

2013 Main Hawaiian Islands  
Reef Assessment and Monitoring cruise

Overview and preliminary results

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# NCRMP

- \* CRCP strategic decision to invest for perpetuity in a NCRMP.
- \* Designed to provide information to assess status and trends.
  - \* - *Status of the living resources*
  - \* - *Assess change over time*
  - \* - *Local threats: overfishing, LBSP, coastal development, invasive species.*
  - \* - *Global threats: Climate change, Ocean Acidification*
- \* Approach: broad but thin.
- \* Provide and analytical context to assess conditions at the subjurisdictional level.
- \* Builds-up on a decade of monitoring and reporting (RAMP, State of the reefs report).

# NCRMP

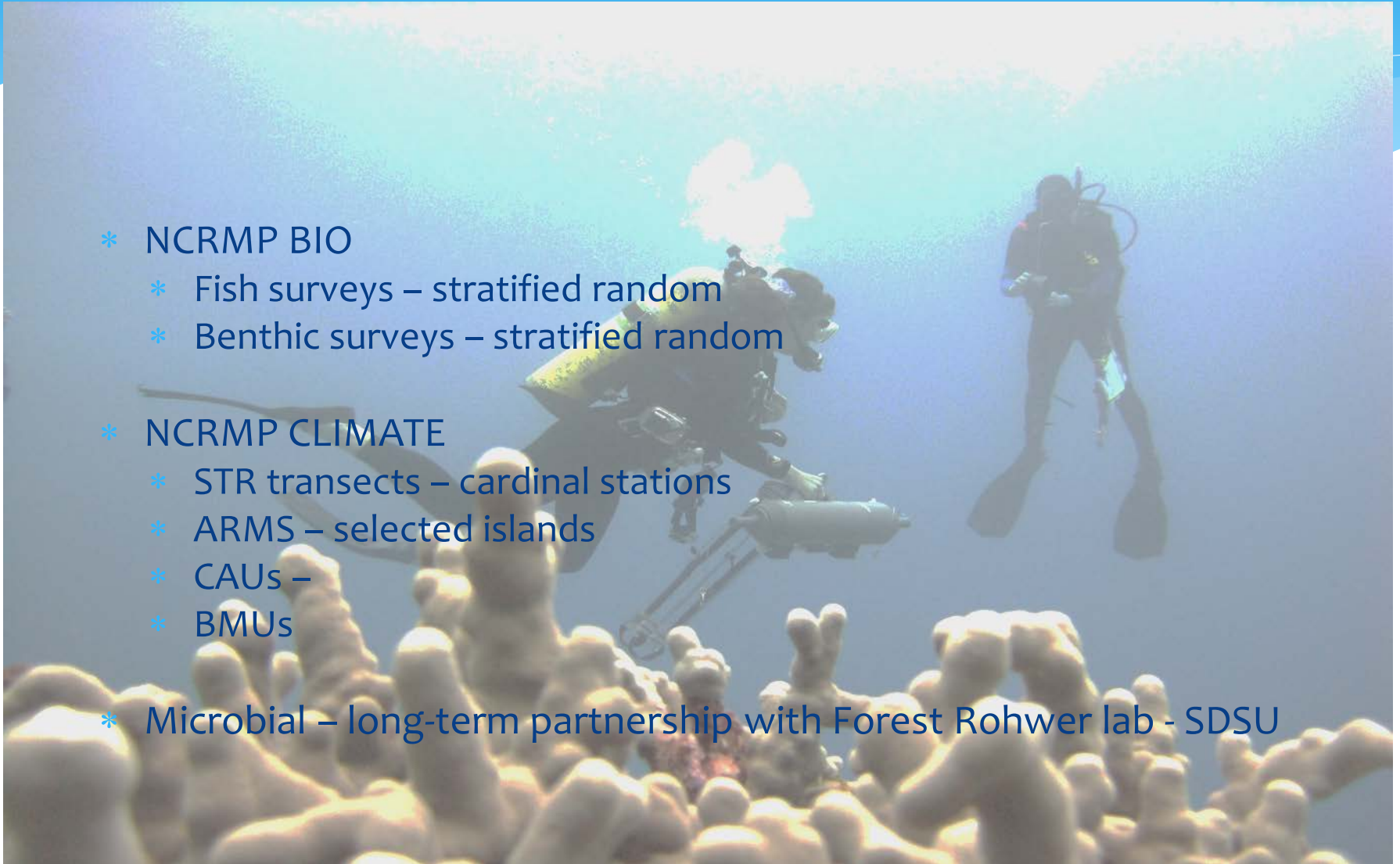
- \* NCRMP BIO

- \* Fish surveys – stratified random
- \* Benthic surveys – stratified random

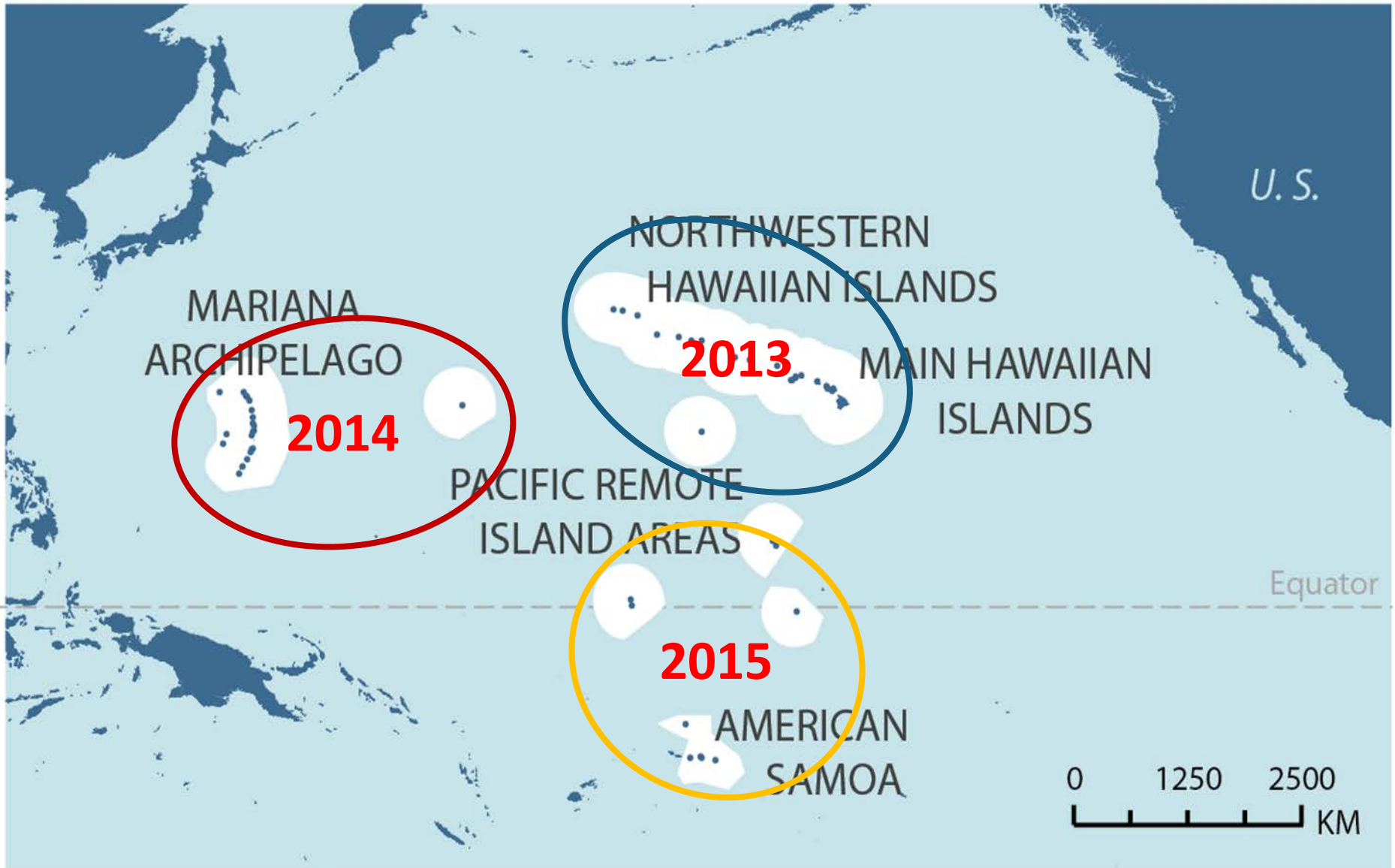
- \* NCRMP CLIMATE

- \* STR transects – cardinal stations
- \* ARMS – selected islands
- \* CAUs –
- \* BMUs

