

# Creating Comprehensive Protected Areas:

The Ecology of the Pūpūkea Tide Pools and their Value to  
the Pūpūkea Marine Life Conservation District



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# Nearshore Ecology: Hawai'i

- Vital coastal zone area including: TIDE POOL habitat
- Tide pool can serve several ecological functions
  - Fish nursery, food/shelter, connection to deeper reefs





# Pūpūkea Tide Pools

- Marine Life Conservation District (MLCD)
- Boundary change and administrative rules
- 1975: Last baseline of tide pools by Kimmerer & Durbin



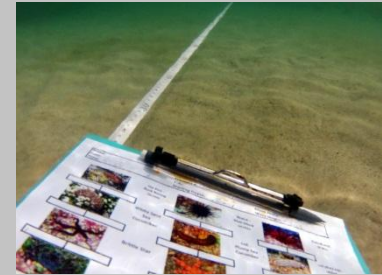
# This Study

- 1. Update 1975 ecological baseline in Pūpūkea tide pools**
- 2. Compare findings to Shark's Cove and other tide pools around O'ahu**
- 3. Make recommendations on future legal efforts concerning administrative rules**



# Measuring the Biological Variables

- Used visual transects
- Measured # of fish and invertebrates and # of species
- Presence/absence of coral species
- Depth, tide, date, and time were recorded





# Measuring the Environmental Variables



- Temperature Loggers
- Measured temperature and salinity at 25 random locations
- Depth measured at transect locations
- Correlation of environmental variables to tide pool biology

