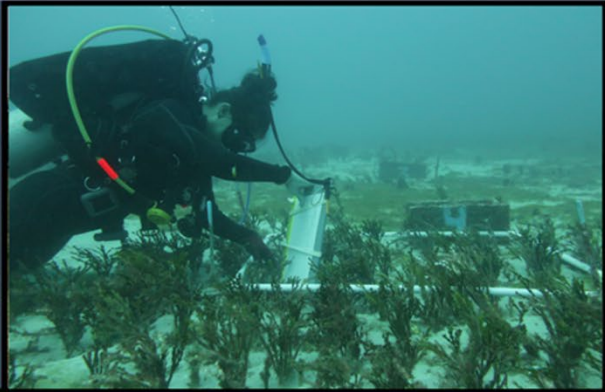




# Aquatic Invasive Species Program



## 2022 ACCOMPLISHMENT REPORT



College of Social Sciences  
Social Science Research Institute  
University of Hawaii at Manoa

**Aquatic Invasive Species Program  
2022 Annual Accomplishment Report**

**State of Hawai`i  
Department of Land and Natural Resources  
Division of Aquatic Resources**

**In Cooperation with**

**The Research Corporation of the University of Hawai`i  
Pacific Cooperative Studies Unit  
And  
Social Science Research Institute**

## Aquatic Invasive Species Program

### Aquatic Invasive Species Control

- Outplanted over 150,000 hatchery-raised juvenile sea urchins to reefs in Kāneʻohe Bay, nearing 1,000,000 urchins outplanted since 2011
- Performed Kāneʻohe Bay non-native coral removal follow up surveys and found no non-native corals present



### AIS Monitoring and Planning

- Completed annual benthic monitoring of Kāneʻohe Bay and the Waikīkī MLCD
- Investigated a reported algal bloom near Kaiona Beach Park, Waimānalo and determined likely culprit was the brown alga golden threads (*Chrysocystis fragilis*)
- Assisted the Coral Nursery Team with coral module outplants and performed monitoring independently of modules 1 month after outplant



### Ballast Water & Biofouling Coordination

- Analyzed arrival and ballast water risk data of 677 vessel arrivals to ports in Hawaiʻi and presented findings at the 2022 Pacific Ballast Water Group Meeting
- Formed the Hawaiʻi Stony Coral Tissue Loss Disease (SCTLD) Planning and Response Team
- Created a risk assessment tool analyzing SCTLD transmission risk for incoming ballast-carrying vessels



### Outreach

- Participated in a variety of local outreach events and campaigns
- Participated in professional conferences and workshops including the Reef Futures Symposium, held in Key Largo, FL.
- Filmed an episode of "Outside Hawaiʻi" with an aquatic invasive species control segment





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## Acronym List

- AFRC – Ānuenuē Fisheries Research Center
- AIC – All Islands Committee
- AIS – Aquatic Invasive Species
- ARMS - Autonomous Reef Monitoring Structure
- BMP – Best Management Practices
- BW/BF – Ballast water/Biofouling
- CGAPS – Coordinating Group on Alien Pest Species
- CZM- Coastal Zone Management
- DAR – Division of Aquatic Resources
- DLNR – Department of Land and Natural Resources
- EPA- Environmental Protection Agency
- HDOA – Hawai‘i Department of Agriculture
- HDOT – Hawai‘i Department of Health
- HDOT – Hawai‘i Department of Transportation
- HIMB – Hawai‘i Institute of Marine Biology
- HISC – Hawai‘i Invasive Species Council
- MLCD – Marine Life Conservation District
- NOAA – National Oceanic and Atmospheric Administration
- NWHI – Northwestern Hawaiian Islands
- RCUH – Research Corporation of the University of Hawai‘i
- SCTL D – Stony Coral Tissue Loss Disease
- SOP – Standard Operating Procedure
- USCG- United States Coast Guard
- USCRTF - US Coral Reef Task Force
- USFWS- United States Fish and Wildlife Service
- VIDA- Vessel Incidental Discharge Act
- WRP- Western Regional Panel on Aquatic Nuisance Species

## Introduction

The Division of Aquatic Resources (DAR), Aquatic Invasive Species (AIS) Program is committed to managing AIS threats to Hawai'i with the goal of minimizing the ecological, economic, and human health impacts through the prevention and management of AIS introduction, expansion, and dispersal into, within, and from Hawai'i<sup>1</sup>. The AIS Program focuses on:

- Prevention of AIS introductions
- Ecosystem monitoring and risk screenings
- Ballast water and hull fouling data gathering and policy development
- Early detection and rapid response to AIS introductions, marine debris, disease outbreaks, coral bleaching, groundings, and other threats to Hawaiian reefs
- Invasive algae management and control in Kāne'ōhe Bay and the Waikīkī Marine Life Conservation District (MLCD) on O'ahu
- Managing and operating the sea urchin hatchery
- Outreach, education, and community engagement
- Policy development
- Collaboration with fellow researchers, stakeholders, community groups, and partners

The AIS Program is composed of three teams to accomplish these goals: the Ballast Water and Biofouling Team, the AIS Field Team, and the Urchin Hatchery Team.

