

# 2013 Main Hawaiian Islands Reef Assessment and Monitoring cruise

## Overview and preliminary results

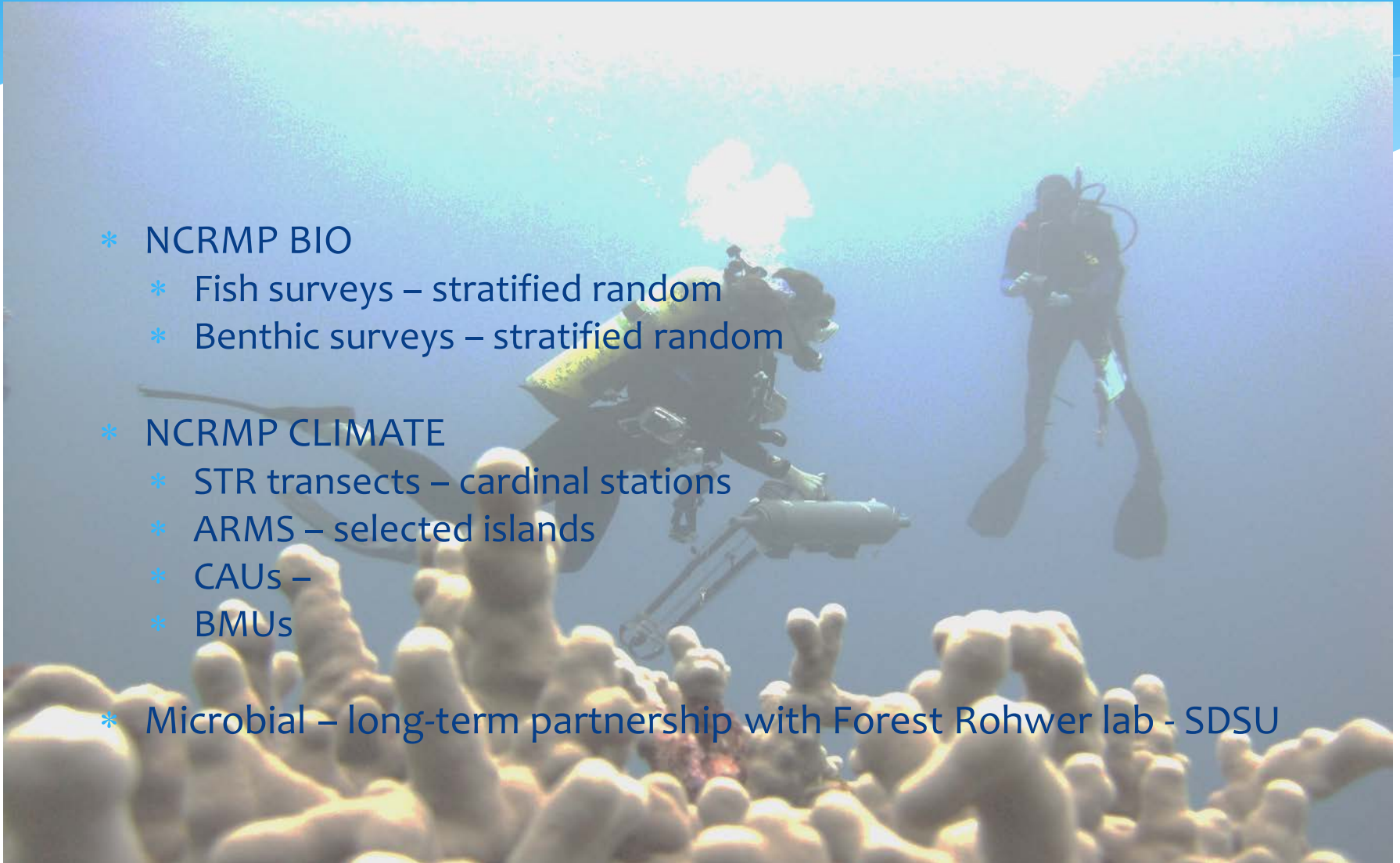
Bernardo Vargas-Ángel

# NCRMP

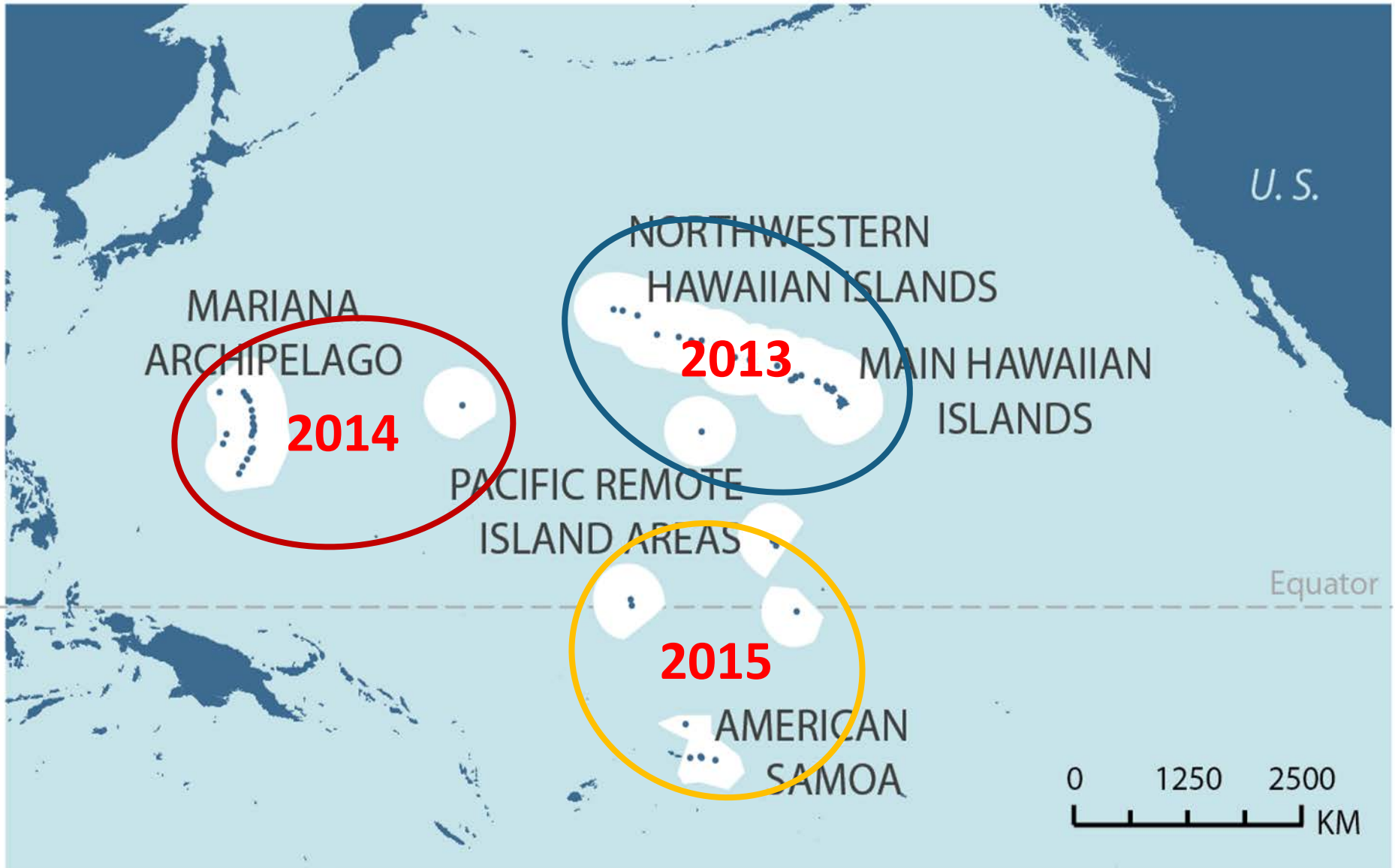
- \* CRCP strategic decision to invest for perpetuity in a NCRMP.
- \* Designed to provide information to assess status and trends.
  - \* - *Status of the living resources*
  - \* - *Assess change over time*
  - \* - *Local threats: overfishing, LBSP, coastal development, invasive species.*
  - \* - *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