# Results: Biological Baseline

## FISH

42 species, 21 families

1. Āholehole
2. Manini
3. Uouoa

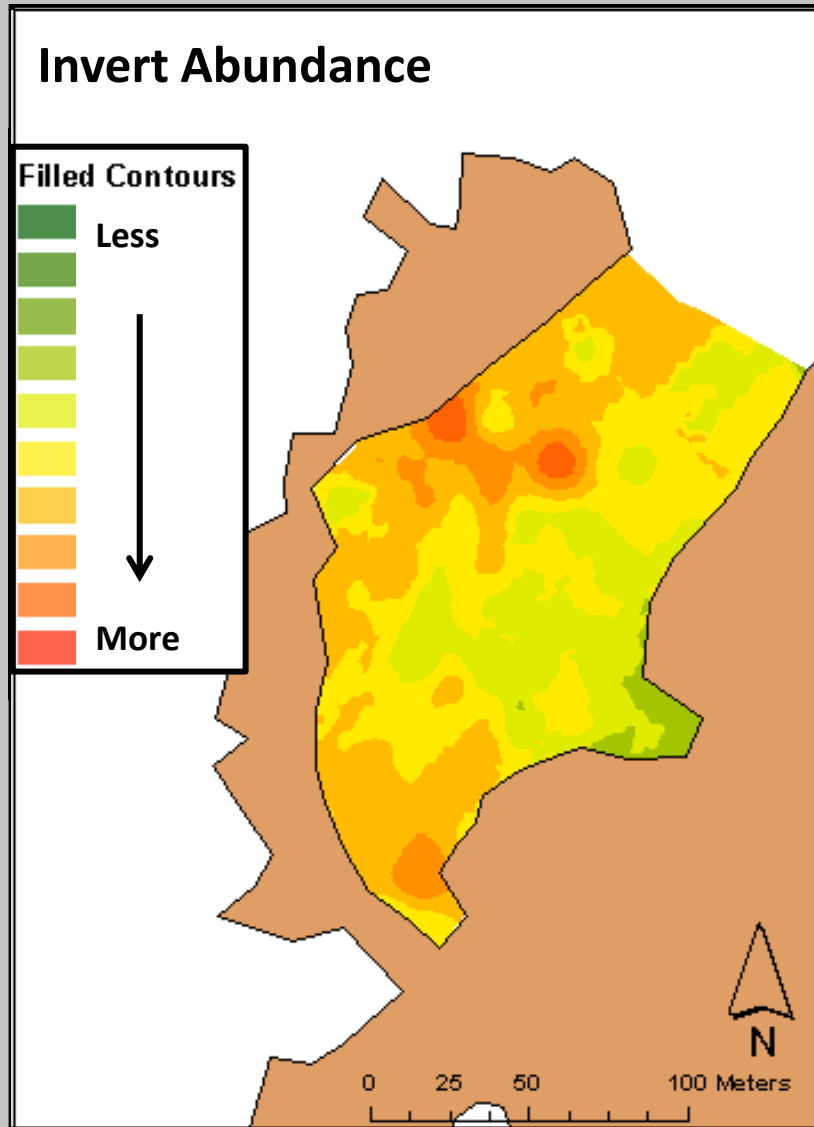
## INVERTEBRATES

26 species

1. 'Ina
2. Teated sea cucumber
3. Wana



# Results: Biological Baseline





# Results: Biological