## Ballast Water and Biofouling Team

### Overview

Ballast discharge (water carried by ships to provide stability and maneuverability) and biofouling (the accumulated growth of algae, sponges, and invertebrates on the wetted surfaces of ship hulls) account for approximately 78% of AIS introductions in Hawai'i. Due to this significant risk, collaboration with the maritime industry, inspection of high-risk vessels, and safer ballast water and biofouling policy development are crucial. The Ballast Water and Biofouling Team is responsible for managing the possible introduction of species associated with ballast water and biofouling to Hawai'i. This is done by evaluating commercial ships arriving in Hawai'i waters from high-risk areas and intervening when necessary. Collaboration and data sharing with other US States and agencies is also a priority, as well as advising partner agencies on mitigating ballast water and biofouling risks.

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<sup>1</sup> State of Hawai'i, 2003. Aquatic Invasive Species (AIS) Management Plan. Available online at <https://dlnr.hawaii.gov/ais/files/2013/12/HAWAII-mgt-PLAN-03.pdf>

## Ballast Water and Biofouling Team Accomplishments

### Key Accomplishments

- Analyzed arrival and ballast water risk data of 677 vessel arrivals to ports in Hawai'i and presented findings at the 2022 Pacific Ballast Water Group Meeting
- Formed the Hawai'i Stony Coral Tissue Loss Disease (SCTLD) Planning and Response Team
- Created a risk assessment tool analyzing SCTLD transmission risk for incoming ballast-carrying vessels

### Ballast Water Data

- Analyzed arrival and ballast water risk data of 677 vessel arrivals to ports in Hawai'i and presented findings at the 2022 Pacific Ballast Water Group Meeting
- Collaborated with California, Oregon, and Washington on the implementation of a new ballast water data-sharing system
- Attempted to collect all Kaua'i Autonomous Reef Monitoring Structure (ARMS) units in collaboration with the Kaua'i DAR Team

### Stony Coral Tissue Loss Disease

- Formed the Hawai'i Stony Coral Tissue Loss Disease (SCTLD) Planning and Response Team
- Created a risk assessment tool analyzing SCTLD transmission risk for incoming ballast-carrying vessels
- Collaborated with representatives from affected U.S. jurisdictions, concerned Pacific jurisdictions, and national leads on dozens of action items related to SCTLD; created outreach materials relating to Hawai'i concerns surrounding SCTLD
- Collaborated with the NOAA National Disease Coordinator, representatives from Guam, and the National Marine Sanctuary of American Samoa on the planning of the agenda for the US Coral Reef Task Force (USCRTF) SCTLD Pacific Preparedness Workshop
- Planned, organized, and presented at the Alien Aquatic Organism Task Force Meeting educating representatives from 18 different agencies across Hawai'i on the potential for transmission of SCTLD to Hawai'i corals

### Rule Making

- Continued to provide briefings to stakeholders and local government officials on concerns behind the implementation of the Vessel Incidental Discharge Act (VIDA), as well as presented concerns at the 2022 International Conference on AIS
- Aided in the revision and scientific language of proposed emergency Hawai'i Administrative Rule Chapter 13-76.1

## Other

- Advised a UH Manoa Global Environmental Science undergraduate student on the completion of her thesis on AS-ISK risk assessments
- Advised on the upcoming Marine Corps Base Hawai'i Biosecurity Plan, the Honolulu Deep Draft Harbor Modification Study, and *Chondria* Best Management Practices (BMPs)
- Refined and updated the SOPs for the ballast water reporting form database

