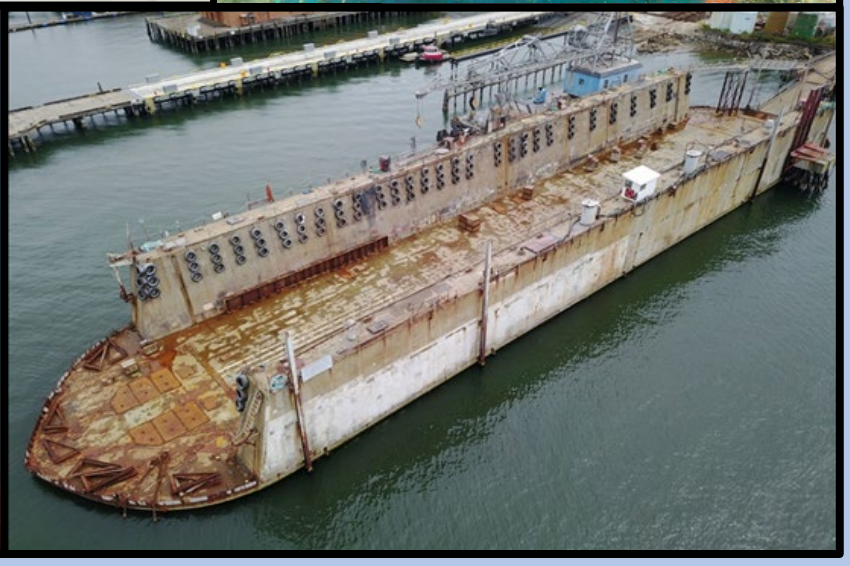
Aquatic Invasive Species Program

2020 ACCOMPLISHMENT REPORT



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

Aquatic Invasive Species Program
2020 Annual Accomplishment Report

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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

Hawaii Division of Aquatic Resources

2020 Accomplishments

Aquatic Invasive Species Program

Aquatic Invasive Species Control

- Outplanted over 55,000 hatchery raised juvenile sea urchins to reefs in Kāne`ohe Bay and the Waikīkī Marine Life Conservation District, totaling over 575,000 urchins outplanted since 2011.
- Rapidly responded to invasive coral in Kāneʻohe Bay and an invasive corallimorph in the Ala Wai.

AIS Monitoring and Planning

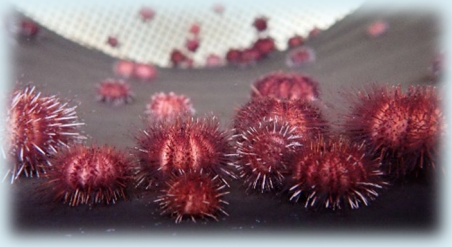
- Conducted annual monitoring of Kāneʻohe Bay and the Waikīkī MLCD.
- Monitored the first round of Kapalāma Coral Modules outplanted.
- Drafted a pre-border database designed to identify AIS threats.
- Continued revising list of high-risk aquatic species to petition to place on HDOA's Prohibited list.

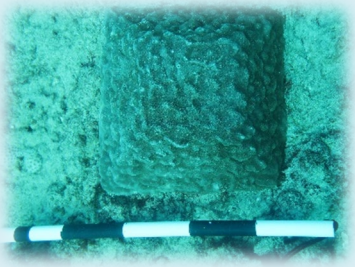
Ballast Water & Biofouling Coordination

- Retrieved and processed two ARMS units in collaboration with the Bishop Museum.
- Continued to watch VIDA developments and provide comments that would support biosecurity priorities.
- Rapidly responded to a high-risk dry dock towed from Washington to Hawaiʻi.

