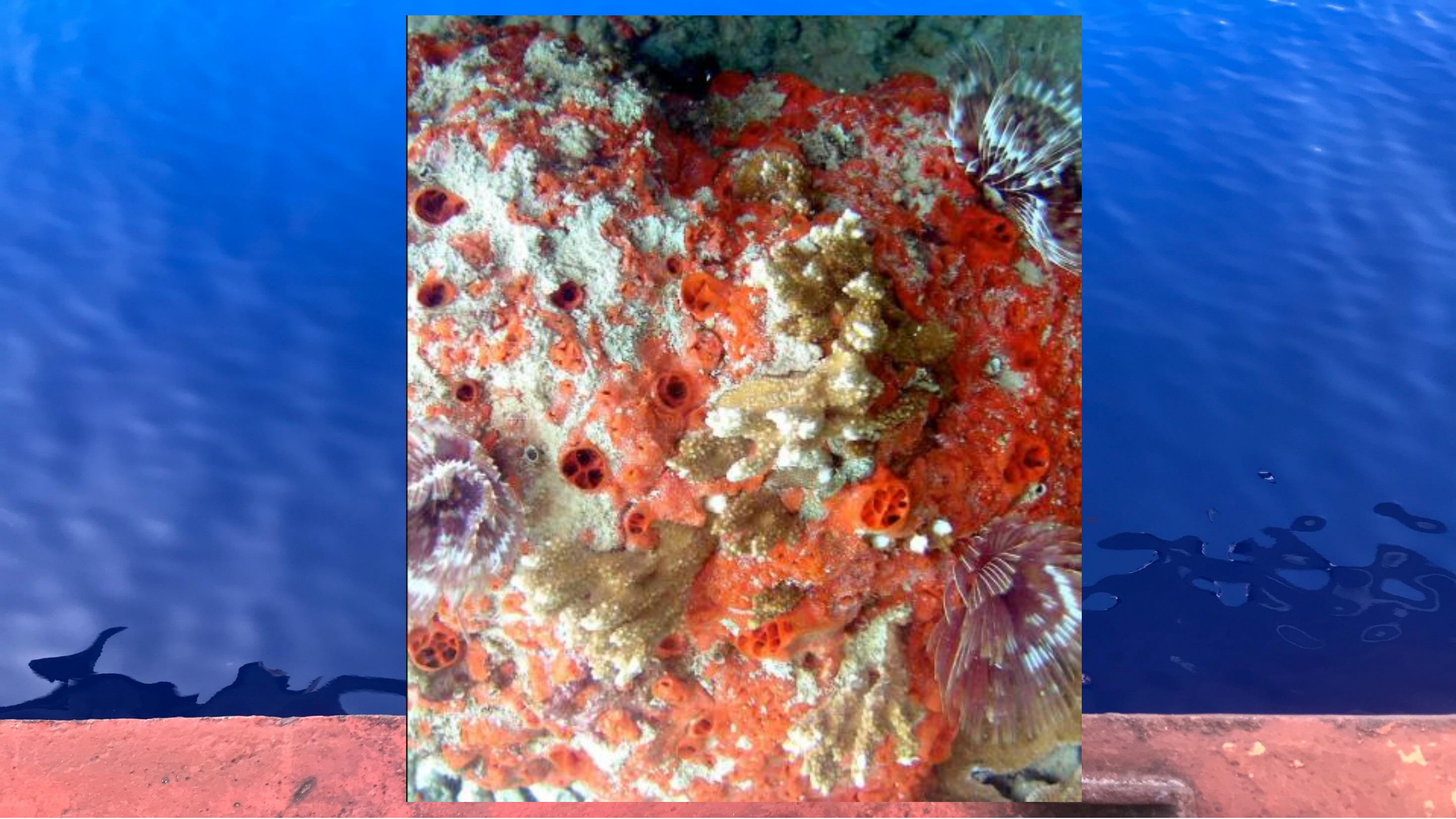


Marine snail



Propagules = babies









# International Dissemination of Epidemic *Vibrio cholerae* by Cargo Ship Ballast and Other Nonpotable Waters

SUSAN A. MCCARTHY<sup>1\*</sup> AND FARUKH M. KHAMBATY<sup>2</sup>

Gulf Coast Seafood Laboratory, Food and Drug Administration, Daingerfield, Alabama 36528,<sup>1</sup> and Division of Microbiological Sciences, Centers for Disease Control and Prevention, Atlanta, Georgia 30333,<sup>2</sup>

Received

In 1991 and 1992, toxigenic *Vibrio* nonpotable (ballast, bilge, and sewage) were recovered from cargo ships. Four of these ships had taken on ballast water in a noninfected country. Isolates examined by pulsed-field gel electrophoresis (PFGE) revealed a Latin American epidemic strain, C670 (VRL 1984), the sixth-pandemic strain, to have been introduced from a foreign port. On the basis of these findings, the U.S. Coast Guard issued an advisory to exchange ballast water on the high seas before entering U.S. waters.