- \* Microbial – long-term partnership with Forest Rohwer lab - SDSU



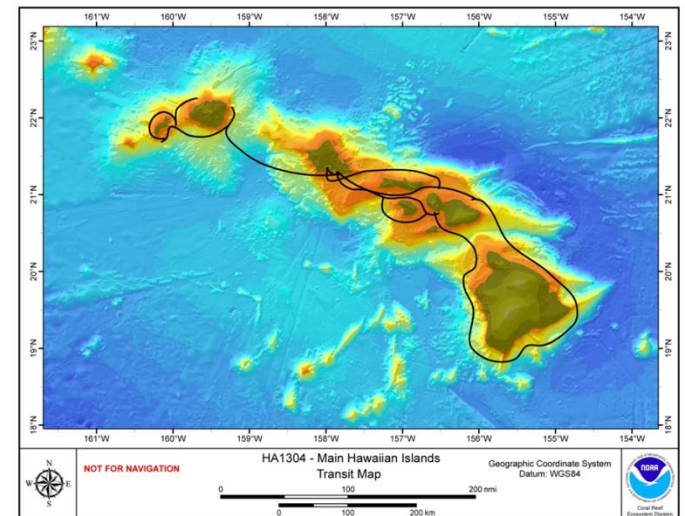
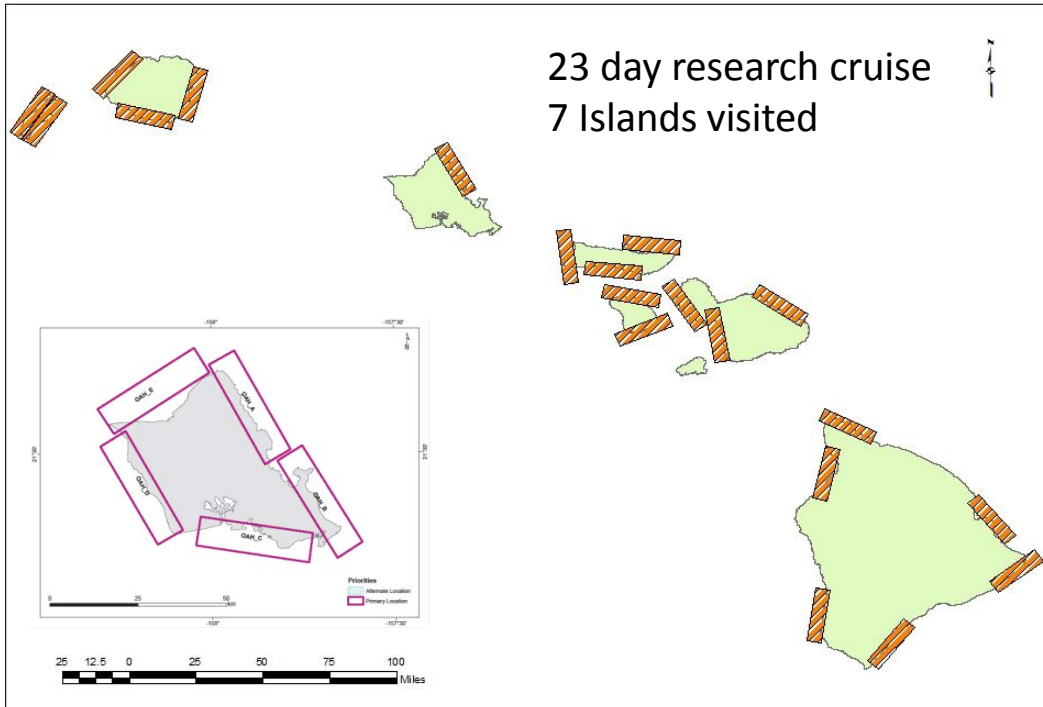
# CRED STUDY AREA



# Operating area

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MHI RAMP Cruise - HA1304  
Survey Areas



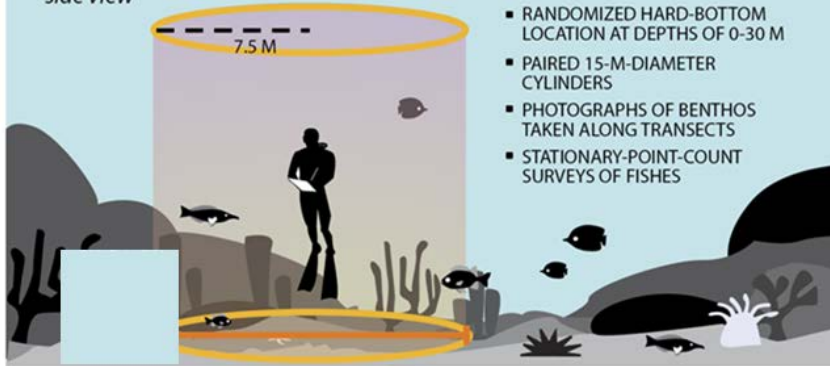
# Fish surveys

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## REA METHODS

### AREA & UNITS: RANDOM REA SITES

*side view*



- \* Document and monitor fish diversity and abundance.
- \* Estimate biomass.



# Benthic surveys

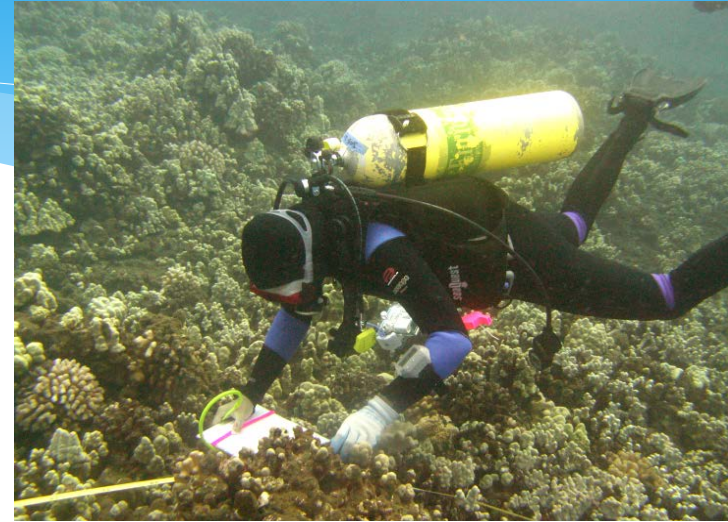
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## REA METHODS

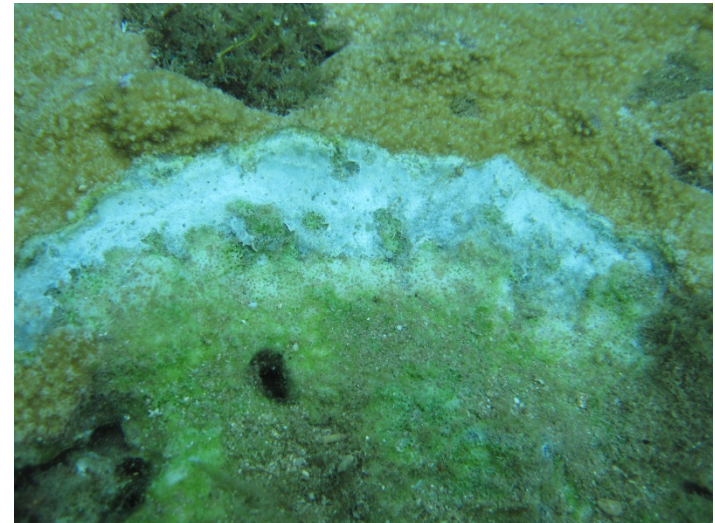
### AREA & UNITS: RANDOM REA SITES

*side view*

- RANDOMIZED HARD-BOTTOM LOCATION AT DEPTHS OF 0-30 M
- PHOTOGRAPHS OF BENTHOS TAKEN ALONG TRANSECTS



- \* Document percent cover of bottom dwelling organisms, coral diversity, abundance, and health condition.
- \* Estimate colony density.



# Towed-diver surveys

## Benthic Observations

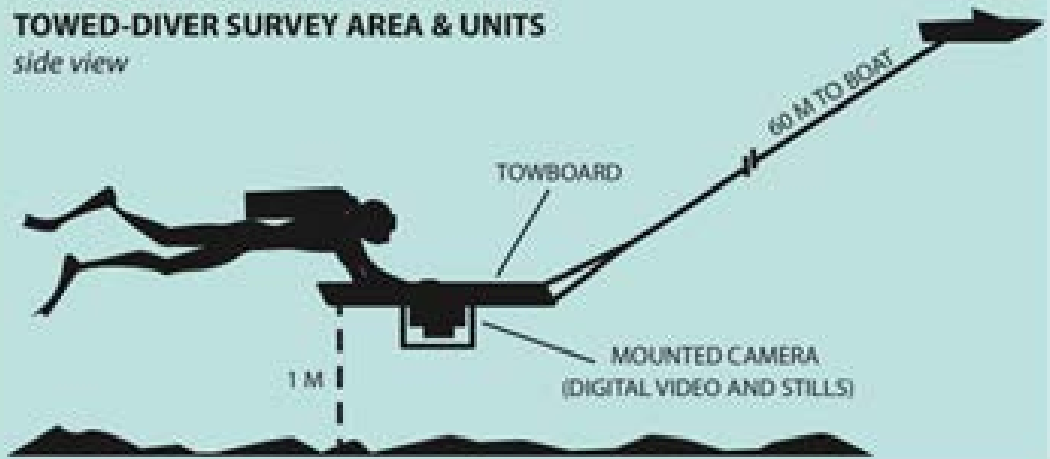
1-Large-scale, benthic habitat assessments at the functional level (hard and soft coral, algae,

2- Document occurrence of elements, such as key species (corallivores), marine debris (derelict fishing gear, anchors, shipwrecks) and unique/unusual events such as coral bleaching, and outbreaks of disease outbreaks, and predators.