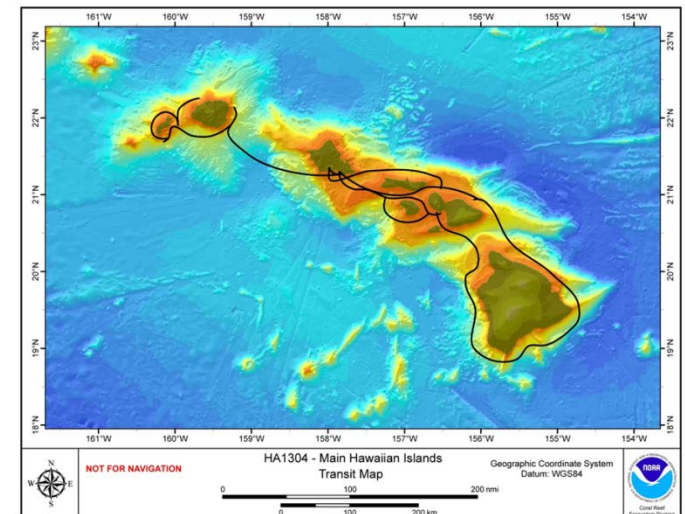
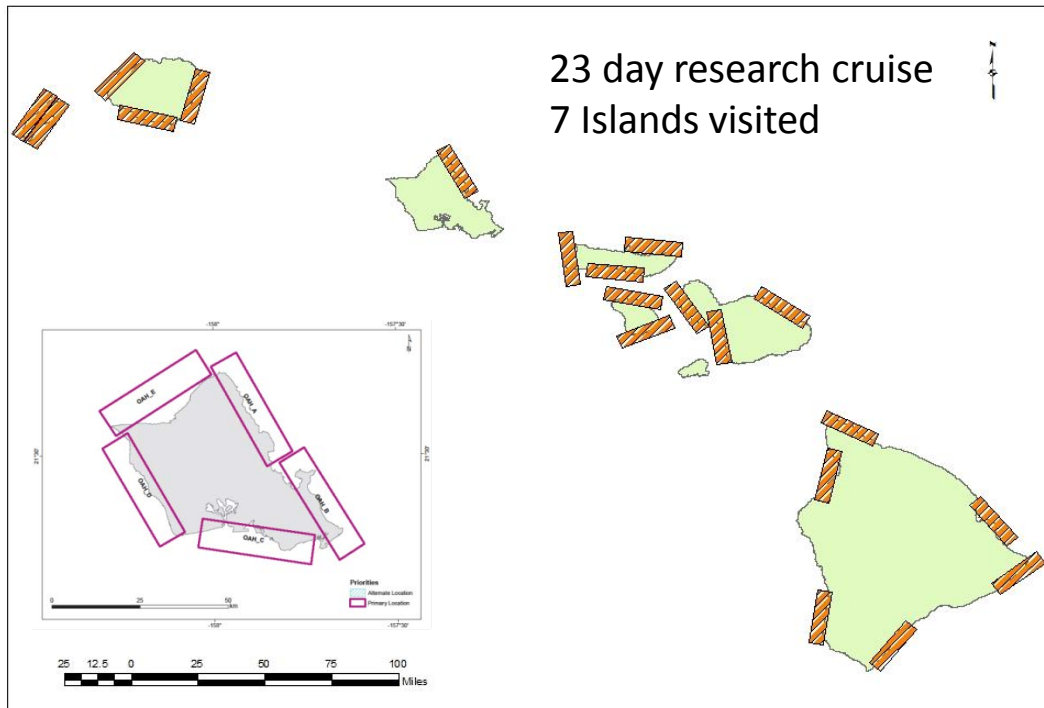
# CRED STUDY AREA



# Operating area

2013 MHIRAMP

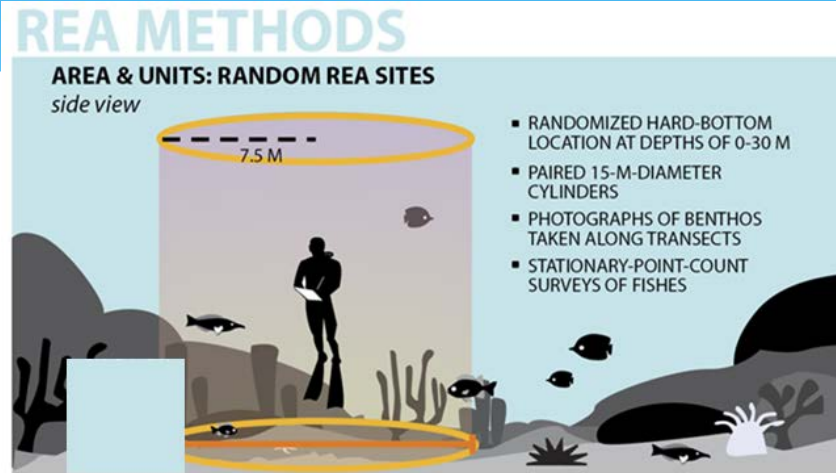
MHI RAMP Cruise - HA1304  
Survey Areas





# Fish surveys

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



# Benthic surveys

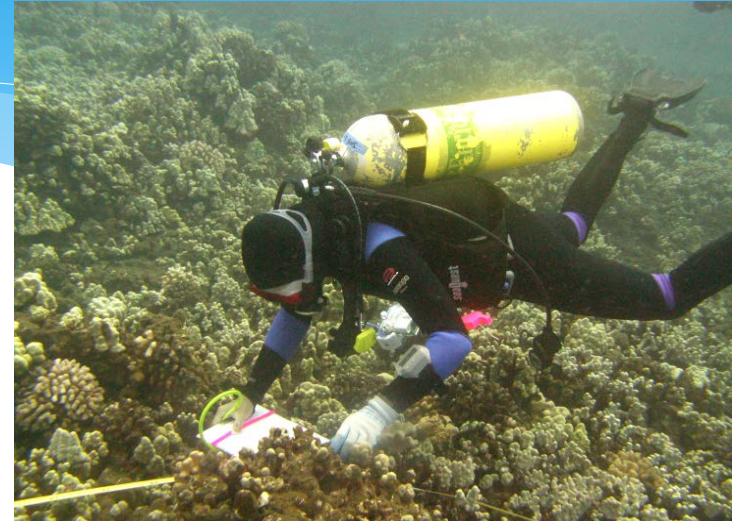
2013 MHIRAMP

## REA METHODS

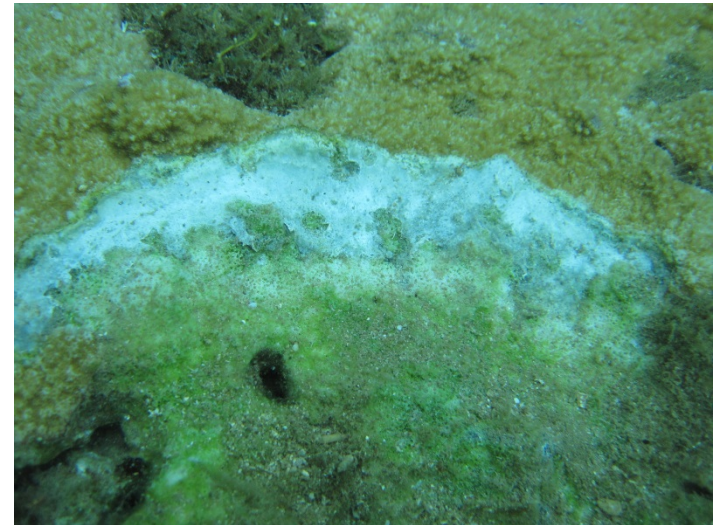
### AREA & UNITS: RANDOM REA SITES

*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

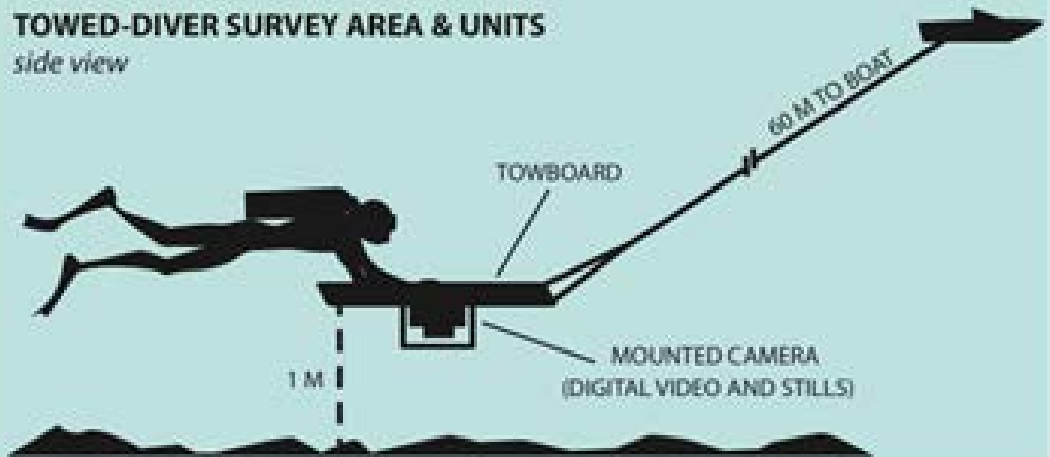
1-Large-scale, benthic habitat assessments at the functional level (hard and soft coral, algae,

