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CONSERVATION PROGRAM

# NOAA Coral Reef Ecosystem Division: Integrated Research Overview

Prepared for the Rose Atoll National Marine  
Monument and American Samoa Ecosystem and  
Fisheries Research Workshop

**Bernardo Vargas-Ángel**



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Pago Pago 26 May, 2015



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## Coral Reef Ecosystem Division

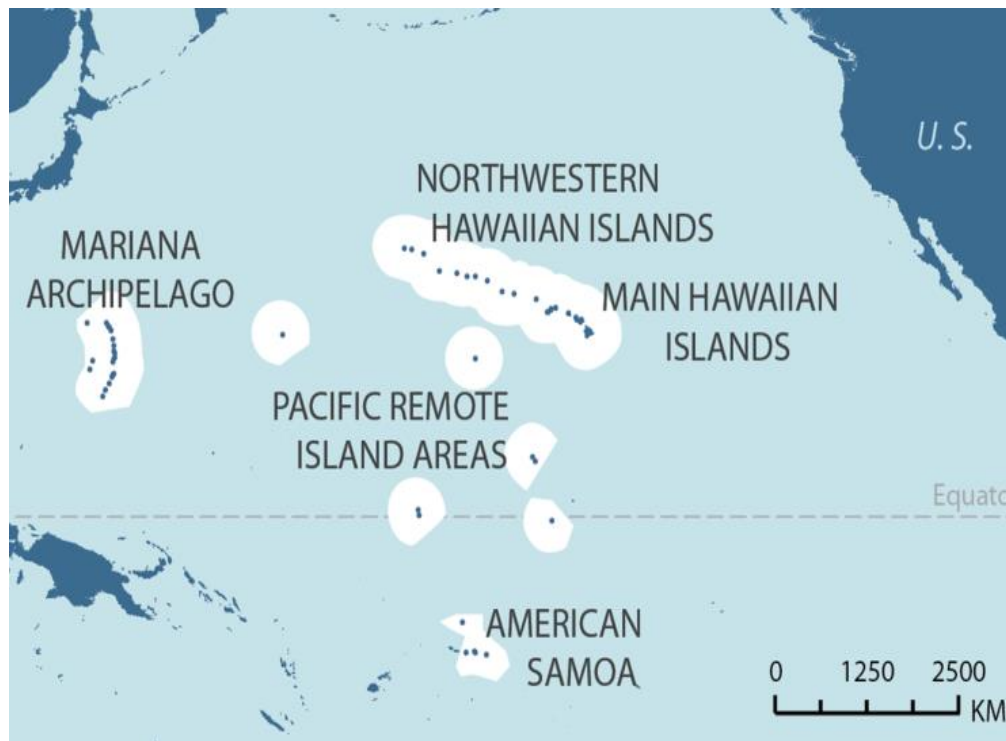
**Mission:** To provide **sound science** to support informed **decision making** for effective **ecosystem-based management and conservation** of coral reef ecosystems and fisheries in the Pacific Islands Region & Internationally



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# CRED: Area of operations and research activities



