

# Mapping Coral Reef Ecosystems in the Main Hawaiian Islands

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NOAA Pacific Islands Fisheries Science Center  
NOAA Coral Reef Conservation Program



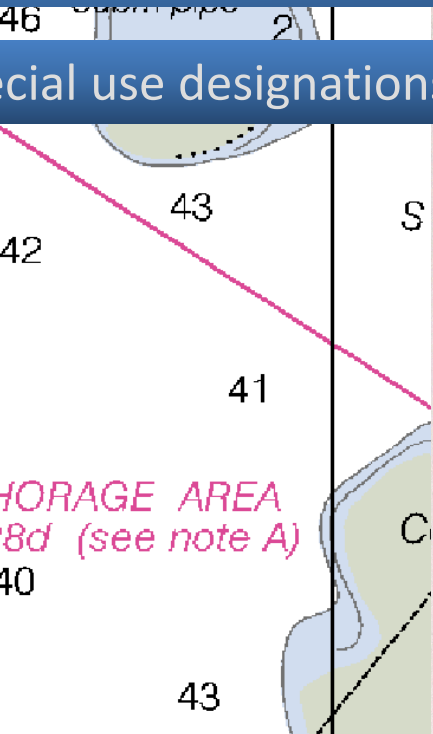
# Benthic Habitat Mapping of Coral Reef Ecosystems in the Main Hawaiian Islands

1. Why map, & how?
2. Previous accomplishments
3. Planned & potential projects for FY14 and beyond
4. Discussion - how can we help you?



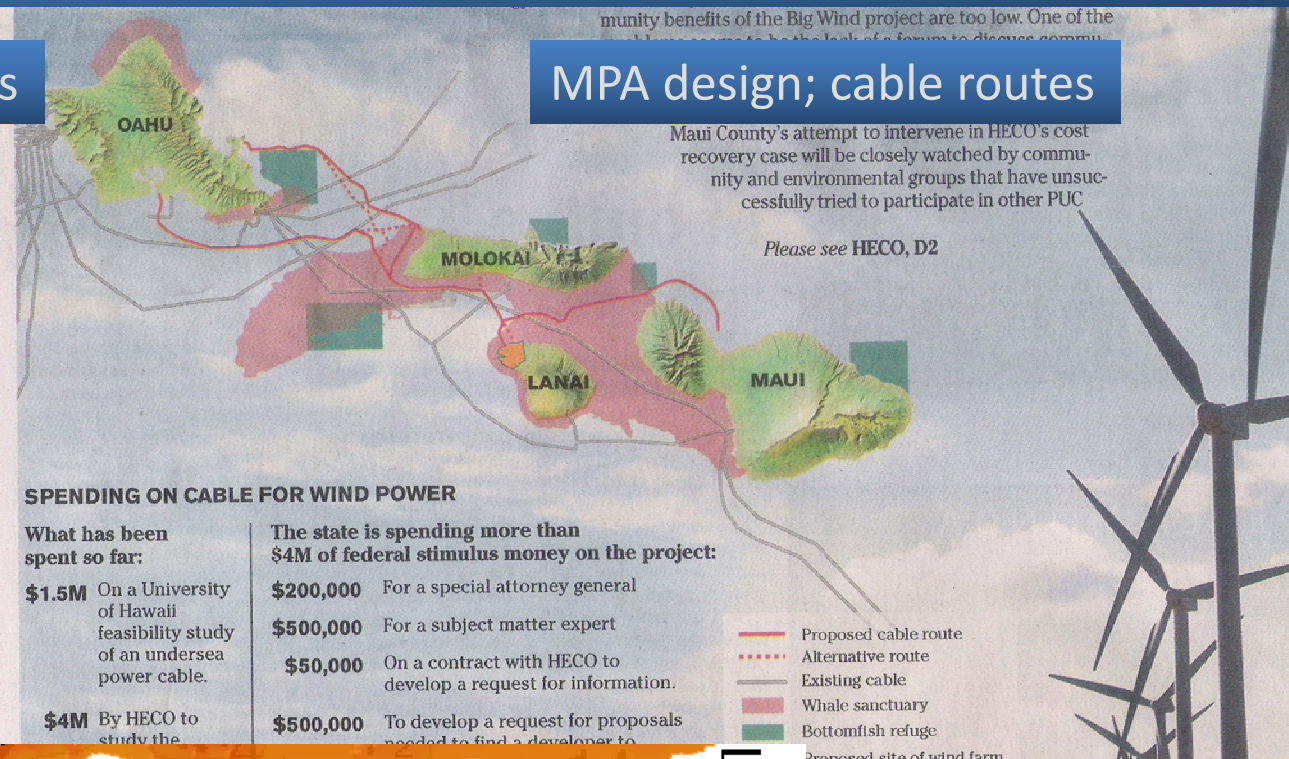
# Maps – critical tools for spatial planning and management

Special use designations

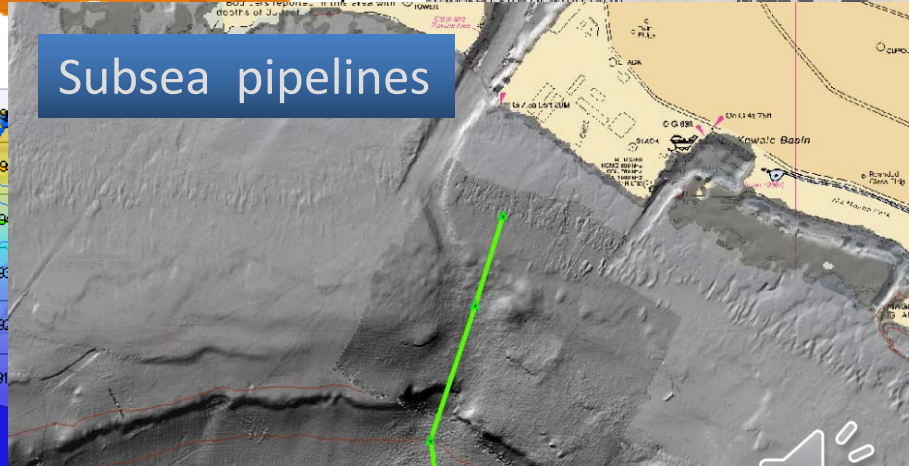


STORAGE AREA  
8d (see note A)

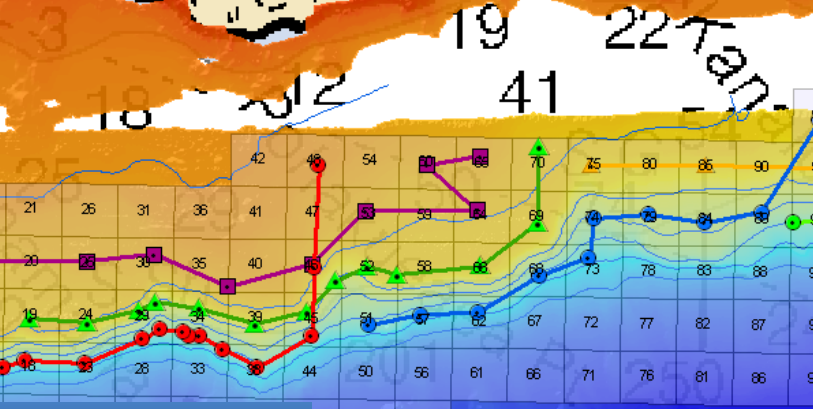
MPA design; cable routes

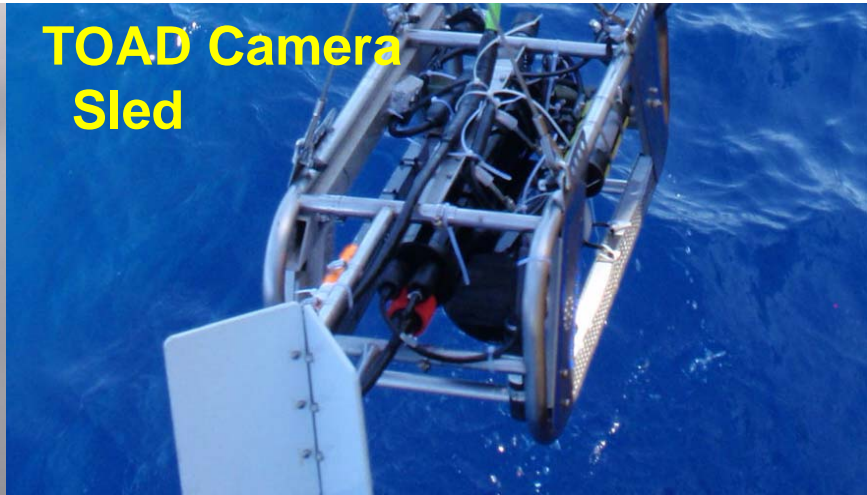
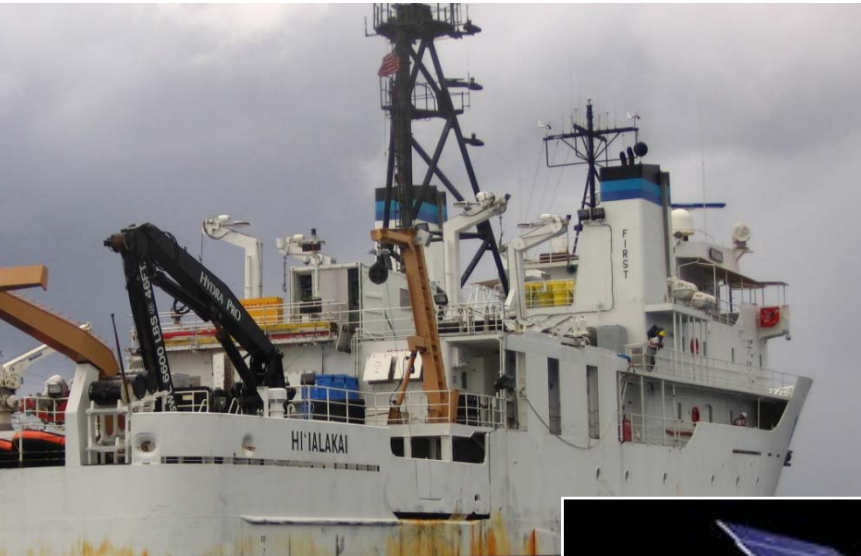