## TOWED-DIVER & REA METHODS

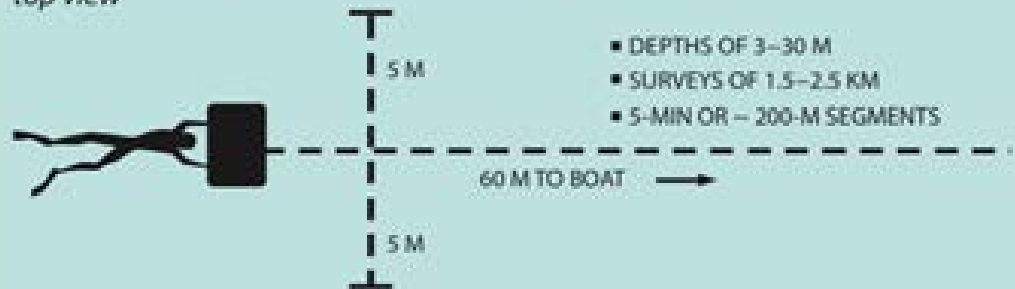
### TOWED-DIVER SURVEY AREA & UNITS

*side view*



### TOWED-DIVER SURVEY AREA & UNITS

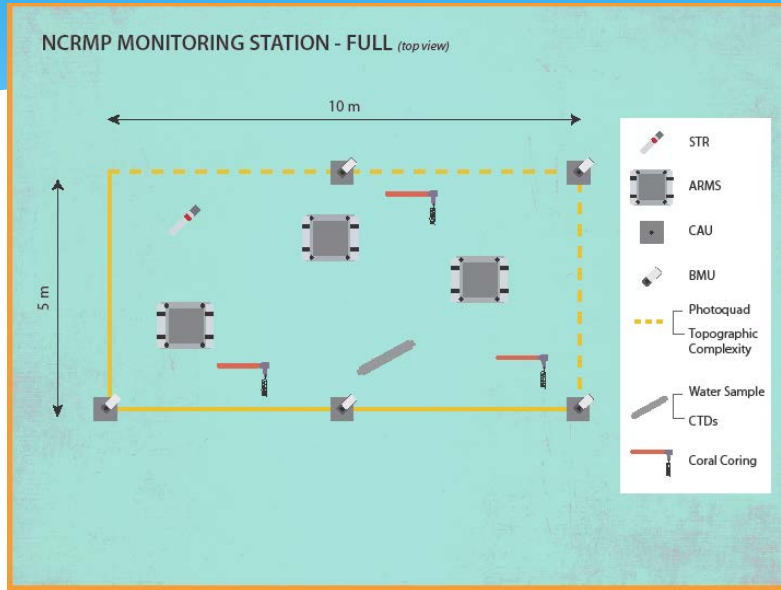
*top view*



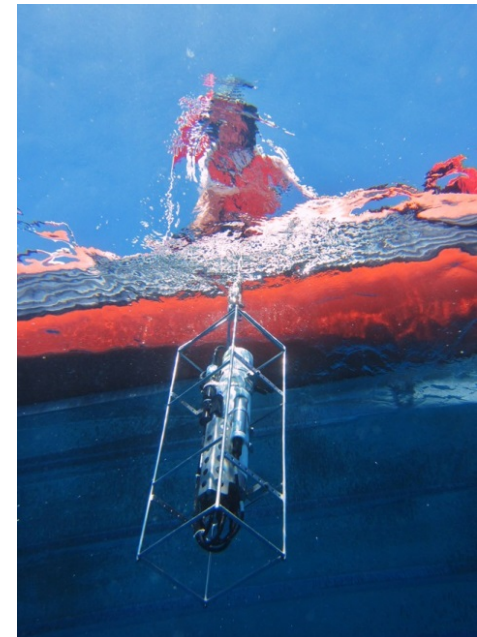


# Instrumentation

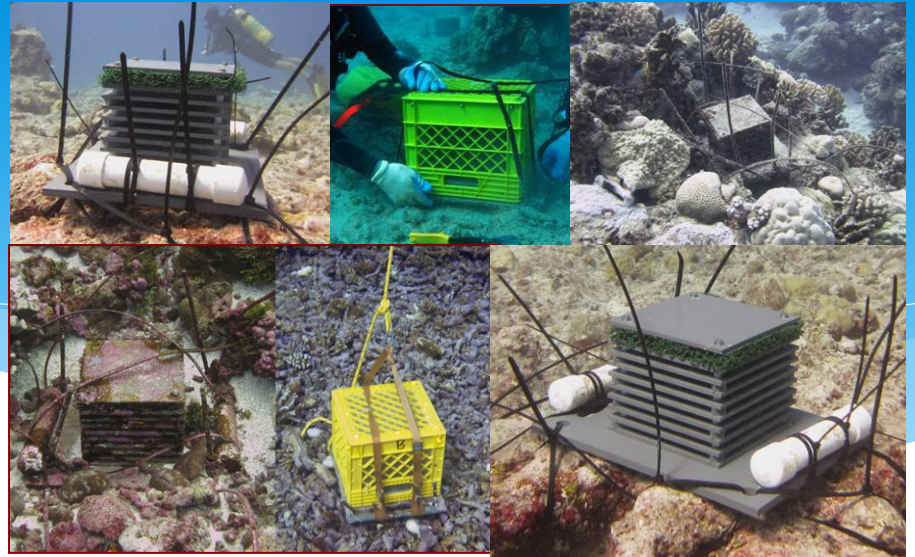
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- \* Monitor biodiversity, calcification, bioerosion, and thermal structure to understand effects of Climate Change and Ocean Acidification.



# ARMS



- \* Design:

- \* 3 ARMS per site
- \* 4 Sites per island

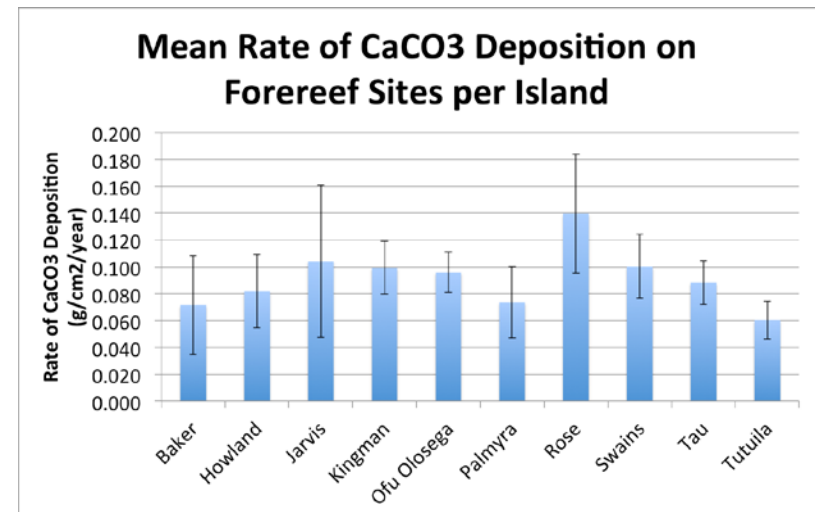
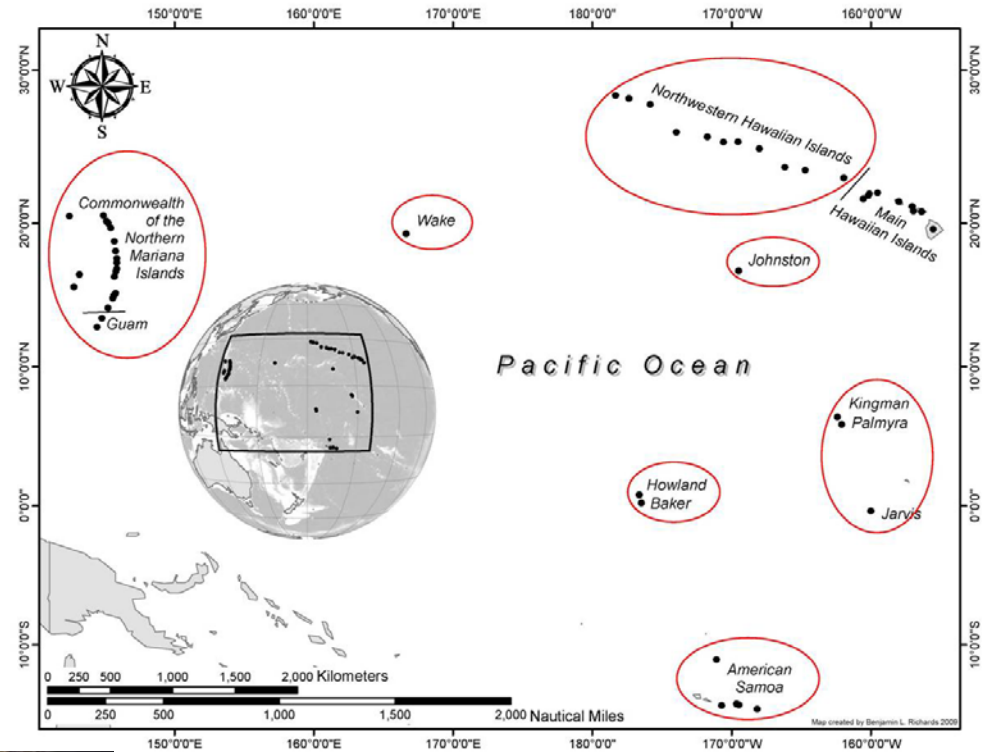
- \* U.S. Pacific:

- \* 465 Deployed
- \* 203 Recovered for assessment and monitoring



# CAUs

- \* **American Samoa**  
40 Sites, 5 Islands  
200 CAUs
- \* **PRIAs**  
44 Sites, 7 Islands  
240 CAUs
- \* **NWHI**  
20 Sites, 4 Islands  
100 CAUs
- \* **Guam & the CNMI**  
40 Sites, 8 Islands  
200 CAUs



