Laulima

Protecting Hawai‘i from Aquatic Invasive Species

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Hawaii Division of Aquatic Resources

What are invasive species

- A nonindigenous aquatic species that, if introduced into an ecosystem, may cause harm to Hawaii's economy, environment, human health, or public safety and welfare.
- Many different means of introduction

200+

20 Marine
41 Freshwater

28

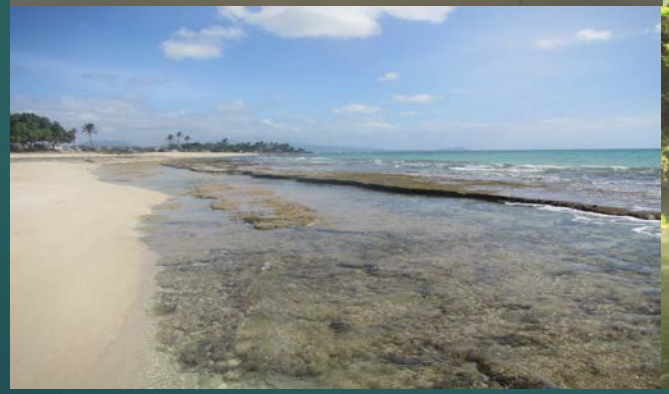
19

What’s at risk?

Due to Hawaii’s isolation the ecosystems here are very unique and are home to many endemic species but are susceptible to invasion

Affected Habitats

- Coral Reefs
- Intertidal
- Estuaries
- Streams and Lakes
- Anchialine pools



What's at Stake

- Economic
- Ecosystem health and services
- Public health
- Food security
- Social and cultural resources

Aquatic Invasive Species Program

- Strategy to minimize adverse impacts

1 Prevention

2 Rapid Response

3 Management and Control

South Shore Molokaʻi Project

Call for Action

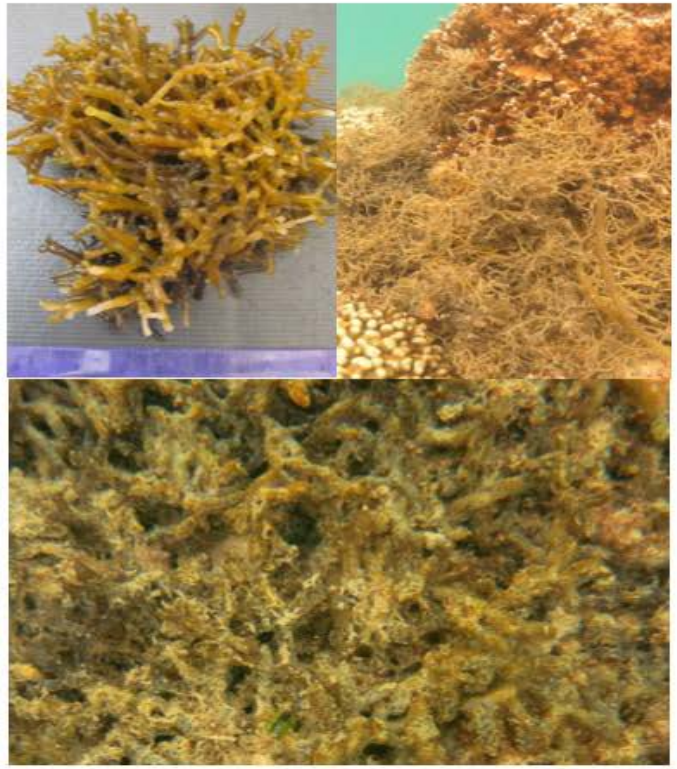
- Molokaʻi community noticed negative impact of the natural resources
- The change has coincided with an increase in invasive algae in the area
- OHA representative Collette Machado helped spearhead a hui to get a grasp of what is happening to this ecosystem

Goals

- map invasive algae species distribution
- map additional coastal features including sediment type, depth, and mangrove presence
- train volunteers on the identification of invasive algae, and mapping techniques using handheld GPS units
- identify areas of critically high invasive algae cover that are impacting aquatic resources for future removal efforts