Subsea pipelines



Survey design





**kai, EM-300, EM-3002,  
for R/V AHI**



**SeaBED AUV**

**R/V AHI,**

PIBHMC Home

Organization

Benthic Habitat Mapping

DATA BY LOCATION

Main Hawaiian Islands

Hiihau

Kauai

Oahu

Maui

Molokai

Peng

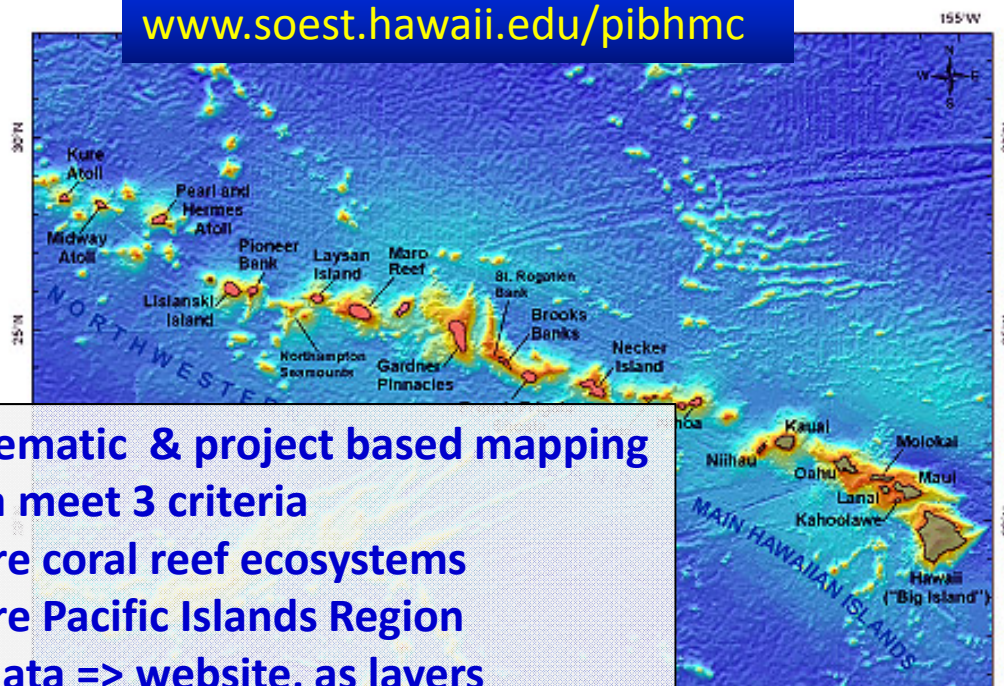
Hon

Hav

Ch

# Main Hawaiian Islands

[www.soest.hawaii.edu/pibhmc](http://www.soest.hawaii.edu/pibhmc)



- Systematic & project based mapping
- Data meet 3 criteria
- Entire coral reef ecosystems
- Entire Pacific Islands Region
- All data => website, as layers
- Why not a single "habitat" layer?
- => Dynamic, web-based delivery

Google™ Custom Search Search

Search our site.

## Benthic Habitat Data

### Bathymetry

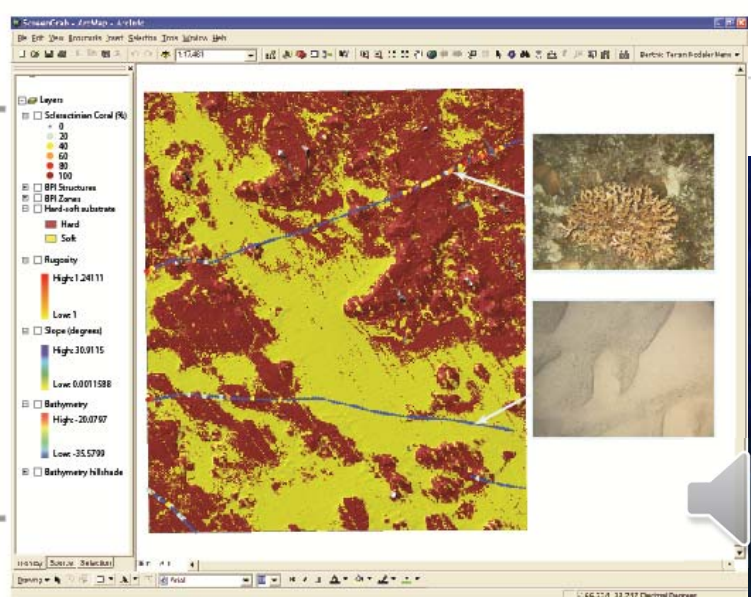
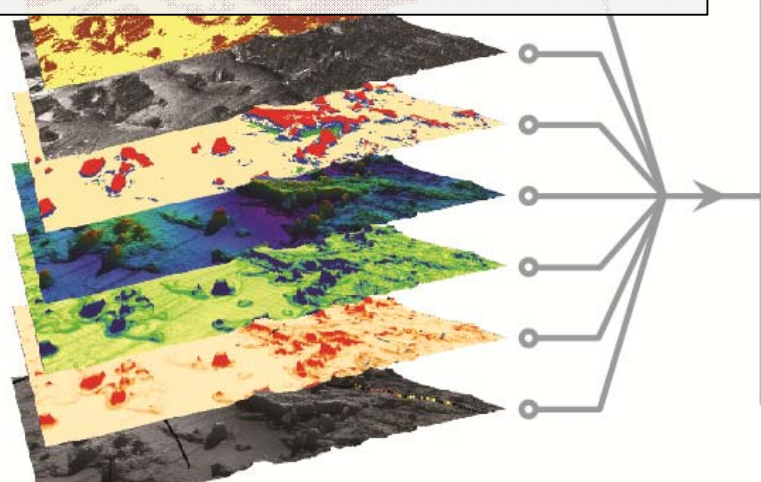
The Main Hawaiian Islands bathymetric data synthesis is maintained by the Hawaii Mapping Research Group (HMRG). [More information...](#)

- Hiihau
- Penguin Bank
- Oahu
- Maui

### Backscatter Imagery

- Hiihau

- BACKSCATTER
- BPI ZONES
- BATHYMETRY
- SLOPE
- RUGOSITY
- OPTICAL IMAGERY



## 2. Past accomplishments – a) high resolution bathymetry

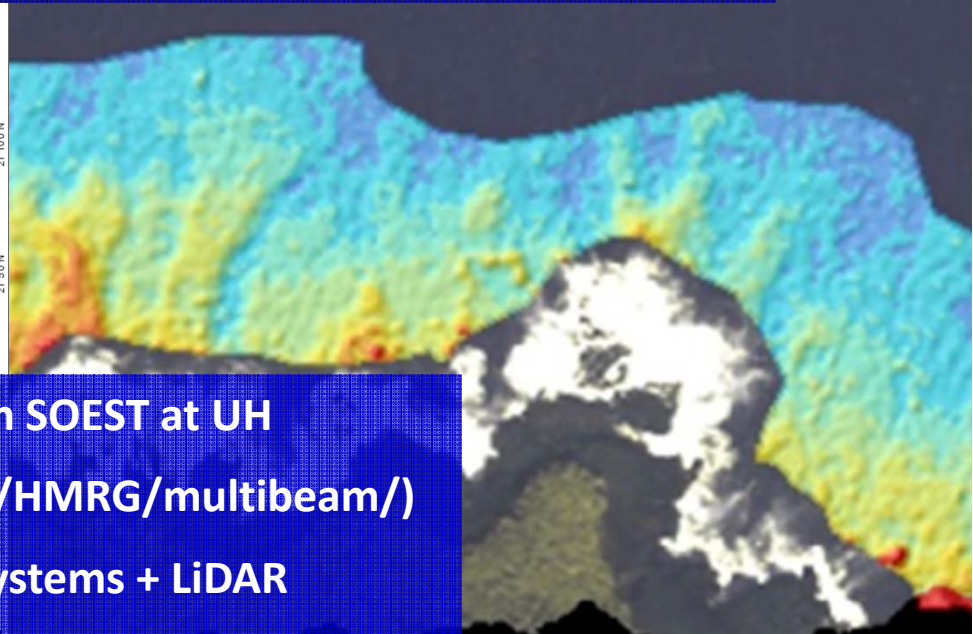
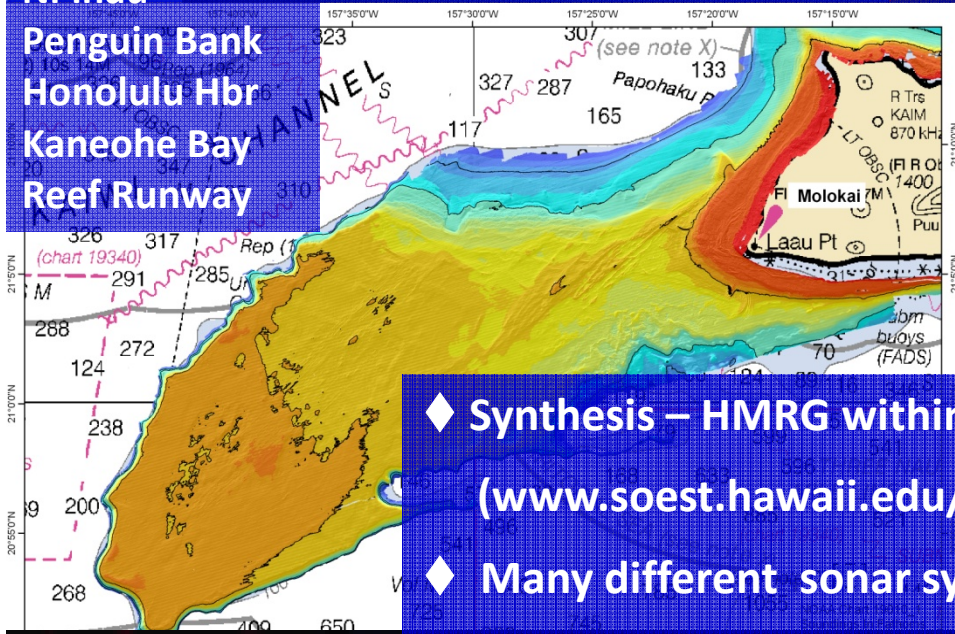
Ni'ihau