# Microbes

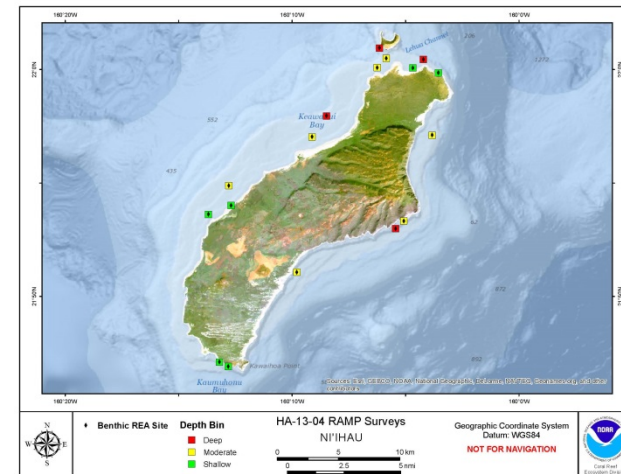
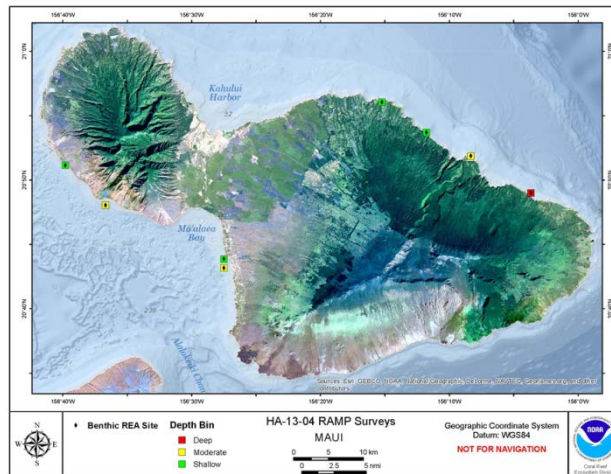
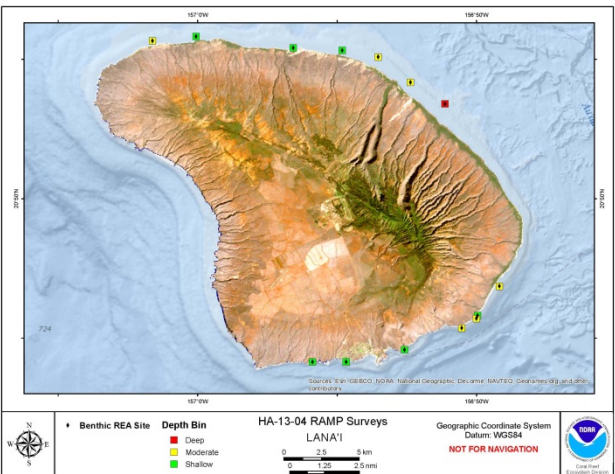
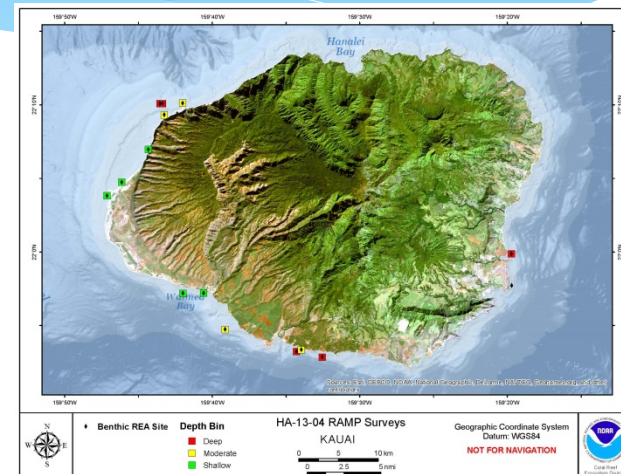
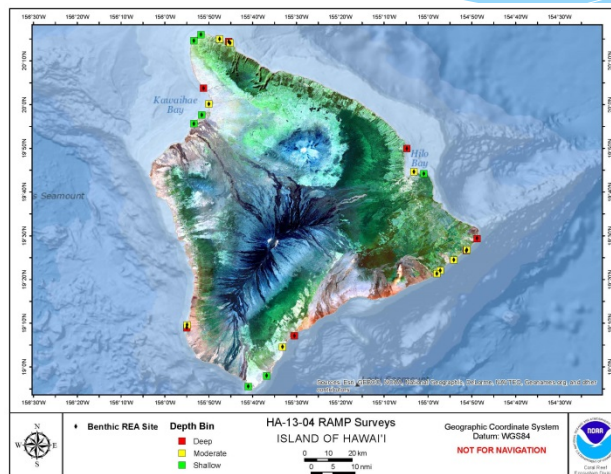
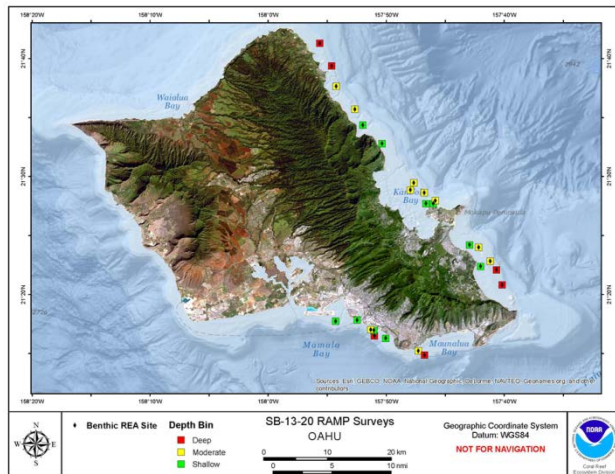
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- \* Partnership with Forest Rohwer Lab.
- \* Study the microbial community to understand the interactions among coral reefs, microbes, and viruses.
- \* Fluorescent staining-biomass.
- \* Metagenomics.



# Accomplishments 2013 MHIRAMP

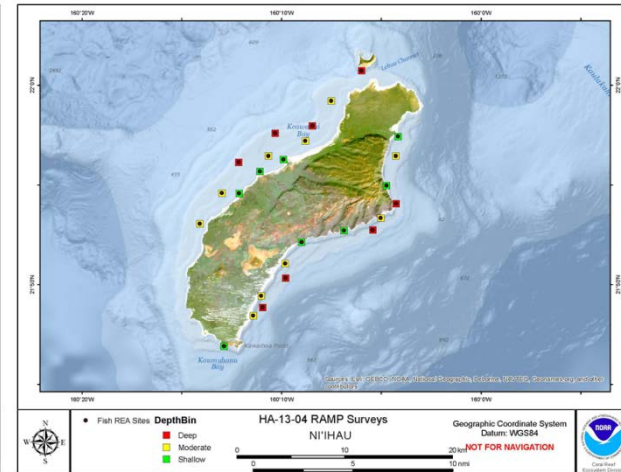
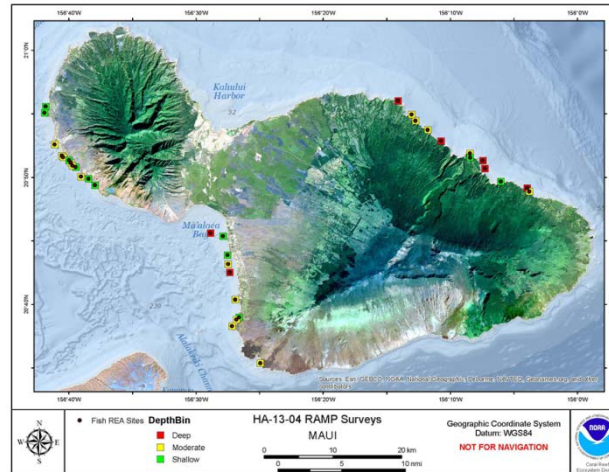
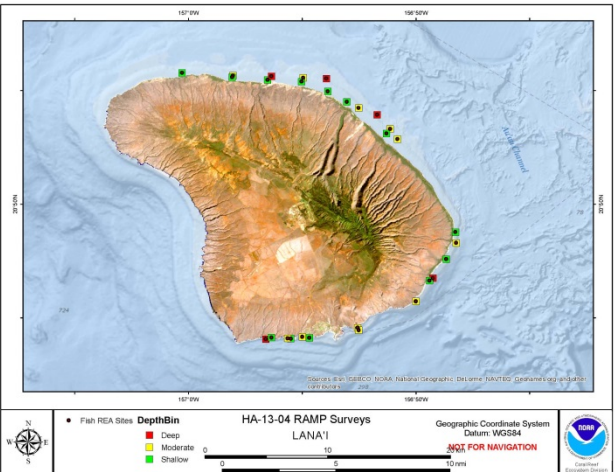
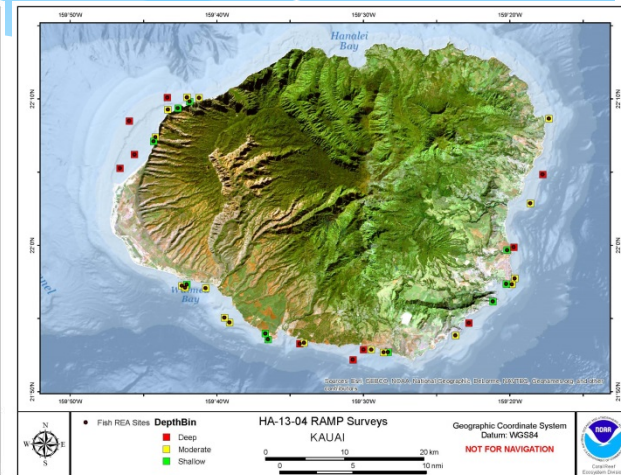
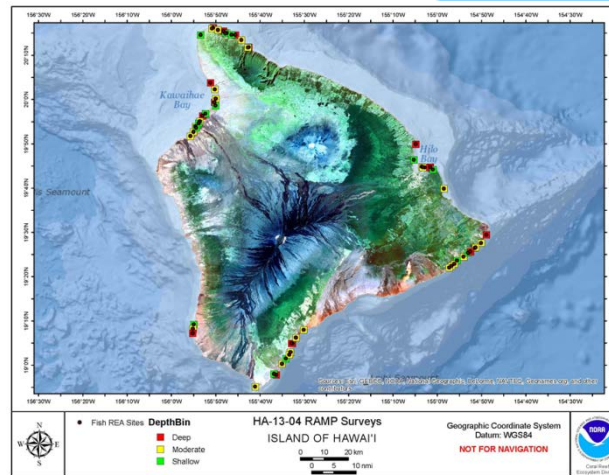
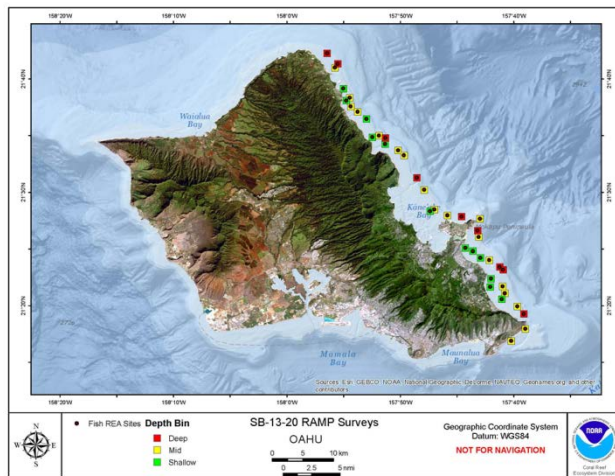
## MHI RAMP Cruise – HA1304 Benthic surveys