## Outreach

- Tom, Sarah
  - Kupu Hō'ike (July 2022) - *Hō'ike Presentation: 2021-2022*
- Monaghan, Elizabeth
  - Aquatic Biosecurity Working Group (January 2022)- *Stony Coral Tissue Loss Disease in the Pacific*.
  - Water and Land Board Briefing (January 2022) – *DLNR-DAR Aquatic Invasive Species*
  - Hawai'i Invasive Species Awareness Month (February 2022) – *Aquatic Invasive Species Prevention and Management on Oahu*
  - USCRTF Pacific Preparedness SCTL D Workshop (February 2022) – *Aquatic Biosecurity and Decontamination in Hawai'i*
  - Pacific Ballast Water Group Meeting (March 2022) – *Hawai'i Ballast Water and Biofouling Program*
  - 2022 International Conference on Aquatic Invasive Species (April 2022) – *A Hawai'i Perspective on Aquatic Invasive Species Concerns Under the Vessel Incidental Discharge Act (VIDA)*
  - Hawai'i Invasive Species Council 3<sup>rd</sup> Quarter Meeting (October 2022) – *Stony Coral Tissue Loss Disease (SCTLD) and Possible Risks in Hawai'i*
  - Alien Aquatic Organism Task Force Meeting (October 2022) - *Stony Coral Tissue Loss Disease (SCTLD) and Possible Risks in Hawai'i*
  - 2022 AGU Fall Meeting (December 2022) – *AGU Voices for Science Policy Track; Policy Fellowship Panel*

## Working Groups

- USCRTF Coral Disease Working Group
- USCRTF SCTL D Pacific Preparedness Working Group
- USCRTF SCTL D Transmission Team Working Group
- USCRTF SCTL D Pacific Preparedness Leads Working Group
- HISC Aquatic Biosecurity Working Group
- HISC Resources Working Group
- Resource Protection Working Group
- ANS Task Force Coastal Committee
- Biofouling International Regulators Discussion (BIRD)



- Hawai'i SCTL D Response Team
- VIDA EPA/USCG/States Working Group

## Training Sessions and Conferences

- AGU Voices for Science Policy Track Workshop
- Eyes of the Reef Identification Training
- Adaptive Management Workshop
- Facilitation Basics for Coastal Managers
- USCRTF SCTL D Surveillance in the Indo-Pacific, Options for Intervention, SCTL D Preparedness Workshops
- 2<sup>nd</sup> National Workshop on Marine eDNA
- QUEST Invertebrates, Limu, and Coral Identification Class
- Biofouling Prevention Forum
- Chainsaw Safety Training
- Kupu Next Steps Workshop
- 2022 Pacific Ballast Water Group Meeting
- 2022 Aquatic Nuisance Species (ANS) Task Force Meeting
- CGAPS General Quarterly Meetings
- HISC General Quarterly Meetings
- Hawai'i Invasive Species Awareness Month
- Alien Aquatic Organism Task Force (AAOTF) Meeting
- 2022 International Conference on Aquatic Invasive Species (ICAIS)
- 2022 US Coral Reef Taskforce (USCRTF) Meeting
- 2022 American Geophysical Union (AGU) Fall Meeting
- 2022 Biofouling Prevention Forum
- Western Regional Panel on Aquatic Nuisance Species 2022 Annual Meeting
- Honolulu Deep Draft Harbor Modification Study Planning Charette

## Staff

- Hired Aquatic Biologist IV/Ballast Water and Biofouling Coordinator (Elizabeth Monaghan)
- Hired PCSU Ballast Water and Biofouling Planning Associate (Sarah Tom)
- Hired 10-month full-time Kupu Placement (Hana Kim Rupnow)

## Priorities for 2023

- Implement a new eDNA monitoring project for commercial harbors in collaboration with UH
- Expand data collaboration with U.S. west coast states

- Fund and create the position of Rapid Response Coordinator for coral disease and bleaching
- Recreate the 2008 DAR recreational vessel hull fouling surveys
- Integrate coral disease monitoring into field activities
- Create an outreach campaign educating dive shops on preventing SCTL transmission

## AIS Field Team

### Overview

Invasive algae control has been one of the primary management priorities of the Department of Land and Natural Resources (DLNR)-DAR AIS Program. The proliferation of introduced invasive algae throughout Kāneʻohe Bay poses a major threat to coral reef ecosystems. As a result, extensive invasive algae management has been instituted throughout Kāneʻohe Bay over the last decade. Past efforts included the manual removal of algae by divers using the “Super Sucker” underwater vacuum system followed by a biocontrol application: outplanting native sea urchins (*Tripneustes gratilla*) that were hatched and reared in the DAR Ānuenuue Fisheries Research Center (AFRC) on Sand Island, Oʻahu. Following the 2014 and 2015 warm water events, the algae in Kāneʻohe Bay declined to levels too low to justify manual removal. Invasive algae persist throughout the Bay, but at levels effectively controlled by urchin grazers. Therefore, ongoing management efforts have shifted to urchin outplanting and herding. The AIS Program began outplanting urchins to the Waikīkī Marine Life Conservation District (MLCD) with additional funding from the Kapalāma Terminal Expansion Project. To date, the AIS Program has outplanted 975,856 urchins to reefs in Kāneʻohe Bay and the Waikīkī MLCD.

