



Marine Alien Species in Hawaii: An Overview

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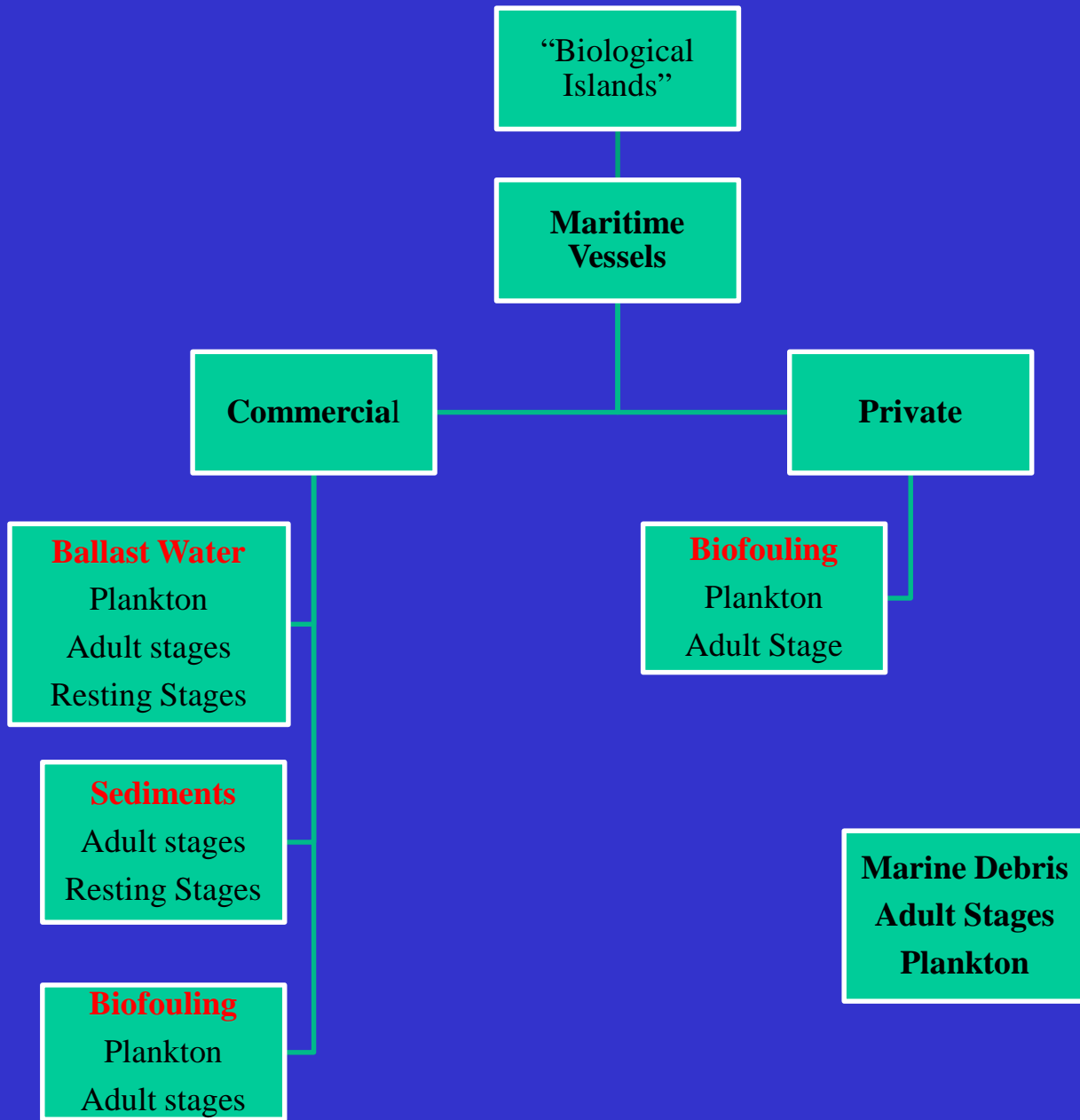


Overview

- Ballast Water: South Oahu Marine Invasion Shipping Study
- Vessel Biofouling: HCRI-Hull Fouling Project
- NWHI Marine Alien Program
 - Risk Assessment
 - Marine Debris
 - Marine Alien Inventory, MHI and NWHI (multi-year collaboration)
 - Biosecurity Development and Implementation
 - Japan Tsunami Marine Debris

Terminology

- Introduced, Alien, Exotic, Non-indigenous “ A non-native species that occurs in a region where it previously did not exist, at least historically”
- Cryptogenic
“A species of uncertain origin that is neither demonstratively native nor introduced”
- Invasive
“an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.”