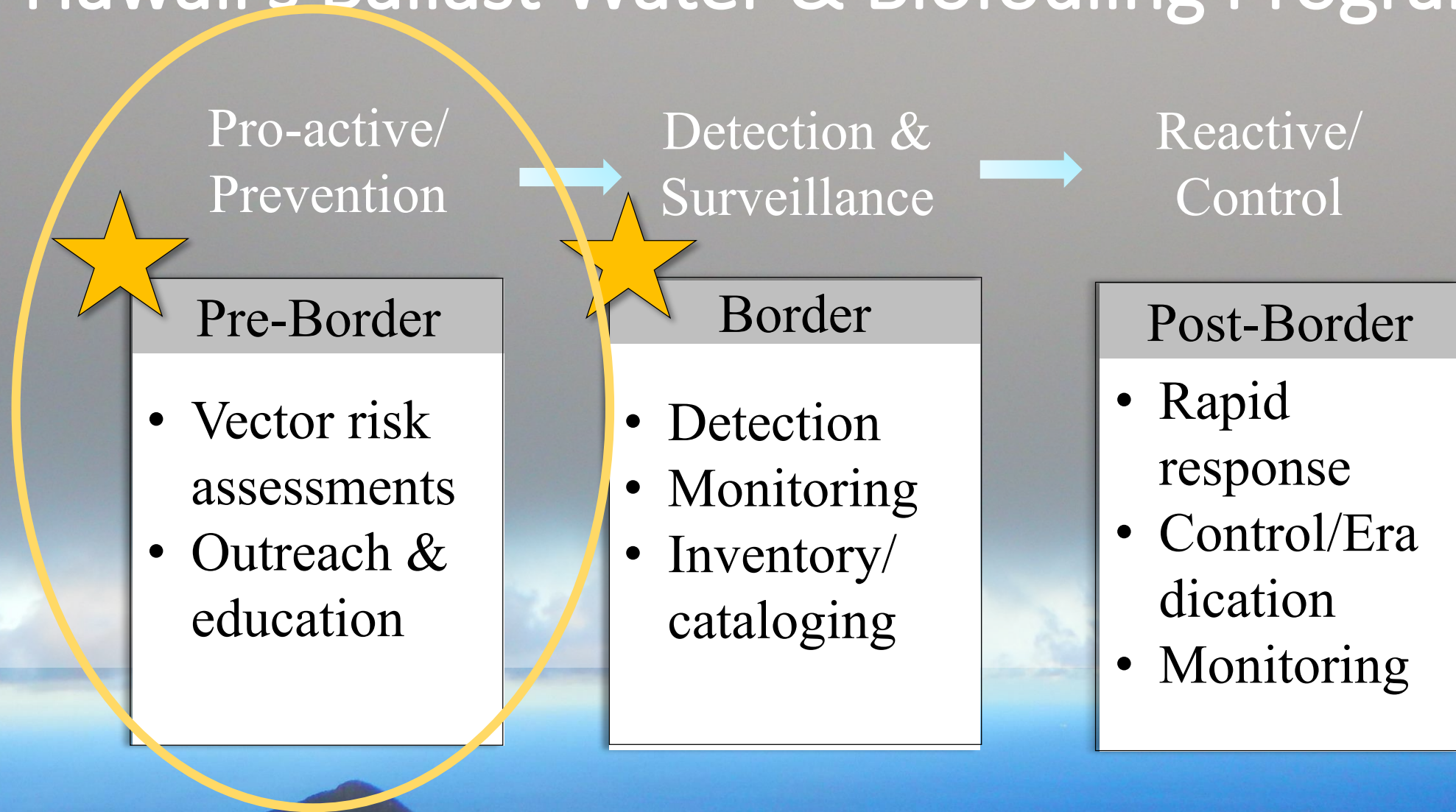
J. CLIMATE



recovered from Gulf of Mexico. *V. cholerae* on ballast in a cargo ship was able from the Gulf Coast strain. A ship arriving in the Gulf ended that the last waters be