Penguin Bank

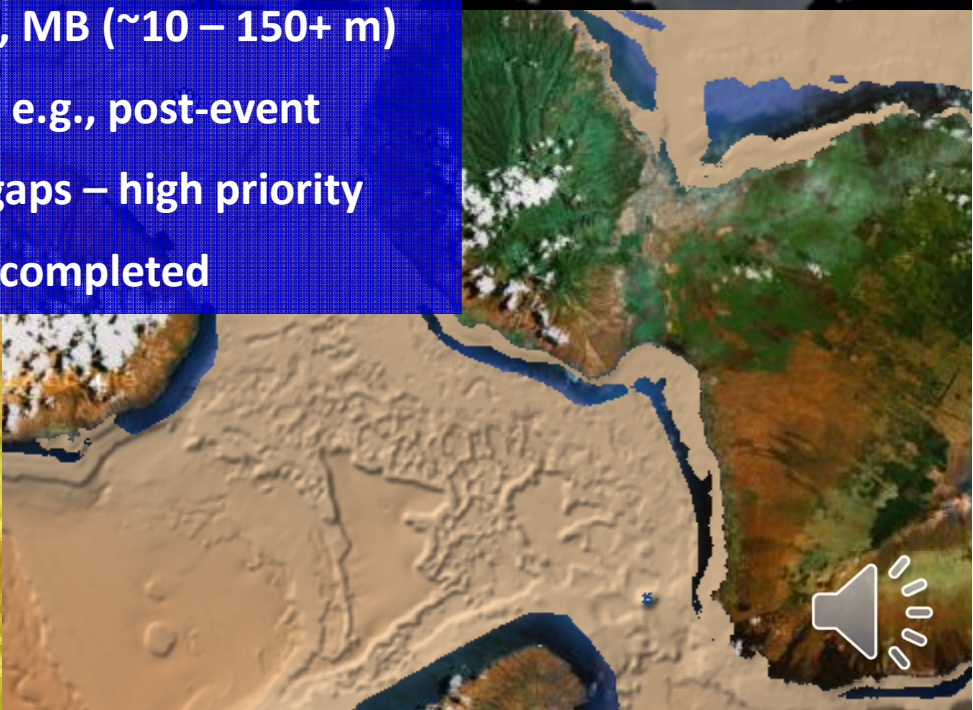
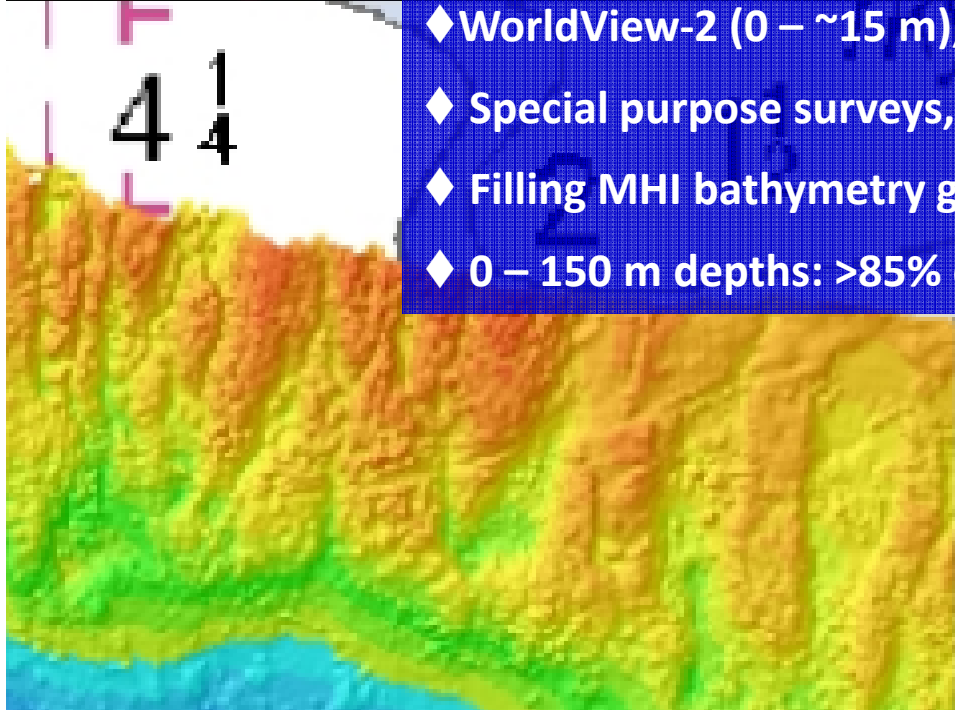
Honolulu Hbr

