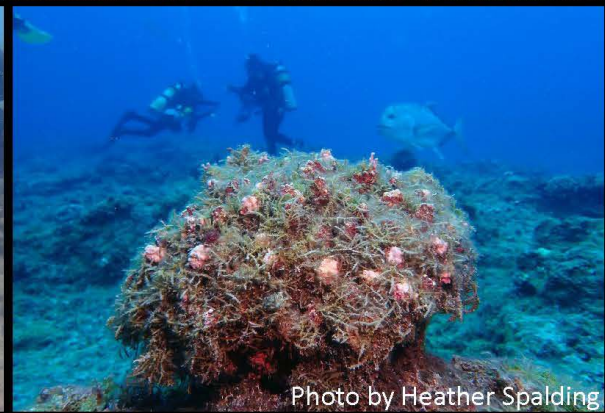




Aquatic Invasive Species Program



2021 ACCOMPLISHMENT REPORT



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

**Aquatic Invasive Species Program
2021 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**

Table of Contents

Introduction	4
Invasive Species Early Detection, Monitoring, and Control.....	4
Overview	4
2021 Accomplishments	5
Prevention.....	5
Surveying and Monitoring.....	5
Control	6
Facilities	7
Presentations, Workshops, and Working Groups.....	7
Staff	7
Priorities for 2022	7
Ballast Water and Biofouling Program	8
Working Groups, Workshops and Conferences.....	8
Presentations	9
Staff	9
Funding	9
2022 Priorities.....	9
Urchin Hatchery	10
2021 Key Accomplishments	10
2021 Activity Highlights	10

Acronym List

- AFRC – Ānuenue Fisheries Research Center
- AIC – All Islands Committee
- AIS – Aquatic Invasive Species
- 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
- SCTLD – Stony Coral Tissue Loss Disease
- SOP – Standard Operating Procedure
- USCG- United States Coast Guard
- 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 of AIS through the prevention and management of AIS introduction, expansion, and dispersal into, within, and from Hawai'i¹. The AIS program's focus areas include:

- Invasive algae management and control in Kāneʻohe Bay and the Waikīkī Marine Life Conservation District on O`ahu
- Managing and operating the sea urchin hatchery
- Ballast water and hull fouling data gathering and policy development
- Prevention of AIS introductions
- Early detection and rapid response to AIS introductions, marine debris, disease outbreaks, coral bleaching, groundings, and other threats to Hawai'i's coral reefs
- Ecosystem monitoring and risk screening
- AIS focused outreach, education, and community engagement
- AIS policy development
- Collaboration with fellow researchers, stakeholder, community groups, and partners

This year (2021) has been productive for the AIS Program, with a wide range of accomplishments including management and control work conducted in Kāneʻohe Bay and the Waikīkī Marine Life Conservation District (MLCD), AIS monitoring on O`ahu, community engagement, and participation in state and national conferences and workshops. This report summarizes the accomplishments of the AIS program in 2021 and presents the program's direction for 2022 and beyond.

Invasive Species Early Detection, Monitoring, and Control

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 conducted throughout the Bay over the past decade. Past efforts primarily included 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 Ānuenue Fisheries Research Center (AFRC) on Sand Island, O`ahu. Following the 2014 and 2015 warm water

¹ 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>

events, which lead to mass coral bleaching, the algae in Kāneʻohe Bay declined to levels too low for manual removal. Invasive algae persist throughout the Bay, but at levels effectively controlled by urchin grazers. Therefore, ongoing management efforts have shifted to urchin out-planting and herding.

The AIS Program began out-planting urchins in the Waikīkī MLCD with additional funding from the Kapalāma Terminal Expansion Project. To date, the AIS program has outplanted over 835,000 urchins to reefs in Kāneʻohe Bay and the Waikīkī MLCD.

The AIS team also carries out various ecosystem monitoring and response efforts throughout the State. The AIS team's experience and ongoing efforts contribute to a wide range of steering committees, workshops, and trainings focusing on AIS and marine resource management.

2021 Accomplishments

Prevention

- Contributed to northern largemouth bass and peacock butterfly bass importation testimony
- Developing risk assessment framework
 - Created rapid risk screening and standard operating procedure (SOP) by combining the Aquatic Species Invasiveness Screening Kit (AS-ISK), the Canadian Marine Invasive Screening Tool (CMIST), and the Risk Assessment Mapping Program (RAMP)
- Conducted risk screenings for potential invaders using AS-ISK for:
 - Largemouth bass (*Micropterus salmoides*)
 - Black carp (*Mylopharyngodon piceus*)
 - Updated bighead carp (*Hypophthalmichthys nobilis*) AS-ISK and literature review
- Contributed to *Chondria tumulosa* best management practices and NFWF Proposals.

