

Aquatic Invasive Species Program

2016 Accomplishment Report



Aquatic Invasive Species Program 2016 Annual Report

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**Department of Land and Natural Resources,
Division of Aquatic Resources**

In Cooperation with:

The Pacific Cooperative Studies Unit

and

The Hawai`i Coral Reef Initiative, Social Science Research Institute

Aquatic Invasive Species Program



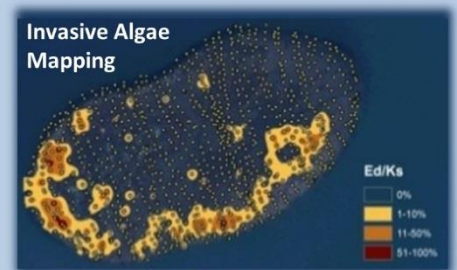
Kāneʻohe Bay Invasive Algae Control

- Treated ~13 acres of coral patch reefs with urchins for biocontrol
- Stocked over 90,000 urchins in 2016, totaling 390,400 urchins outplanted since inception
- Supplied urchin larvae and technical support to Oceanic Institute, Hawaiʻi Pacific & Chaminade Universities



AIS Monitoring and Planning

- Conducted AIS surveys in Kāneʻohe Bay, Maunalua Bay, Kauai, Molokaʻi, and Lānaʻi
- Coordinated the first state-wide marine debris inventory of the main Hawaiʻian Islands
- Contributed to the completion of the Hawaiʻi Interagency Biosecurity Plan 2017-2027



Ballast Water & Hull Fouling Coordination

- Conducted the first Ballast Water compliance inspection for the State of Hawaiʻi
- Inspected multiple vessels for hull fouling organisms
- Participated and engaged maritime stakeholders, policy makers, and interagency coordination meetings
- Completed an in-water cleaning study with partners at CGAPS, SERC, and Hauʻoli Mau Loa Foundation



Rapid Response and Marine Debris

- Responded and documented a large fresh water coral die-off event in Kāneʻohe Bay
- Responded to Japanese tsunami debris reports and sampled potential AIS for analysis



Outreach

- Featured on local Hawaiian news broadcasts highlighting invasive algae control and marine debris
- Hosted two international conference field trips
- Participated in steering committees, community events, science fairs, professional conferences, & workshops

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Introduction

The Division of Aquatic Resources (DAR), Aquatic Invasive Species (AIS) Program is committed to managing AIS threats to Hawai'i by 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'i (State of Hawai'i Aquatic Invasive Species Plan 2003). The DAR, AIS program's main focus areas include:

- Invasive algae management and control in Kāne`ohe Bay, O`ahu
- Managing and operating the Ānuenu sea urchin hatchery
- Ballast water and hull fouling data collection, policy development, and vessel inspection
- Prevention of AIS introduction and early detection
- AIS management and control consultation
- Ecosystem monitoring
- AIS focused outreach, strategic communication, education, and community engagement
- AIS policy development
- Rapid response to AIS introductions, marine debris, disease outbreaks, coral bleaching, and other threats to Hawai'i's coral reefs
- Coordination and collaboration with other management agencies, conservation groups, community groups, practitioners, and researchers

This year (2016) was very productive for the AIS Program, with a broad range of accomplishments including invasive species policy development, contributions to the State Biosecurity Plan, management and control work conducted in Kāne`ohe Bay, aquatic invasive species monitoring on O`ahu, Moloka`i and Lāna`i, ballast water and hull fouling inspections, community engagement, and participation in state, national, and international conferences and workshops. This report summarizes the accomplishments of the AIS program in 2016 and lays out the program's direction for 2017.

Invasive Algae Control, Monitoring, Rapid Response, Marine Debris, and Collaborative Partnerships

Overview

Invasive algae control is one of the primary management priorities of the DLNR-DAR Aquatic Invasive Species Program. The proliferation of introduced invasive algae throughout Kāne`ohe Bay poses a major threat to coral reef ecosystems. As a result, extensive invasive algae management has been carried out over the past decade. Past efforts primarily included manual removal of algae by divers using the "Super Sucker" underwater vacuum system, a sea urchin biocontrol hatchery, and ecosystem monitoring.