Outreach

- Participated in a variety of local outreach events and campaigns
- Featured on local news reports concerning Nile Tilapia in Hilo, Hawai`i, and Invasive Corals in Kāneʻohe Bay.
- Participated in professional conferences and workshops





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Acronym List

- AFRC – Ānuenue Fisheries Research Center
- AIS – Aquatic Invasive Species
- BW/BF – Ballast water/Biofouling
- CGAPS – Coordinating Group on Alien Pest Species
- CDC- Center for Disease Control
- CZM- Coastal Zone Management
- DAR – Division of Aquatic Resources
- DLNR – Department of Land and Natural Resources
- DOFAW- Division of Forestry and Wildlife
- EPA- Environmental Protection Agency
- HCRI- Hawai‘i Coral Reef Initiative
- HDOA – Hawai`i Department of Agriculture
- HDOT – Hawai`i Department of Transportation
- HIBP- Hawai`i Interagency Biosecurity Plan
- HIMB – Hawai`i Institute of Marine Biology
- HISC – Hawai`i Invasive Species Council
- HOST – Hawai`i Ocean Safety Team
- MLCD – Marine Life Conservation District
- NERR- National Estuarine Research Reserve
- NIS – Non-indigenous species
- NOAA – National Oceanic and Atmospheric Administration
- ORMP – Ocean Resources Management Plan
- TNC – The Nature Conservancy
- UH- University of Hawai‘i
- USCG- United States Coast Guard
- USFWS- United States Fish and Wildlife Service
- USGS- United States Geological Survey
- 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`i (SOH, 2003)[1]. The AIS program`s focus areas include:

- Invasive algae management and control in Kāne`ohe 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, and other threats to Hawai`i's coral reefs
- Ecosystem monitoring
- AIS focused outreach, education, and community engagement
- AIS policy development
- Collaboration with fellow researchers, stakeholder, community groups, and partners

This year (2020) has been productive for the AIS Program, with a wide range of accomplishments including management and control work conducted in Kāne`ohe 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 2020 and lays out the program's direction for 2021 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 Kāne`ohe 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: out-planting native sea urchins (*Tripneustes gratilla*) that were hatched and reared in the DAR Ānuenue Fisheries

[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

Research Center (AFRC) on Sand Island, O`ahu. 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 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. The AIS program aims to outplant a total of 105,000 urchins to manage 4.3 acres of invasive algae within an 18 acre area in 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 contributed to a wide range of steering committees, workshops, and trainings focusing on AIS and marine resource management.

2020 Key Accomplishments

- Outplanted over 55,000 hatchery raised juvenile sea urchins to reefs in Kāne`ohe Bay and the Waikīkī Marine Life Conservation District, totaling over 575,000 urchins outplanted since 2011.
- Largest single settlement of hatchery reared urchins at the DAR Urchin Hatchery, over 200,000 urchins in a single event.
- Transitioned appropriate AIS staff to telecommuting in response to the COVID19 pandemic. Resumed field work by developing operating procedures that adhered to CDC recommendations. Hatchery remained open by modifying operating procedures to be CDC compliant.
- Monitored the first Kapalāma coral module outplant.
- Rapidly responded to invasive coral in Kāneʻohe Bay and an invasive corallimorph in the Ala Wai.
- Participated in conferences, outreach events, trainings and presented for multiple events.

2020 Activity Highlights

Hatchery Improvements and Advancements

- Reassessed hatchery protocols to maintain operations through COVID 19 pandemic. Implemented extra layers of safety to hatchery operations while maintaining satisfactory production.
- Supplied juvenile urchins to the AFRC Coral Nursery for tank maintenance.
- Supplied juvenile urchins to the Waikīkī Aquarium for tank maintenance and exhibit.
- Supplied benthic biofilm samples to Chaminade University developmental biology course for DNA extraction.

Cape Flattery Reef Restoration Plan

- Outplanted 23,100 to nine patch reefs. The nine patch reefs encompass 81.3 acres of reef habitat.
- Updated Kāneʻohe Bay monitoring plan to account for additional bay wide coverage. SNAP 10 reefs that have highest coral and algae cover. Presence-absence survey on 12 patch reef and fringing reef areas. This allows the team to quickly cover more ground than SNAPs of all reefs
- Conducted annual SNAP / presence -absence monitoring of Kāneʻohe Bay reefs in June 2020, delayed due to COVID-19.

Kāneʻohe Bay Ecosystem Monitoring

- Discontinued long-term monitoring of fixed Kāneʻohe Bay transects upon recommendation from Administration.