Kaneohe Bay

Reef Runway

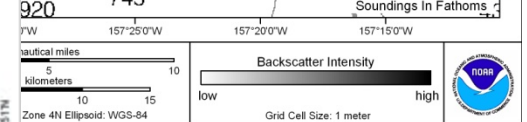
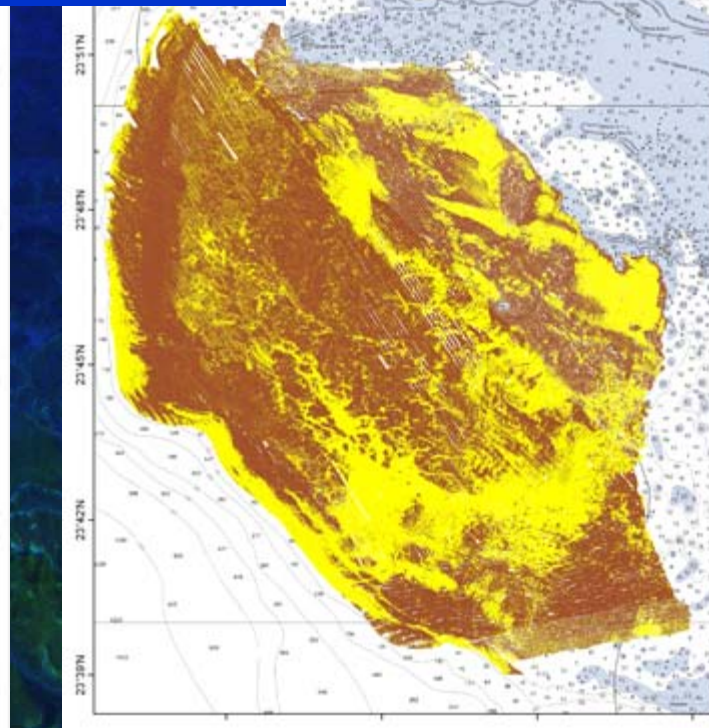
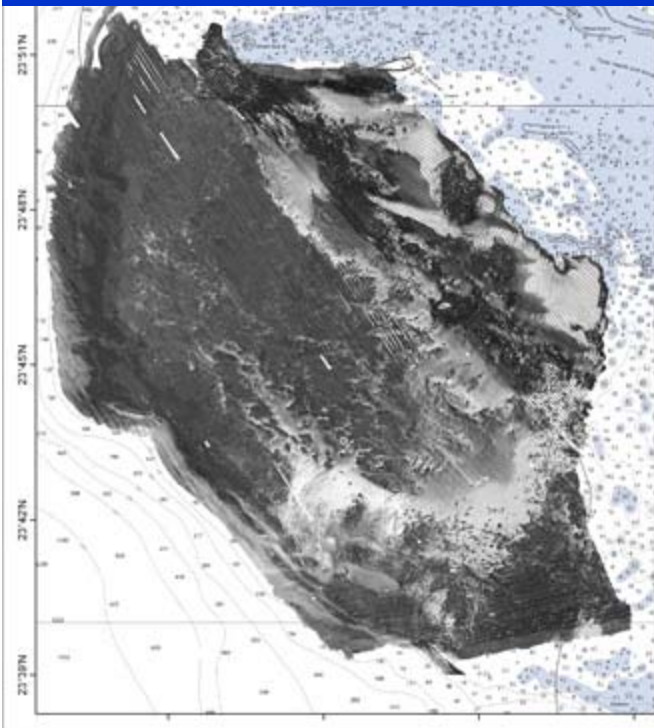
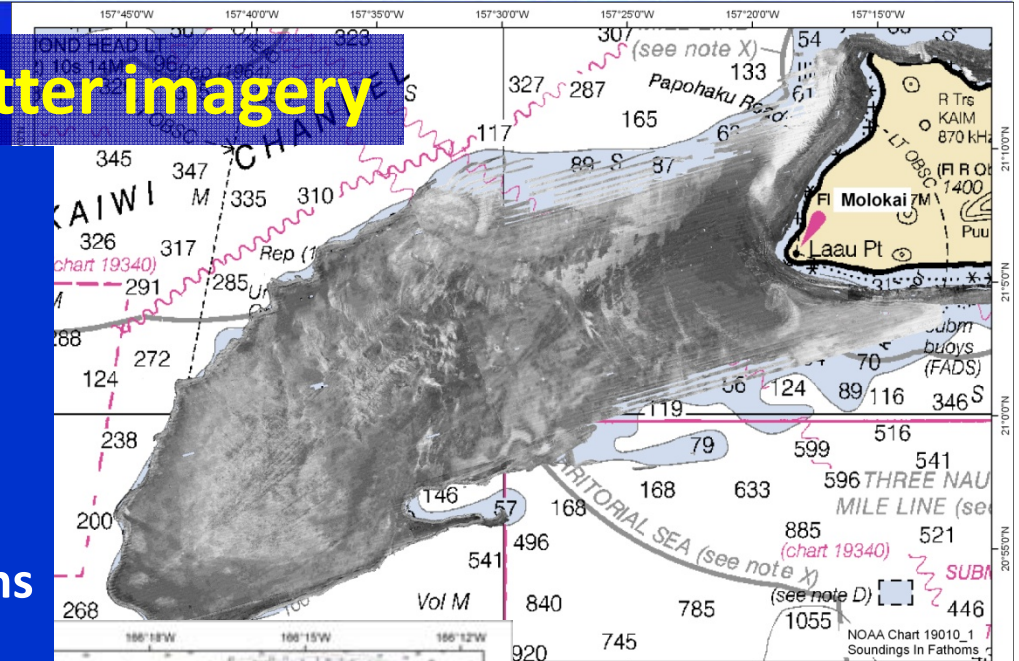


- ◆ Synthesis – HMRG within SOEST at UH  
([www.soest.hawaii.edu/HMRG/multibeam/](http://www.soest.hawaii.edu/HMRG/multibeam/))
- ◆ Many different sonar systems + LiDAR
- ◆ WorldView-2 (0 – ~15 m), MB (~10 – 150+ m)
- ◆ Special purpose surveys, e.g., post-event
- ◆ Filling MHI bathymetry gaps – high priority
- ◆ 0 – 150 m depths: >85% completed

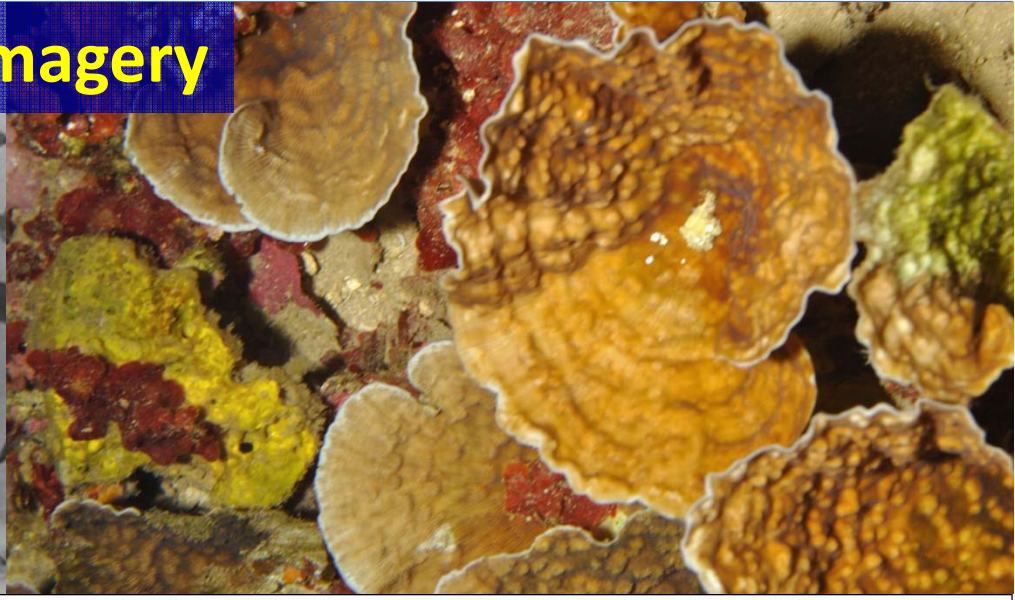
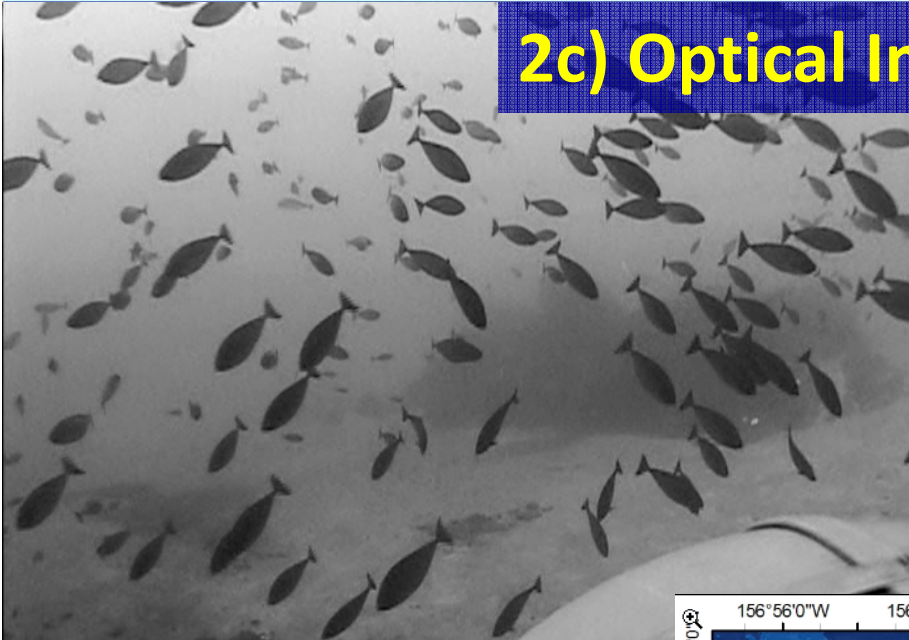