Following the 2014 and 2015 warm water events, which lead to mass coral bleaching, the algae in Kāne`ohe Bay declined to levels too low for manual removal. Invasive algae still persist throughout the Bay, but only at levels effectively controlled by urchin grazers. Therefore, management efforts have shifted entirely to urchin outplanting.

The AIS team also carried out a wide range of ecosystem monitoring protocols throughout the state focusing primarily on coral and invasive algae. In addition, the DAR AIS team served as the main rapid

response dive team to respond to unusual events including invasive species reports, coral disease, coral bleaching, ship groundings, and urchin disease. Further, the AIS team participated in a wide range of steering committees, workshops, and trainings focusing on AIS and marine resource management.

2016 Key Accomplishments

- Outplanted 96,500 hatchery raised juvenile sea urchins to reefs in Kāne`ohe Bay, totaling 390,400 urchins outplanted since inception in 2011
- Treated invasive algae on eight patch reefs in Kāne`ohe Bay, totaling approximately 13 acres
- Conducted AIS surveys in Kāne`ohe Bay, Maunalua Bay, Kauai, Moloka`i, and Lāna`i
- Completed an AIS harbor monitoring pilot study for eleven O`ahu harbors
- Completed the first State-wide marine debris inventory of the main Hawai`ian Islands
- Coordinated, sampled and cataloged Japanese Tsunami Debris landings
- Contributed to the completion of the Hawai`i Interagency Biosecurity Plan 2017-2027
- Participated in hosting field trips, outreach activities, and presentations at the IUCN World Conservation Conference and ICRS Coral Reef Symposium

2016 Activity Highlights

Hatchery Improvements and Advancements

- Initiated macroalgae culture systems by installing four new production tanks
- Supplied urchin larvae and technical support to Oceanic Institute to help jump-start a second urchin hatchery facility
- Supplied urchin larvae and technical support to HPU graduate students to investigate urchin larval diets
- Supplied early stage larvae and gametes to Chaminade University developmental biology course for DNA extraction
- Supplied larval stage subsamples to Chaminade University for future use in lipid profiling study

Marker 12 Reef Restoration Plan

- Finalized a work plan for invasive algae control on Marker 12 reef
- Completed the Kāne`ohe Bay Baseline Assessment Report, leading to reef prioritization for invasive algae biocontrol in the Bay
- Initiated urchin outplantings to control invasive algae and completed four of the eleven priority reefs

Kāne`ohe Bay Ecosystem Monitoring

- Completed final field surveys for the NOAA Restoration Grant Monitoring on Reefs 26, 27, 28, and 29. Monitoring results show that invasive algae control efforts have been successful in maintaining low levels of invasive algae regrowth for over four years.
- Completed water temperature monitoring and tagged coral colony monitoring surveys
- Completed a baseline assessment to prioritize invasive algae control efforts in Kāne`ohe Bay as part of the Cape Flattery Settlement
- Completed monitoring on reefs selected for the mitigation bank
- Conducted invasive algae surveys on fringing and barrier reefs in Kāne`ohe Bay to for future urchin outplantings

- Updated AIS team's coral assessment toolbox by using a new coral cover assessment software (Coral Net)

Marine Debris and Rapid Response

- Completed the first-state wide comprehensive marine debris survey using aerial imagery and GIS analysis techniques.
- Created a Marine Debris Database for tracking Japanese tsunami debris reports and debris biofouling sampling.
- Sampled biofouling from Japanese tsunami debris landings throughout the state
- Responded to and documented a large fresh water coral die-off event in Kāne`ohe Bay
- Responded to and removed a large mooring buoy on Reef 13 in Kāne`ohe Bay
- Responded to and removed a large fishing net from Reef 3 in Kāne`ohe Bay