Baseline

## Day

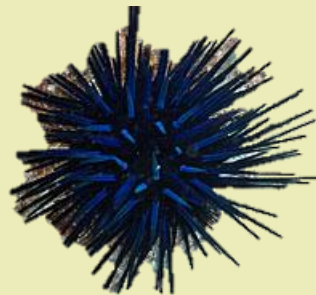
1. 'Ina



2. Teated sea cucumber



3. Wana

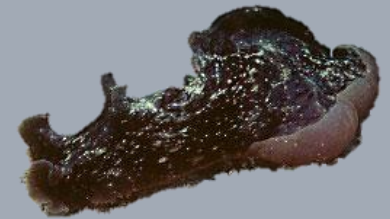


## Night

1. 'Ina



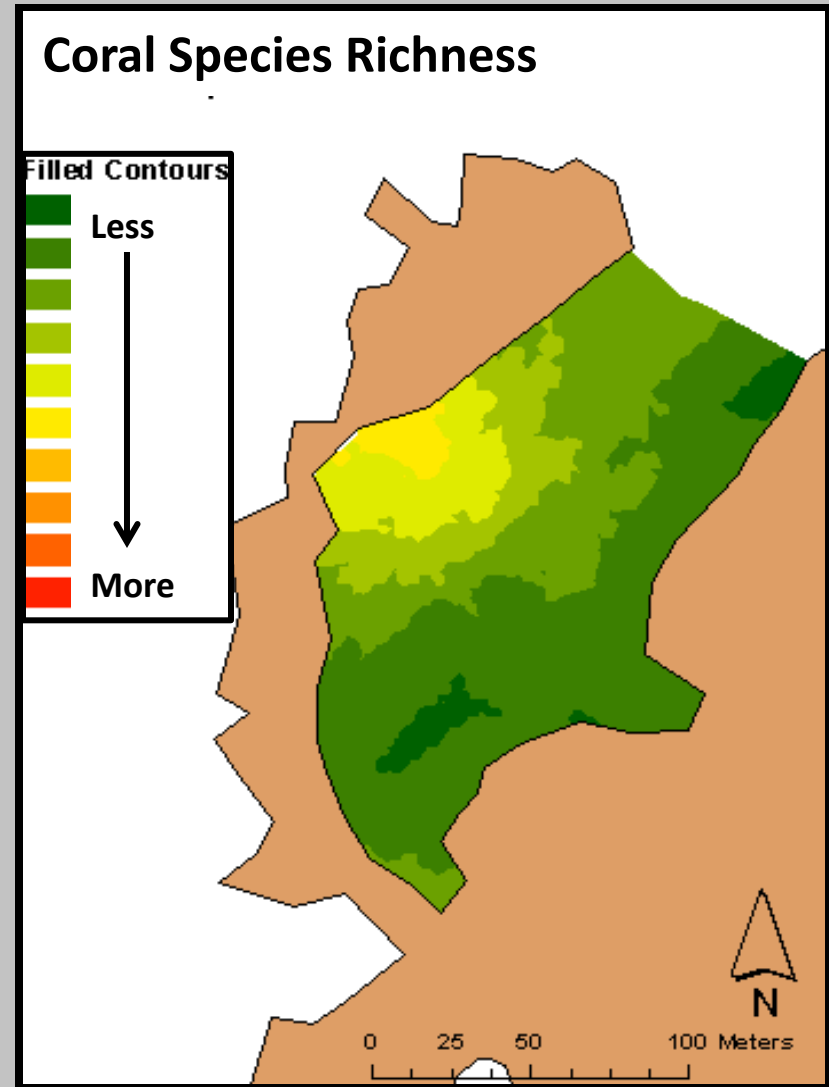
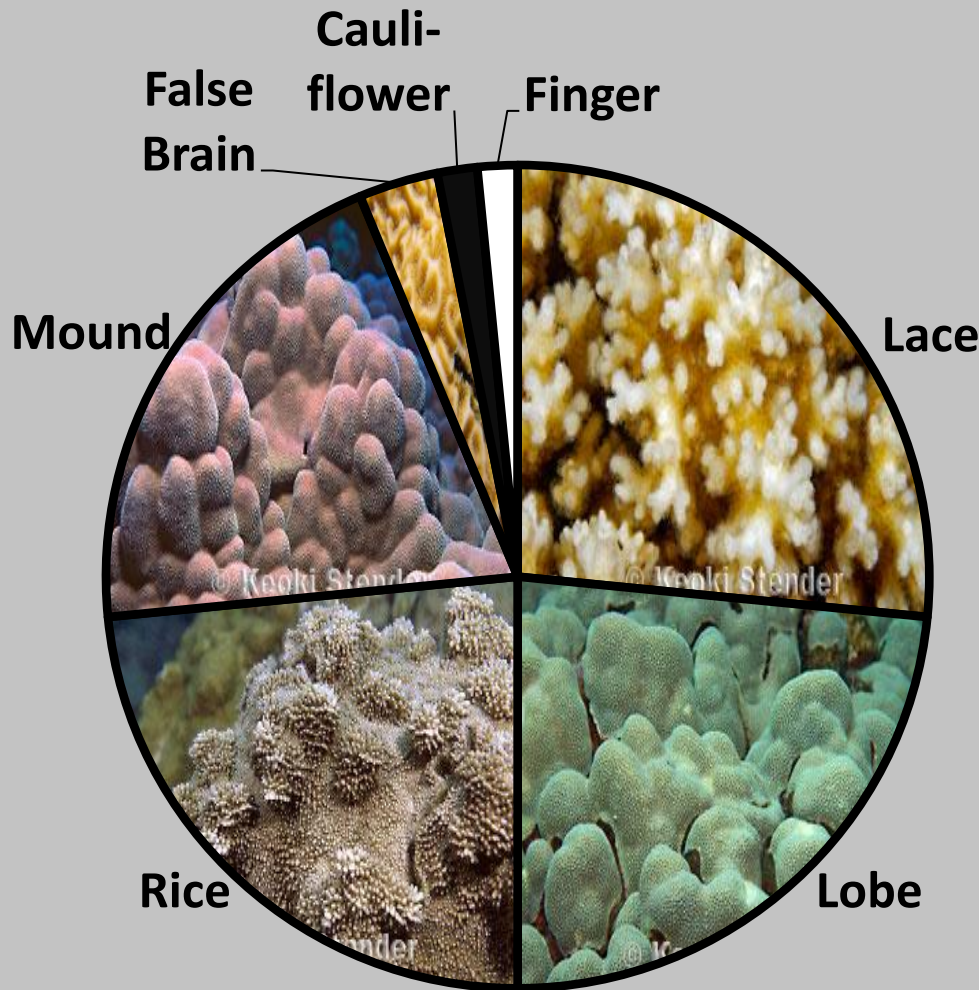
2. Sea hare