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

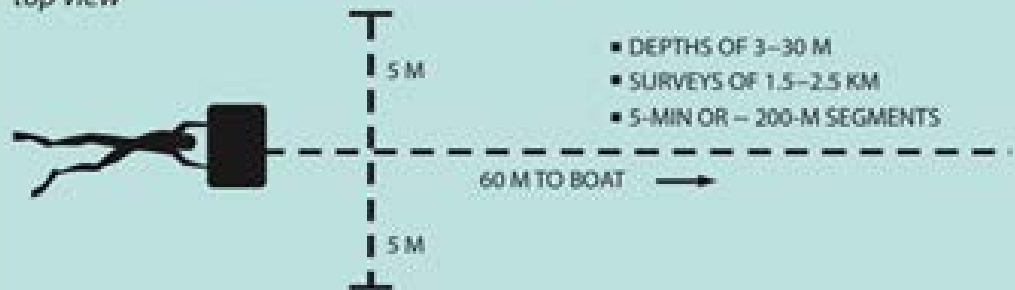
### TOWED-DIVER SURVEY AREA & UNITS

*side view*



### TOWED-DIVER SURVEY AREA & UNITS

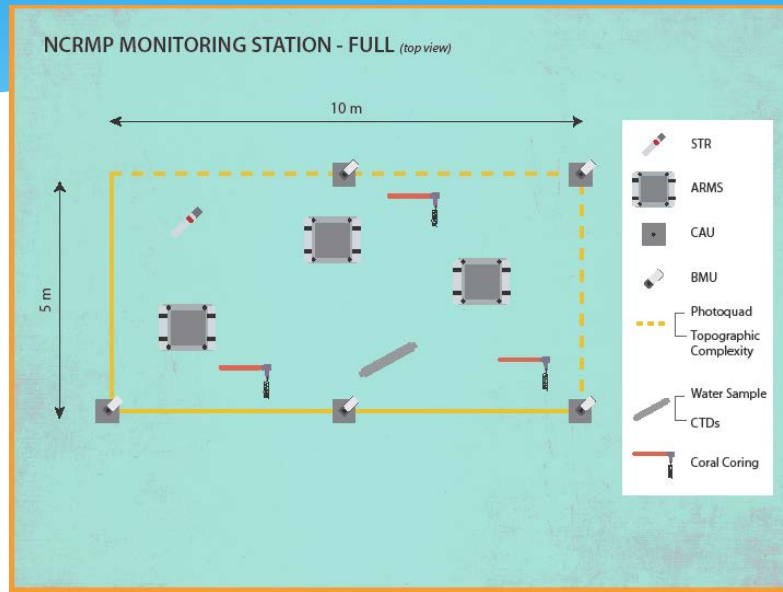
*top view*



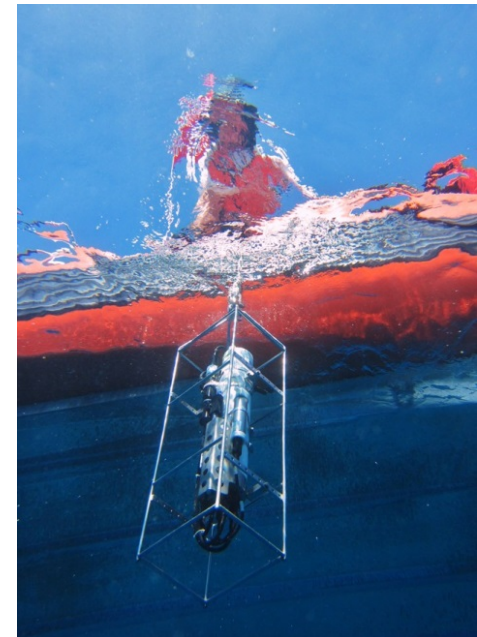


# Instrumentation

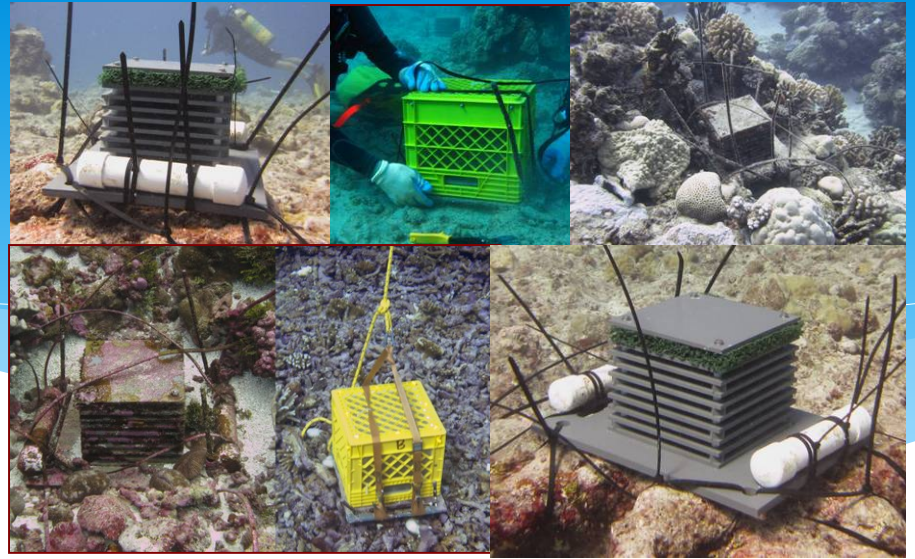
2013 MHIRAMP



- \* 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

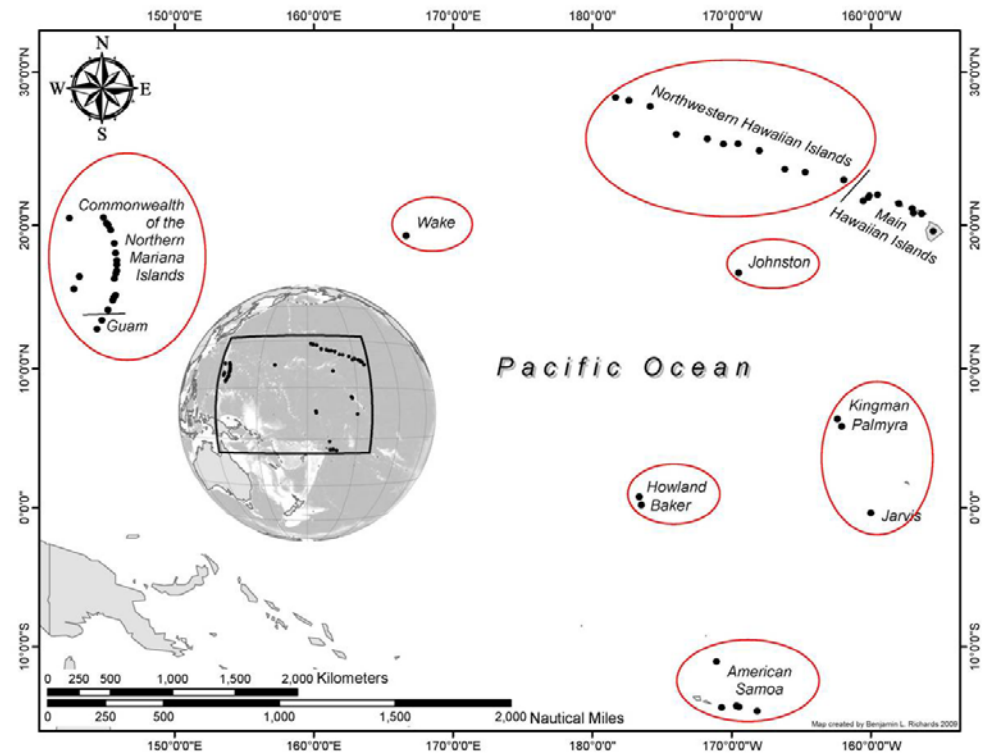
- \* U.S. Pacific:

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

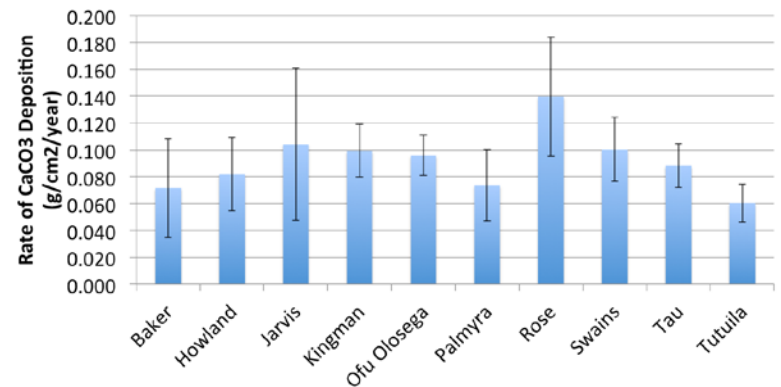


# CAUs

- \* **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



**Mean Rate of CaCO<sub>3</sub> Deposition on Forereef Sites per Island**





# Microbes

2013 MHIRAMP

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

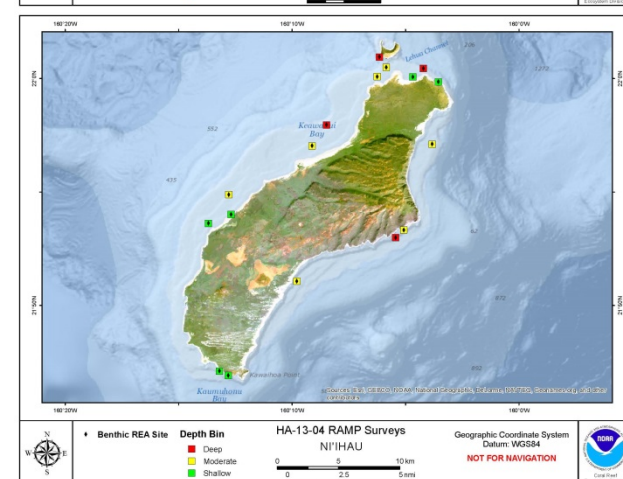
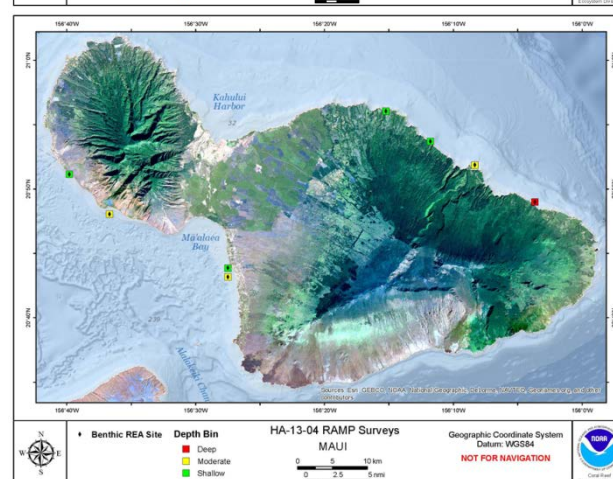
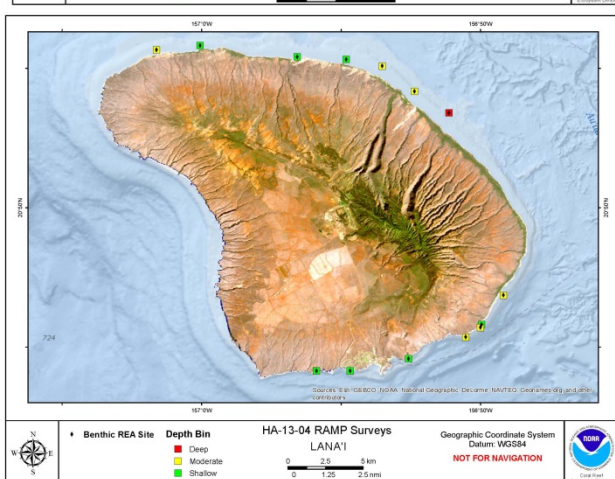
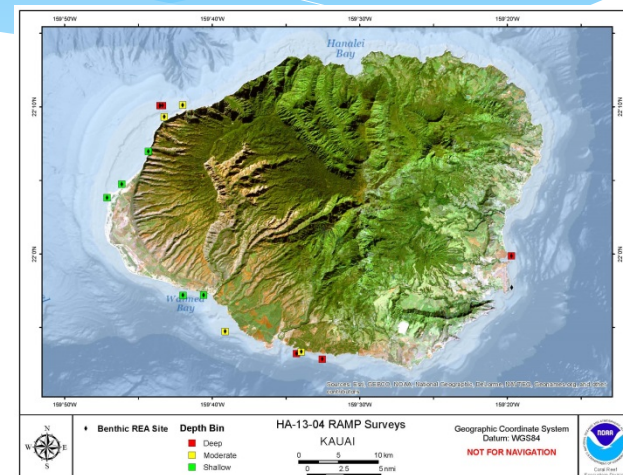
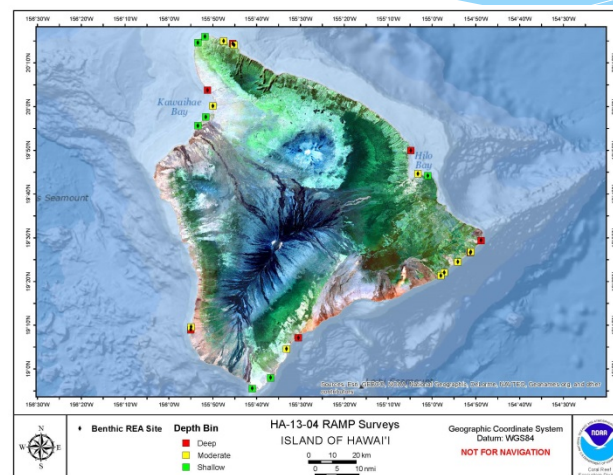
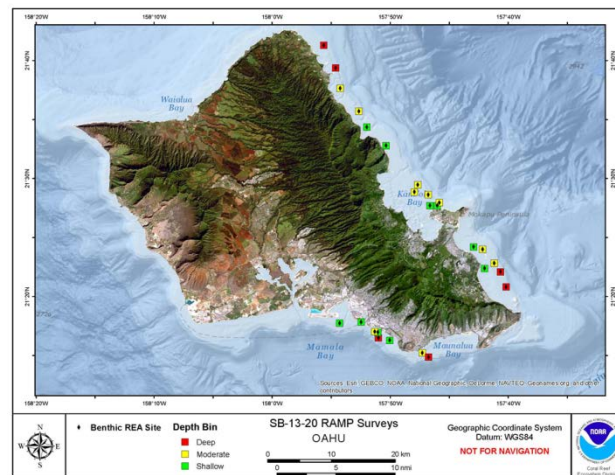