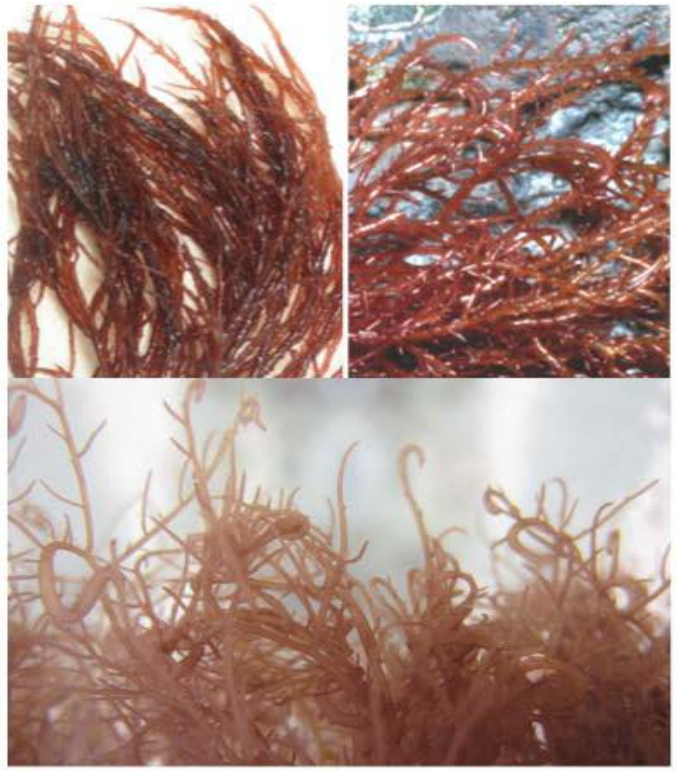
Species of Concern

Gorilla Ogo
Gracilaria salicornia



Prickly Seaweed
Acanthophora spicifera

Hookweed
Hypnea musciformis



Survey Methods

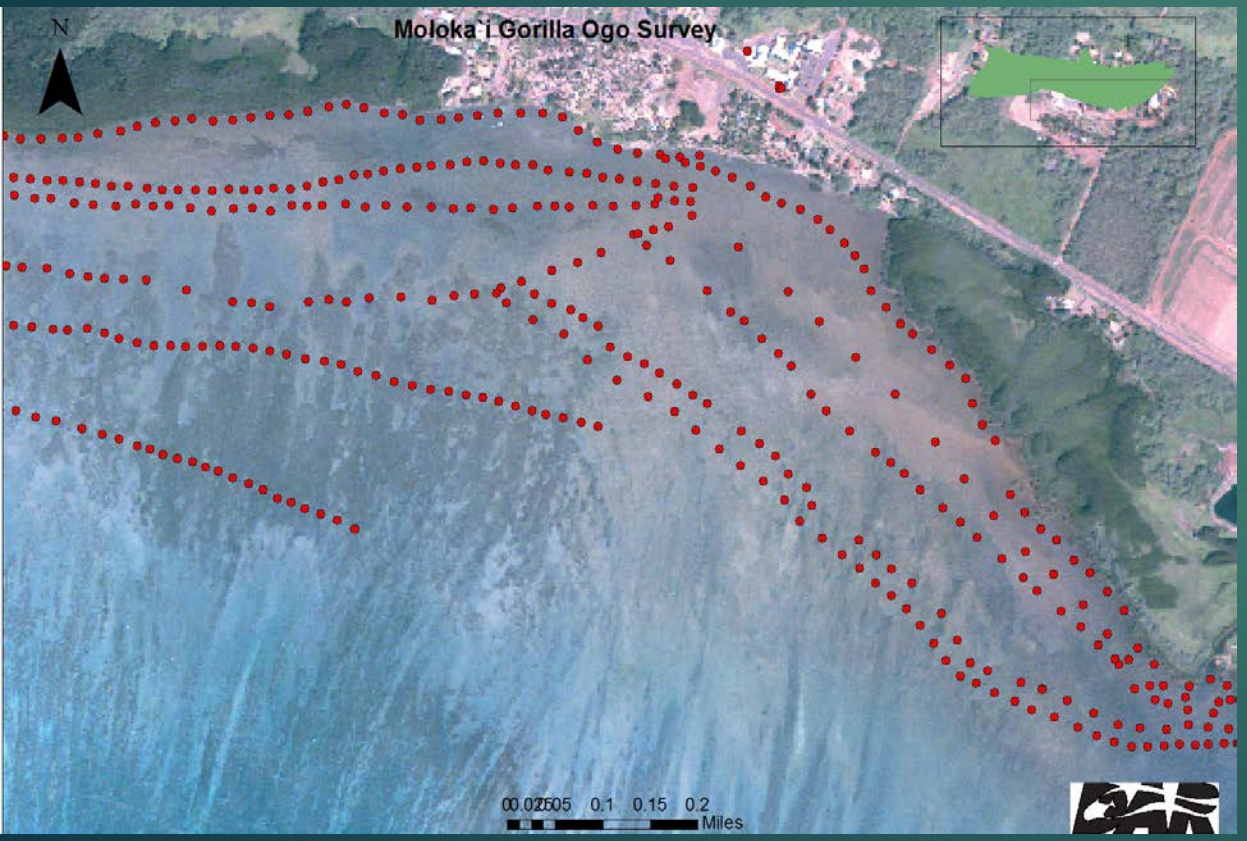
Train community volunteers about invasive algae identification and how to operate GPS units

- Assign groups to different sections of coastline
- Divide groups into pairs and spread out 50ft apart in a line
- Take a GPS point
- ID and rank invasive algae abundance
- Measure sediment
- check for mangroves in area
- Walk forward down the coast and repeat