Other Surveys

- Conducted a resurvey of the Maunaloa Bay shoreline to assess the current status of invasive algae and compare changes over time to previous DAR surveys
- Conducted invasive algae surveys of the southern shoreline of Moloka`i with community members
- Completed an AIS assessment on the island of Lāna`i in collaboration with Conservation International and Pūlama Lāna`i
- Completed an AIS harbor monitoring pilot study of O`ahu harbors in collaboration with The Smithsonian Environmental Research Center, Moss Landing Marine Lab, and Williams Mystic College, and The Bishop Museum
- Initiated an eDNA monitoring pilot project for detecting the invasive aquatic plant *Salvinia molesta* in collaboration with Oceanic Institute
- Participated in benthic and reef fish surveys of the north shore of Kauai
- Participated in a sea grass assessment in Honolulu Harbor
- Participated in electroshocking surveys to assess the feasibility of AIS removals in Mānoa Stream
- Participated in estuary invasive fish species cast net surveys on O`ahu

Interagency Cooperation

- Participated in the development of the Hawai'i Interagency Biosecurity Plan
- AIS advisory for the Kāpalama Container Terminal Expansion Project
- Assisted United States Geological Services (USGS) researchers with an ongoing sea urchin bioassay study by providing vessel and logistical support
- Assisted USGS with Sand Island urchin health and population surveys
- Assisted U.S. Fish and Wildlife Services with Marine Corps Training Area, Bellows, O`ahu Rapid Ecological Surveys
- Assisted the National Oceanic and Atmospheric Administration (NOAA) Monument Office with ship inspections for hull fouling organisms
- Participated in the NOAA Main Hawai`ian Island Reef Assessment and Monitoring Program Cruise
- Continued DAR and The Nature Conservancy (TNC) Kāne`ohe Bay Coordination Meetings
- Participated in Hui Ulu Kāko`o `Ōiwi meetings with local farmers and community members in Kāne`ohe Bay

- Collected eDNA samples of Honolulu and Pearl Harbors as part of a world-wide assessment of AIS associated with ballast water
- Participated in shipworm surveys of O`ahu Harbors
- Collaborated with partners at NOAA and UH to compile coral bleaching data from the 2014 and 2015 bleaching events

Reports and Publications

- “Herbivore and manual removal successfully reduce invasive macroalgae on coral reefs”- manuscript draft completed for submission to Marine Ecology Progress Series journal
- “Mapping patterns of marine debris on coastlines of the main Hawai`ian Islands using high-resolution aerial orthoimagery and spatial analysis”- manuscript draft prepared for Marine Pollution Bulletin journal
- “Mapping patterns of marine debris on coastlines of the main Hawai`ian Islands using high-resolution aerial orthoimagery and spatial analysis”- published in PICES Newsletter
- “Lāna`i Aquatic Invasive Species Assessment”- report
- “Cape Flattery Settlement Restoration Project: Restoring Reefs in Kāne`ohe Bay”- Bi-annual report
- “Cape Flattery Settlement Restoration Project: Restoring Reefs in Kāne`ohe Bay”- Baseline Monitoring Report
- “AIS Field Team Training Manual and SOP’s”

Presentations

- Hawai`i legislative briefing on Invasive Species
- 9th International Conference on Marine Bioinvasions
- 13th International Coral Reef Symposium (ICRS)
- Marine Biology course lectures, University of Hawai`i, Mānoa
- Coral Bleaching Recovery Workshop
- Hawai`i Pacific University Marine Science Symposium
- Lāna`i High School Presentation

Steering Committees, Workshops, and Trainings

- Participated as Steering Committee members on the following groups and initiatives: Cooperating Group on Alien Pest Species, Hawai`i Interagency Biosecurity Plan, Western Regional Panel on Alien Nuisance Species, Hawai`i Coral Bleaching Data Collaborative, and Hawai`i’s 30 by 30 Oceans Target
- Participated in the Coral Bleaching Recovery Plan Workshop
- Participated in the CBSFA post-designation management procedures workshop
- Participated in a NOAA biofouling and hull inspection training
- Participated in the Anchialine Pool Workshop in Hilo, HI
- Participated in a FWS habitat mapping training
- Participated in a NOAA sponsored ESRI ArcGIS training