# Accomplishments 2013 MHIRAMP

## MHI RAMP Cruise – HA1304

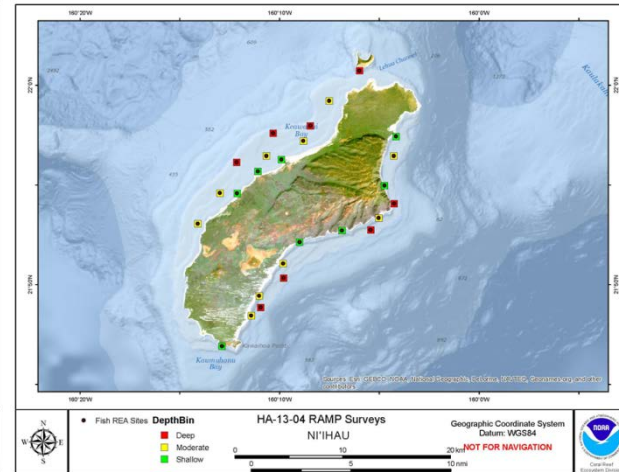
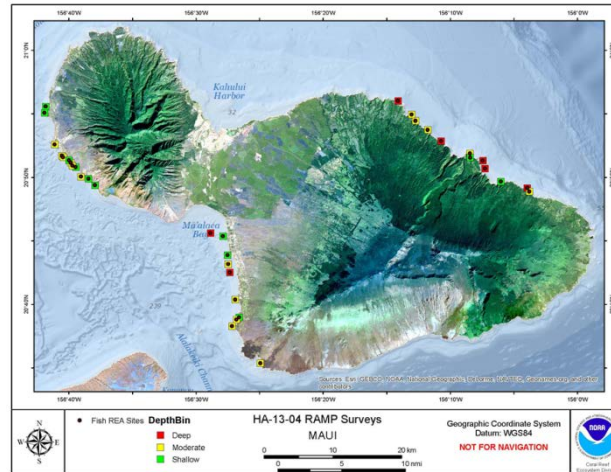
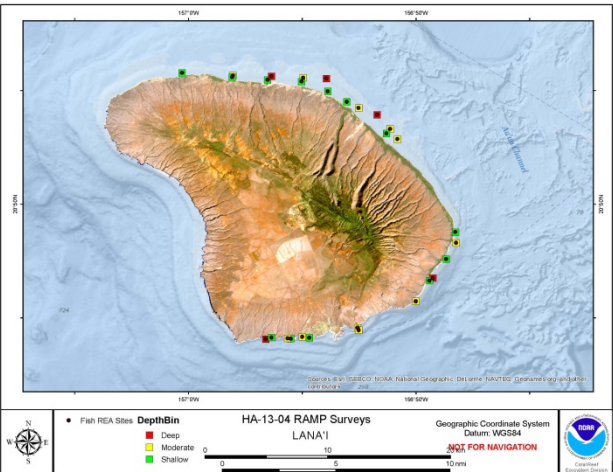
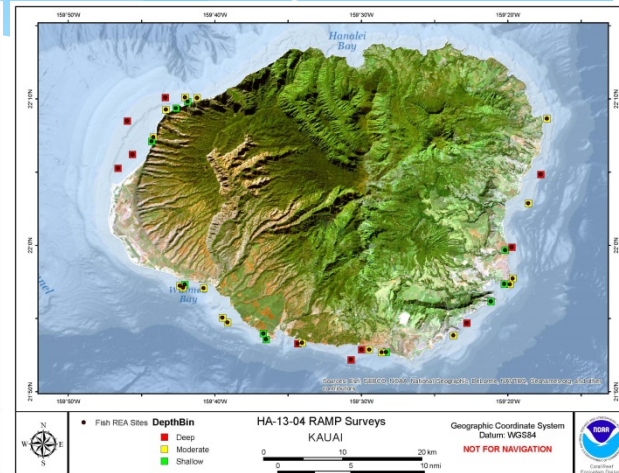
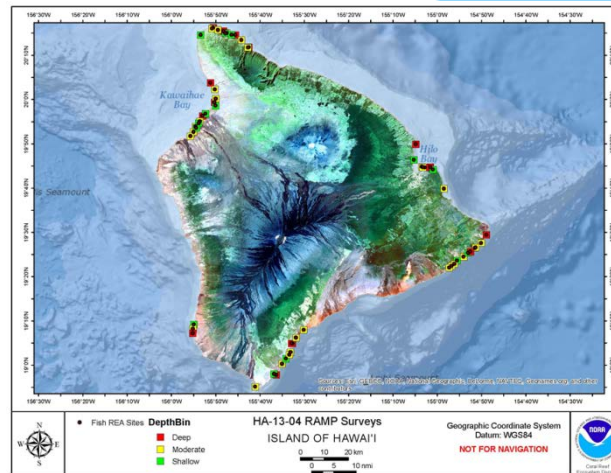
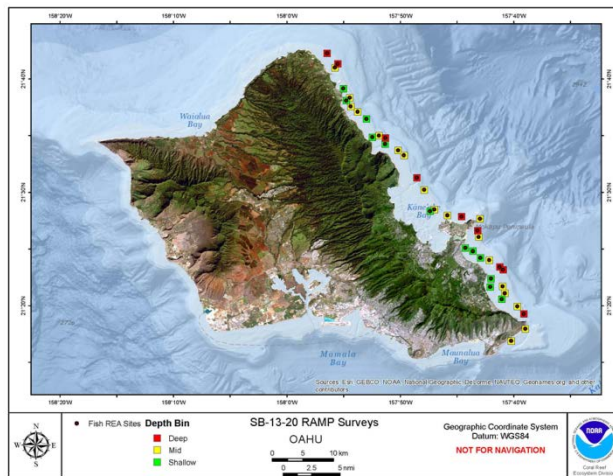
### Benthic surveys