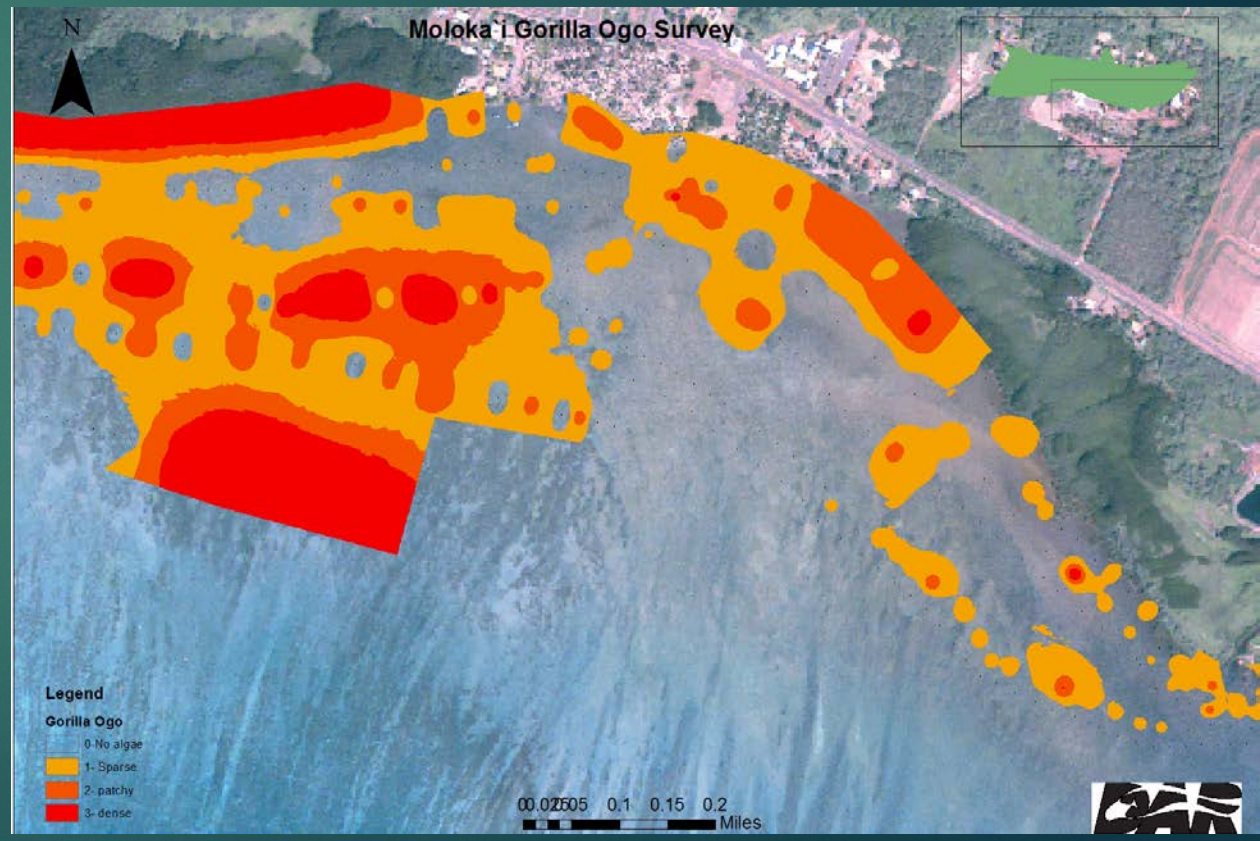
Low Tide

Mapping the data

Map of GPS points

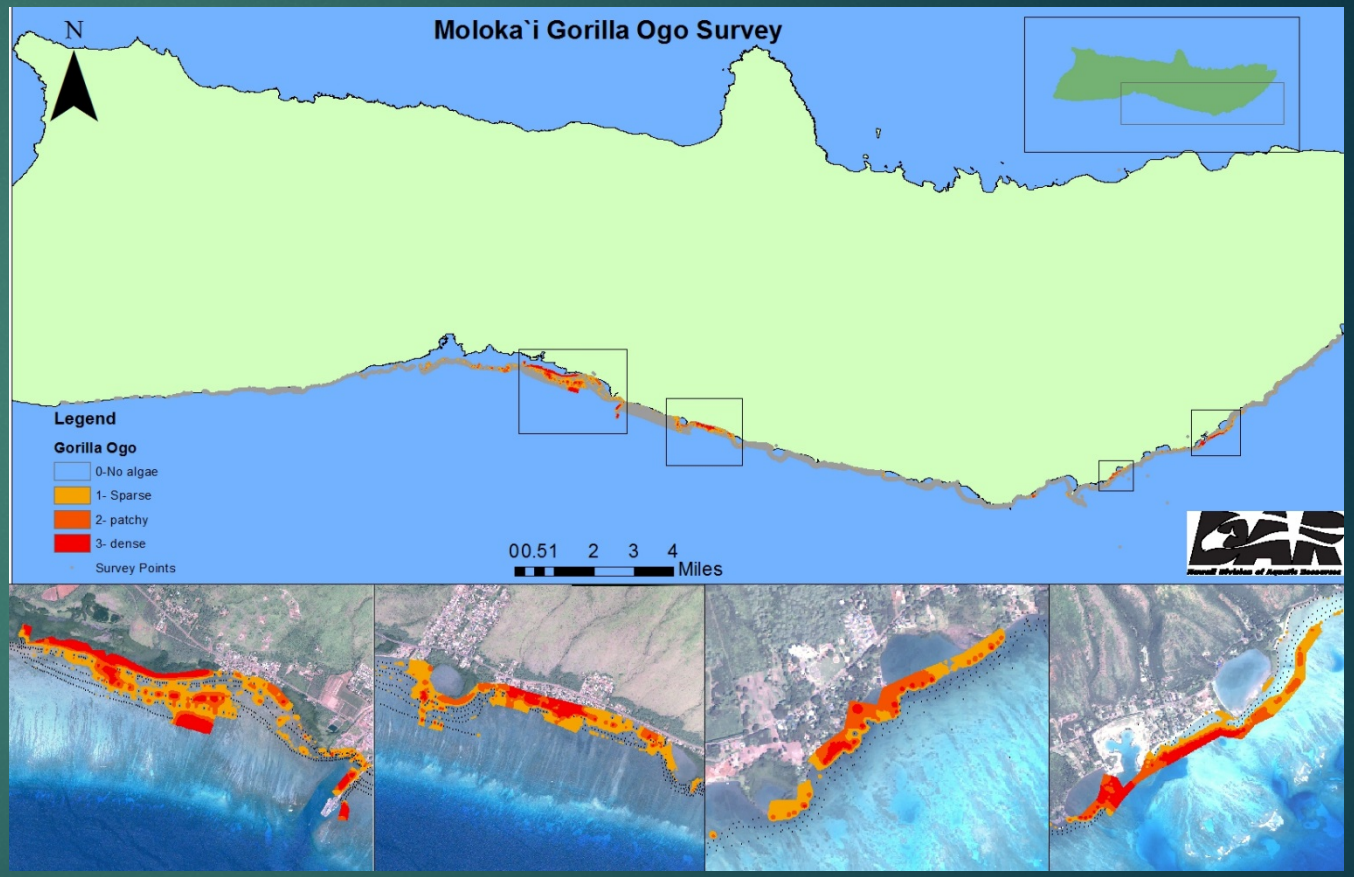


Interpolation of points



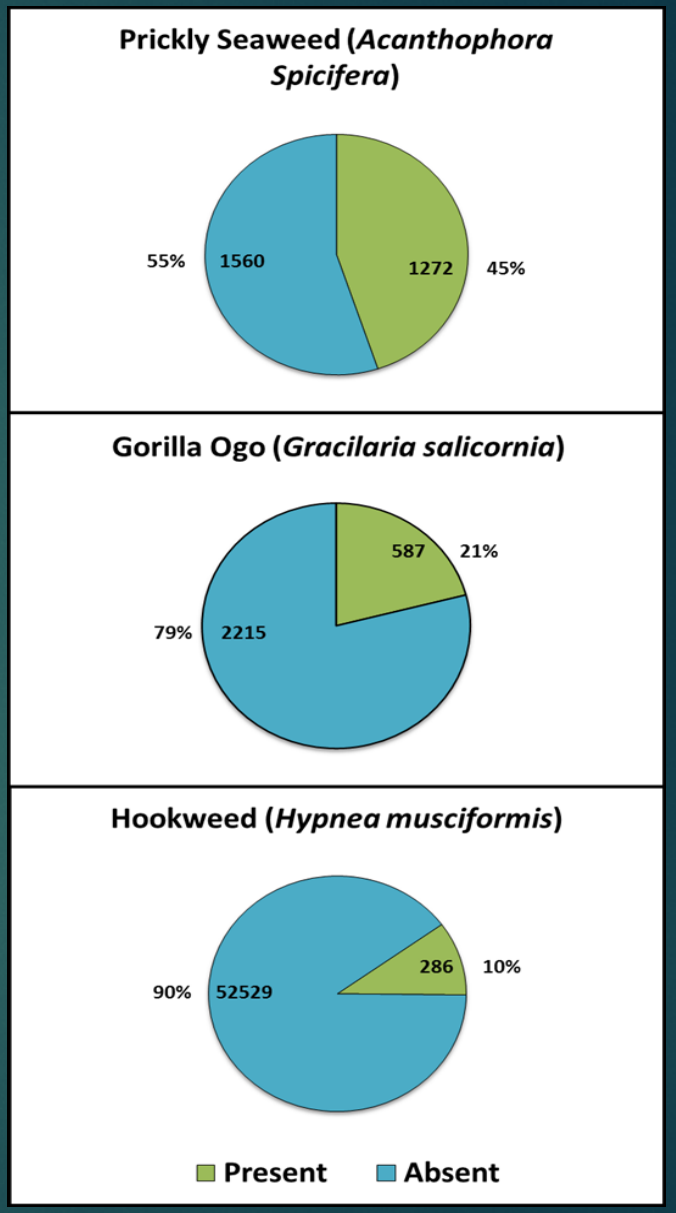
What was accomplished

- 33 miles of coastline survived
- 2,800 acres of reef flat characterized with invasive algae abundance
- Over 40 community members trained on survey methodology
- Conducted surveys over the course of 4 trips spanning 2 years
- Outreach events for school groups and Molokaʻi Earth Day celebration to spread information on the project
- Building partnerships for future projects
- Expanded the awareness of the issues caused by invasive species



Results

- Prickly seaweed is the most widespread invasive algae(45% of area)
- Gorilla Ogo is most dense in and around fishponds
- Mangroves and invasive algae are found in overlapping areas
- Many species of native algae still present in affected areas



Continuing efforts

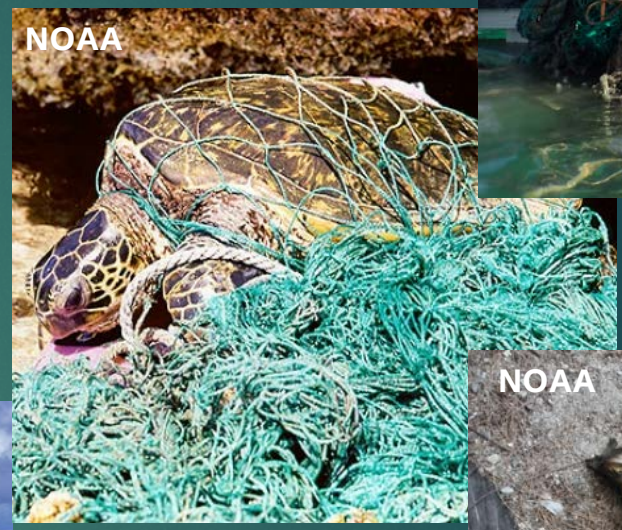
- Management plan