Staff

AIS Team:

- Completed the hiring of two replacement AIS Fishery Technician IV Civil Service positions

- Completed the hiring of two staff for the Kāne`ohe Bay Restoration Project funded through the Cape Flattery Settlement:
 - Kāne`ohe Bay Monitoring Coordinator
 - Kāne`ohe Bay Reef Habitat Monitoring Technician
- Converted Aquatic Biologist IV, Aquatic Biologist III, and two Fishery Technician IV positions from temporary to permanent civil service

Urchin Hatchery Team:

- Completed the hiring of a new lead hatchery technician position
- Hired replacements for three hatchery technician and two Kupu interns

Other staff:

- Participated in hiring committees for the Mitigation Bank Coordinator position and DAR Biologist IV recruitment

Grants

- Hawai`i Invasive Species Council (HISC) Outreach Grant
- HISC AIS Neighboring Islands Expansion Grant
- U.S. Fish and Wildlife Service, Alien Nuisance Species Grant
- Japanese Tsunami Debris Gift Fund: Harbor Monitoring project, Aerial Imagery Survey and Analysis project
- North Pacific Marine Science Organization (PICES) Grant: Aerial Imagery Survey and Analysis

2017 Priorities

Kāne`ohe Bay Restoration:

- Continue invasive algae control efforts in Kāne`ohe bay
- Identify new areas in Kāne`ohe Bay for invasive algae treatment
- Conduct UAV high resolution reef mapping survey of Kāne`ohe Bay reefs
- Continue research into algae decline in Kāne`ohe Bay
- Complete Mitigation Monitoring analysis and report
- Submit algae control manuscript for publication

AIS Monitoring

- Complete *Salvinia molesta* eDNA monitoring pilot project in Kauai
- Investigate and test control methods for *Salvinia molesta*
- Continue surveys in Waimanalo in coordination with U.S. Fish and Wildlife Service
- Investigate reporting's of invasive *Avrainvillea amadelpha* in Ewa, HI

AIS Control and Management

- Develop Restoration Plan for He`eia Watershed in collaboration with the U.S. Forest Service Restoration Team, The Nature Conservancy, Sea Grant, Kako`o Ōiwi, Paepae o He`eia, Ko`olaupoko Hawai`ian Civic Club
- Continue Harbor monitoring project on neighboring islands and complete report for O`ahu
- Continue analysis of invasive algae in Maunalua Bay by carrying out biomass estimates of *Avrainvillea amadelpha* on data collected from 2007 and 2016 surveys and complete report

- Continue invasive algae surveys of the southern shoreline of Moloka`i and complete report
- Submit aerial imagery manuscript for publication
- Investigate adding new invasive algae control sites to restoration plans: Waikiki, Moloka`i, Maunalua Bay
- Conduct pilot study investigating coral re-attachment at invasive algae control sites
- Complete shipworm follow-up survey
- Create a Hawai`i AIS Database, with a non-native (established) species list
- Create a Priority Species Watch List
- Conduct a risk assessment of Watch List species
- Participate in the MarineGEO Hawai`i Bioblitz
- Present at the Hawai`i Conservation Conference: Harbor AIS Monitoring, Moloka`i Community-based Monitoring, Invasive Algae Control, and Management Response to Japanese Tsunami Debris

Program Development

- Make preparations for developing the AIS Strategic Plan in 2018

Staff

- Convert two new Fishery Technician IV's from temporary to permanent full-time Civil Service
- Complete the hiring process to refill Kāne`ohe Bay Reef Technician position

Ballast Water and Hull Fouling Coordination

Overview

The Ballast Water and Hull Fouling (BW&HF) Coordinator is a collaborative position between the Pacific Cooperative Studies Unit (PCSU), and the Department of Land and Natural Resources (DLNR), Division of Aquatic Resources (DAR). The position is jointly funded by grants from the Hawai`i Invasive Species Council and the U.S. Fish and Wildlife Service. A critical supporting project was funded by the Hau`oli Mau Loa Foundation. Support was also provided by the Coordinating Group on Alien Pest Species (CGAPS) by providing a full-time legal fellow dedicated solely to DAR's AIS policy initiatives.