# The Silver Lining: Hawaii's Ballast Water & Biofouling Program





# Hawaii Ballast Water Rules

## Ballast Water Management Report

OMB number 1625-0069  
Exp. date: 31-Dec-2018

### Vessel Information

Vessel name   
ID number  IMO number   
Country of Registry  Select country  
Owner/operator   
Type  Select vessel type Gross Tonnage   
Ballast water volume units  cubic meters  
Total ballast water capacity  cubic meters Number of tanks on ship  0  
Onboard BW Management System

### Voyage Information

Arrival port (port and state)  Select state  
Arrival date   
Last port (port and country)  Select country  
Next port (port and country)  Select country  
Total ballast water on board  cubic meters Number of tanks in ballast   
Number of tanks discharged   
Alternative BW management conducted, per instructions from COTP ☐

### Certificate of accurate information

By checking this box, I attest to the accuracy of the information provided and that ballast water management activities were in accordance with the ballast water management plan required by CFR 151.2050(g). ☒

Responsible Officer's name and title   
Report type  New report  
Submitted by  Contact information

### Ballast Water History

On the following page(s), provide the ballast water history for each tank discharged into the waters of the United States or to a reception facility, en route to or at the arrival port. Vessels entering the Great Lakes or Hudson River (north of George Washington Bridge) from beyond the US EEZ must also provide the history for empty tanks that underwent alternative management.

[Submit report via e-mail](#)

[Submit report on-line](#)





# Hawaii Biofouling Rules (in development)

Hawaii Biofouling Questionnaire for commercial vessels	
<b>Vessel Information &amp; Particulars</b>	
Vessel Name	
Official / IMO Number	
Vessel type (containership, barge etc)	
Responsible Officer's Name and Title (Person filling this form)	
Vessel/Company/Agent Email address	
Date of Submission (Day/Month/Year)	
Vessel Age (years)	
Vessel typical speed (laden speed in knots over the last four months)	
Vessel typical port residence time (hours or days)	hours OR days
<b>Previous Dry Docking</b>	
Since delivery, has the vessel been removed from water for maintenance?	Yes <input type="checkbox"/> No <input type="checkbox"/>
If YES, enter the date and location of the <u>most recent</u> out-of-water maintenance:	Date (Day/Month/Year): 04/15/2015 City/Port: Country:
If NO, enter the delivery date and location where the vessel was built:	Delivery Date (Day/Month/Year): City/Port: Country:
<b>Anti-Fouling Paint (A/F Paint)</b>	
Were the vessel's <u>submerged portions</u> coated with an anti-fouling paint (includes foul-release paint) during the out-of-water period listed above?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
If <u>not</u> , when was the last anti-fouling coating applied to the vessel?	Date of A/F paint application (Day/Month/Year):
For the most recent anti-fouling coating, what product (top coat A/F paint) was used for hull surfaces? Please list more than one if necessary and indicate what parts of the hull each product was used on?	For the <u>hull bottom</u> Manufacturer/Company: Product Name:  For the <u>hull sides</u> Manufacturer/Company: Product Name:
Were additional anti-fouling coatings used for other submerged surfaces (e.g. rudder, thrusters, sea-chests)?	No <input type="checkbox"/> Don't know <input type="checkbox"/> Yes <input type="checkbox"/>  If yes, what products were used Manufacturer/Company: Product Name:  Manufacturer/Company: Product Name:





# Vessel Biofouling Best Management Practices

“Clean early and often”

“Clean, drain, dry”

“Clean before you leave”