## 2b) Acoustic backscatter imagery

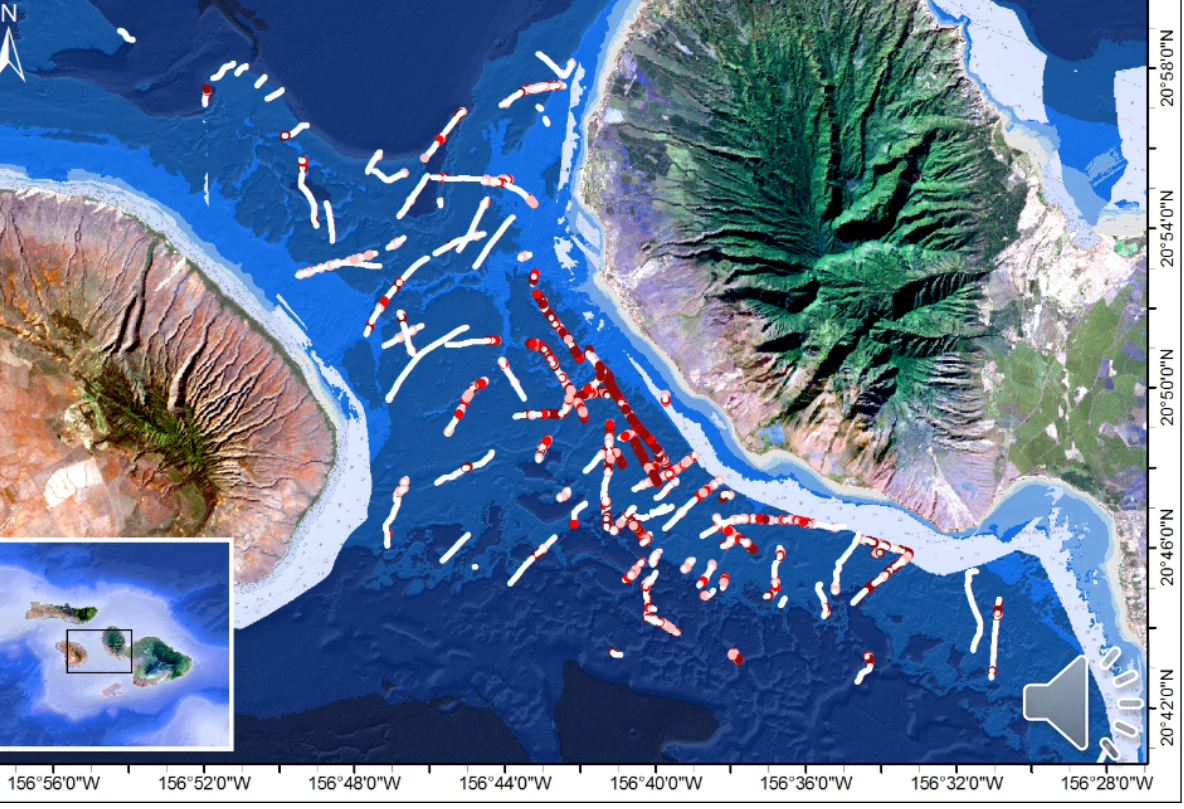
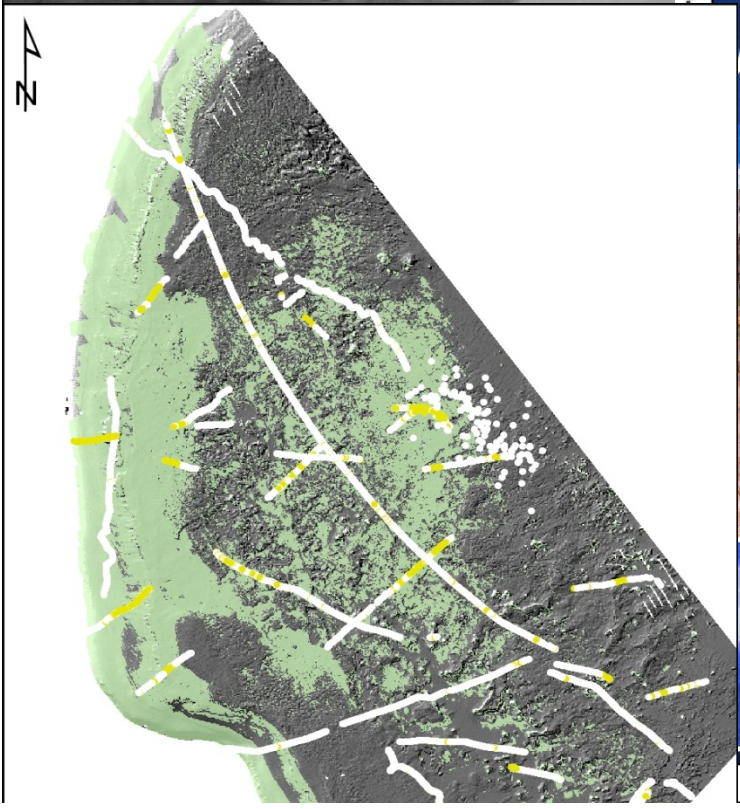
- ◆ Many different agencies & sonars
- ◆ Available for some contiguous areas; SOEST working on synthesis
- ◆ Biologically important dataset (Hard/Soft maps)
- ◆ Use satellite imagery for 0-15 m depths
- ◆ Survey stratification across region



# 2c) Optical Imagery



156°56'0"W 156°52'0"W 156°48'0"W 156°44'0"W 156°40'0"W 156°36'0"W 156°32'0"W 156°28'0"W



156°56'0"W 156°52'0"W 156°48'0"W 156°44'0"W 156°40'0"W 156°36'0"W 156°32'0"W 156°28'0"W

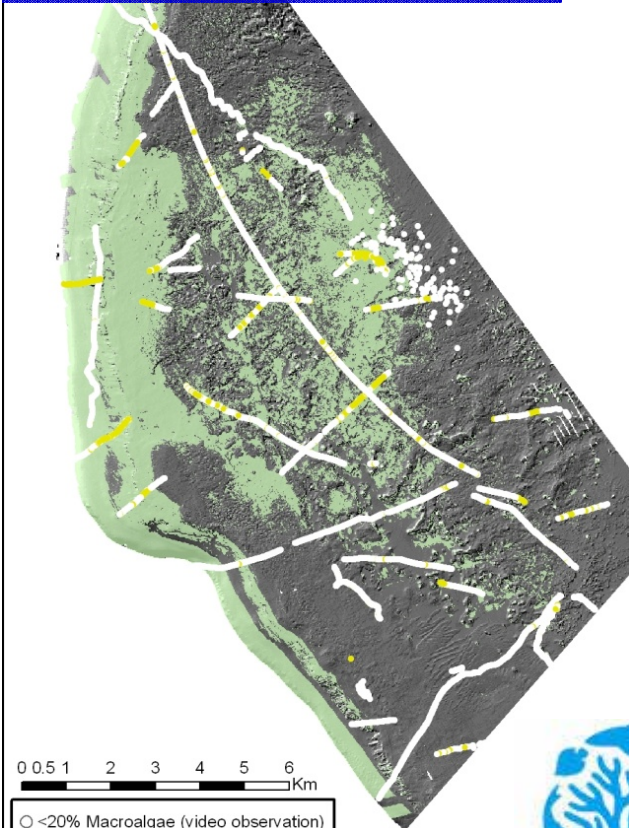
20°58'0"N 20°54'0"N 20°50'0"N 20°46'0"N 20°42'0"N



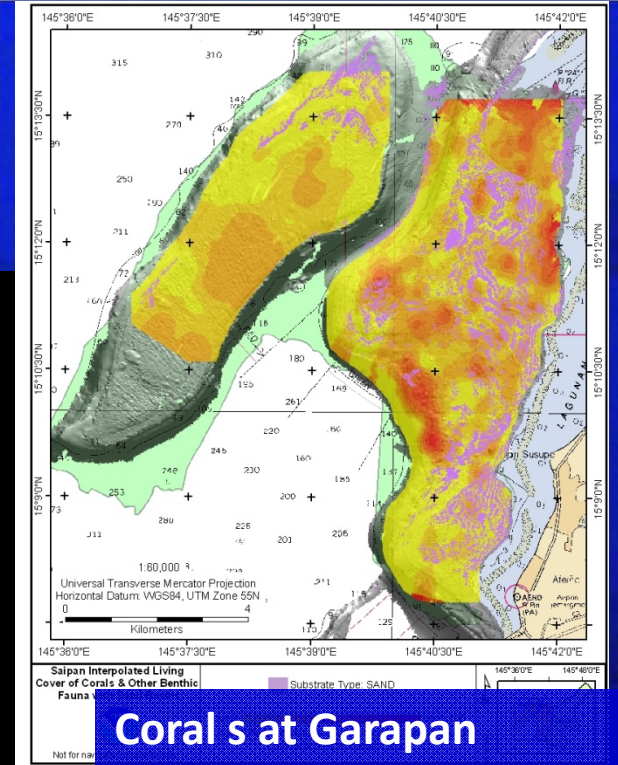
## 2d) Modeling the Distribution of Benthic Communities

- Include diver observations to cover ENTIRE coral reef ecosystem, from 0 – 150 m