Kapalāma Container Terminal Expansion Project

- Outplanted 31,450 urchins to Waikīkī MLCD with the end goal of controlling 4.3 acres of invasive algae within an 18 acre area
- Conducted bi-annual SNAP surveys for invasive algae in Waikīkī MLCD restoration area in May and November 2020.
- Assisted coral nursery in locating new outplant site.
- Conducted coral module monitoring at Reef Runway coral outplant site

Rapid Response

- *Bartholomea annulata*/ Carribean Corkscrew Anenome
    - Distribution of *B. annulata* was resurveyed in August 2020. While the southern extent in the bay was never located, the northern extent does not seem to have spread any further than 2019.
    - Because impact remains unknown, the only further action to take will be to ask for community/ colleague reports of the species with novel distribution.
- Invasive Coral Removal in Kāneʻohe Bay
    - Kawelo ʻOhana reported non-native corals to scientific community, AIS program received report May 13, 2020
    - Dr. Fenner from NOAA identified two of the species as *Montipora foliosa, Montipora digitata,* and the third species as either *Montipora stellata* or *Monitipora carinata*.
    - A non-native anemone, believed to be *Anemonia manjano,* was also found.
    - All three corals could be designated as invasive since they were seen overgrowing native corals and could serve as a vector of disease for native corals.

    - The AIS program collaborated with the NERR, Waikīkī Aquarium, USFWS and NOAA to develop a response plan, and initiate removal of the corals on July 29, 2020.
    - The AIS team continues to monitor the site for regrowth of the invasive corals.
- Corallimorph Control in the Ala Wai
    - Previous reports showed eradication by the AIS program in 2008 of the corallimorph believed to be *Discosoma nummiforme*.
    - It was found again in 2020 growing in the same area as the initial report
    - The AIS program removed all polyps on loose debris and smothered the remaining polyps with Quickrite, cement and Z-spar.
    - Follow up surveys are being conducted, where a few polyps have been found each time and smothered with Z-spar.

Other AIS Projects

- Trained Fishery Technician (Jesse Boord) on how to use risk screening tools- Aquatic Species Invasiveness Screening Kit and the Canadian Marine Invasive Screening Tool. Drafted content needed to petition to move Bighead Carp to the HDOA import Prohibited List.

Other DAR Projects

- Assisted in species assessment surveys of artificial reefs off Waianae, Kāne`ohe Bay and Maunalua Bay
- Assisted with creel surveys associated with the opening of the Waikīkī- Diamond Head Shoreline Fisheries Management Area
- Provided input in environmental reviews for the division
- Aquatic Biologist IV- Secretary of the DAR Dive Control Board.
- Lanikai unexploded ordinances (UXO): Assessed impact to resources before and after two UXO were blown in place.
- Moved into the new Kapalāma Building at AFRC. Emptied and turned off the AC in old offices. Installed gutter system on the building.

Interagency Cooperation

- Reviewed permit applications to HDOA Plant Quarantine Branch for species imports
- Conducted Environmental Reviews for new project applications across O`ahu
- Participated in multi-year shipworm surveys in O`ahu harbors
- Hawai`i Institute of Marine Biology
    - Installed 22 reef markers in partnership with HIMB to clearly mark the regulated fishing areas within the Hawaiʻi Marine Laboratory Refuge.
    - Boat Support for Gates Lab Corals of Resilience Project

- Provided boat and dive support and technical assistance for a National Oceanic and Atmospheric Administration (NOAA) Coral Table restoration project; which is a staging area for loose coral colonies following a damage event that will be used in future restoration efforts
- Assisted with Ahu ʻo laka (Kāneʻohe Sand Bar) surveys for DOFAW.
- Participated in meetings for:
    - Coordinating Group on Alien Pest Species (CGAPS)
    - Hawai`i Invasive Species Council (HISC)
    - Ocean Resources Management Plan (ORMP)
    - Western Regional Panel (WRP)
- HISC/ CGAPS Strategic Plan- Chair for the Aquatic Biosecurity Working Group.
- Provided updates to the Hawai`i Interagency Biosecurity Plan (HIBP) accomplishments