# Accomplishments

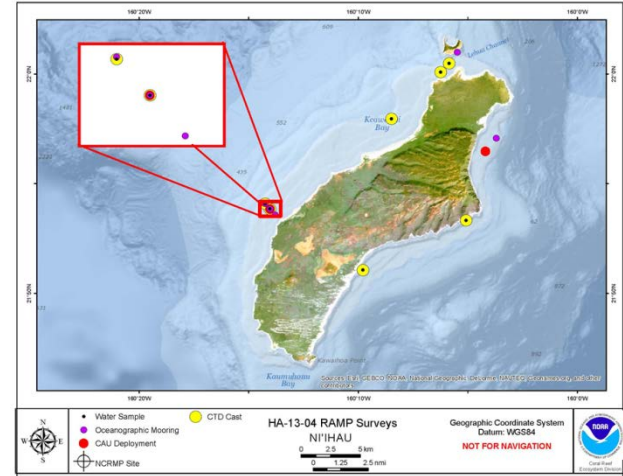
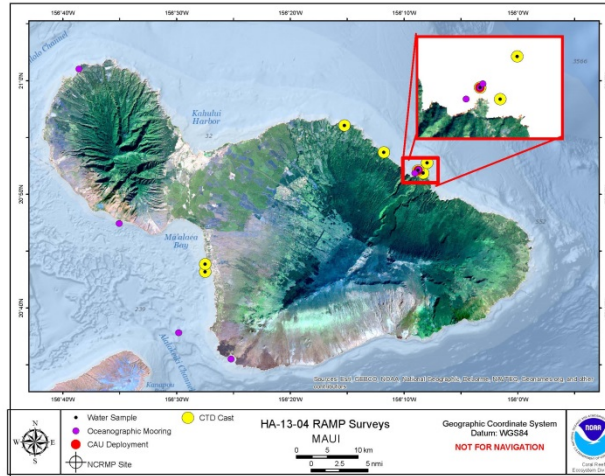
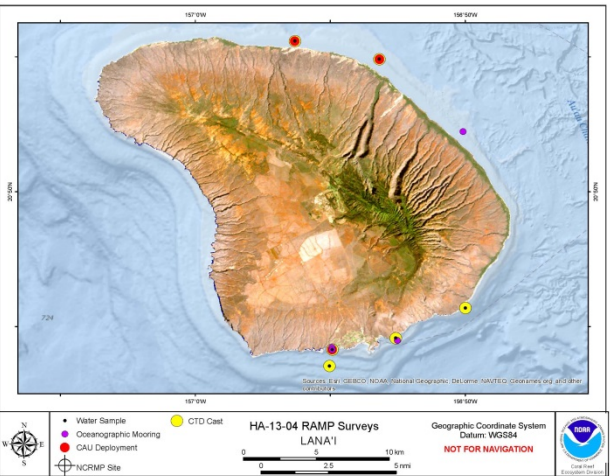
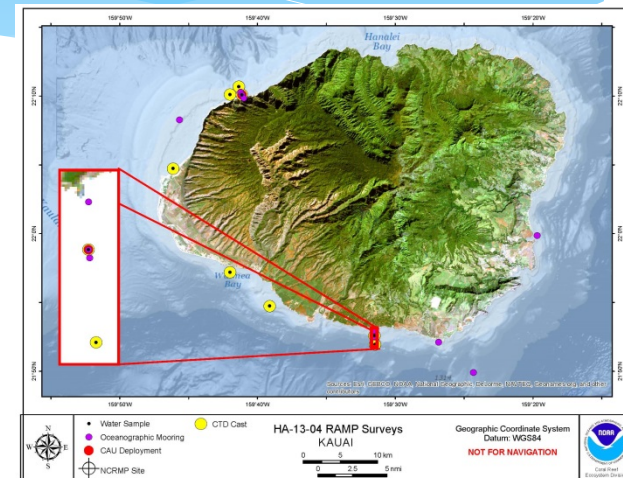
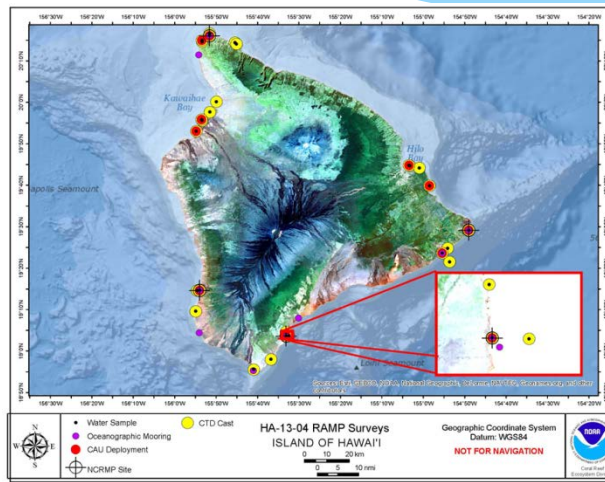
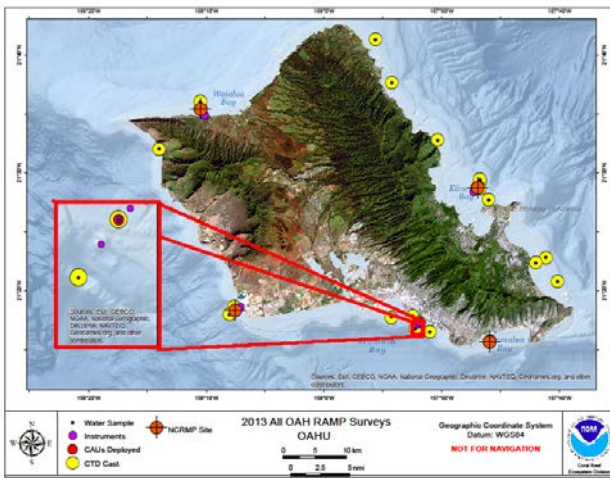
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## MHI RAMP Cruise – HA1304 Fish surveys



# Accomplishments 2013 MHIRAMP

## MHI RAMP Cruise – HA1304 Instrumentation

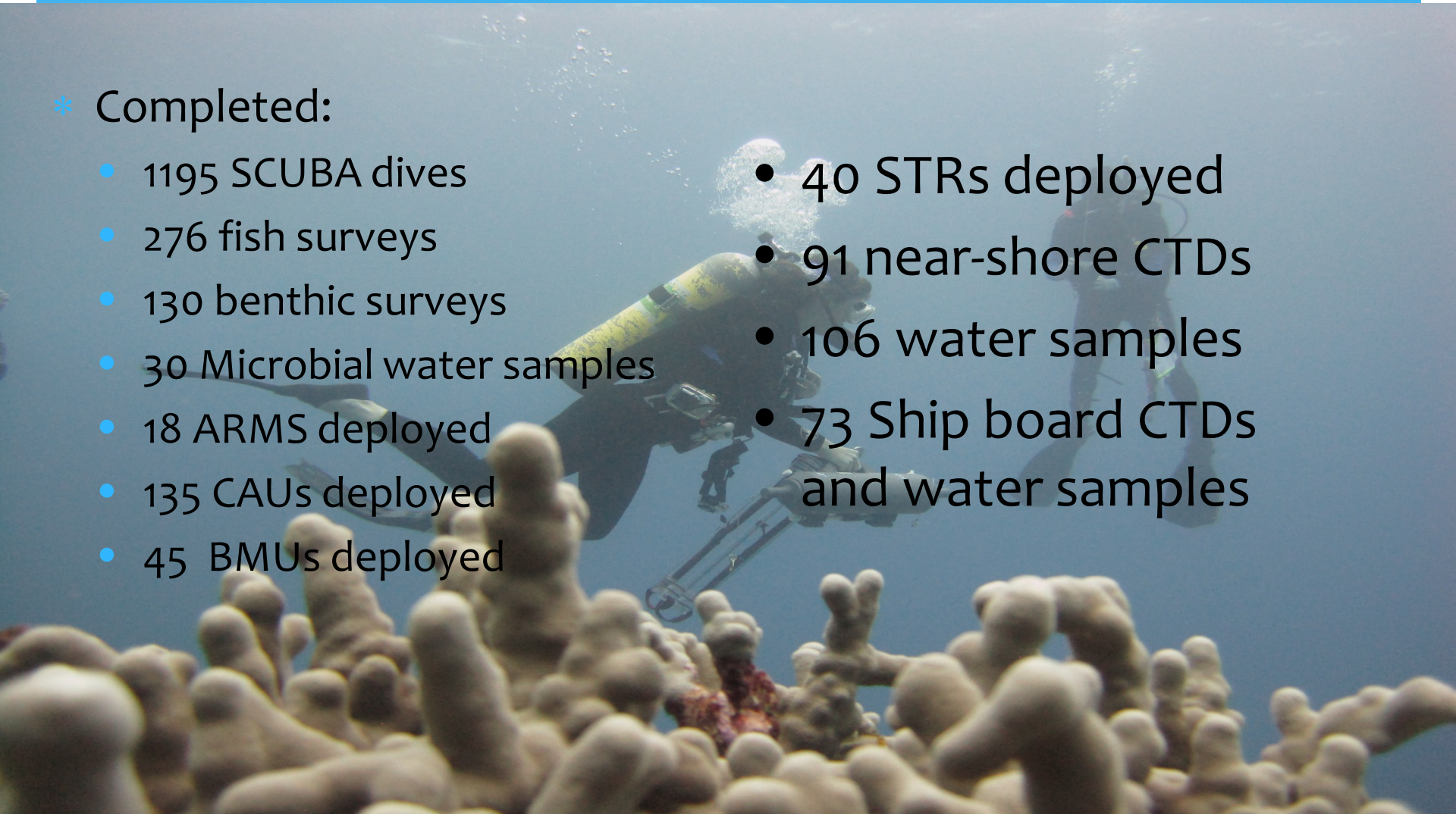


# Accomplishments

2013 MHIRAMP

## \* Completed:

- 1195 SCUBA dives
- 276 fish surveys
- 130 benthic surveys
- 30 Microbial water samples
- 18 ARMS deployed
- 135 CAUs deployed
- 45 BMUs deployed
- 40 STRs deployed
- 91 near-shore CTDs
- 106 water samples
- 73 Ship board CTDs and water samples