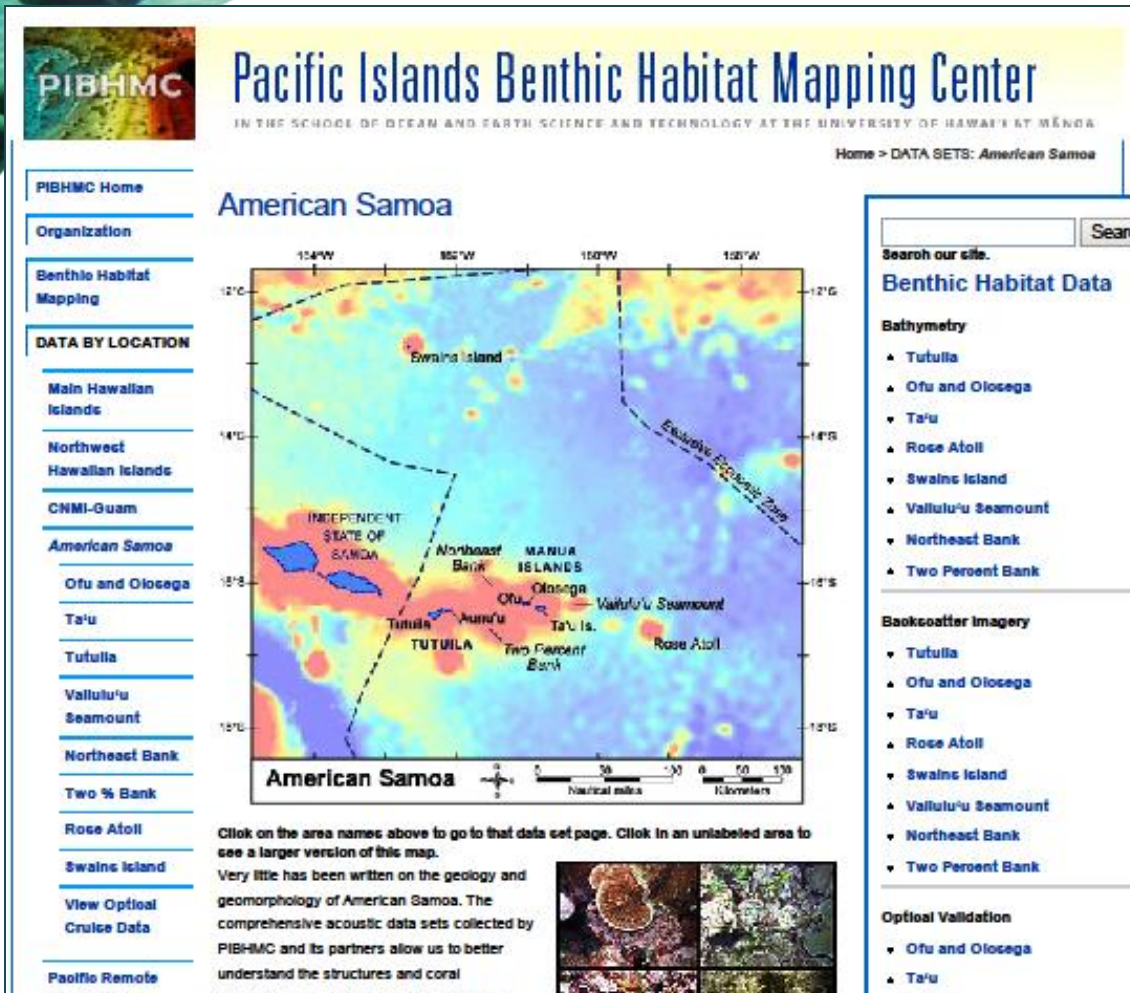
- **Eco-spatial Information: Benthic Habitat mapping**
- **Long-term monitoring:** Abundance, distribution, diversity, and condition of fish, corals, inverts, and microbes
- **Ocean and climate change:** Thermal structure and acidification
- **Management effectiveness:** Integrated ecosystem assessment and management advice
- **Technical assistance and capacity building:** Locally and the Asia-Pacific region



## Data portal

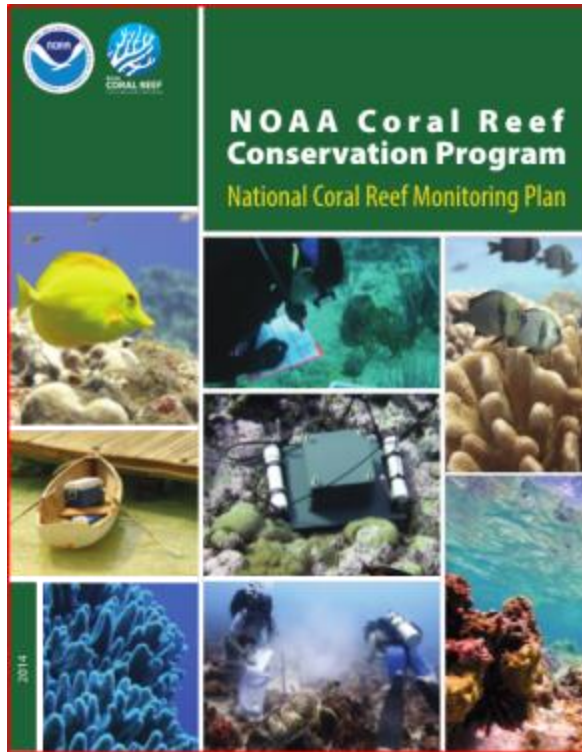
# Ecospatial Information

## Mapping technology



# Long-term Monitoring: National Coral Reef Monitoring Plan

## NCRMP



### Tier 1 - Critical

#### Benthos/ Coral

- Percent cover of benthic organisms/substrate
- Coral condition (*e.g.*, bleaching, disease)
- Abundance and size structure
- Rugosity
- Benthic diversity
- Key species