  - Strategic hand removal of invasive algae
  - Continued community work days
  - Potential bio control with native urchins
  - Grant applications for full time project funds

Community members play a critical role in the fight against invasive species and with out them this project would not be possible

Japanese Tsunami Marine Debris

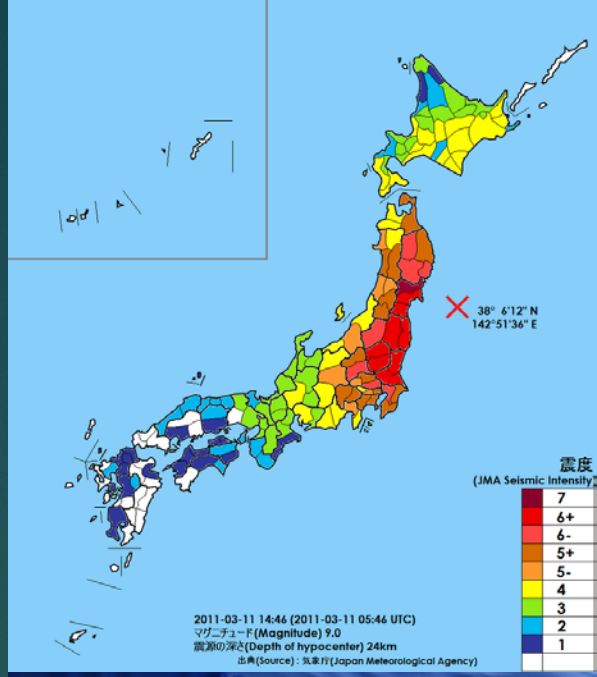
Marine Debris in Hawai‘i

- Navigation Hazard
- Habitat degradation: Coral Reefs and Beaches
- Entanglement
- Ingestion
- Alien species transport



Japanese Tsunami Marine Debris

- March 2011: 9.0 earthquake triggering a 23 foot tsunami devastated Honshu, Japan
- ~5M tons of debris, 70% sank immediately. 1.5M tons dispersed across the Pacific
- Sept. 2012: Hawaii's first confirmed JTMD item
- JTMD still arriving through 2017



Alien Species and JTMD

- JTMD may be fouled with Japanese species which may become invasive

Blue mussels (left) and chiton and limpets (right) not native to Hawaii are a concern. Call DLNR.