# Accomplishments 2013 MHIRAMP

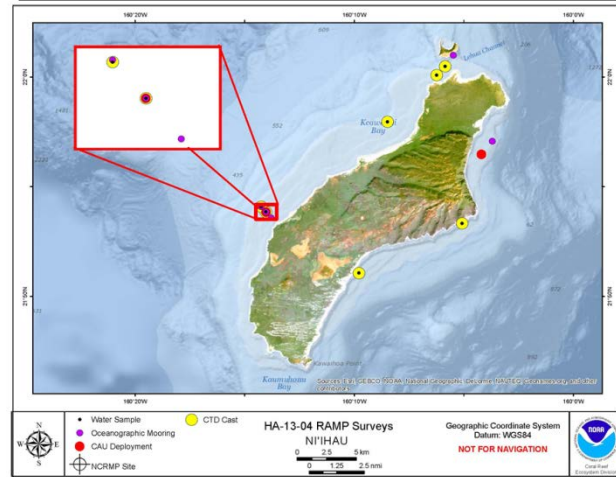
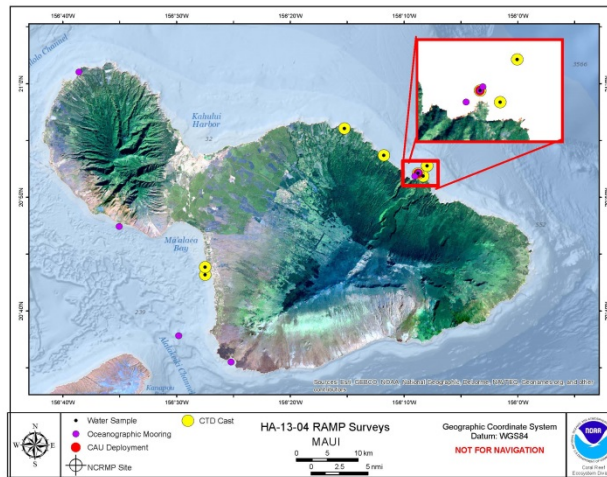
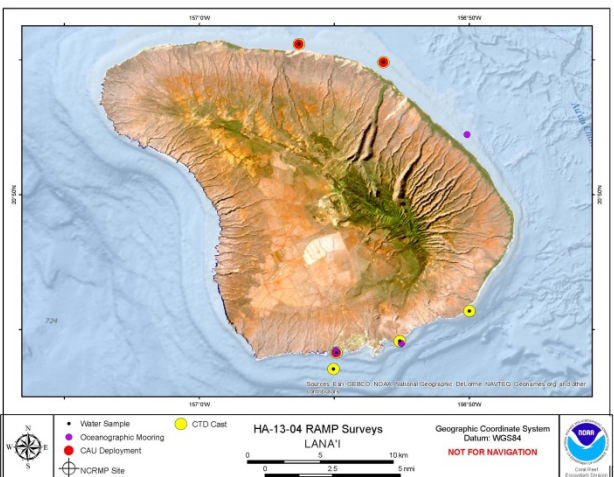
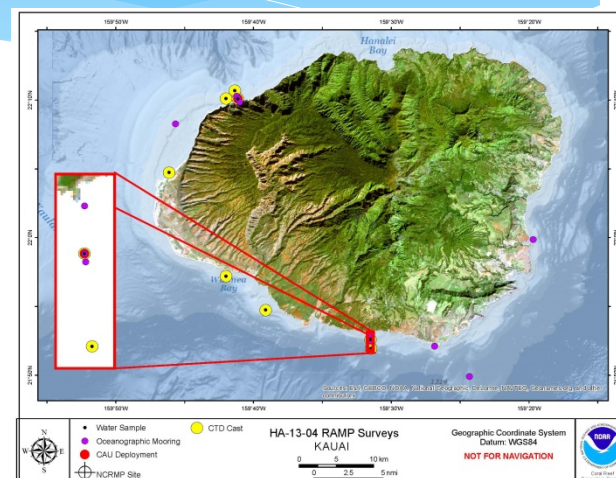
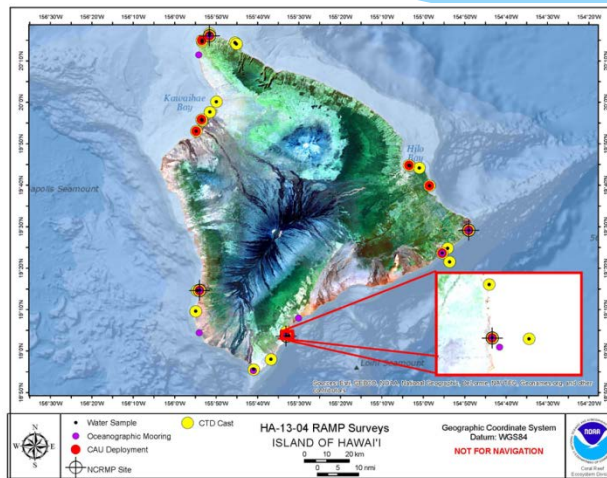
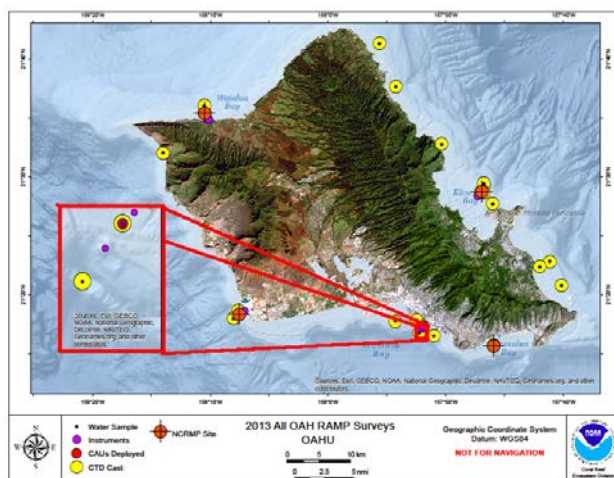
## MHI RAMP Cruise – HA1304 Fish surveys