#### Fish

- Abundance and size structure
- Diversity
- Key species

#### Climate

- Temperature/thermal stress
- Vertical thermal structure
- Carbonate chemistry

#### People

- Participation in coral reef activities
- Knowledge, attitudes, and perceptions of coral reefs and management strategies
- Population changes and distribution
- Economic dependence on coral reefs



# CRED Long-Term Monitoring Mission: Timeline at Rose Atoll and American Samoa

**RAMP:** Reef Assessment and  
Monitoring Program

**ASRAMP:** American Samoa and  
Rose Atoll RAMP

**2002**

1<sup>st</sup> CRED American Samoa RAMP cruise (ASRAMP): Habitat mapping / fish surveys, semi-quantitative coral surveys

**2004**

2<sup>nd</sup> ASRAMP cruise: Added discrete water-quality sampling; corals and algae demographics

**2006**

3<sup>rd</sup> ASRAMP cruise: Added coral disease surveys; carbonate chemistry, DIC, TA and nutrients

**2008**

4<sup>th</sup> ASRAMP cruise: Updated fish surveys: increased “n”, added stratified random sampling design and expanded depth range to 30 m;

**2010**

5<sup>th</sup> ASRAMP cruise: added coral coring, carbonate accretion rate studies, ARMS, and microbial studies

**2012**

6<sup>th</sup> ASRAMP cruise: Normal operations

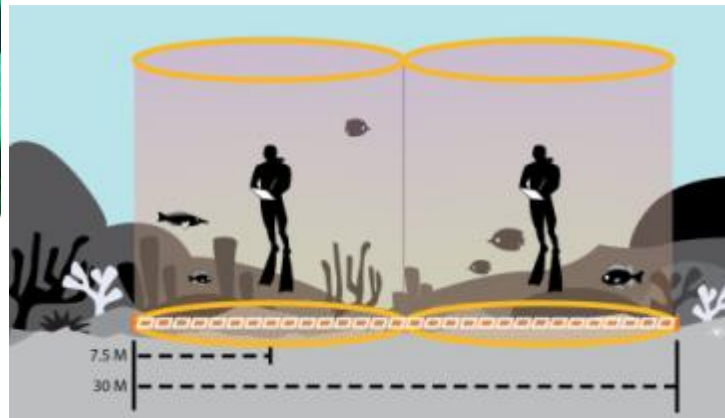
**2015**

7<sup>th</sup> ASRAMP cruise: Commenced 3-yr cycle. Updated coral surveys; increased “n”, added stratified random sampling design and expanded depth range to 30 m. Expanded multi-beam mapping