Reports and Publications

- Hawaiʻi Aquatic Invasive Species Program. (2020). Discosoma Eradication at the Ala Wai Small Boat Harbor: Honolulu, Oʻahu. *Report for the Division of Aquatic Resources.*
- Hawaiʻi Aquatic Invasive Species Program. (2020). Unexploded Ordnance Disposal Resource Evaluation: Lanikai Beach, Oʻahu. *Report for the Division of Aquatic Resources.*
- Hawaiʻi Aquatic Invasive Species Program. (2020). Cape Flattery Settlement Restoration Project: Restoring Reefs in Kāneʻohe Bay. *Annual Report for the Flattery Board of Trustees.*
- Hawaiʻi Aquatic Invasive Species Program. (2020). Kapalāma Container Terminal Restoration Project: Waikīkī Reef Restoration using Sea Urchin Biocontrol for Invasive Algae. *Annual Report for Hawaiʻi Department of Transportation.*

Presentations

- Cohen, D. (2020)
    - Organized and chaired the Sea Urchin Aquaculture session for the World Aquaculture Society, Aquaculture America 2020 Conference in Waikiki. Delivered the presentation, Sea Urchin Hatchery Update: Improved Survivorship, Pest Reduction and Community Involvement.
    - Windward Community College: Delivered AIS primer and sea urchin aquaculture lecture for AQUA 106 Small Scale Sustainable Aquaculture class. Hosted AQUA 106 class at AFRC for urchin harvest and hatchery tour.
    - UH Hilo: Delivered AIS primer and sea urchin aquaculture lecture for AQUA 353, Culture of Invertebrates and Algae class via Zoom.
- Fuller, K. (2020)
    - (February 2020) *Invasive algae management in the State of Hawaiʻi.* Honu World Workshop, Honolulu, HI, United States.
    - *Exploring Innovative Control Options for the Caribbean Corkscrew Anemone (Bartholomea annulata), a Novel Introduction to Hawaiʻi*
        - (September 2020) Hawaiʻi Conservation Conference. Virtual.

        - (September 2020) Western Regional Panel on Aquatic Nuisance Species. Virtual.
    - (December 2020) Hosted Conservation International Brownbag: "Developing a Taste for Local and Sustainable Seafood in Hawai‘i" by Jhana Young and Matt Ramsey.

- Dukes, W. (2020)
    - (February 2020) *Sea Urchin Biocontrol of Invasive Macroalgae: Aquaculture Innovation for Successful Reef Restoration*. World Aquaculture Society-Aquaculture America. Honolulu, Hawai‘i.
        - Moderated Coral Restoration Session
    - (September 2020) *Coral Reef Restoration using Native Sea Urchins (Tripneustes gratilla) for Biocontrol of Invasive Macroalgae*. Hawai‘i Conservation Conference. Virtual.
- Devine, G. (September 2020). *Rapid Response and Distribution Investigation of Bartholomea annulata (the Caribbean Corkscrew Anemone), A Novel Introduction to Hawai‘i.* Hawai‘i Conservation Conference. Virtual.
- Boord, J. (September 2020). *Evaluating United States Policy Intended to Reduce Collisions Between Vessels and Cetaceans in the Pacific*. Hawai‘i Conservation Conference. Virtual.

Steering Committees, Workshops, and Trainings

- CGAPS
- CGAPS/ HISC Aquatic Biosecurity Working Group
- HISC
- Hālau `Ōhi`a
- Western Regional Panel Annual Conference- Virtual
- Ocean Acidification Plan Webinar
- NOAA- Pearl and Hermes Algae Working Group, Coral Bleaching Collaboration
- Hawai‘i Conservation Conference- Virtual
- DAR 30x30
- DAR Wetland Protection Plan
- Ballast Water and Biofouling Steering Committee
- TNC Restoration Success Webinar

Staff

AIS Team

- Filled one HCRI Habitat Monitoring Technician Position (Jon Ehrenberg) and one civil-service Fishery Technician IV position (Jesse Boord).
- Filled Aquatic Biologist III position, but subsequently was vacated.
- Two Fishery Technician Positions and the Aquatic Biologist III position are unfunded/ lost until further notice.