# Accomplishments 2013 MHIRAMP

## MHI RAMP Cruise – HA1304 Instrumentation



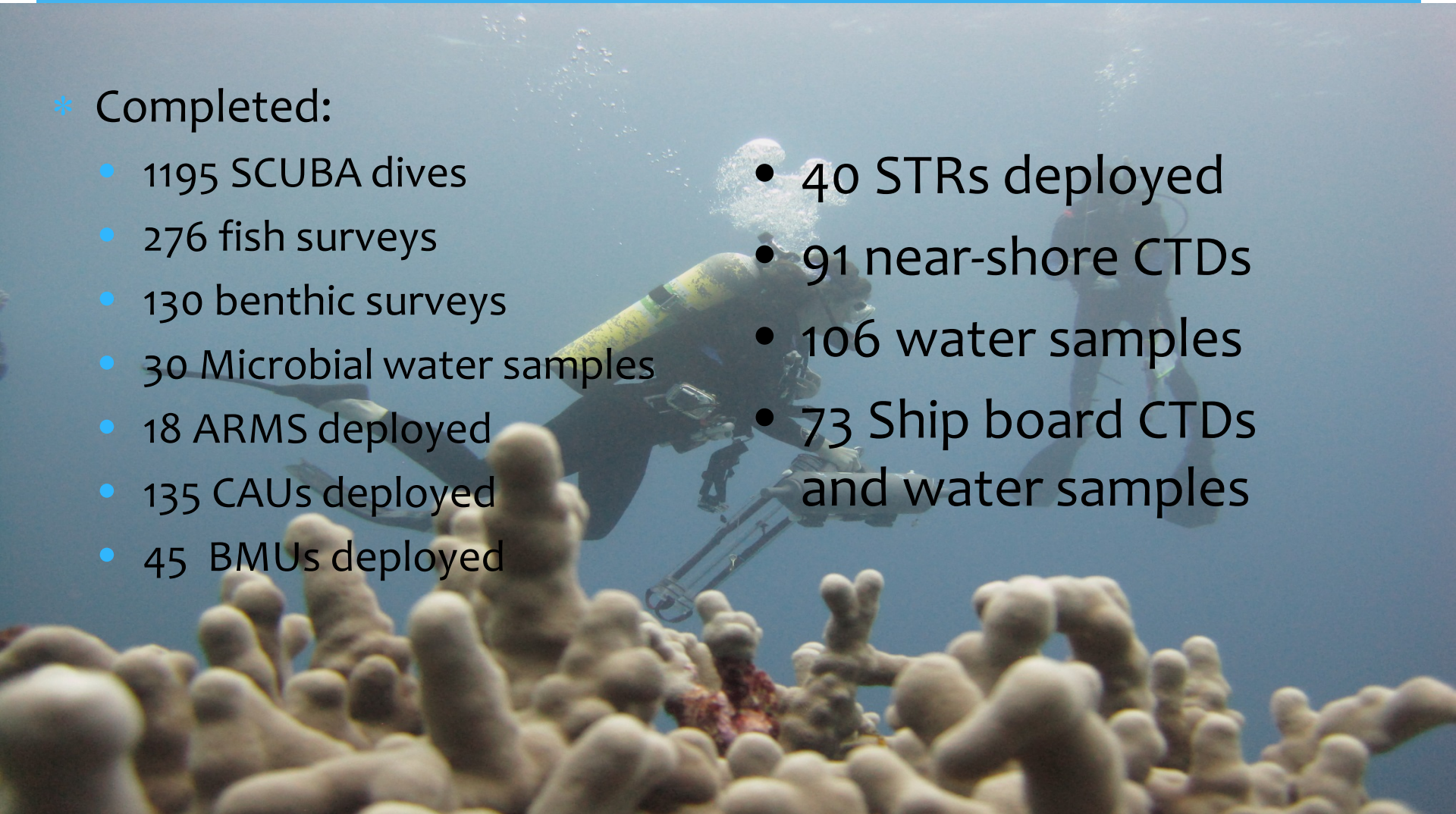


# Accomplishments

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

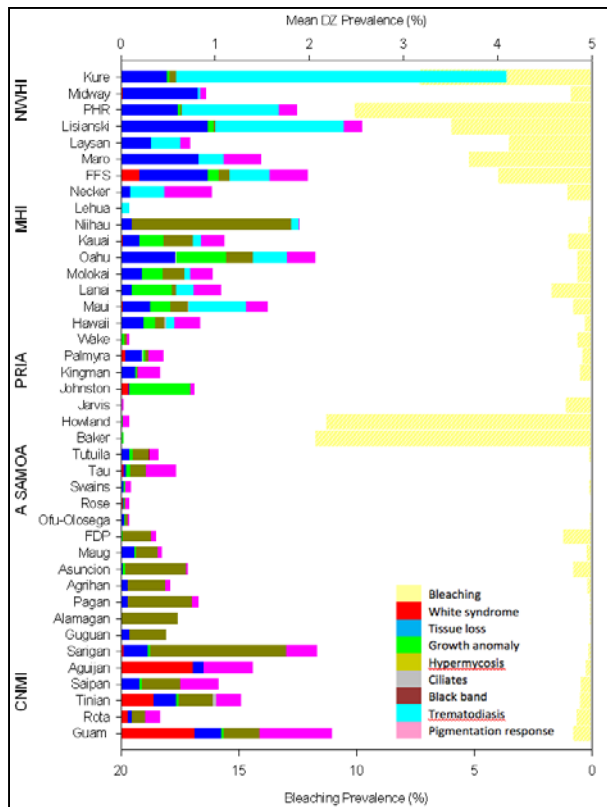




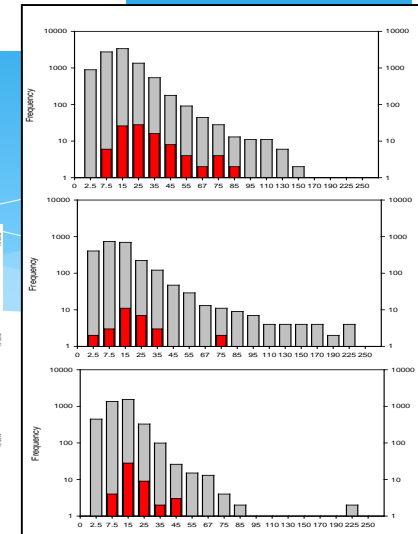
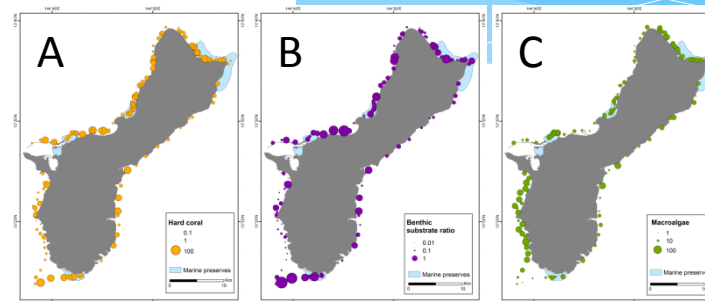
# Types of data

## Coral disease & size class

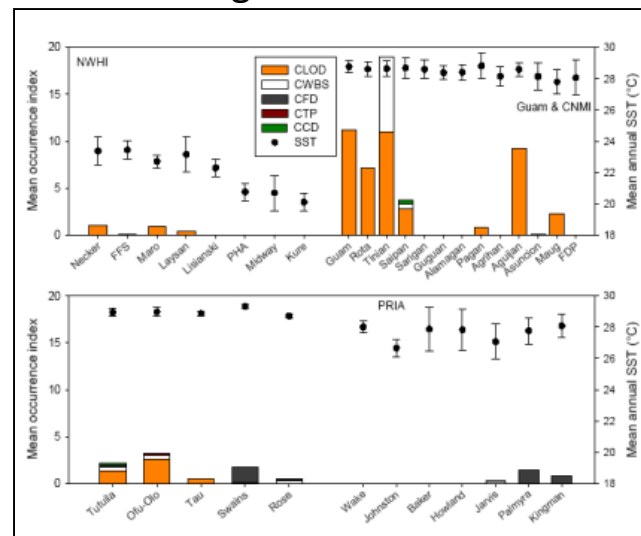
### Coral disease prevalence



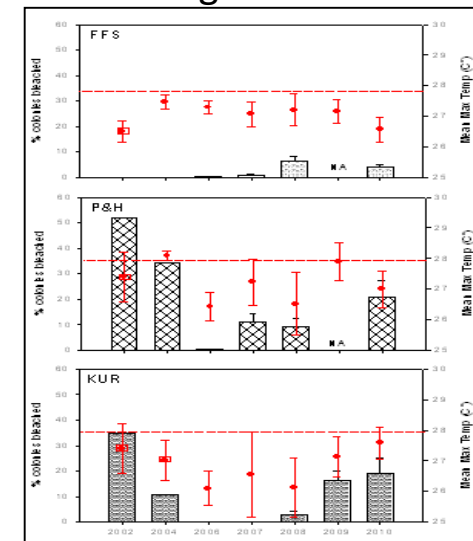
### Benthic cover



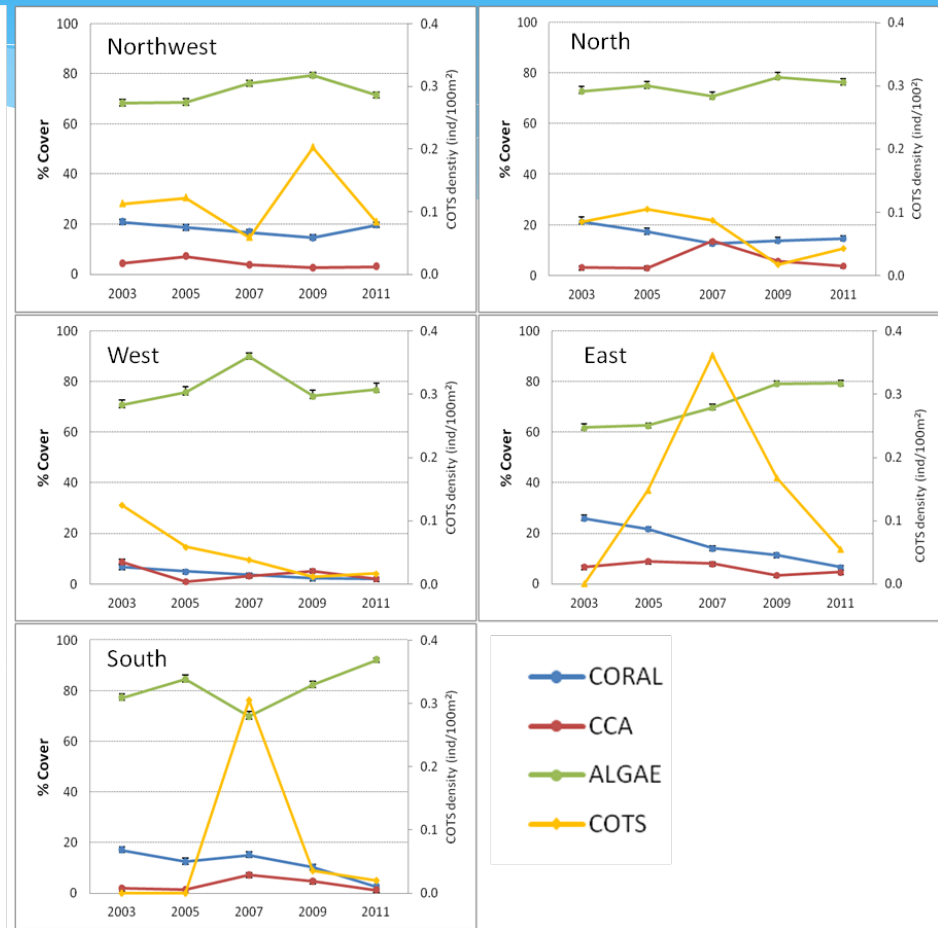
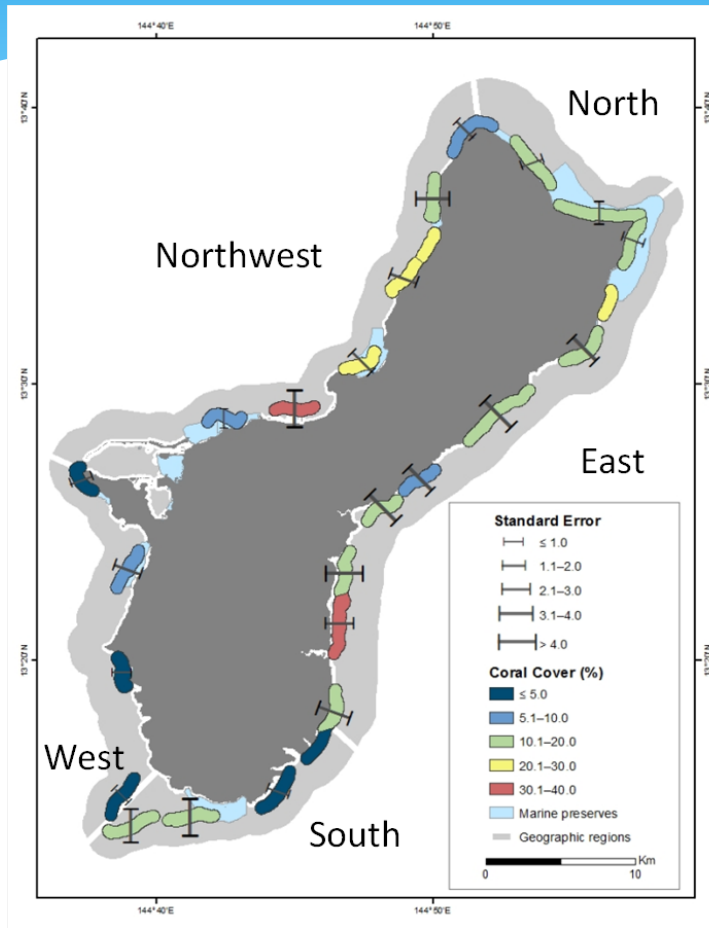
### Coralline algal disease