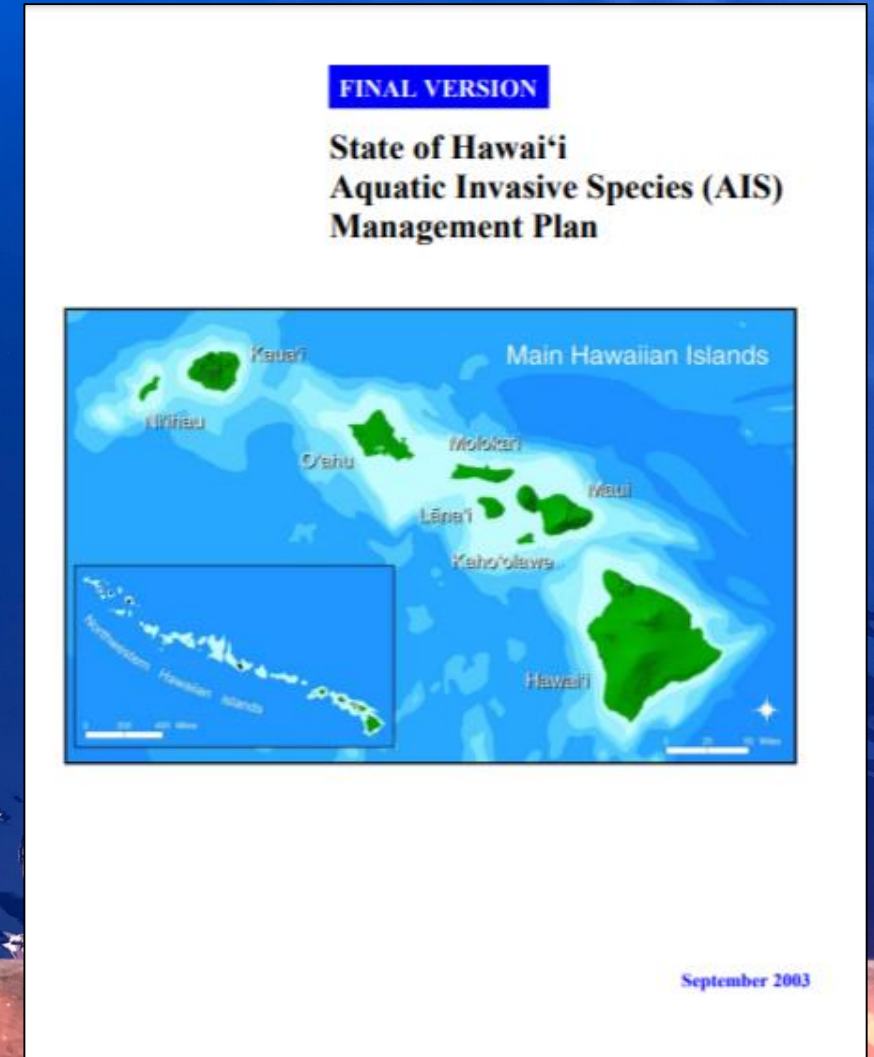
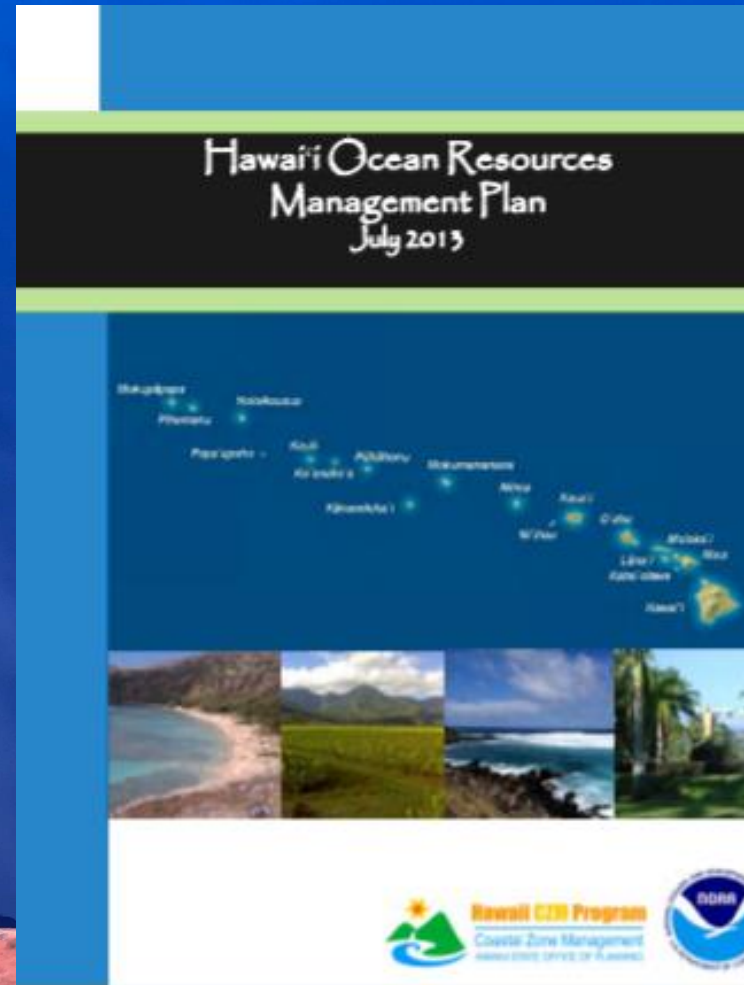
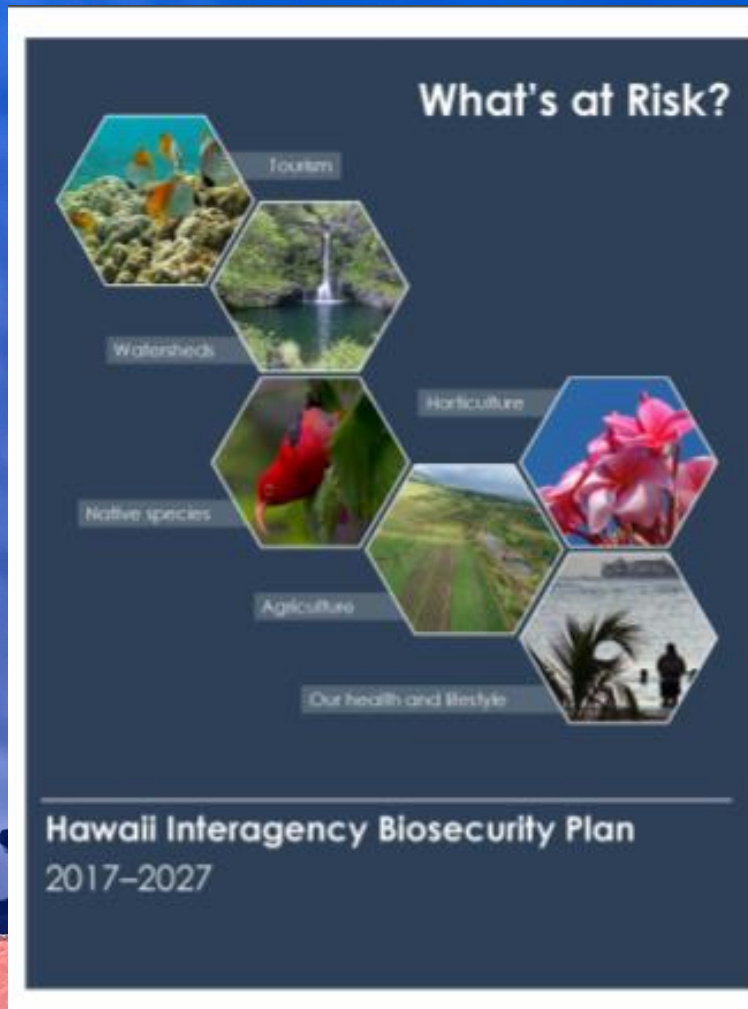
“Beards on faces, not on boats”