The AIS Field Team is also responsible for rapid response to reports of new species introductions. Rapid response has been critical in preventing the establishment of newly introduced species. Once a species becomes established, eradicating it can be incredibly difficult, if not impossible. The AIS Field Team carries out various ecosystem monitoring and response efforts throughout the State. The AIS Field Team’s experience and ongoing efforts contribute to a wide range of steering committees, workshops, and training sessions focusing on AIS and marine resource management.

## AIS Field Team Accomplishments

### Key Accomplishments

- Outplanted over 150,000 hatchery-raised juvenile sea urchins to reefs in Kāneʻohe Bay, nearing 1,000,000 urchins outplanted since 2011
- Participated in outplanting Hawaiʻi Coral Restoration coral modules and monitored all outplanted coral modules one-month from outplant independently.

- Participated in the Honolulu Harbor 'Ewa channel emergency coral relocation and applied for reimbursement with National Fish and Wildlife Foundation for contracted work

## Prevention

- *Chondria tumulosa*:
  - Worked to create best management practices to reduce the risk of *C. tumulosa* spread from the Midway and Pearl and Hermes
  - Observed Papahānaumokuākea Marine Debris Project (PMDP) ship and marine debris offload after returning from the Northwestern Hawaiian Islands (NWHI) for invasive *Chondria tumulosa* using visual inspections and eDNA analysis
- Conducted risk screenings for invasive and potentially invasive species:
  - Silver Carp
  - Black Carp
  - Northern Large Mouth Bass
  - Diamond Backed Terrapin
  - Mangrove Oyster

## Rapid Response and Control

- Performed Kāneʻohe Bay non-native coral removal follow-up surveys and found no non-native corals present.
- Performed Ala Wai corallimorph follow up surveys and found no corallimorphs.
- Investigated a reported algal bloom near Kaiona Beach Park, Waimānalo and determined likely culprit was the brown alga golden threads (*Chrysochysis fragilis*)
- Performed a site inspection in response to a report of a non-native Diamondback Terrapin in the Ala Wai.
- Performed pilot urchin cage study in Waikīkī Marine Life Conservation District and assessed urchin survivorship and benthic change. Assisted Mālama Maunalua with an urchin survivorship project in Maunalua Bay
- Outplanted over 150,000 hatchery-raised juvenile sea urchins to reefs in Kāneʻohe Bay, nearing 1,000,000 urchins outplanted since 2011

## Surveying and Monitoring

- Performed monthly dive operations at two sites offshore of Sand Island for *Avrainvillea erecta* monitoring and helped to establish reference plots for shallow monitoring sites
- Conducted annual SNAP surveys to monitor invasive algae in Kāneʻohe Bay and the Waikīkī MLCD

- Assisted the Coral Nursery Team with coral module outplants and performed monitoring independently of modules one month after outplant
- Collaborated with National Oceanic and Atmospheric Administration (NOAA) to survey the long term recovery of the Vogue Trader grounding site near Barbers Point Harbor
- Installed pins to facilitate long term monitoring of the Honolulu Harbor dredging damage on the east side of the channel

## Other

- Participated in the Honolulu Harbor 'Ewa channel emergency coral relocation and applied for reimbursement with National Fish and Wildlife Foundation for contracted work
- Participated in outplanting Hawai'i Coral Restoration coral modules and monitored all outplanted coral modules one-month from outplant independently
- Produced annual Kapalāma and Flattery Reports
- Biologists provided comments for eight environmental reviews on behalf of DAR
- Provided field support for Kimberly Fuller's MA Thesis: "Spectral Signatures of Macroalgae on Hawaiian reefs."
- Assisted Dr. Nancy Treneman with shipworm settlement research

## Outreach

- Johannsen, Trevor
  - Castle High School (November 2022) - *Managing Invasive Species in Hawai'i*
- Gonzales, Kate
  - Kupu Ho'ike (August 2022) - *Aquatic Invasive Species*
- Shem, Jessica
  - Reef Futures Symposium (September 2022) - *Managing Invasive Algae Using Urchins as a Native Biocontrol in Hawai'i*
- Participated in Mālama Pu'uloa Festival
- Filmed an episode of Outside Hawai'i with an aquatic invasive species control segment.
- Responded to public inquiries
- Updated AIS website with new research and reports