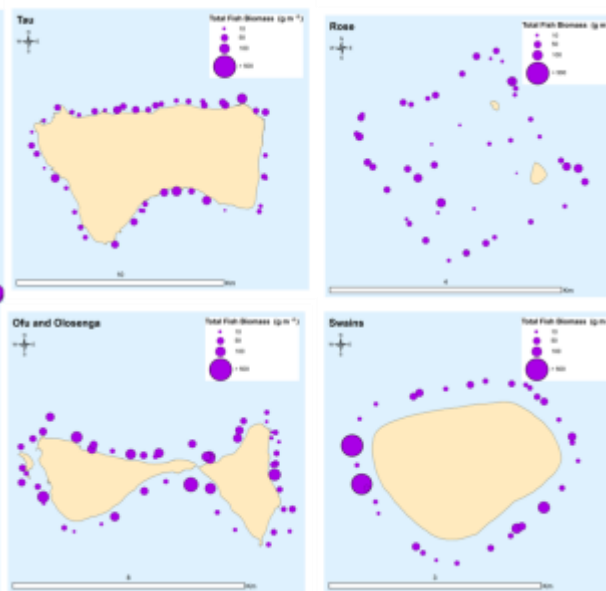
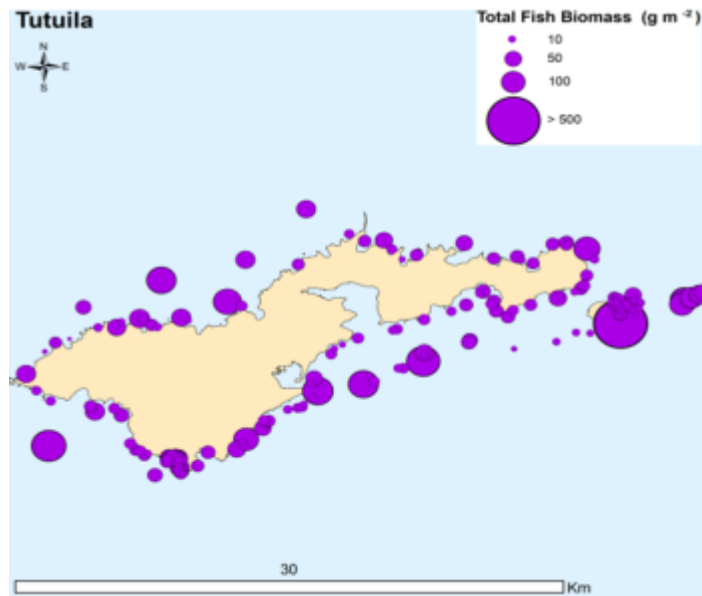


# Long-term Monitoring: Reef Fishes

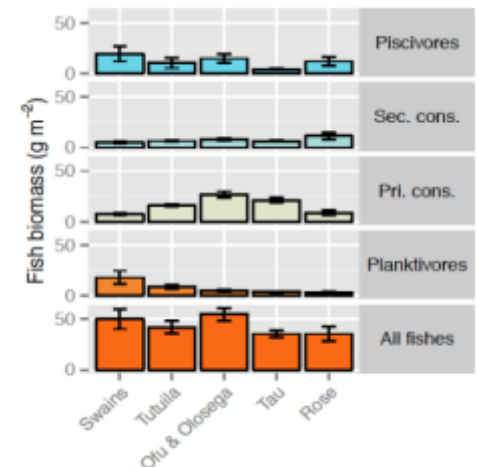


## Data Collection:

- Stationary-Point-Count
- Paired 15-m diameter cylinders: fish species ID and sizes
- Randomized hard-bottom location at depths of 0-30m
- Stratified-random based on depth (0-6m, 6-18m, 18-30m)
- Habitat Data: Complexity, urchin density, benthic cover



## Fish biomass



# Long-term Monitoring: Reef Corals

## REA SURVEY AREA & UNITS

side view

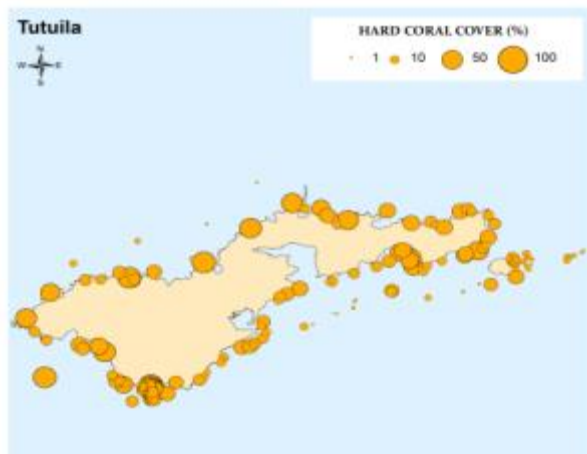
- DEPTHS OF 10-20 M
- SURVEYS ALONG 2-3 TRANSECTS OF 25 M
- VARIOUS SAMPLING UNITS ALONG TRANSECTS