In-water cleaning capture system



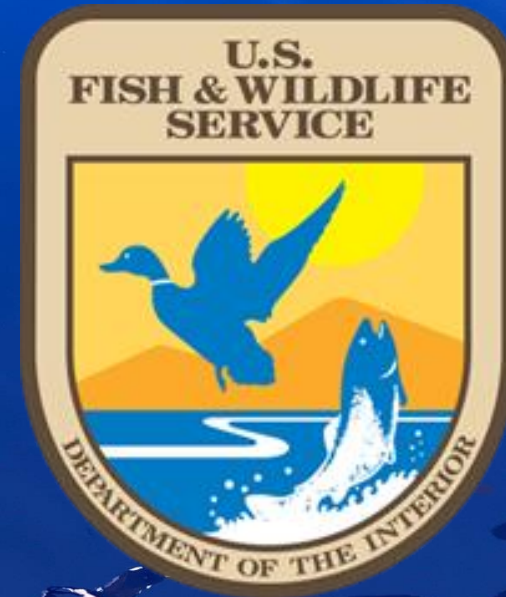


# Prevention Guided by Strategic Plans



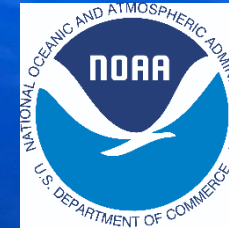


# Prevention Currently Supported by Grants





# Prevention through Collaboration



Military, federal, state agency stakeholders, commercial/recreational maritime industry, scientists, vector management system vendors, national/international experts