Pelagic Species are not of concern

- Gooseneck Barnacles

Newly settled

- Citizens were key in reporting and removing suspected JTMD
- Identify and quantify alien species
- Biological samples collected
- JTMD catalogued
- An aerial survey using aerial ortho-imagery: DAR, Pices, NOAA Marine Debris Program, Hawaii Coral Reef Initiative Research Program and Resource Mapping Hawai‘i

JTMD Landings

2012-2017

- 262 suspected JTMD items, 35 confirmed items
- Majority of debris: on Kaua‘i and O‘ahu and on the windward (north-east) side of islands
- JTMD Types: Vessels, plastic, processed wood, buoys and floats

JTMD Biofouling

2012-2017

- 62 species were identified from JTMD landings (55 invertebrates and 7 algae species)
- 92% of JTMD species were non-native (51 invertebrates and 6 algae)
- 85% of species are known Japanese species (47 invertebrates and 6 algae) previously undocumented in Hawai‘i

- JTMD Biofouling Results published in Science
- Tsunami-driven rafting: Transoceanic species dispersal and implications for marine biogeography (Carlton et al 2017)
- US Pacific Northwest and HI
- Citizen science contributing to top tier literature

Aerial State-wide Marine Debris Survey

- identified and mapped over 20,000 individual debris items
- Four vessels were confirmed as JTMD
- Primarily on windward shorelines
- Most common debris: Plastics, followed by derelict fishing gear

Key Findings

- JTMD landings into 2017- Six years after Tsunami
- Japanese biofouling species are able to survive for years at sea before landing in Hawai‘i
- Species specific monitoring- identified 85% as Japanese
- Windward coasts should be prioritized

Continuing Efforts:

- Citizen participation was key- need continued reporting
- Continue to survey for potential invasive species from Japan
- Early detection and Rapid Response
- Report the Debris: Call DLNR at (808) 587-0400 or send an email to dlnr.marine.debris@hawaii.gov and disasterdebris@noaa.gov

Kilauea River Salvinia Project

Salvinia molesta

- Aquatic Fern
- Native to Brazil
- Used in an ornamental plant in ponds and aquariums
- Highly invasive
- Established populations in much of the southern US

Lake Wilson

- January 2002 salvinia covered 80% of the 325 acre surface of the lake
- Took almost two years of State, City & County and Military crews to clear
- Cost over $1 million to remove

Kilauea Neighborhood

- North East Kauai
- Large perennial stream with wide banks and calm water
- Heavily vegetated banks with California grass and hau trees
- 2016 community reached out after observing salvinia growing rapidly

Removal Efforts

- Scoop Nets
- Cutting out mats of vegetation
- Trash pump

Group Effort

- DAR
- DOA
- KISK
- HILT
- Kilauea Neighborhood Assn.
- Kilauea Ag. Park

Continuing Efforts

- Monitoring of regrowth in removal areas
- Organizing community work days for manual removal
- Distribution of handouts about the problem and how to avoid further spread
- E-DNA sampling of all perennial streams on the windward side of Kauai to assess extent of population