3. *Polypsectana kefersteini*



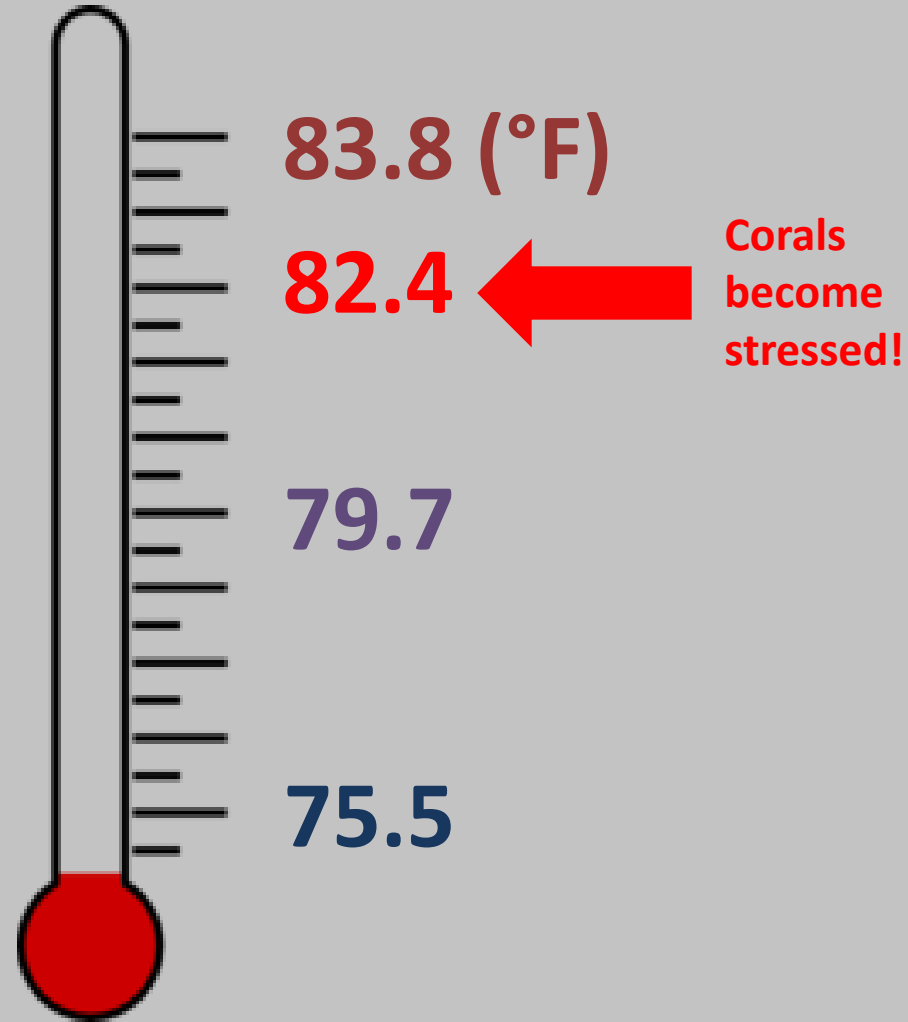
# Results: Biological Baseline





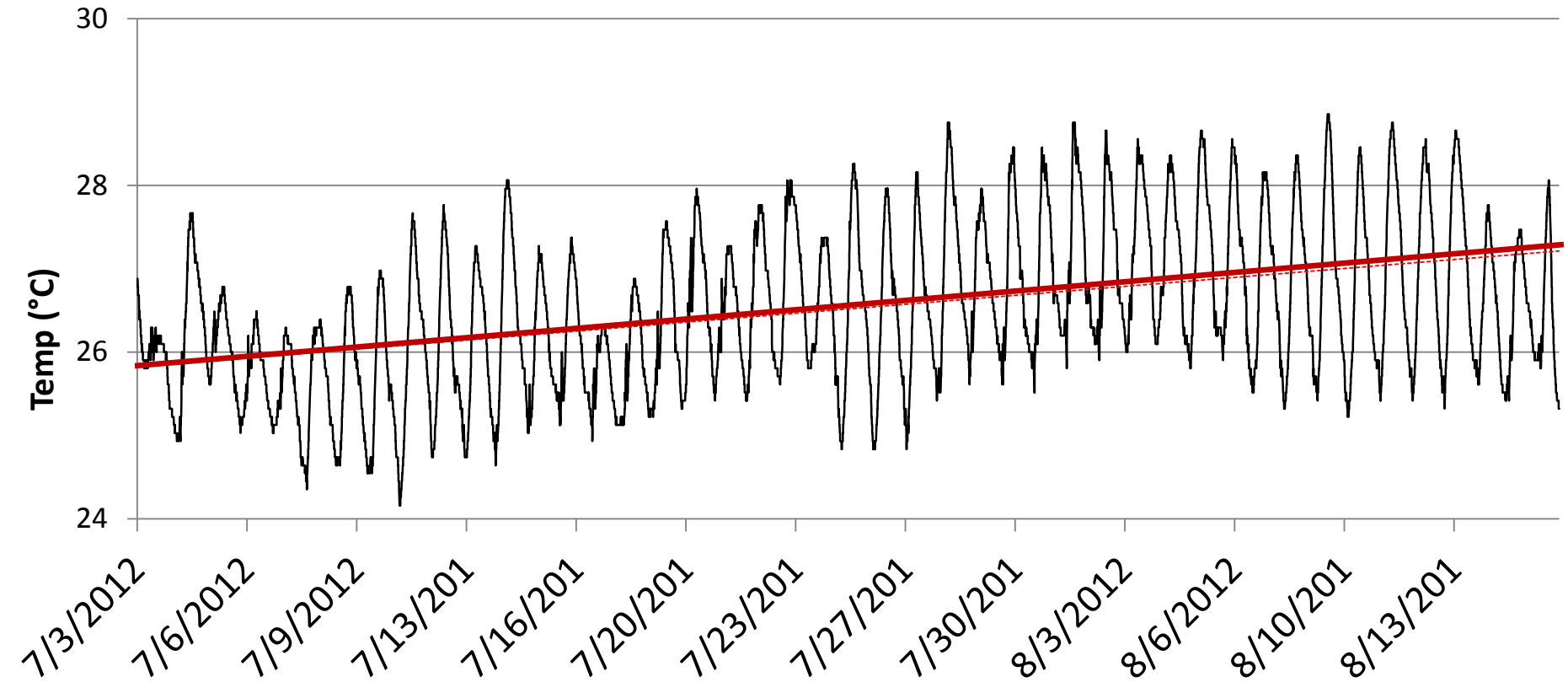
# Results: Environmental Variables