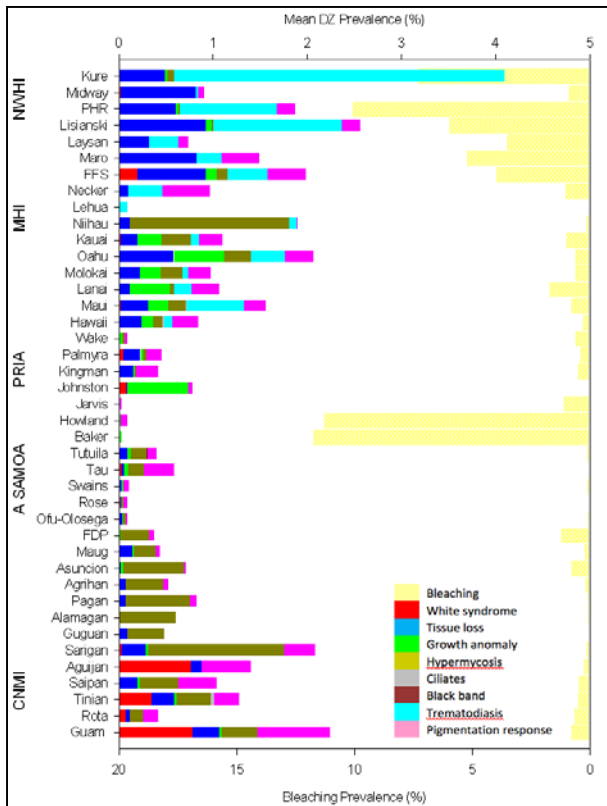




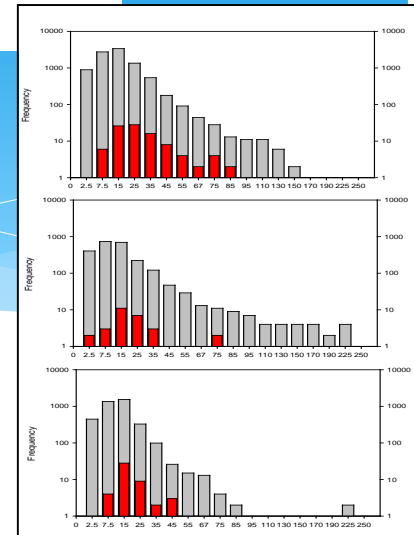
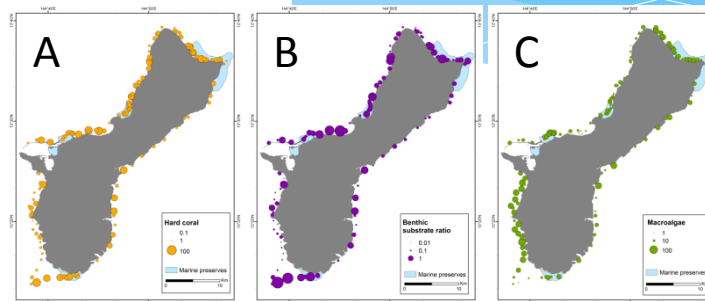
# Types of data

Coral disease & size class

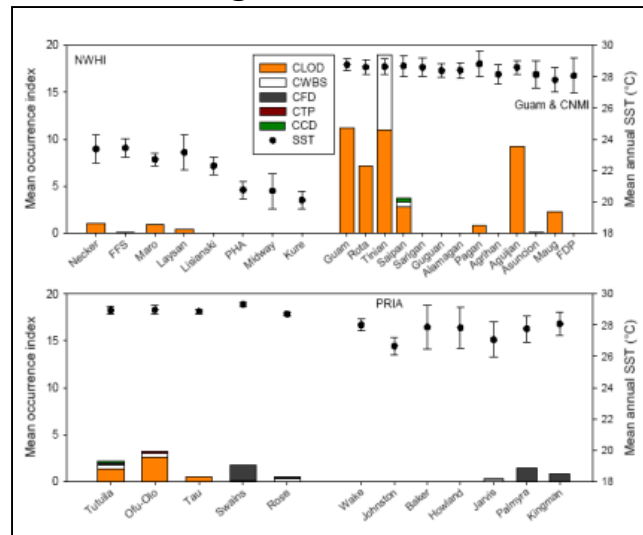
## Coral disease prevalence



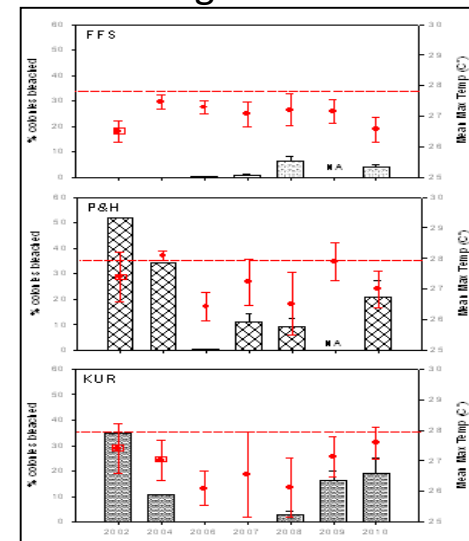
## Benthic cover



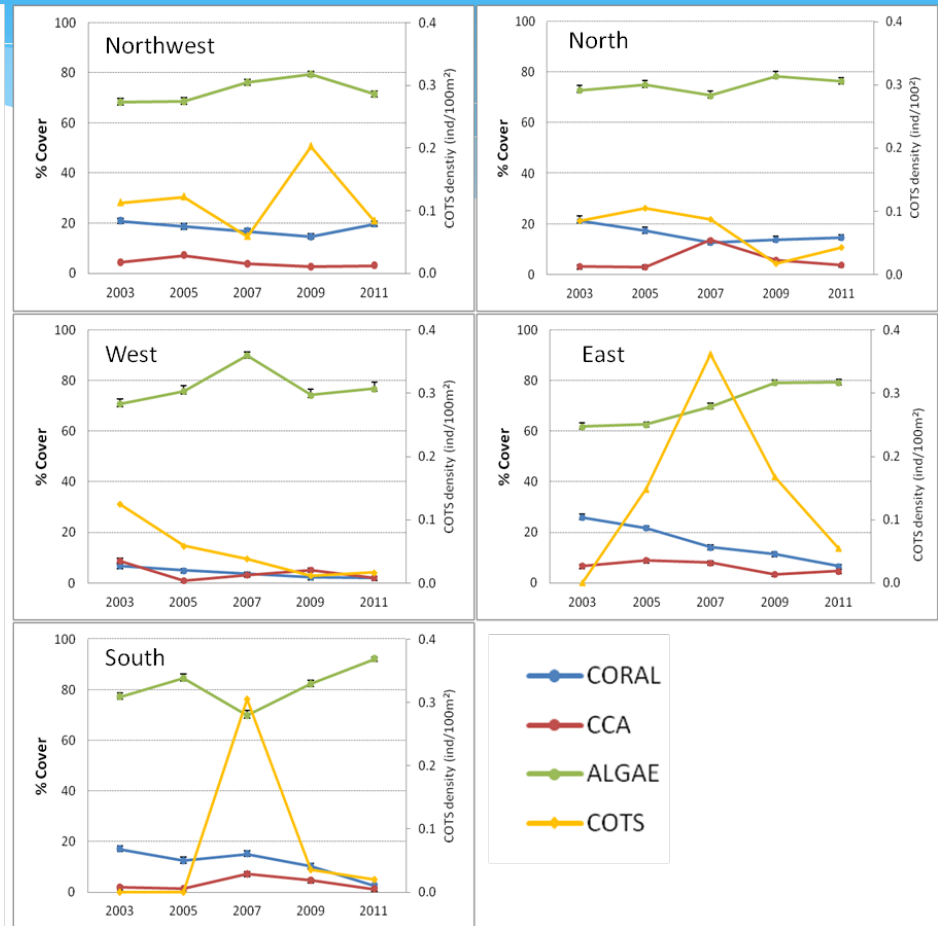
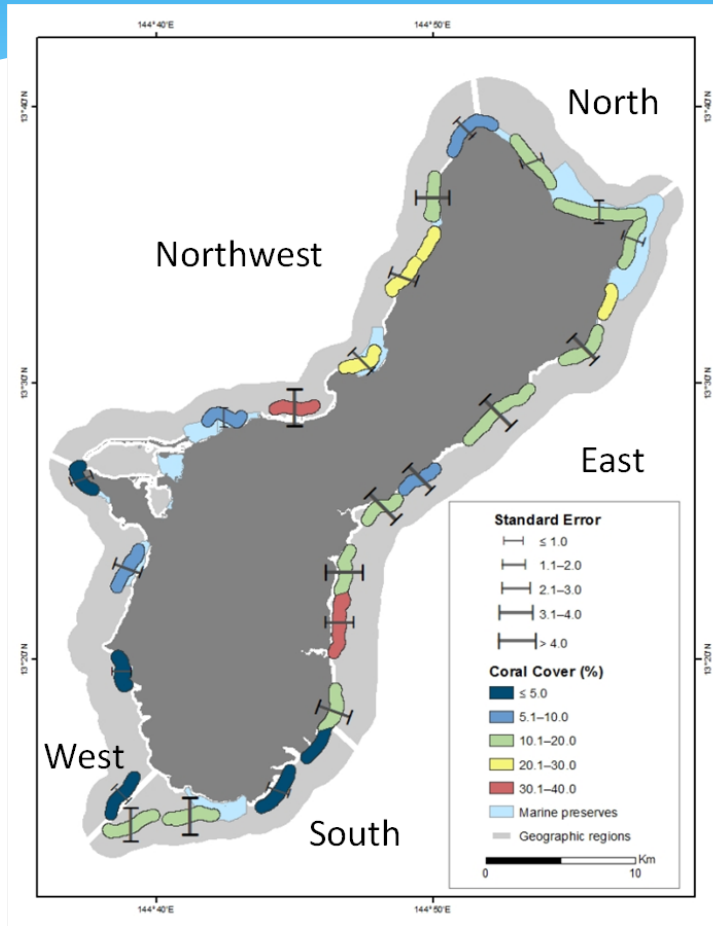
## Coralline algal disease