“Biological
Islands”

Maritime
Vessels

Commercial

Private

Ballast Water

Plankton
Adult stages
Resting Stages

Sediments

Adult stages
Resting Stages

Biofouling

Plankton
Adult stages

Biofouling

Plankton
Adult Stage

Marine Debris

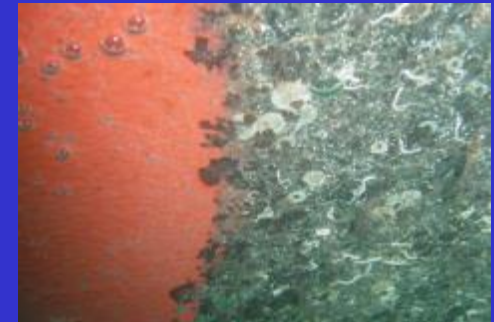
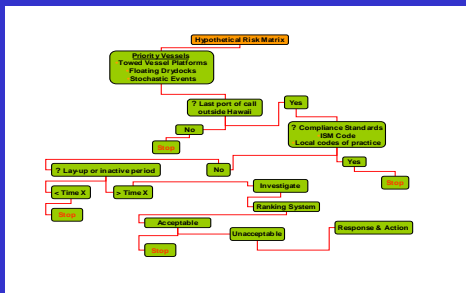
Adult Stages
Plankton