The BW&HF Coordination program is one of DLNR's primary programs for protecting Hawai`i's marine resources from invasive species threats. The majority of introduced marine species have been brought to Hawai`i by the shipping industry via biofouling (78%) and ballast water (6%). The focus of the BW&HF coordinator has been BW&HF policy development, data gathering, and engagement with regional BW&HF policy makers, managers, and stakeholders.

2016 Key Accomplishments

- Hired Julie Kuo as Ballast Water and Hull Fouling Coordinator for the State of Hawai`i
- Worked with local and regional partners to oppose the VIDA Act, which would have compromised Hawai`i's ability to manage invasive species introductions through ballast water and hull fouling
- Conducted the first ballast water compliance inspection in Hawai`i

- Collaborated with the Smithsonian Environmental Research Center (SERC), CGAPS, and Hau'oli Mau Loa Foundation in completing a draft entitled "In-water vessel cleaning: current and emerging technologies, associated risks, and management options for Hawaii"
- Collaborated with Pacific States (CA, WA & OR) and Canada (BC) in the completion of a draft whitepaper entitled "Biofouling in the U.S. Pacific States and British Columbia" evaluating the risks of recreational and commercial vessel biofouling and the development of regional management strategies
- Collaborated with State managers in incorporating ballast water and biofouling management into the State Biosecurity Plan
- Engagement with state, national, and international stakeholders, managers, and researchers on ballast water and biofouling policy, treatment, and monitoring

2016 Activity Highlights

Ballast Water (BW) Policy

- Collaborated with the DLNR Chair, DAR Administrator, and Pacific states (CA, WA & OR) on developing strategies for countering legislation that removes state authority from regulating aquatic invasive species transfer via the maritime industry (the VIDA Act)
- Discussed with Senators Schatz's and Hirono's office representatives on the implications of legislation that denies states' authority from regulating aquatic invasive species transfer via the maritime industry
- Two foreign commercial vessels were boarded for ballast water compliance inspections
- More than 1,000 ballast water reporting forms were transcribed into a database

Biofouling Monitoring and Policy

- Performed one dive inspection with NOAA on a vessel seeking entry into the Papahānaumokuākea Marine National Monument
- Performed two ROV inspections with NOAA on two vessels seeking entry into the Papahānaumokuākea Marine National Monument
- Engaged in public comment periods of the California State Lands Commission, New Zealand Ministry for Primary Industries, and Washington Department of Fish and Wildlife on their reports and strategic planning documents related to ballast water and biofouling
- Engaged maritime stakeholders on the marine biosecurity risks of ship in-water cleaning at a meeting of the Hawai'i Ocean Safety Team and Hawai'i Harbors User Group

Regional Working Groups

- Participated in the Coastal Subcommittee of the Western Regional Panel on Aquatic Nuisance Species (WRP) meetings
- Reconnected and recruited maritime industry leads, state agency representatives, and scientists to join the Alien Aquatic Organism Task Force; this advisory group will provide input on policies rules regulating aquatic invasive species arriving via the maritime industry
- Ongoing active representation of DAR-DLNR at meetings, strategic planning and legal prioritization activities of the Hawai'i Invasive Species Council and CGAPS
- Representation of Hawai'i's progress and concerns at the Pacific Ballast Water Group, California State Lands Commission Technical Advisory Group, WRP annual meeting and the Washington State Ballast Water Working Group meetings

Outreach and Community activities

- Presentation, meeting, and date:

- “Protecting Hawai`i from Alien Species Invasions Through Collaboration”, Hawai`i Harbor User Group Meeting, October 25, 2016
- “Analysis of USCG, EPA VGP, and Hawai`i State Ballast Water and Biofouling Regulations”, Hawai`i Ocean Safety Team General Membership Meeting, August 25, 2016
- “Hawai`i Ballast Water and Biofouling Management”, DLNR Internal Briefing with the Chair, May 12, 2016
- “Using Policy and Coral Restoration Action to Prevent Invasions by Aquatic Aliens on Hawai`i’s Coral Reefs”, June 20, 2016
- “Hawai`i Interagency Biosecurity Plan: Protecting Hawai`i from Alien Species Through Collaboration”, Ocean Regional Response Team Meeting, September 22, 2016
- “Hawai`i Interagency Biosecurity Plan: Protecting Hawai`i from Alien Species Through Collaboration”, Prevention First Meeting, September 28, 2016
- “Hawai`i Ballast Water and Biofouling Management Update”, March 30 2016
- Collaborated with the AIS Team to host a marine invasive species fieldtrip in Kāne`ohe Bay for the International Coral Reef Symposium conference attendees
- Participated in a discussion on biofouling that was part of a 1-hour educational video focusing on the biosecurity risks of aquatic invasive species
- Interviewed by the Cruise Lines International Association newsletter representative on the current status and future priorities of Hawai`i’s ballast water and hull fouling rules and programs
- Posted PowerPoint presentations presented at the DLNR In Water Cleaning Workshop in 2015 on the [DLNR AIS website](#)

Staff

- Collaborated with the CGAPS legal fellow on various projects related to ballast water and vessel biofouling
- Hired a Kupu Intern for data entry, aiding in the development of Hawai`i’s ballast water and vessel biofouling inspection programs, and conducting education and outreach biosecurity risks associated with ballast water and vessel biofouling

Grants

- Hawai`i Invasive Species Council (HISC) Grant – Minimizing the spread and introduction of invasive species through Ballast Water and Hull Fouling
- US Fish and Wildlife Service Aquatic Nuisance Species Grant

2017 Priorities

- Complete public consultation on Hawai`i’s ballast water rule amendments and obtain stakeholder support for the rule
- Develop SOPs for ballast water viability inspections
- Draft SOPs for commercial vessel biofouling inspections
- Draft in-water cleaning policies
- Compile the necessary documentation and scientific evidence to support the development of biofouling rules
- Draft vessel biofouling policy options
- Obtain DLNR approval on the recommended policy option

Outreach and Community Engagement

Overview

The AIS and Urchin Hatchery teams participated in a variety of outreach and community engagement events in 2016. Events were aimed towards local community members, resource managers, researchers, students, and the general public. The team also worked to distribute outreach materials in order to better communicate AIS issues to Hawai`i's aquarium trade retail shops.

Key Accomplishments

- Hosted field trips and provided AIS program outreach for the IUCN World Conservation Conference and International Coral Reef Symposium
- Featured in multiple local Hawai`i news stories
- Participated in a variety of local outreach events and campaigns

2016 Activity Highlights

- Featured articles on local Hawai`i news stations:
 - 300,000 Urchin Release Milestone
 - Aerial Imagery Tsunami Marine Debris Survey
 - IUCN Coral Bleaching Press Release
- Participated in Waikiki Aquarium Earth Day Mauka to Makai Event
- Participated in Pride in Public Service Day
- Participated in Eyes of the Reef Lecture at Chaminade University
- Hosted ICRS Field Trip for symposium participants
- Hosted IUCN Media Day Field Trip
- Hosted IUCN National Geographic Kāne`ohe Bay and Coconut Island Field Trip
- University of Hawai`i guest lecture
- NOAA Outreach Video and Article
- Waikalua Loko algae removal community workdays
- Distributed "Don't Let It Loose" national campaign bags to aquarium retail shops
- Press release for 300,000 urchin release
- Hosted urchin hatchery tours for HPU Marine Invertebrate class and international groups associated with the ICRS and IUCN conferences
- Provided urchins for displays at the Papahānaumokuākea Marine National Monument, Waikiki Aquarium, and Aquarium/HPU joint coral project
- Participated in International Coastal Clean-up Day

2017 Priorities

- Continue to engage community members and groups, stakeholders, resource managers, rule makers, keiki and students regarding AIS issues
- Organize community algae clean-up in Kāne`ohe Bay
- Continue serving on steering committees and working groups for AIS and aquatic resource conservation initiatives in Hawai`i