## Bleaching

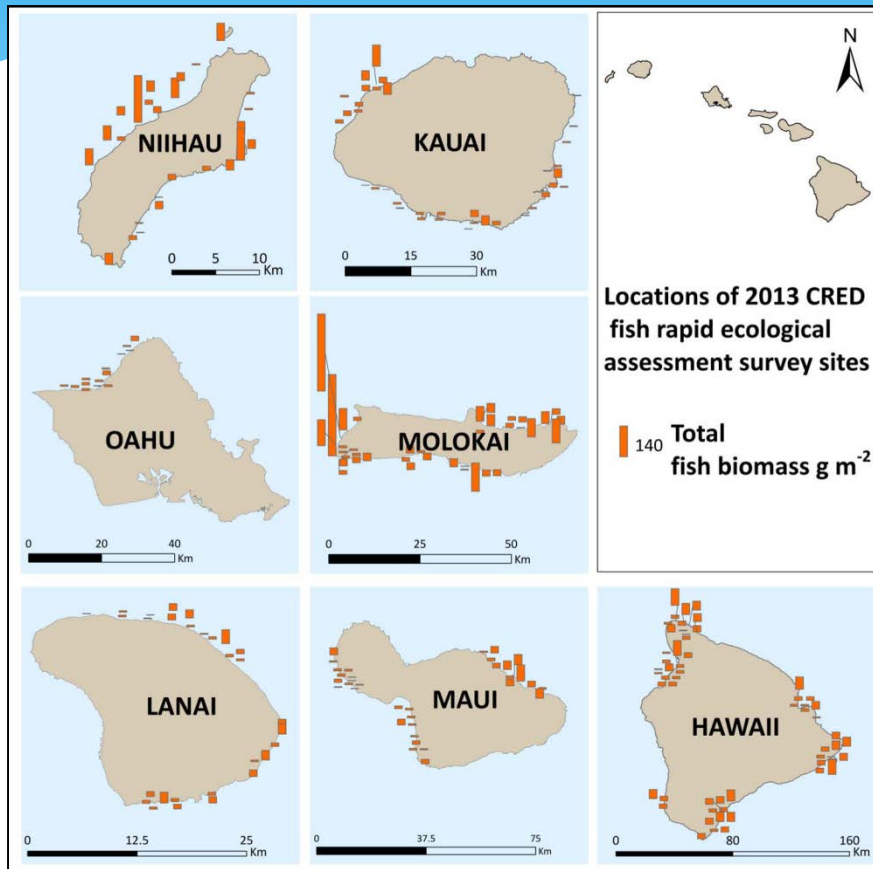


# Types of data

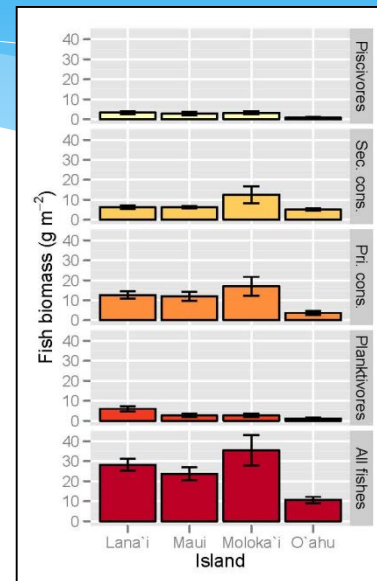


Analysis of legacy-archived towed-diver imagery to support NOAA Blueprint Initiative implementation for Guam

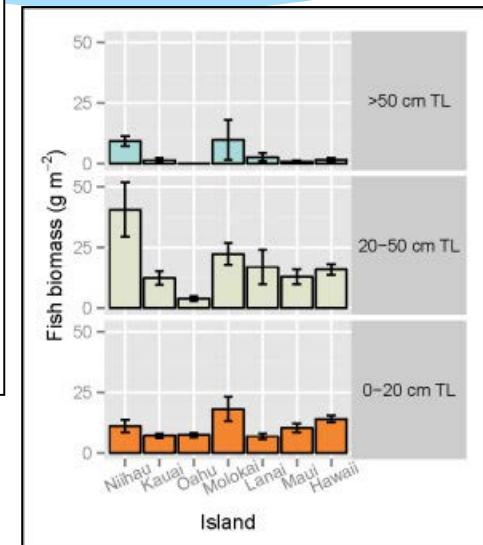
# Types of data



Mean total fish biomass ( $\text{g m}^{-2}$ ) at sites surveyed.

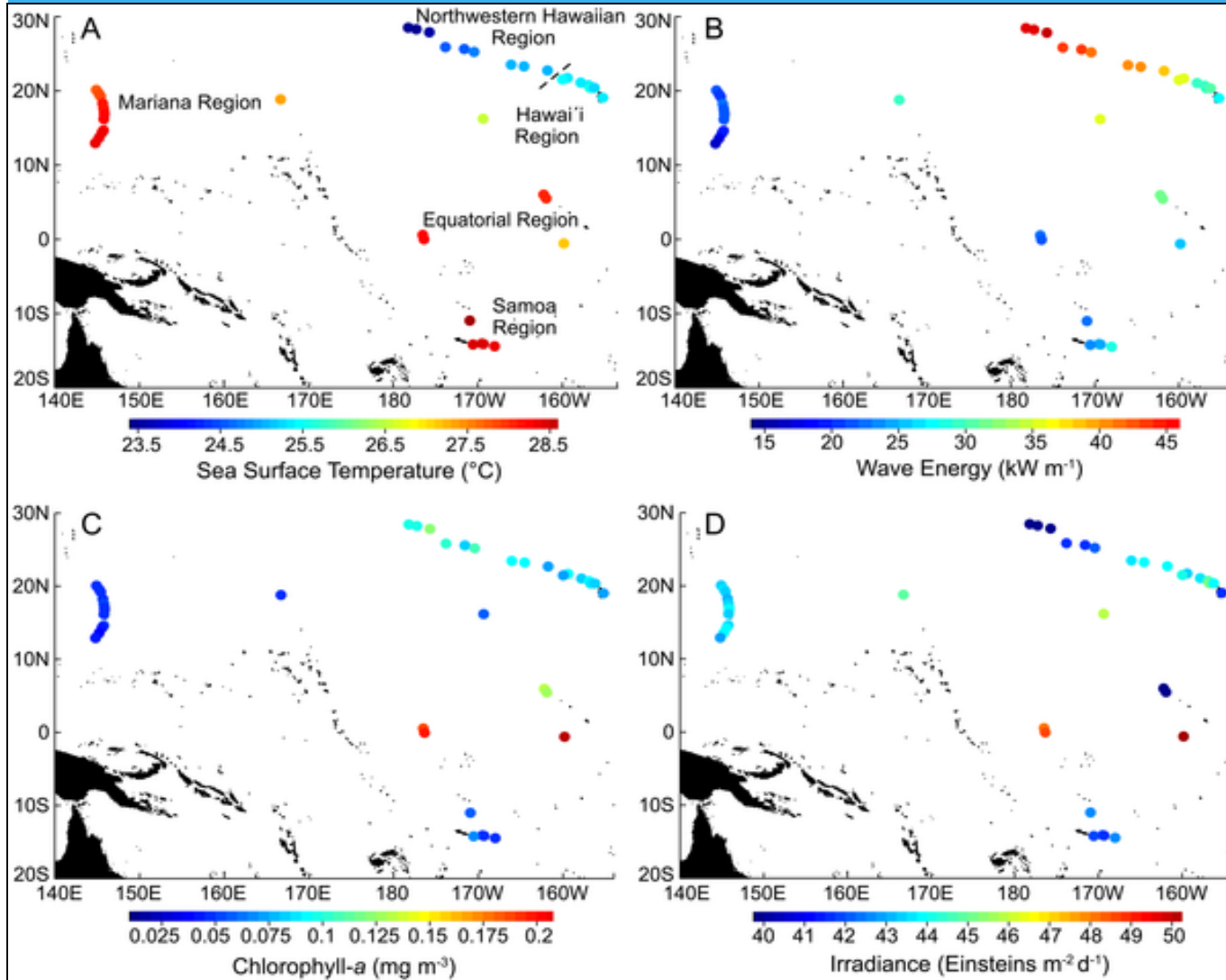


Mean consumer group fish biomass ( $\pm 1$  standard error). Primary consumers are herbivores and detritivores, and secondary consumers are omnivores and invertivores.



Mean fish biomass per size class ( $\pm 1$  standard error). Fish measured by total length (TL) in centimeters (cm).