Citizen Science

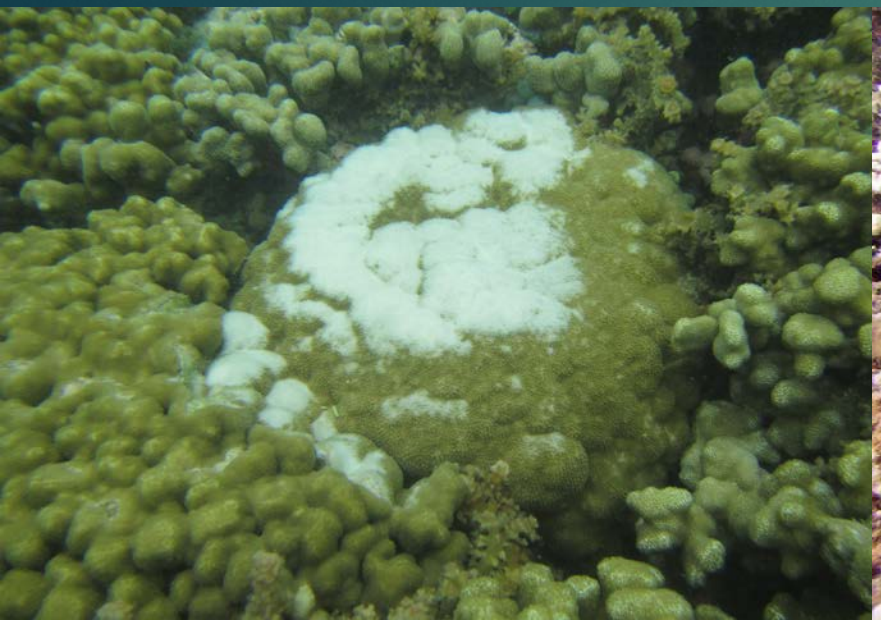
Citizen Science

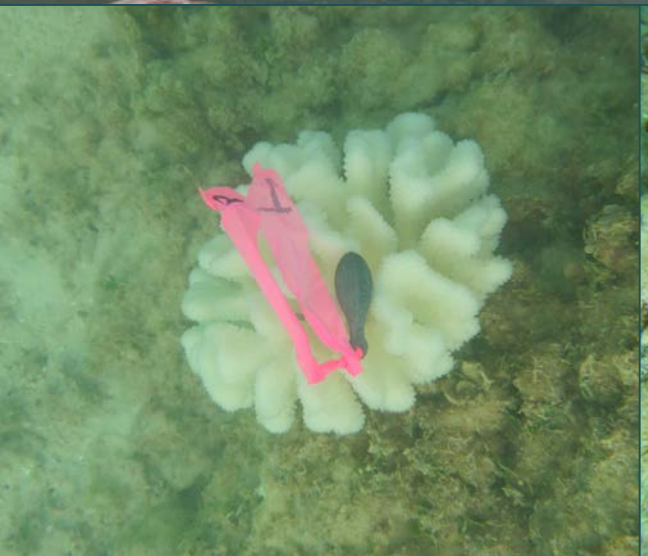
- AIS too large a task for one agency or group to manage.
- Reporting, tracking, and controlling.
- The citizens are our eyes- Early detection and Rapid response

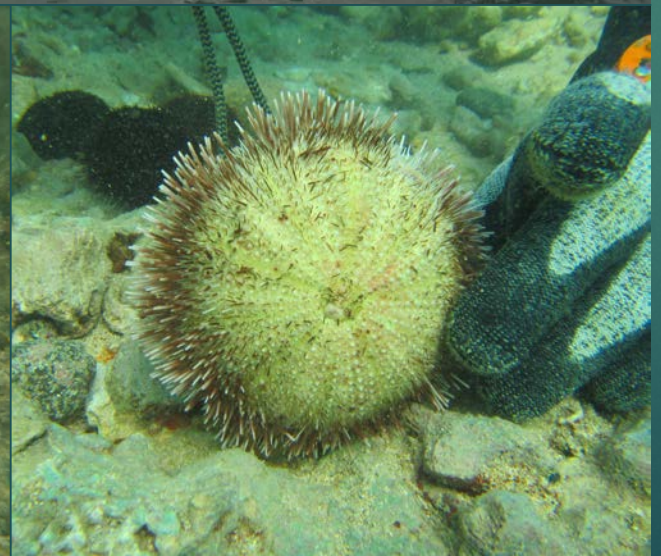
Eyes of the Reef Network

- Volunteer member based organization
- coral bleaching, disease, Crown-of-Thorn and invasive species outbreaks
- first tier of Hawaii's Rapid Response Contingency Plan
- Becoming member is easy. Attend a training in your area and keep your eyes open. That's it!

<http://eyesofthereef.org/>







EOR Training

- EOR offers free trainings to people with all levels of ocean knowledge
- Local monitoring and educational support
- Contact your Island Coordinator

EOR Online Reporting

- Coral Bleaching and Disease
- Crown of Thorns sea stars
- Fish disease and miscellaneous
- Aquatic Invasive Species

Links to report through EOR

<http://dlnr.hawaii.gov/ais/report-an-aquatic-invasive-species/>

Report instructions & forms

<http://eyesofthereef.org/>

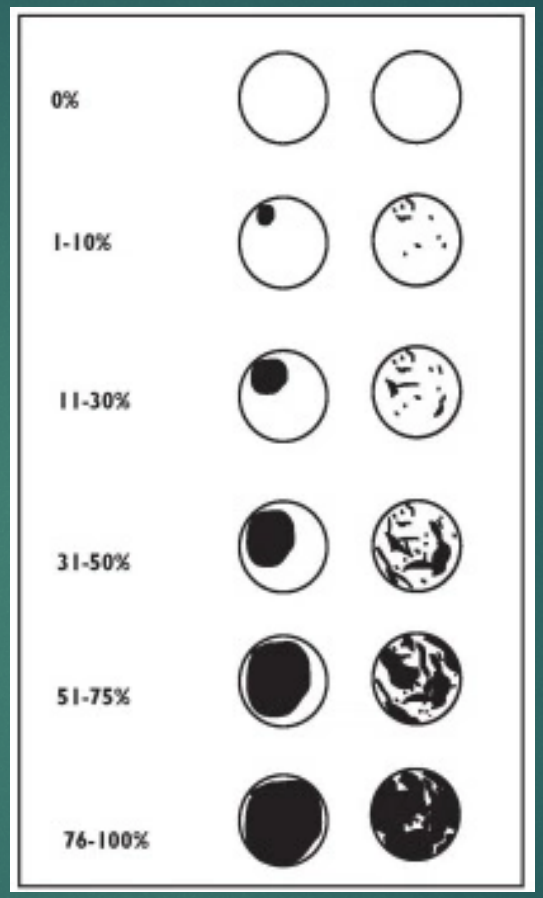


Table 1: Amount of live coral and/or affected coral.
This figure is designed to help you in estimating percentage cover. Source: EOR