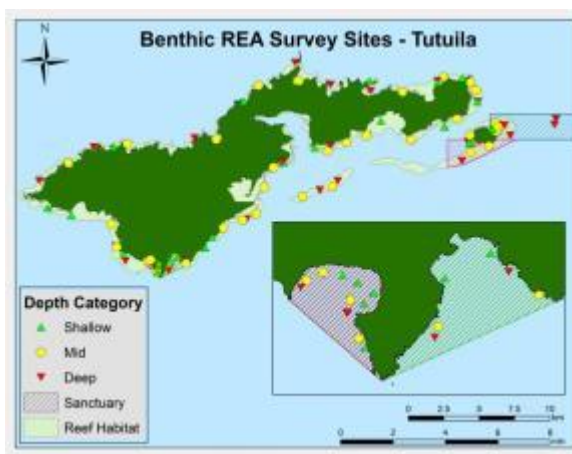
## Data Collection:

- Belt transects
- Randomized hard-bottom location at depths of 0-30m
- Stratified-random based on depth (0-6m, 6-18m, 18-30m)
- Adults (> 5cm) 2 x 10 m<sup>2</sup> belt transect: size, condition, disease
- Juveniles (< 5cm) 2 x 3m<sup>2</sup> belt transects: size
- Benthic cover: 2 x 15 photo-quadrats

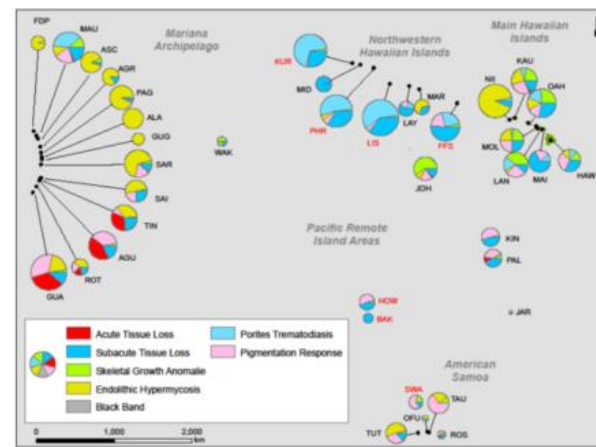
## Benthic percent cover



## Coral colony density



## Coral condition and disease



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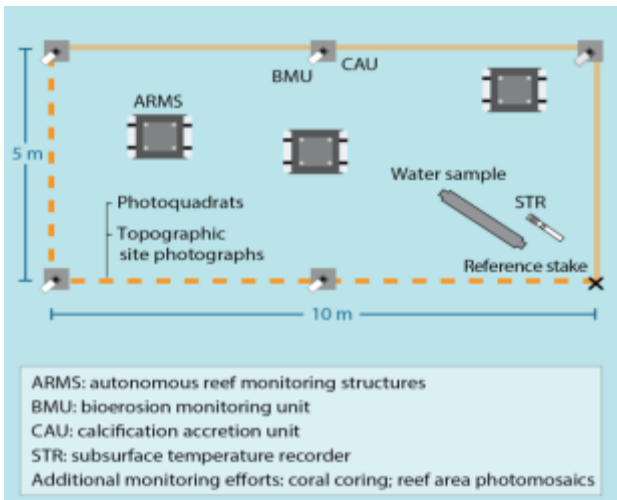
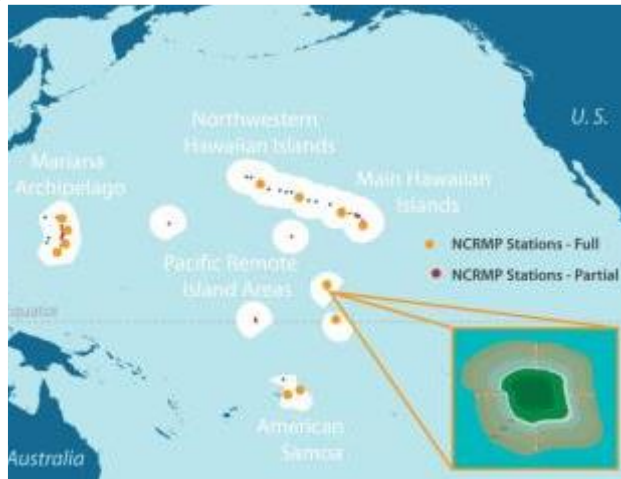
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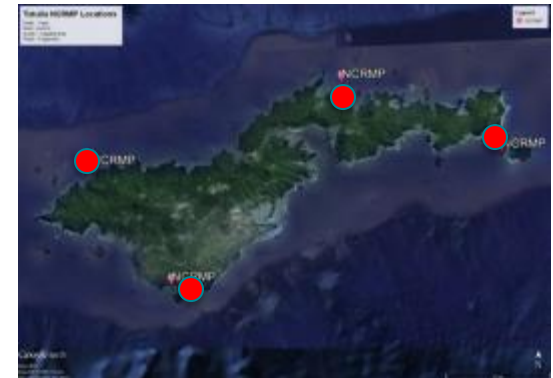
# Ocean and Climate Change