*Microdictyon* sp at French Frigate Shoals, NWHI



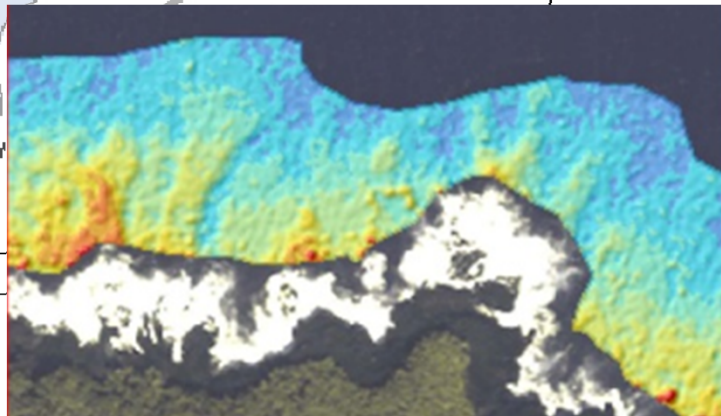
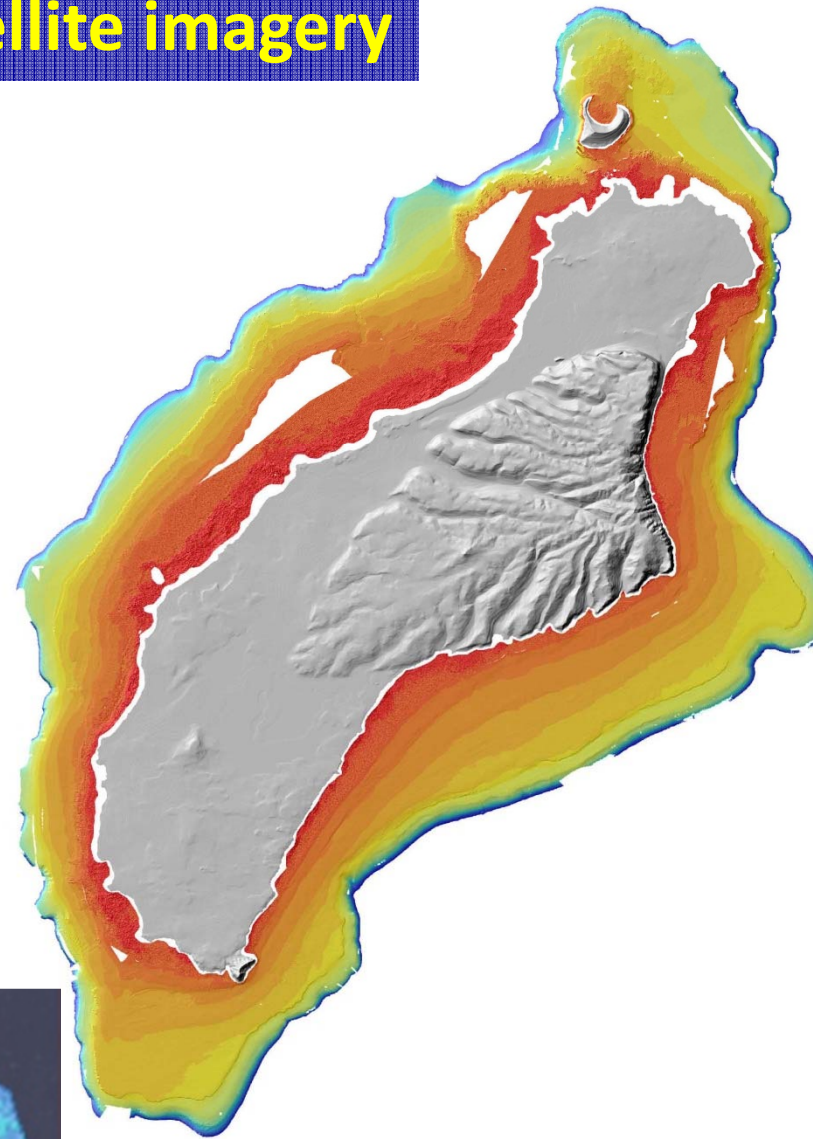
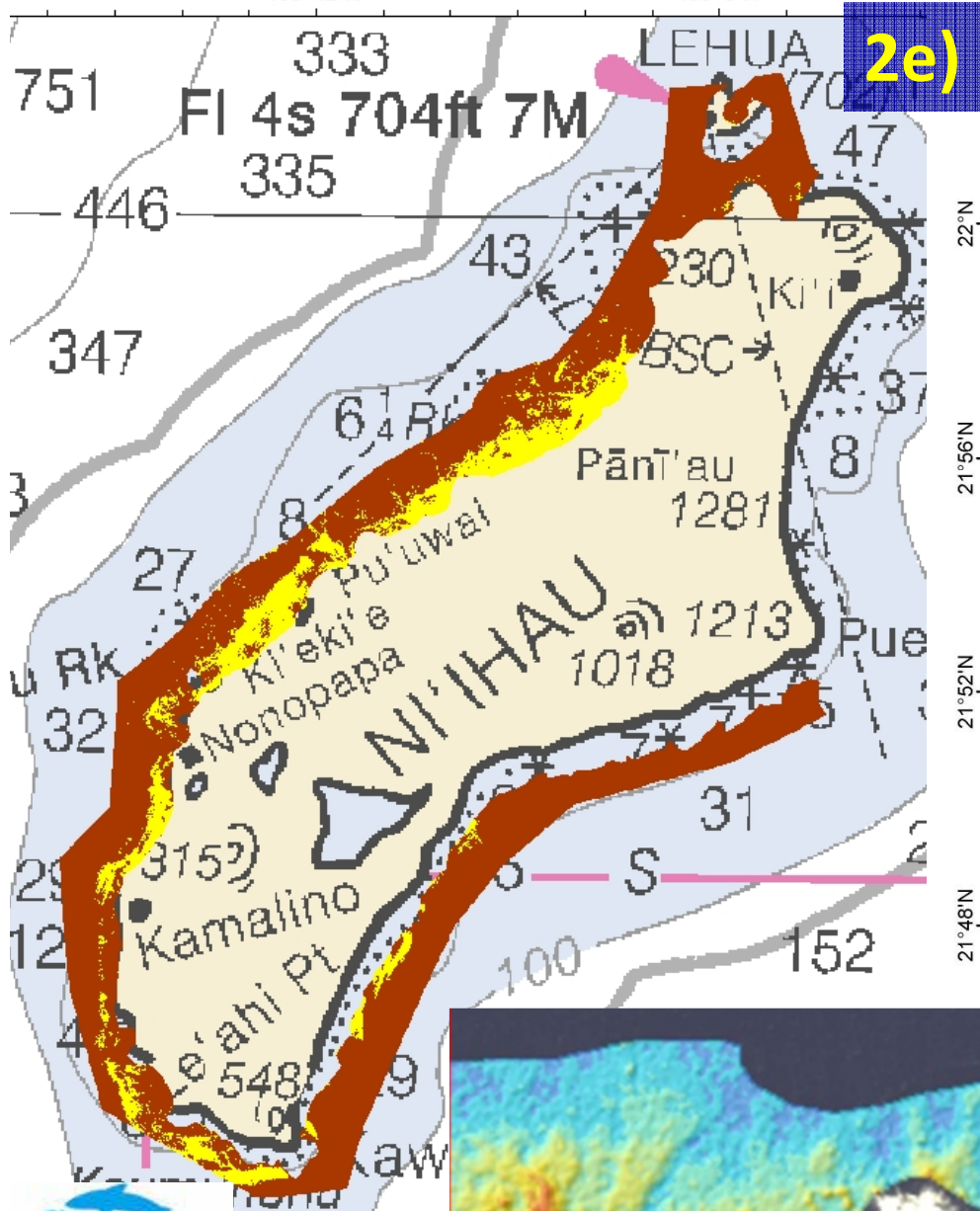
*Leptoseris* sp corals in the Au'au Channel



Coral s at Garapan Anchorage, Saipan, CNMI



## 2e) Satellite imagery



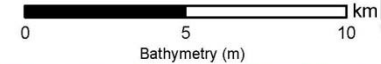
NOAA  
REEF SMART

160° 12' W  
substrata,  
satellite imagery  
116

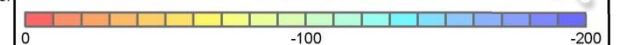
Bathymetry

Division  
cal, R/V AHI  
2 derived depths.

Universal Transverse Mercator Projection,  
Zone 4N, Ellipsoid: WGS84



Bathymetry (m)



NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
U.S. DEPARTMENT OF COMMERCE

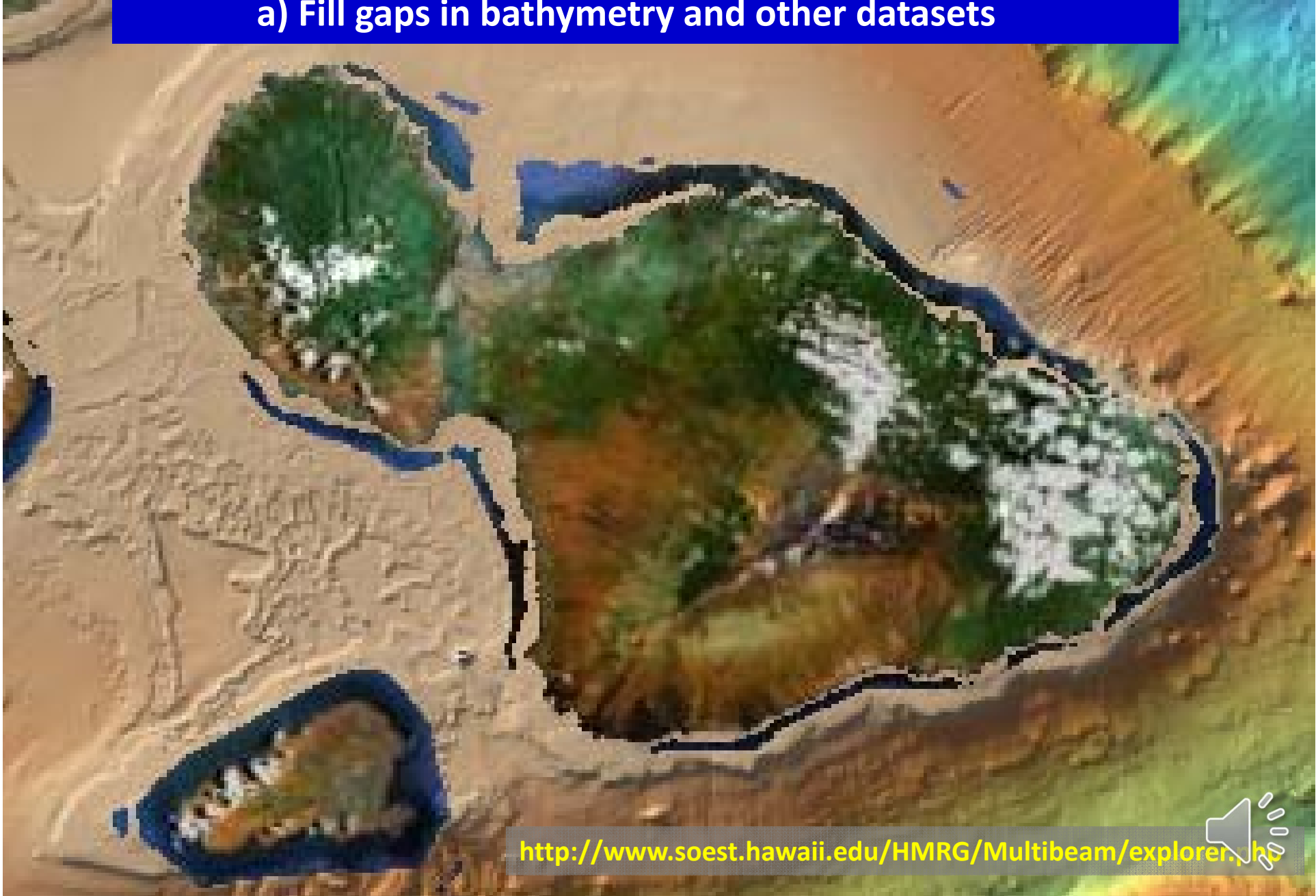
# The Good, the Bad & the Ugly...