Hatchery Team

- One temporary Hatchery Technician position created and filled (Sep 2020- Jan 2021)
- Hosted Kupu intern Sawyer Johnson (Jan 2020 - Aug 2020, completed)
- Hosted Kupu intern Brianna Fragata (Oct 2020- present)

Funding

- Cape Flattery Coral Damage Mitigation Trust Funds
- Port Royal Coral Damage Mitigation Trust Funds
- Kapalāma Terminal Expansion Funds
- USFWS Aquatic Nuisance Species Grants

2021 Program Priorities

Kāne`ohe Bay Restoration

- Continue invasive algae control on patch and fringe reefs
- Annual SNAP surveys of treated reef areas
- Continue coral reattachment monitoring

Kapalāma Container Terminal Expansion Project

- SNAP survey of Waikīkī MLCD invasive algae control site
- Continue outplanting of sea urchins in the Waikīkī MLCD

AIS Control and Management

- Submit petitions/ work with HDOA to update import regulation lists
    - Add unlisted high-risk AIS to the list of prohibited species
    - Update list placement following risk assessments (e.g. move species from conditionally approved to restricted or prohibited list for more stringent regulation)
- Develop and disseminate standard operating procedures for rapid response to new aquatic species introductions.
- Continue to monitor 2020 invasive coral and corallimorph eradication attempts.
- Improve Early Detection and Rapid Response workflow.

Staff

- Hire HCRI Monitoring Coordinator (Vacated in May 2021)
- Host one Kupu intern
- Request to re-establish and fund AIS Aquatic Biologist III.

Ballast Water and Biofouling Program

Overview

On average, more than 1,000 commercial ships visit Hawai`i annually, each carrying the potential threat of AIS introductions into the State. Vessel ballast water and biofouling (BW/BF) has been estimated to be responsible for nearly 80% of the 350 non-indigenous (NIS) marine algae and invertebrate species currently established in Hawai`i, and scientific evidence indicates that vessel-borne AIS have been linked to a number of significant socioeconomic and human health implications worldwide (Davidson et. al., 2014).[2]

The Ballast Water and Biofouling Program was developed to address these top two introduction vectors. The 2012 §187A-32 Hawai`i Revised Statutes, designated DLNR-DAR as the lead State agency for preventing and managing AIS introductions through the regulation of BW/BF organisms.

Hawai`i's Ballast Water and Biofoulings Program's vision is:

To effectively manage the ballast water and vessel biofouling vectors of aquatic alien species transfer into and among the Hawaiian Islands to mālama (protect) native marine habitat.

The Program's mission is:

To preserve and protect the native Hawai`i an marine ecosystem from further alien species introductions and transfer among the islands, through a strong alliance with the local, national and international maritime industry, and government and community stakeholders.

The Program is heavily focused on preventative measures including developing or optimizing legislation for managing both sources of NIS transfer, conducting biosecurity risk assessments of commercial vessels, creating enforcement standard operating procedures, and monitoring current and newly established NIS.

This year, efforts were focused on gathering stakeholder support and collaboration aimed at preparing the Program for the co-enforcement of Vessel Incidental Discharge Act (VIDA) with the United States Coast Guard (USCG), providing consultation to federal agencies on compliance standard development under VIDA, continuing to perform outreach/education to targeted stakeholders and general public, and participating in important local, national and international working groups to review technical reports, strategic plans, and make informed decisions on Program direction.

[2] Davidson I., Ruiz G., Gorgula, S. (2014) Vessel biofouling in Hawaii: current patterns of a potent marine bioinvasion vector and potential management solutions. Report to the Department of Land and Natural Resources (DLNR), Coordinating Group on Alien Pest Species (CGAPS), and the Hauoli Mau Loa Foundation. Honolulu, Hawaii.