## Data Collection:

- Temperature, thermal stress and vertical structure
- Carbonate chemistry: DIC, pH, TA, Salinity
- Carbonate accretion: CAUs and BMUs
- Calcification: Coral coring
- Cryptic biodiversity: ARMS



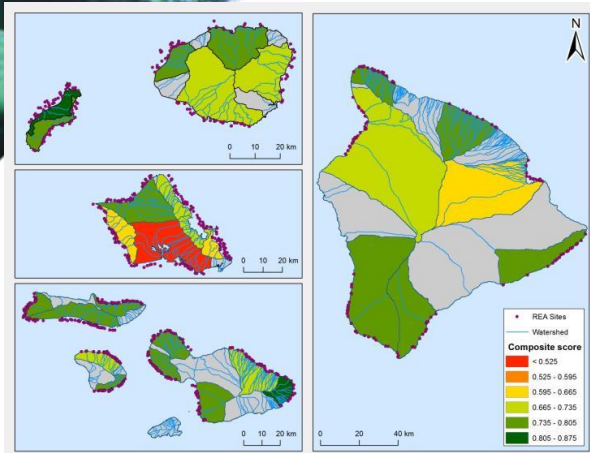
## NCRMP Climate Stations in American Samoa



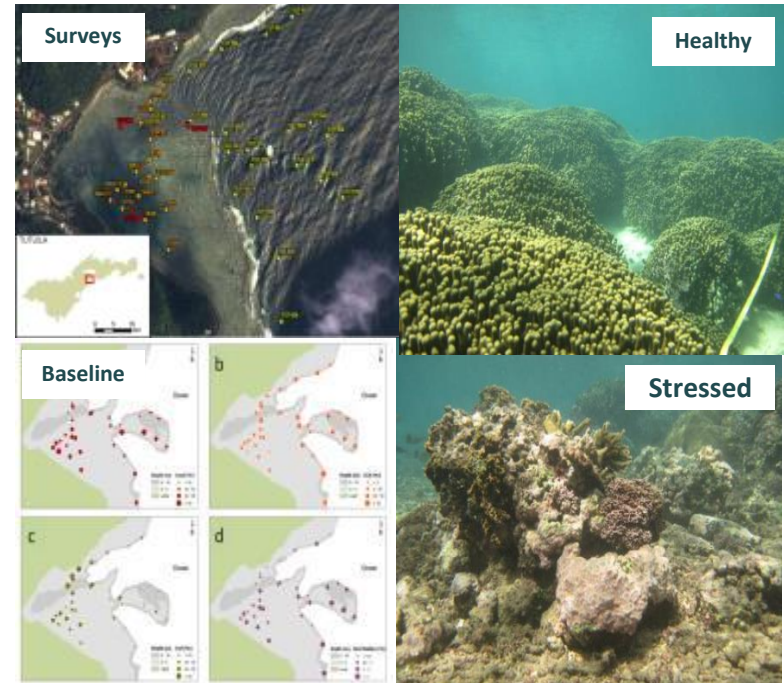
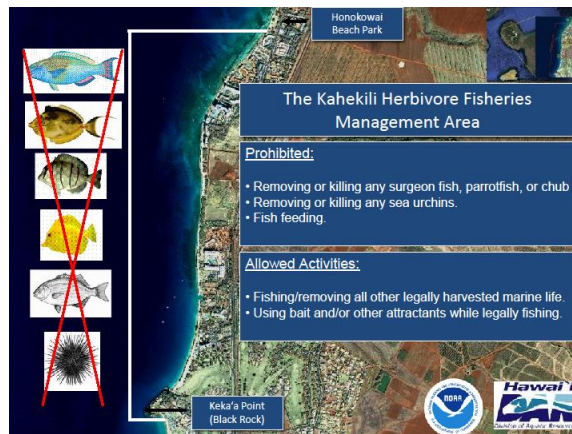
## Reef Resilience Potential