- Up to 5% of CRCP budget to be spent on mapping...  
**Where???**
- Funding declines → diminished mapping capabilities
- Some mapping capabilities should be considered a “limited time opportunity, ” e.g., Hi‘ialakai & R/V AHI
- What can we do to help address your agency’s needs for management of CREs?



### 3. Planned/Possible Future Projects

a) Fill gaps in bathymetry and other datasets

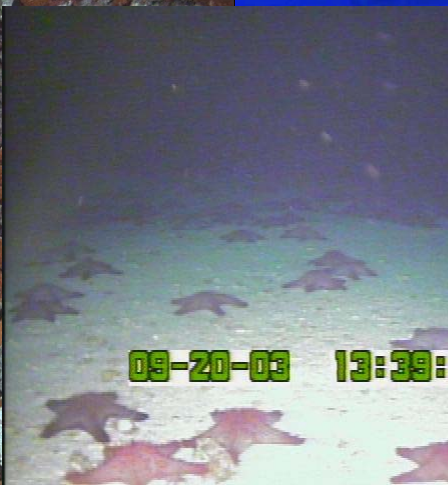
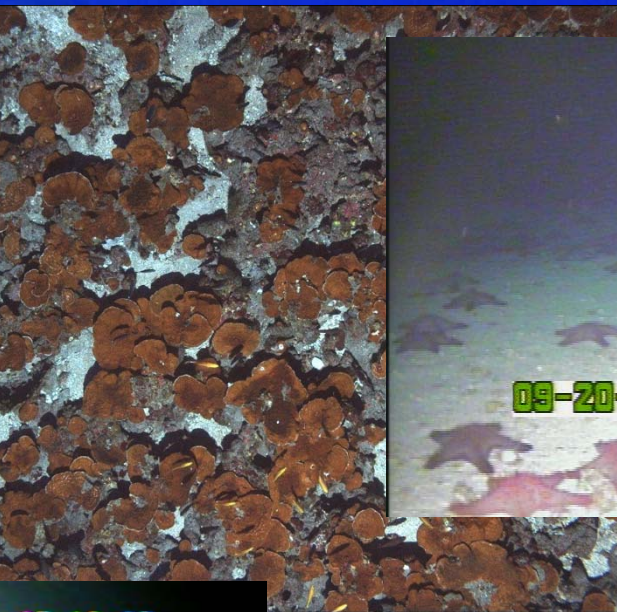


<http://www.soest.hawaii.edu/HMRG/Multibeam/explorer.html>



# Planned/Possible Future Projects

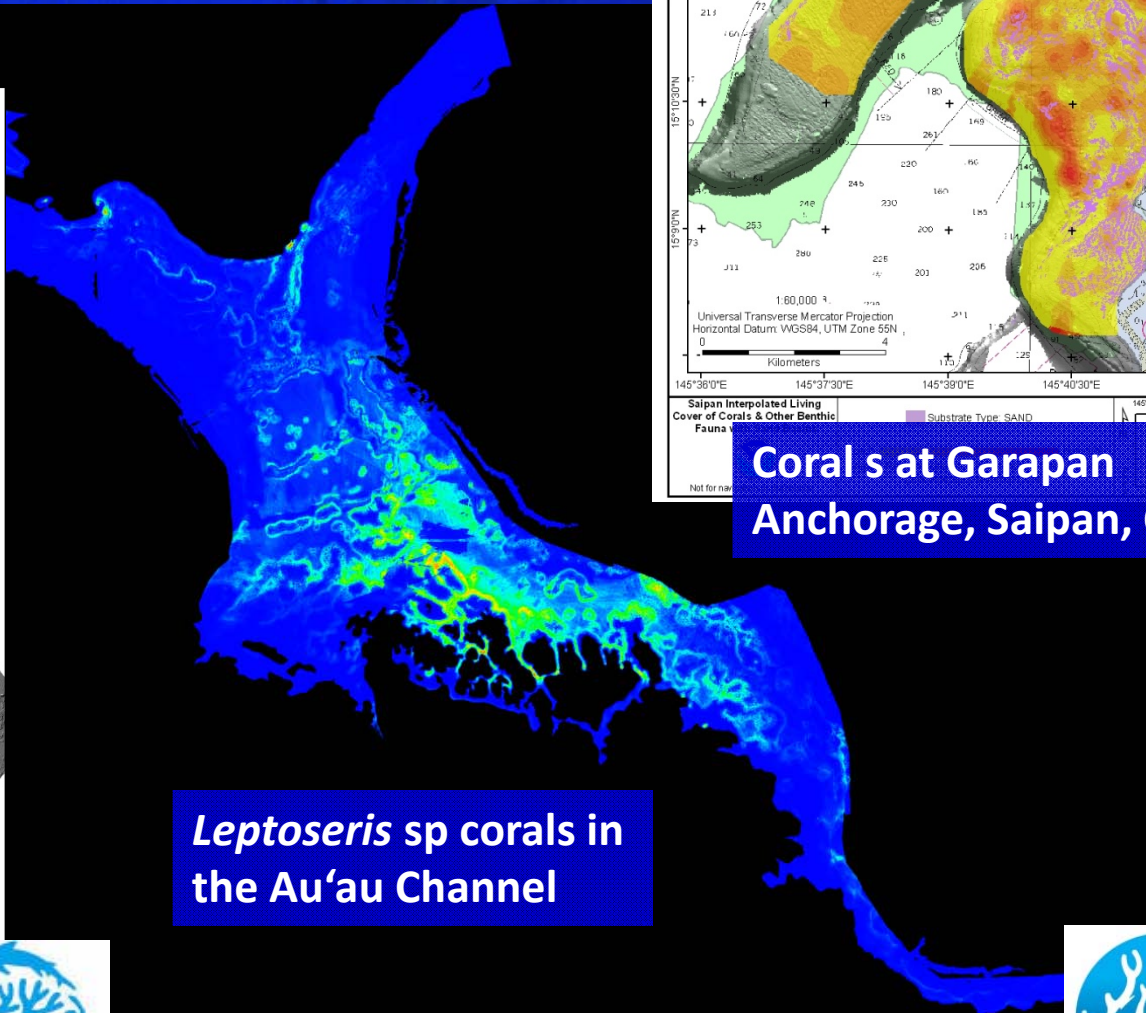
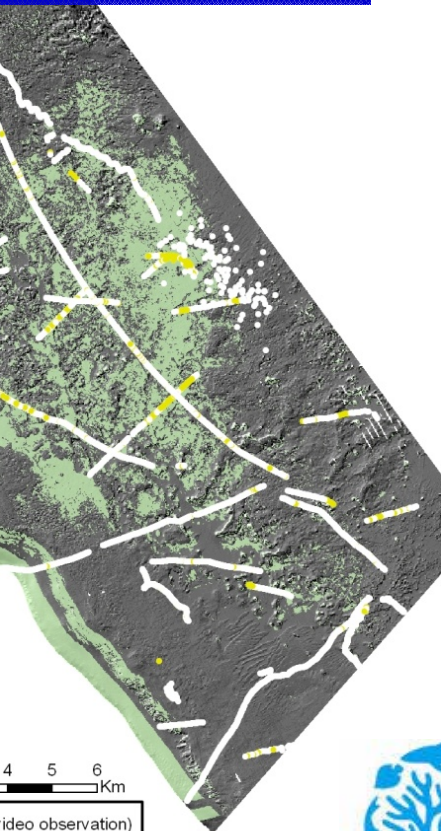
Survey coral reef fish & benthic communities below diver depths; requires  
gaining local management interest



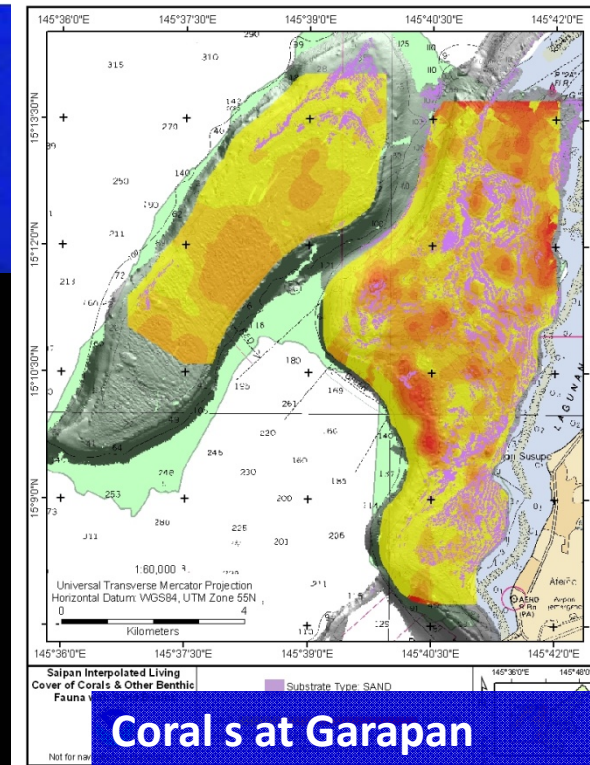
## Planned/Possible Future Projects

c) Model distributions of benthic & demersal communities for entire CREs, using optical & acoustic data