### Bleaching

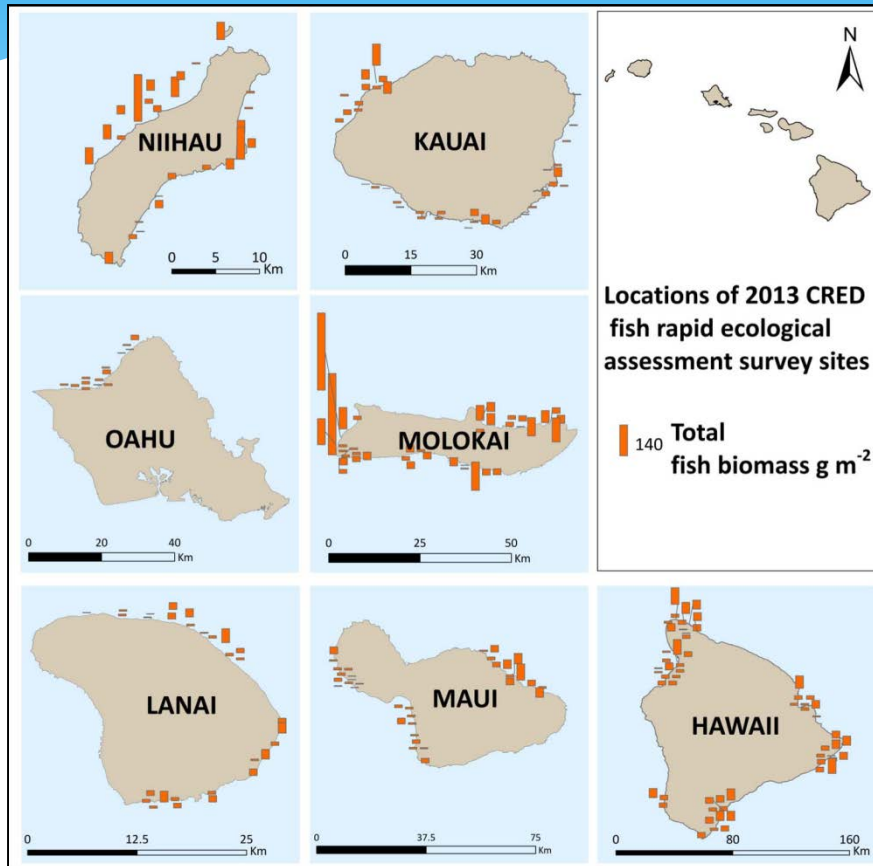


# Types of data

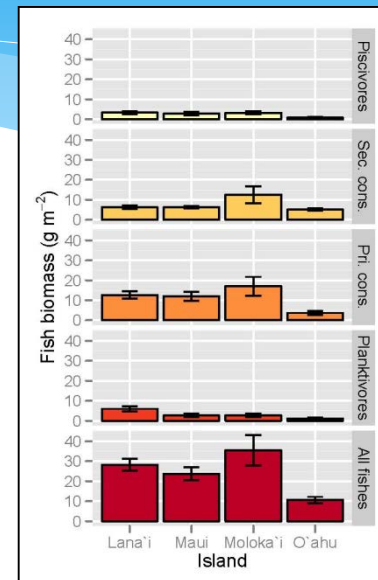


Analysis of legacy-archived towed-diver imagery to support NOAA Blueprint Initiative implementation for Guam

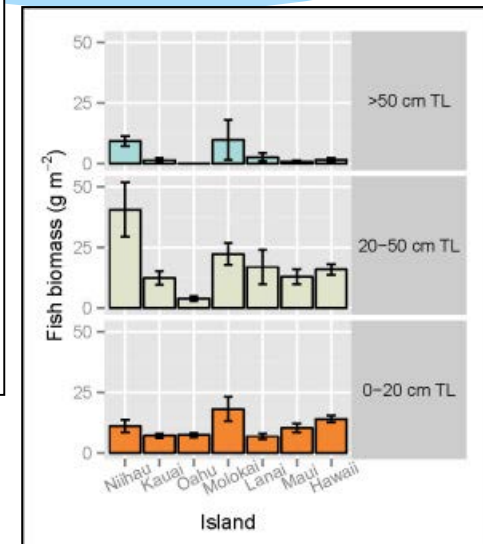
# Types of data



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

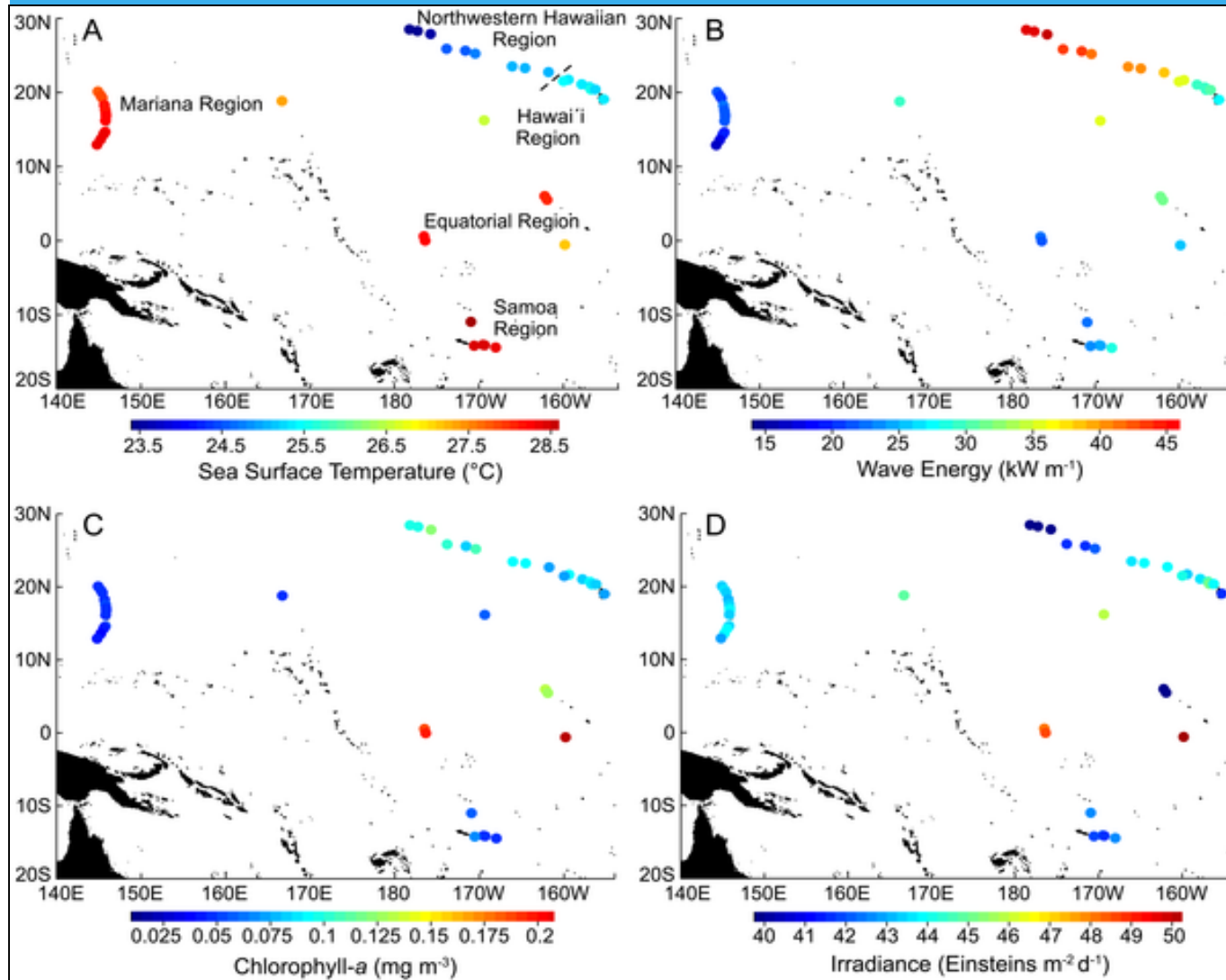


Mean consumer group fish biomass ( $\pm 1$  standard error). Primary consumers are herbivores and detritivores, and secondary consumers are omnivores and invertivores.



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

# Types of data

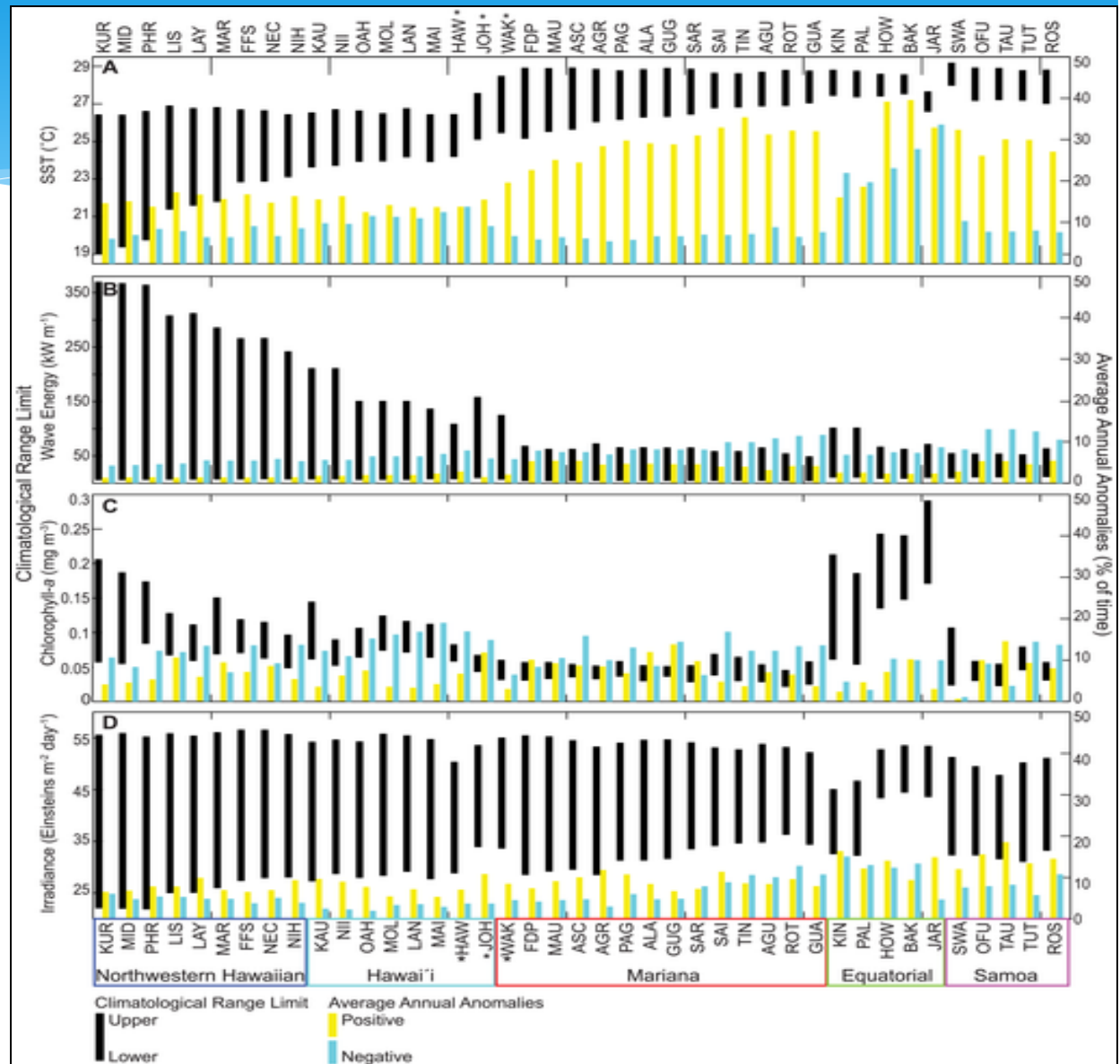


Map of long-term means in A) SST, B) wave energy, C) chlorophyll-a and D) irradiance across each of the regions that comprise the coral reef ecosystems of the U.S. Pacific.