South Oahu Marine Invasion Shipping Study (SOMISS) 1998-2000

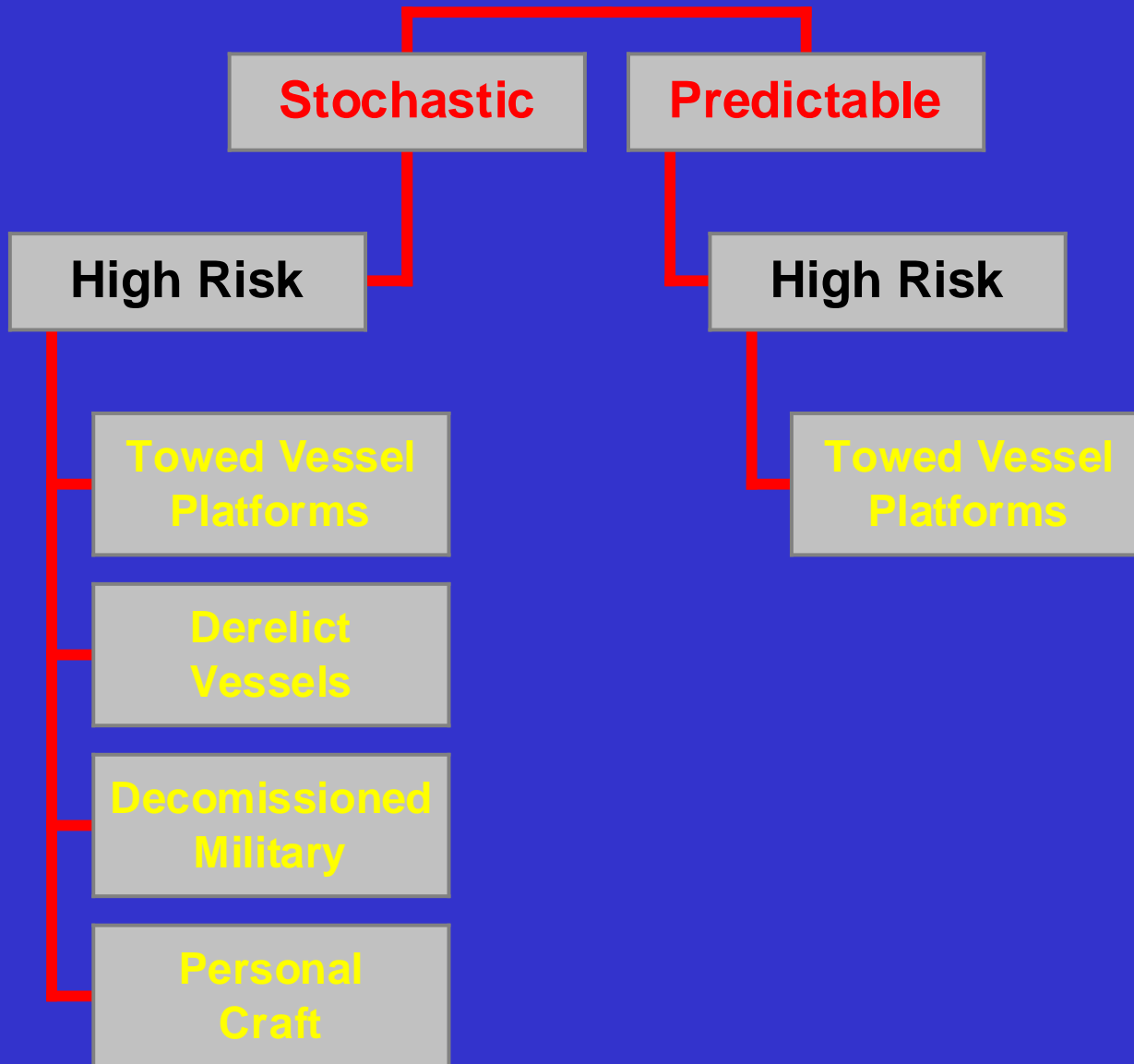
- Goal of the SOMISS was to broadly survey the maritime shipping industry in Hawai'i through the collection of biological and operational data that would relate to the issue of marine alien introduction.
- Specifically looked at ballast water and sediments (74 vessels) but conducted a pilot study on biofouling (8 vessels)
- The majority of ballast water being discharged was minimal but the level of biofouling transport was determined to be more important

Hawaii Coral Reef Initiative: Hull Fouling Project Grant 2003-2004

- A total of 35 vessels were surveyed, which yielded 112 species from 10 different phyla. There were 48 species identified as AIS and 12 as cryptogenic.
- Formed a working group to determine the goal, major criteria and potential alternatives for management. It produced an initial framework for the management of hull fouling, through a series of pro-active, reactive and post-event measures.



Components of Port Arrivals Related to Biofouling Transport



Marine Debris Transport 2000, and 2007-2008



- Conducted in the NWHI only
- Surveys of derelict fishing gear at French Frigate Shoals, Pearl and Hermes Atoll, Kure Atoll and Midway Atoll
- 1 new record at Pearl and Hermes Atoll and 4 records of species which were established in the MHI