## Training Sessions, Working Groups, and Conferences

- Hawai'i Invasive Species Council Resources Aquatic Biosecurity Working Group
- Coordinating Group on Alien Pest Species (CGAPS) Steering Committee
- CGAPS public meetings

- USCRTF SCTL D Surveillance in the Indo-Pacific, Options for Intervention, SCTL D Preparedness Workshops
- 5<sup>th</sup> International Symposium on Anchialine Ecosystems (Kona, November 2022)
- Eyes of the Reef Training (October 2022)
- Reef Futures Symposium (September 2022)
- Hawai'i Conservation Conference (July 2022)
- Resource Protection Working Group

## Staff and Facilities

- Hired an 11-month full-time Kupu intern (Kate Gonzalez) for her second term with the team
- Hired a full-time Fishery Technician (Trevor Johannsen) and two Fish and Habitat Monitoring Technicians (Kasey MacRae, Jessica Schem)
- Refurbished 22' Force

## Priorities for 2023

- Contract a planner to update the 2003 State of Hawai'i Aquatic Invasive Species Management Plan and get the plan approved by the Aquatic Nuisance Species Task Force
- Promote early detection of incipient introduced species and rapidly respond to reports.
- Continue processing species on the AIS Preborder Database and the Hawai'i Prevention Priority Distribution List using an updated risk assessment framework
- Continue monitoring coral and invasive algal cover to guide urchin outplanting efforts in Kāne'ohe Bay
- Continue monitoring outplanted corals and incorporate new monitoring methodologies such as largescale imaging for the Kapalāma Terminal Expansion Project
- Assist and support neighbor islands with AIS issues
- Continue collaborative efforts with partner agencies and organizations
- Increase participation in outreach events now that the COVID-19 regulations are less stringent
- Attend and present at local and national conferences

## Sea Urchin Hatchery Team

### Overview

The Sea Urchin Hatchery at AFRC in Honolulu raises native collector urchins (*Tripneustes gratilla*), for invasive alien macroalgae control. This project by DAR and the Research Corporation of the University of Hawai'i (RCUH) was initiated in 2009 with the first outplanting

of hatchery-raised urchins in early 2011. Since 2012 the DAR AIS Field Team has outplanted these urchins for biocontrol on a regular basis.

Invasive macroalgae can overgrow reefs, smothering and killing coral. Native collector sea urchins are important grazers that help to keep invasive macroalgae under control and promote healthy reefs. Unique methods were developed for the AFRC hatchery to produce these native herbivores for the State's groundbreaking invasive algae control program.

As of the end of 2022, the hatchery has released over 980,000 urchins in Kāneʻohe Bay and Waikīkī for biocontrol of invasive seaweeds. The hatchery produced an average of 50,000 urchins per year from 2012 to 2020. Recent changes to hatchery methods have tripled sea urchin production for 2021 and 2022.

## Urchin Hatchery Team Accomplishments

### Recurring Duties

- Produced over 150,000 hatchery-raised juvenile sea urchins to outplant on reefs in Kāneʻohe Bay nearing 1,000,000 urchins outplanted since 2011
- Supplied juvenile urchins to the AFRC Coral Nursery for tank maintenance
- Supplied juvenile urchins to the Waikīkī Aquarium for tank maintenance and exhibit
- Maintained partnerships with the Department of Marine Sciences, University of Puerto Rico, Mayaguez, and the Institute for Socio-Ecological Research, Lajas
  - Herbivore alternatives: Restocking of *Echinometra viridis* and *Tripneustes ventricosus* on coral reefs to reduce the abundance of nuisance species. Advised on urchin hatchery methods
- Continued to produce salt-tolerant aquatic plants for the Honouliuli restoration project

## AIS Program Funding and Grants

- HISC FY23 grant awarded to support Hawai'i Ballast Water and Biofouling Program
- US Fish and Wildlife Service Aquatic Nuisance Species Grants:
  - FY 19-20: Completed use of funds and closed out the grant. Submitted Final Financial and Final Programmatic Reports
  - FY20-21, FY21-22: Submitted Partial Financial and Partial Programmatic Reports.
  - FY22-23: New grant awarded
- Submitted applications for the United States Department of Defense Readiness and Environmental Protection Integration (REPI) Program funding.
- Proposed projects for Capital Improvement Plan funding