Surveying and Monitoring

- *Avrainvillea erecta* monitoring
 - Performed monthly dive operations at two sites offshore of Sand Island
 - Helped to establish reference plots for shallow monitoring site
- Kāneʻohe Bay Coral Reef Impact Survey
 - Designed and conducted reef use survey for recreational ocean users
 - Reported minimal impact findings
- Conducted annual SNAP surveys for invasive algae in Kāneʻohe Bay and the Waikīkī MLCD
- Flattery Scar Monitoring

- Surveyed coral cover and collected orthoimagery data
- Cooperatively monitored with the United States Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA)
- Assisted Nancy Treneman retrieve shipworm settlement panels
- Vessel Grounding Inspection
 - Completed DAR vessel grounding training
 - Assessed coral reef damage in Kāneʻohe Bay
 - Assessed coral reef and live rock damage near Ko Olina
 - Assessed Honolulu Harbor coral damage
- Unexploded Ordnance Reconnaissance near the Sampan Channel in Kāneʻohe Bay
 - Delineated sensitive areas using orthoimagery and provided recommendations
 - Reattached corals from one UXO to nearby pavement.
- Kapalama Coral Monitoring
 - Assisted Coral Team with the selection and testing of outplant sites
 - Performed monitoring of modules
- Surveyed Kāneʻohe Bay Marine Corps Base for invasive algae
- Spectroscopy of Algae
 - Collected algae samples for spectroscopy in collaboration with the Asner Lab at Arizona State University
- Assisted with Artificial Reef monitoring

Control

- Outplanted urchins to the Waikīkī MLCD with the end goal of controlling 4.3 acres of invasive algae within an 18-acre area
- Urchin Cage Projects
 - Assessment of urchin survivorship in the Waikīkī MLCD
 - Assisted Malama Maunalua with urchin pilot project.
- Assisted Kauaʻi Team in preventing the spread of invasive water hyacinth (*Eichhornia crassipes*) from the upper Kapahi Reservoir on Kauaʻi
- Corallimorph control in the Ala Wai
 - Continued site inspections to check for new polyps
 - Smothered polyps with epoxy
- Kauaʻi non-native coral removal from Anini Beachpark
 - Assisted with site characterizations, removal, and collection of specimens
- Kāneʻohe Bay non-native coral removal
 - Revisited site for a follow-up inspection

Facilities

- Built new dive gear facilities at the Hawaiian Institute of Marine Biology (HIMB)
- Rewired the Force (22' working vessel)

Presentations, Workshops, and Working Groups

- Fuller, Kimberly. (2021). *Introduction to limu, coral, and invasive algae*
 - Participated in limu themed Lawai'a Camp at Miloli'i on Hawai'i Island
 - Trained participants (adults and children of varying ages) in the line, point, intercept methodology of assessing benthic cover
- Devine, Genevieve
 - Academy of Natural Resources Project Mentorship and Career Exploration Fair at Waipahu High School
- Organized and moderated 11 aquatic invasive species talks for Hawai'i Invasive Species Month
- Host Hawai'i Invasive Species Council (HISC) Aquatic Biosecurity Working Group meetings
- HISC Resources Working Group
- CGAPS Steering Committee
- CGAPS public meetings

Staff

- Hired 11-month full-time Kupu intern (Kate Gonzalez)
- Hired full-time Fish and Habitat Monitoring Specialist (Eric Dilley)

Priorities for 2022

- Continue urchin outplanting and monitoring for Flattery and Kapalāma as needed
- Continue monitoring Kapalāma Coral Modules
- Continue processing species on the AIS Preborder Database and the Hawai'i Prevention Priority Distribution List using updated risk assessment framework
- Continue assisting and supporting neighboring islands with AIS
- Continue assisting and supporting our collaborative efforts with partner programs
- Reintroduce outreach events now that the COVID-19 regulations are less stringent
- Present at and attend local and national conferences
- Reinstate annual orthoimagery of coral reattachment sites in Kāne'ohe Bay
- Complete 22' Force overhaul (repairs, painting, wiring, maintenance)
- Continue developing AIS reporting form

Ballast Water and Biofouling Program

- All O`ahu Autonomous Reef Monitoring Structures (ARMS) units were retrieved and processed in collaboration with Bishop Museum and volunteers
- Created a question guide for the AS-ISK risk screening
- Completed AS-ISK screening for the northern pacific sea star (*Asterias amurensis*) and the Chinese mitten crab (*Eriocheir sinensis*)
- Continued to develop the Priority Pre-border AIS Database and quick risk assessment tool
 - Created a standard operating procedure for the quick risk assessment tool
- Analyzed the ballast water data of 729 vessel arrivals and prepared graphs that were presented at the Pacific Ballast Water Group Conference
- Held a series of briefings on the Vessel Incidental Discharge Act (VIDA) in collaboration with the Coordinating Group on Alien Pest Species (CGAPS) for internal DAR staff, stakeholders, the governor's office, partners, and other interested agencies
- Coordinated with the Hawai'i Department of Health (HDOH), the Hawai'i Department of Transportation (HDOT), CGAPS, DAR, the west coast states, the Coastal Zone Management (CZM), and All Islands Committee (AIC) on VIDA
- Improved Ballast Water Risk Matrix to prioritize high-risk vessels more accurately
- Conducted biofouling hull inspection for the sailboat, Makani Olu, traveling to the Northwestern Hawaiian Islands (NWHI)
- Developed commercial fishing vessel biofouling best management practices outreach document