# Management Effectiveness and Support of Local Action Strategies

Baseline LBSP – Faga’alu and Vatia



## Herbivore Fisheries Exclusion Management Area - Kahekili



# Technical Assistance and Capacity Building

## Benthic Monitoring Training Workshop



### Coral Reef Ecosystem Benthic Assessment and Monitoring Training Workshop

#### -Agenda-

Pago Pago November 18-21, 2014  
Tauese P. F. Sunia Ocean Center

#### Workshop Objectives

- 1- Provide a detailed overview of an ecosystem-scale, survey design approach for coral population and benthic community structure assessment and monitoring
- 2- Present an overview of protocols and training for collection of coral demographic and benthic community structure metrics
- 3- Provide a framework for protocol implementation and data analysis



## Scientific support to coral critical habitat designation of protected species



NOAA Τεχνική Μετα-οργάνωση NMME ΠΙΛΟΤ

Σεπτέμβριος 2011

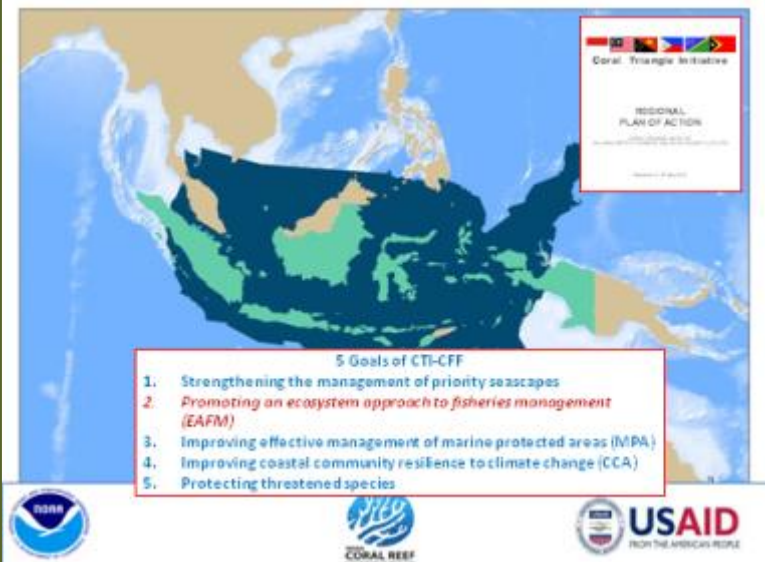
### Status Review Report of 82 Candidate Coral Species Petitioned Under the U.S. Endangered Species Act



Russell E. Brainard, Charles Birkeland, C. Mark Eakin,  
Paul McElhany, Margaret W. Miller, Matt Patterson,  
and Gregory A. Piniak

Παράρτημα 1: Κατάλογος των 82 υποψηφίων ειδών κοραλλιών.  
National Marine Fisheries Service  
National Oceanic and Atmospheric Administration  
U.S. Department of Commerce

## Promoting an ecosystem approach to fisheries management Coral Triangle



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# Acknowledgements

- Local Marine Resource Management Agencies for allowing us to conduct work in the Territory
  - Coral Reef Advisory Group (CRAG)
  - American Samoa Department of Marine and Wildlife Resources (DMWR)
  - National Marine Sanctuary of American Samoa (NMSAS)
  - National Park of American Samoa (NPAS)
  - Rose Atoll Marine Nat'l Monument and Wildlife Refuge (USFWS)
  - American Samoa Department of Commerce (ASDOC)
  - American Samoa Community College (ASCC)
  - Jurisdictional Liaisons: Gataivai Talamoa, Fatima Sauafea-Leau, and Hideyo Hattori
- San Diego State University (SDSU)
- Scripps Institution of Oceanography (SIO)
- University of Hawaii (UH)
- Woods Hole Oceanographic Institute (WHOI)
- NOAA Pacific Islands Fisheries Science Center (PIFSC)
- NOAA Pacific Regional Office (PIRO)
- Officers and crew members of the NOAA Ship *Hi'ialakai*



# Questions ?