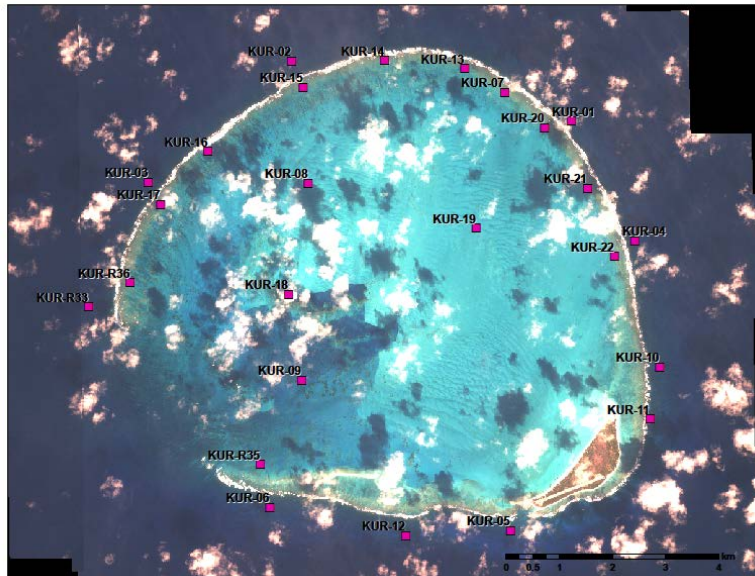


NWHI Risk Assessment

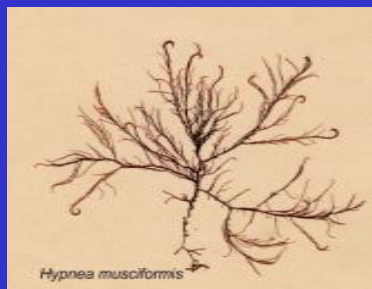
- Collaboration between NOAA-ONMS and HIMB 2006
- Assessment of the risk of exposure to marine alien species
- Vessel biofouling associated with research and resupply activities deemed the greatest risk.
- MHI the source area with the highest risk



Marine Alien Inventory, MHI and NWHI 1998-2016 Data Collection Methods



The Alien and Cryptogenic Marine and Estuarine species of the Hawaiian Archipelago 1998-2016



Taxon	MHI		NWHI	
	Alien	Cryptogenic	Alien	Cryptogenic
Fungi	3	0	0	0
Protozoans	5	0	0	0
Sponges	14	28	4	11
Cnidarians	24	30	2	0
Ctenophores	1	0	0	0
Nematodes	2	0	0	0
Rotifera	0	5	0	0
Platyhelminthes	12	3	0	0
Annelida	24	32	9	2
Molluscs	32	26	0	0
Arthropods-crustaceans	61	8	5	0
Arthropods-insects	39	4	0	0
Pycnogonida	12	0	0	0
Phoronida	1	0	0	0
Bryozoan & Kamptozoon	23	0	3	1
Echinoderms	1	1	0	0
Tunicates	31	1	14	1
Fish	18	0	3	0
Red Algae	13	0	1	0
Green Algae	2	3	0	0
Brown Algae	2	0	0	0
Flowering plants	12	0	1	0
Totals	332	141	42	15

NWHI Marine Biosecurity Program Process

Introduction

- **Prevention of Introduction**
 - Permit System
 - Vessel Inspection
 - BMPs

Establishment

- **Inventory**
 - Document existing and new records
 - Docks, seawalls
 - Shallow near-shore
 - RAMP
 - ARMS

Growth/Spread

- **Monitoring & Control (???)**
 - Prevent spread via Disinfection Program
 - Monitor spread of established alien species

Japan Tsunami Response



Response



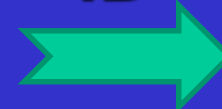
Safety



Field Guide



ID



- SOMISS: Godwin and Eldredge 2001

<http://hbs.bishopmuseum.org/pdf/tr20.pdf>

- HCRI Hull Fouling: Godwin *et al.* 2004

<http://hbs.bishopmuseum.org/pdf/bmtechrep28.pdf>

- Marine Debris and Alien Species: Godwin *et al.* 2008

- NWHI

- Risk Assessment: Godwin *et al.* 2006

- Marine Alien Inventory, MHI (multi-year collaboration)
(Carlton and Eldredge 2009, 2015)

- Marine Alien Inventory, NWHI Godwin and Bolick, *In Prep*

- Biosecurity Development and Implementation

- Japan Tsunami Marine Debris

https://marinedebris.noaa.gov/sites/default/files/Japan_Tsunami_Marine_Debris_Report.pdf

Acknowledgments



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NOAA Marine Debris Program
NOAA Coral Reef Conservation Program
NOAA Coral Reef Ecosystem Division



State of Hawaii Department of Land and Natural Resources,
Division of Aquatic Resources.



Pacific Remote Islands National Wildlife Refugees
Midway Atoll Special Management Area



United States Coast Guard



Hawaii Coral Reef Initiative

Questions?