Working Groups, Workshops and Conferences

- Hawai'i Invasive Species Council (HISC) Aquatic Biosecurity Working Group meetings
- HISC Resources Working Group
- Pacific Ballast Water Group
- IMarEST 1st Global Conference on Biofouling Management for Maritime Industries
- CGAPS Ballast Water Group meetings
- CGAPS Steering Committee Meetings
- VIDA Environmental Protection Agency (EPA)-State Meetings
- United States Coast Guard (USCG) VIDA Working Group
- Stony Coral Tissue Loss Disease (SCTLD) Pacific Workshop
- USCRF coral disease Working Group (SCTLD)
- Facilitation Workshop by Donna R. Ching
- Hawai'i Conservation Conference

- HISAM webinar

Presentations

- Dunn, Natalie
 - Pacific Ballast Water Group Conference (March 2021)- Hawai'i Ballast Water and Biofouling Program
 - EPA USEPI Briefing (August 2021) - Briefing on Marine Invasive Species Related to the EPA Rulemaking for the Vessel Incidental Discharge Act
 - CGAPS Quarterly Meeting (September 2021) –SCTLD Overview
- Tom, Sarah
 - Hawai'i Invasive Species Month (February 2021)- Ballast Water and Biofouling the Major Vector of Marine Introduced Species
 - Kupu Hō'ike (July 2021)- DAR's Ballast Water and Biofouling Program 2020-2021
 - Created StoryMaps to introduce ballast water and biofouling for outreach
- Monaghan, Elizabeth
 - The Hawai'i Institute of Marine Biology: Kahala Hotel Sunset Seminar Series (December 2021)- Problems and Solutions for O'ahu's Aquatic Invasive Species

Staff

- Filled PCSU Ballast Water and Biofouling Planner position (Elizabeth Monaghan)
- Hired one 11-month full-time Kupu intern (Sarah Tom)
- Hired one 8-month full-time intern (Caroline Parker)

Funding

- HISC FY22 grant awarded to support the Hawai'i Ballast Water and Biofouling Program
- USFWS Aquatic Nuisance Species FY21 grant awarded

2022 Priorities

- Continue to work with Bishop Museum to analyze ARMS units and retrieve and process the remaining units on the neighboring islands (Kaua'i, Maui, and Hawai'i Island)
- Provide consultation and continue to work with CGAPS, DAR team, west coast states, working groups, federal agencies, and other agencies on VIDA
- Increase capacity through various funding sources
- Collaborate with other agencies to address concerns regarding the prevention of new species arrivals
- Continue to develop a list of species of concern
- Continue developing BW reporting form database and reporting prioritization tool
- Introduce new BW/BF monitoring projects

Urchin Hatchery

2021 Key Accomplishments

- Outplanted over 260,000 hatchery-raised juvenile sea urchins to reefs in Kāne`ohe Bay and the Waikīkī Marine Life Conservation District, totaling over 835,000 urchins outplanted since 2011

2021 Activity Highlights

- Maintained operations through COVID-19 pandemic with added layers of safety protocols while achieving higher than normal production
- Guest lectured (via Zoom) with the Maui Nui Resource Council
 - Delivered the presentation: Aquaculture of Native Sea Urchins to Control Invasive Macroalgae
- Guest presenter and panelist for Waianae High School Marine Science Learning Center Aquaculture Workshop and Career Mingle (via Zoom)
- Supplied juvenile urchins to the AFRC Coral Nursery for tank maintenance
- Supplied juvenile urchins to the Waikīkī Aquarium for tank maintenance and exhibit
- Supplied juvenile urchins to the Hawai`i Institute of Marine Biology, Gates Lab for herbivory research
- Supplied juvenile urchins to the California Academy of Sciences Steinhart Aquarium in San Francisco for tank maintenance and exhibit
- Maintained partnership 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.
- Supplied benthic biofilm samples to Chaminade University developmental biology course for DNA extraction
- Continued to produce salt-tolerant aquatic plants for Honouliuli restoration project
- Purchased and installed four new limu production tanks for the urchin hatchery
- Assisted with design and purchase of eight new limu tanks for AFRC hosted `Ewa Limu Project