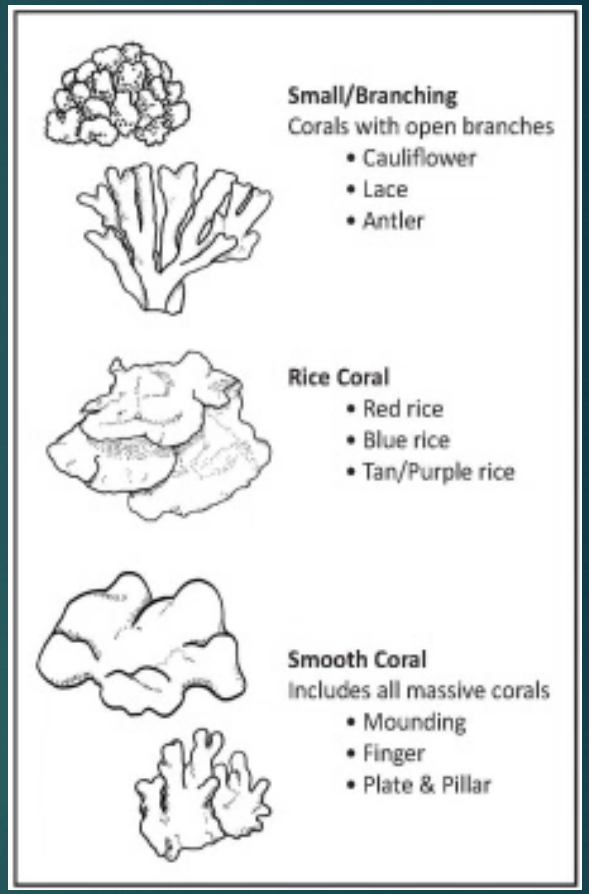


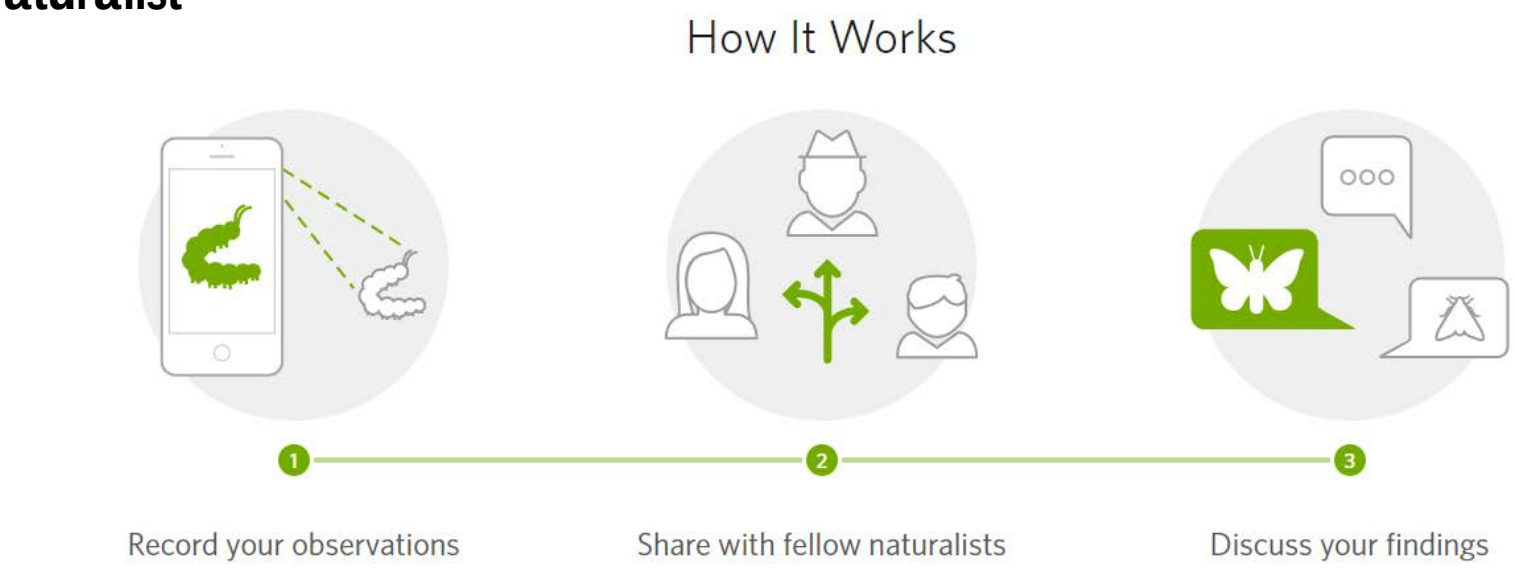
Table 2: Coral ID Key
This figure is a guide to the main shapes of corals. Source: EOR

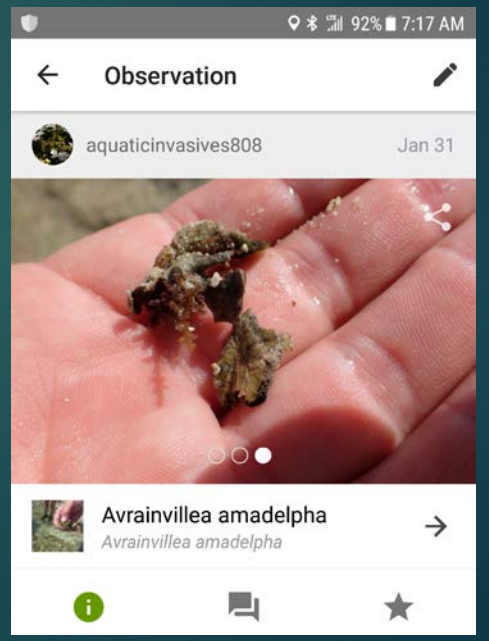
iNaturalist

- **iNaturalist is an online social network of people sharing biodiversity information to help each other learn about nature**
- crowdsourced species identification system
- organism occurrence recording tool
- Free to join, Free app!