*Sycon* sp at French Shoals, NWHI



*Leptoseris* sp corals in the Au'au Channel



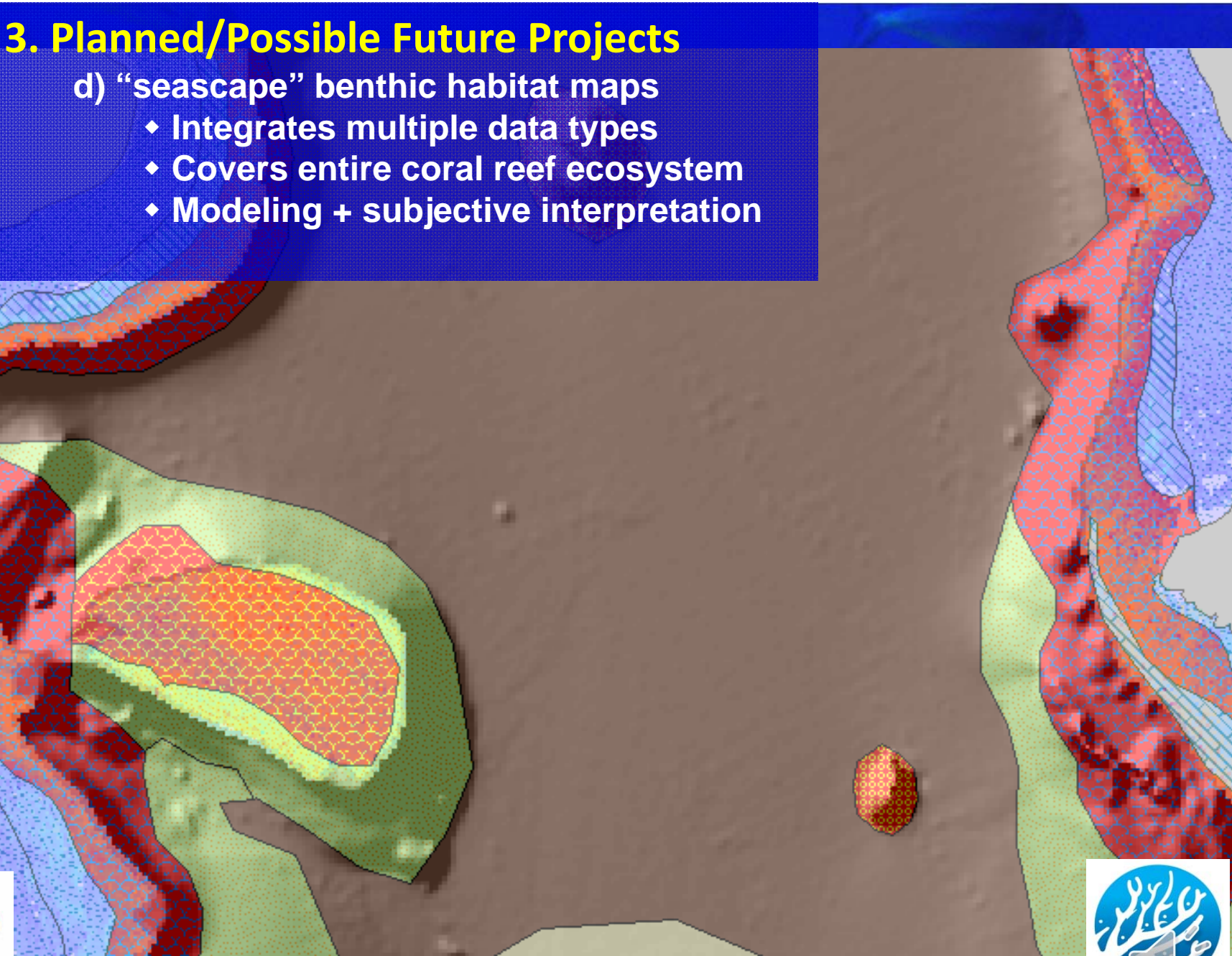
Coral s at Garapan Anchorage, Saipan, CNMI



### 3. Planned/Possible Future Projects

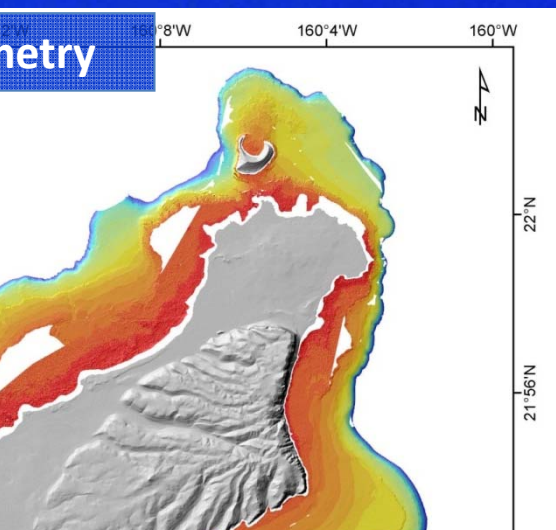
#### d) “seascape” benthic habitat maps

- ◆ Integrates multiple data types
- ◆ Covers entire coral reef ecosystem
- ◆ Modeling + subjective interpretation



# Planned/Possible Future Projects

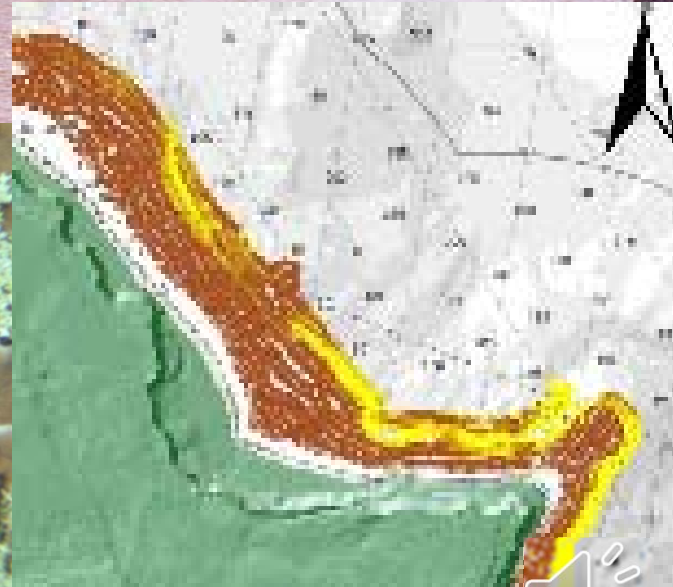
Derive near-shore bathymetry & potentially other products from satellite imagery (0 - ~30 m depths)



Turbidity Index/ Sediment influx



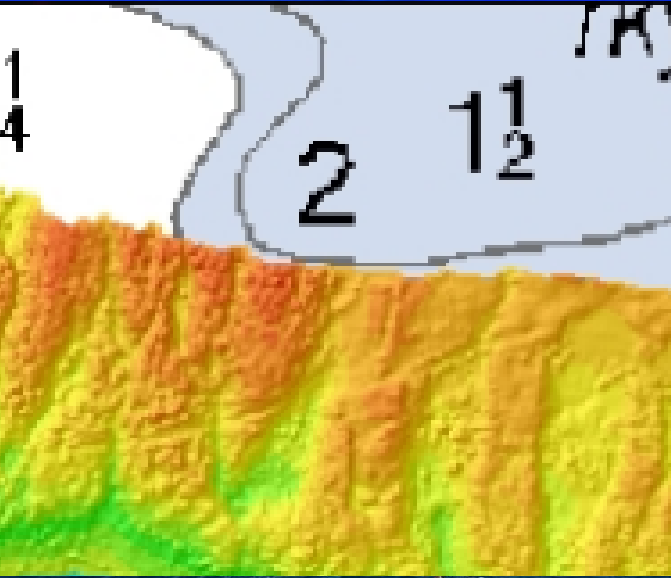
Index of Coral vs Algal cover





# Planned/Possible Future Projects

Respond to events; may require CRCP approval



## 4. Discussion - how can we help you?

Bathymetry surveys to fill gaps? Priority areas?

Survey fish & benthic communities below diver depths?  
Specific sites?

Model distributions of benthic & demersal communities for  
entire CREs or a specific sites, using optical & acoustic  
data? Specific sites?

Dynamic, web-based map delivery?

"Seascape" benthic habitat maps, integrating multiple  
datasets? Specific sites?

Derive hard/soft and potentially other products from satellite  
imagery? Specific sites? Products?

Respond to groundings? Other events?

Others???



# Mahalo nui loa!

Pacific Islands Benthic habitat Mapping  
Center (PIBHMC)

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