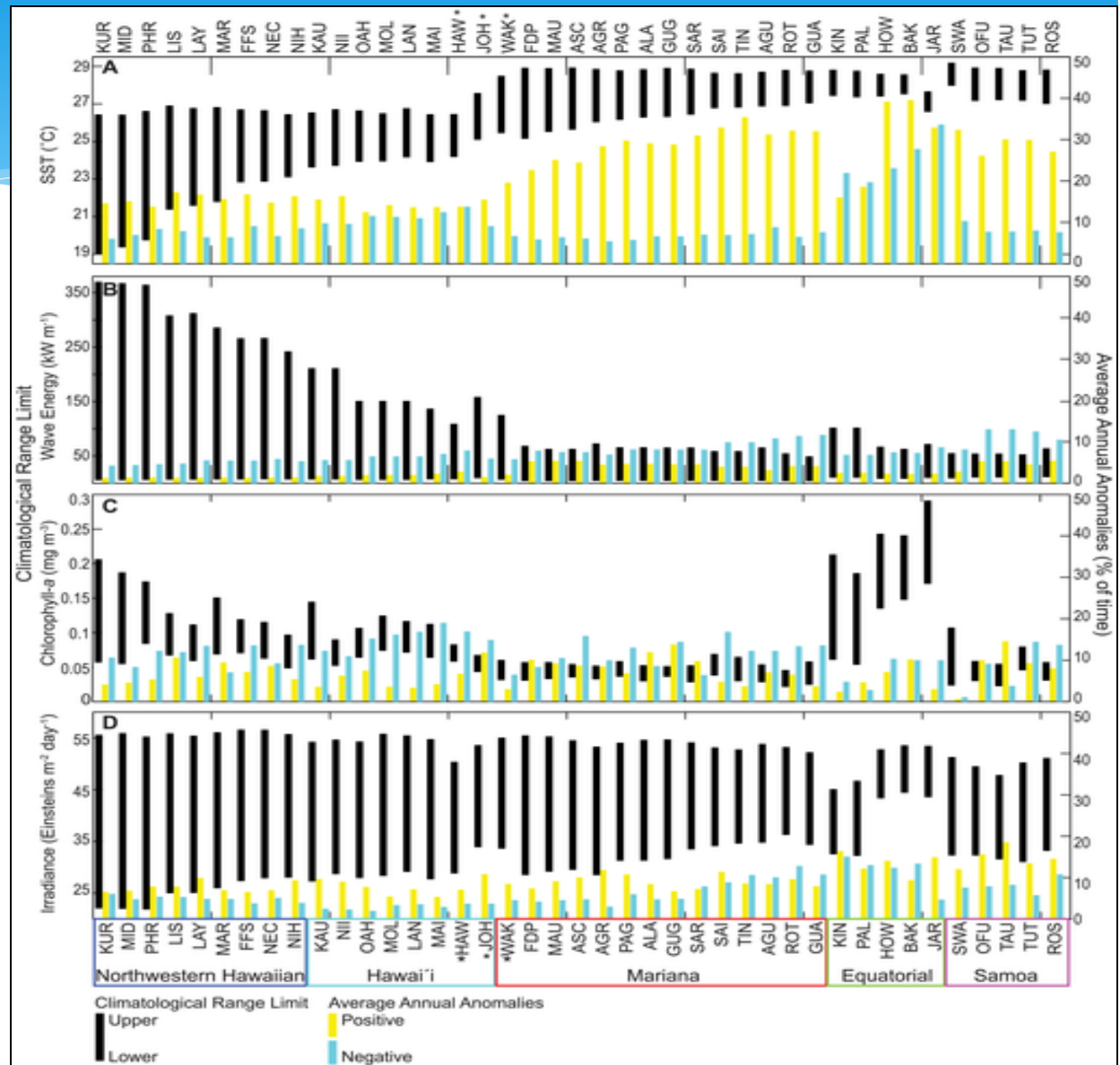
# Types of data



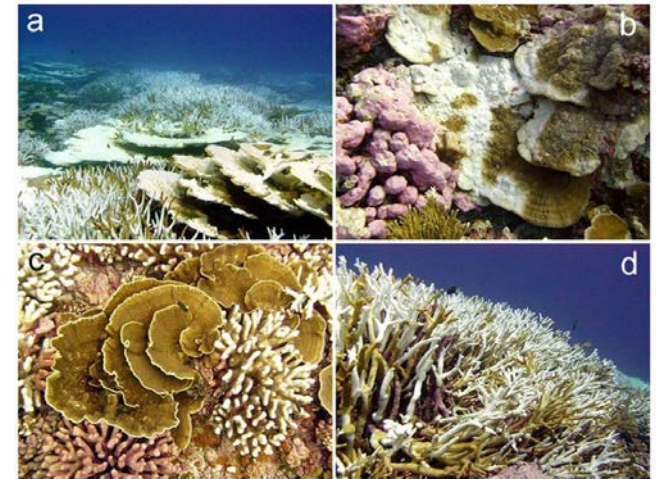
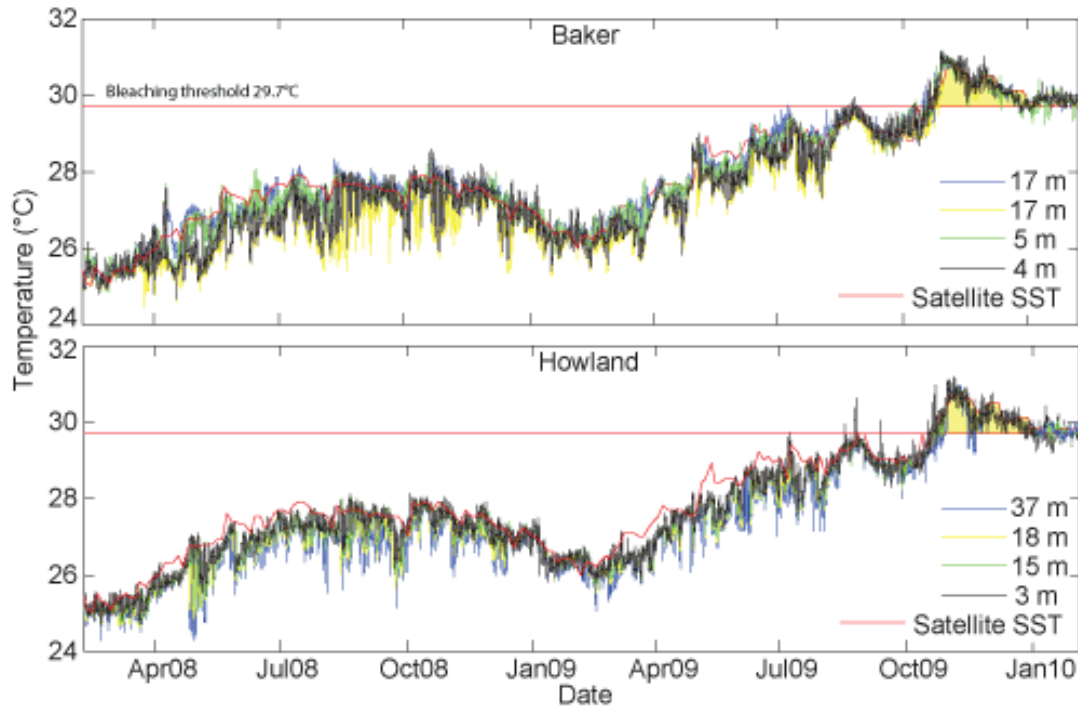
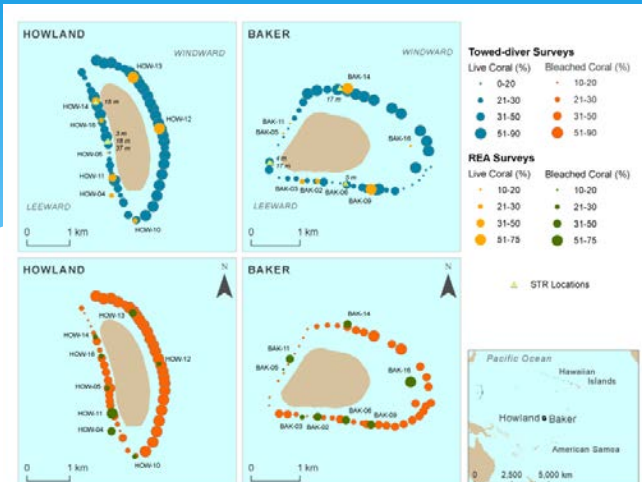
Map of long-term means in A) SST, B) wave energy, C) chlorophyll-a and D) irradiance across each of the regions that comprise the coral reef ecosystems of the U.S. Pacific.

# Types of data

Climatological ranges and average annual anomalies for U.S. Pacific coral reef ecosystems.



# Types of data



# INTEGRATE and ANALYZE

## Turning Data into Information

**data collection**



satellites



instruments

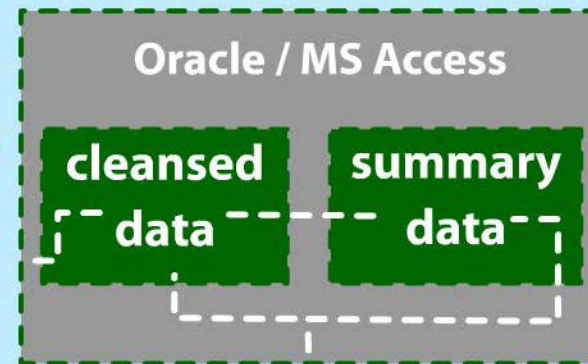


observations

**data QC**



**data storage**



**information**

**distribution**

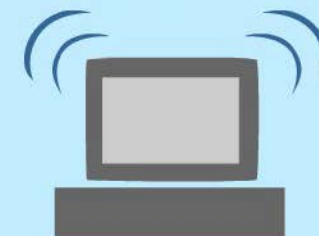
**monitoring & cruise reports**



**peer reviewed publications**



**internet**



# Partnership Projects



NATIONAL GEOPHYSICAL  
DATA CENTER