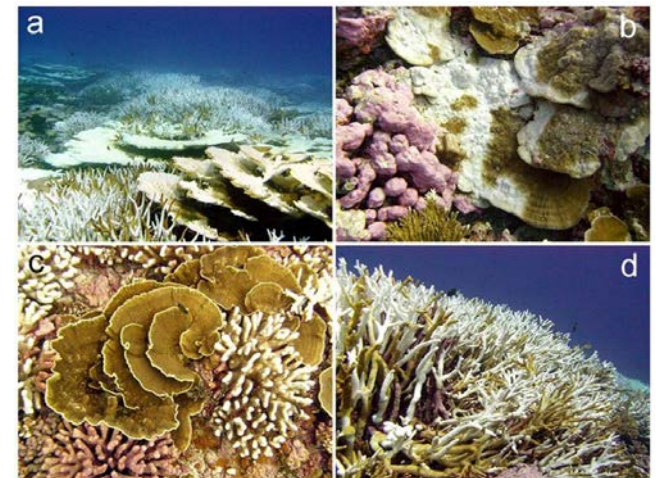
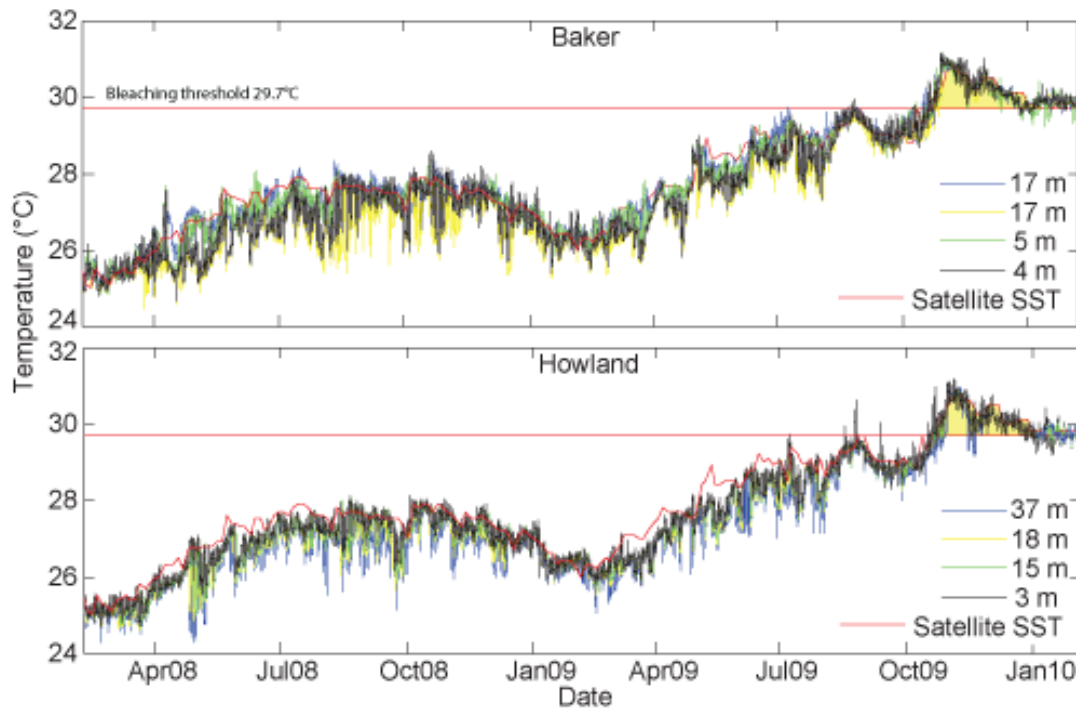
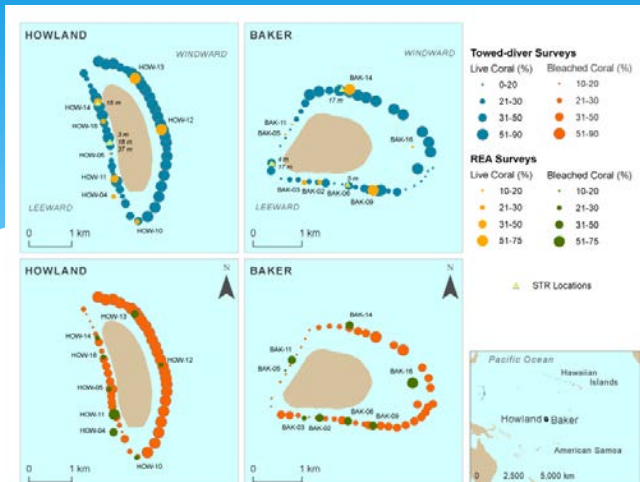


# Types of data

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

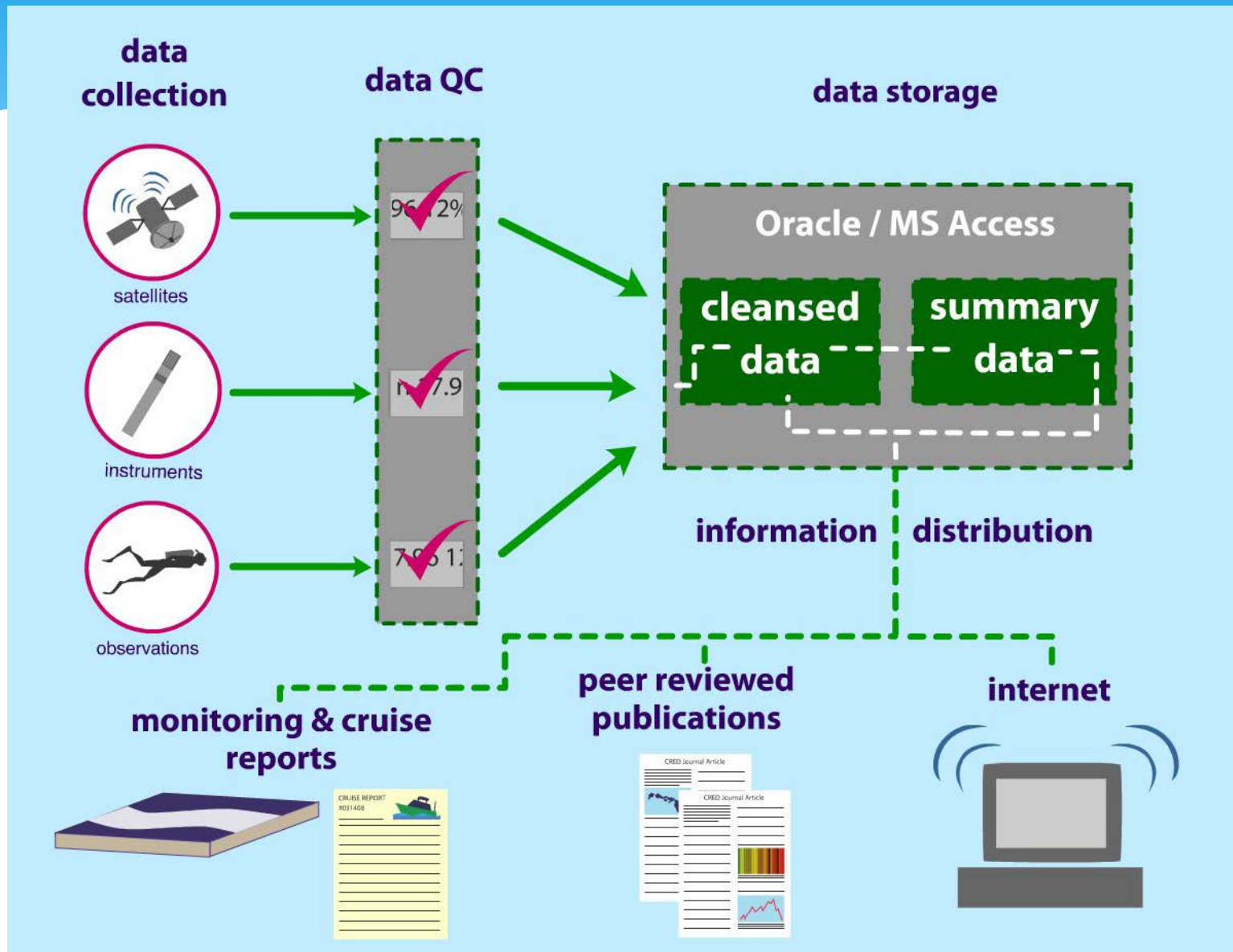


# Types of data



# INTEGRATE and ANALYZE

## Turning Data into Information



# Partnership Projects



NATIONAL GEOPHYSICAL  
DATA CENTER