2020 Activity Highlights

- The COVID-19 pandemic delayed the ARMS project for several months but the team was able to adapt protocols and resumed work safely. Two ARMS units were retrieved and processed in collaboration with the Bishop Museum and volunteers.
- Held an interagency meeting to expand collaborations and discuss strategic plan and timeline of ARMS project in order to balance goals with capacity.
- Worked with CGAPS to compile and submit (1) comments on VIDA EPA proposed rule, (2) a multi-state letter, (3) and supported Governor's objection and (4) CZM consistency review.
- Held a series of briefings on VIDA in collaboration with CGAPS for internal DAR staff, stakeholders, Gov's office, other departments, partner and other interested agencies.
- Coordinated with HDOH, HDOT, CGAPS, DAR team, west coast states, Coastal Zone Management (CZM), and All Islands Committee (AIC) on VIDA.
- Participated in USCG-State VIDA quarterly meetings.
- Rapidly responded to an arrival of a high-risk dry dock that had been stationed in Washington State for 30 years. Collaborated with Washington managers to request the hull be cleaned prior to transit, which the company did voluntarily. Upon arrival in Hawaiʻi, we performed an interagency hull survey. All live organisms were removed and sent to the Bishop Museum for taxonomic and genetic analysis. A follow-up letter was sent to the shipping company. One of the species collected was *Asterias amurensis* (Northern Pacific seastar), a known invasive species in Australia.
- Developed draft Pre-border AIS database for Hawai`i, which addresses key actions in HISC/CGAPS 2025 joint strategy. The database was shared with the HISC Aquatic Biosecurity Working Group to obtain input from partners and identify areas for collaboration. The Pre-border database will keep a record of species of concern, screen for risk of invasion, prioritize species for management action, and track barcoding gaps.
- Finalized the Recreational Vessel Biofouling Management Best Practices with the subgroup of the Western Regional Panel Coastal Committee.

Working Groups, Workshops, and Conferences

- State-USCG VIDA consultation group
- Pacific Ballast Water Group
- HISC Aquatic Biosecurity Working Group
- HISC Resources Working Group
- WRP: Member of Coastal Committee, participated in WRP annual conference
- USCG NRL seminars
- CGAPS quarterly meetings
- Biofouling International Regulators Discussion (BIRD)
- WesPac Island Report

- DAR 30x30

Presentations

- Hawaii Conservation Conference (2)
- Pacific Ballast Water Group Meeting
- HISC Brown Bag

Staff

- Recruiting a BWBF Planner position through PCSU
- Completed the hiring of one temporary part-time Kupu intern and one 10-month full-time Kupu intern (Sara Tom).
- Recruited UH students for ARMS support

Funding

- HISC FY21 grant awarded to support Hawai`i's Ballast Water and Biofouling Program
- U.S. Fish and Wildlife Service Aquatic Nuisance Species FY20 grant awarded

2021 Priorities

- Continue to work with the Bishop Museum to analyze ARMS units and retrieve and process remaining Oahu ARMS units
- Provide consultation and continue to work with CGAPS, DAR team, west coast states, working groups, federal agencies, and other agencies on VIDA
- Continue to develop list of species of concern
- Develop risk assessments and process
- Continue developing BW reporting form database
- Refine and develop BW reporting prioritization tool
- Develop Commercial Fishing Vessel biofouling best management practices outreach document
- Develop BW/BF monitoring projects as COVID situation permits

Outreach and Community Engagement

Overview

The AIS Field Team, Urchin Hatchery Team, and BW/BF Team participated in a variety of outreach and community engagement events in 2020. Events were aimed towards legislature members, local community members, resource managers, researchers, students, and the public. The teams also developed and distributed outreach materials in order to better communicate AIS issues.

2020 Activity Highlights

- Participated in Online Science Fair Judging
- Hosted educational booth for the Hilo Nile Tilapia Fishing Tournament
- Presented many talks at various conferences virtually

2021 Priorities

- Continue to engage community members and groups, stakeholders, resource managers and legislators.
- Continue serving on steering committees and working groups for AIS and aquatic resource conservation initiatives in Hawai`i.
- Increase non-native species distribution reporting from colleagues and the community.