<https://www.inaturalist.org/>

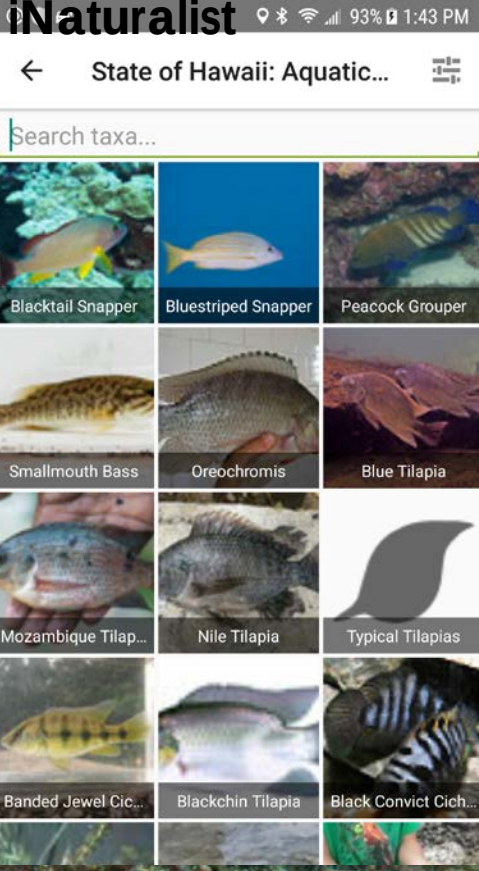
iNaturalist

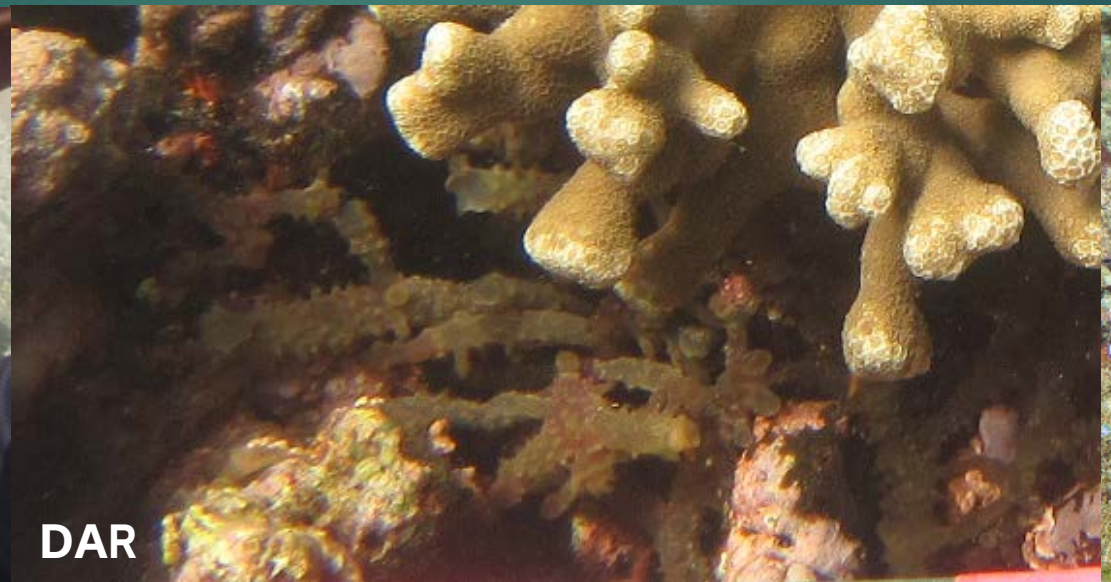




iNaturalist and AIS

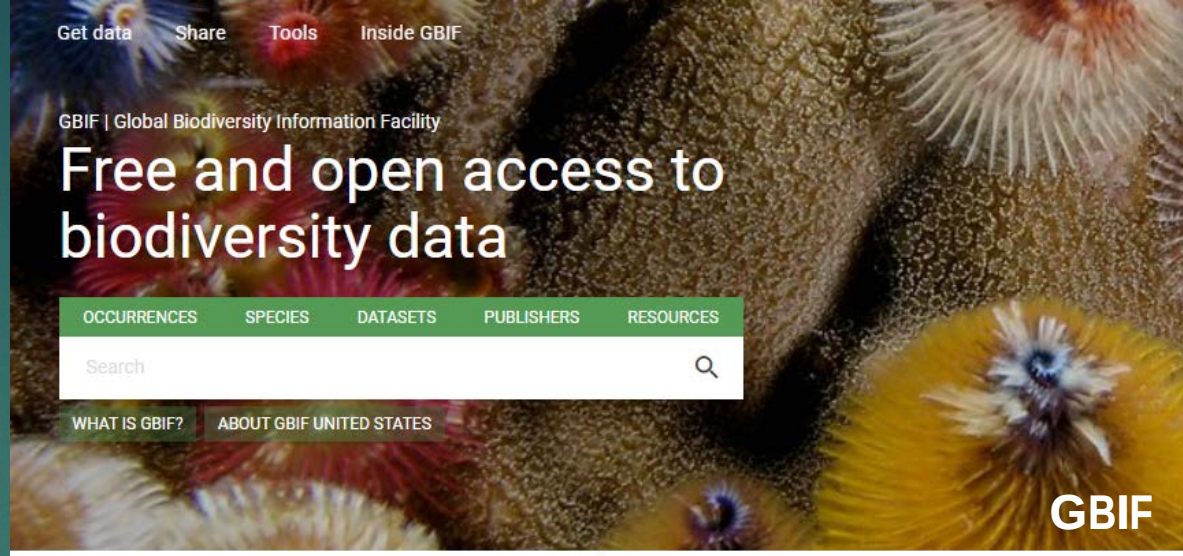
- Join the State of Hawaii: Aquatic Invasive Species project
- Reference our Guide for introduced species
- Snap a photo and document- make sure to add observations to our project!
- Location and distribution data helps us directly to manage AIS





iNaturalist to GBIF

- iNaturalist shares the findings you report with scientific data repositories
- Global Biodiversity Information Facility (GBIF)
  - allows anyone, anywhere to access data about all forms of life on our planet Earth.



Resources and Contact Info

- DLNR: DAR: Aquatic Invasive Species **<http://dlnr.hawaii.gov/ais/>**
  - **dar.ais@hawaii.gov**
  - Eyes of the Reef <http://eyesofthereef.org/>
  - iNaturalist <https://www.inaturalist.org/>
  - JTMD: Report the Debris:
    - Call: DLNR at (808) 587-0400
    - Email:
      - dlnr.marine.debris@hawaii.gov d
      - disasterdebris@noaa.gov

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