## Temperature Loggers



# Results: Environmental Variables

## Temperature Loggers

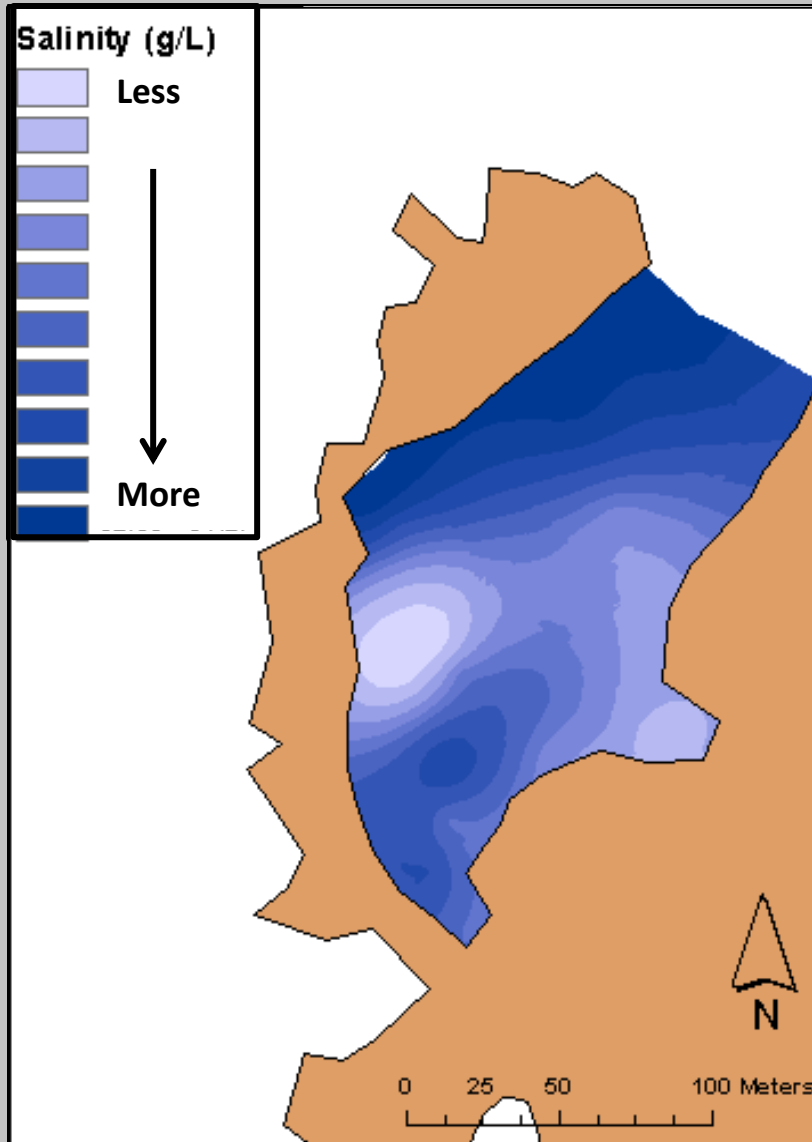


Temperature Profile from Logger in shallow water

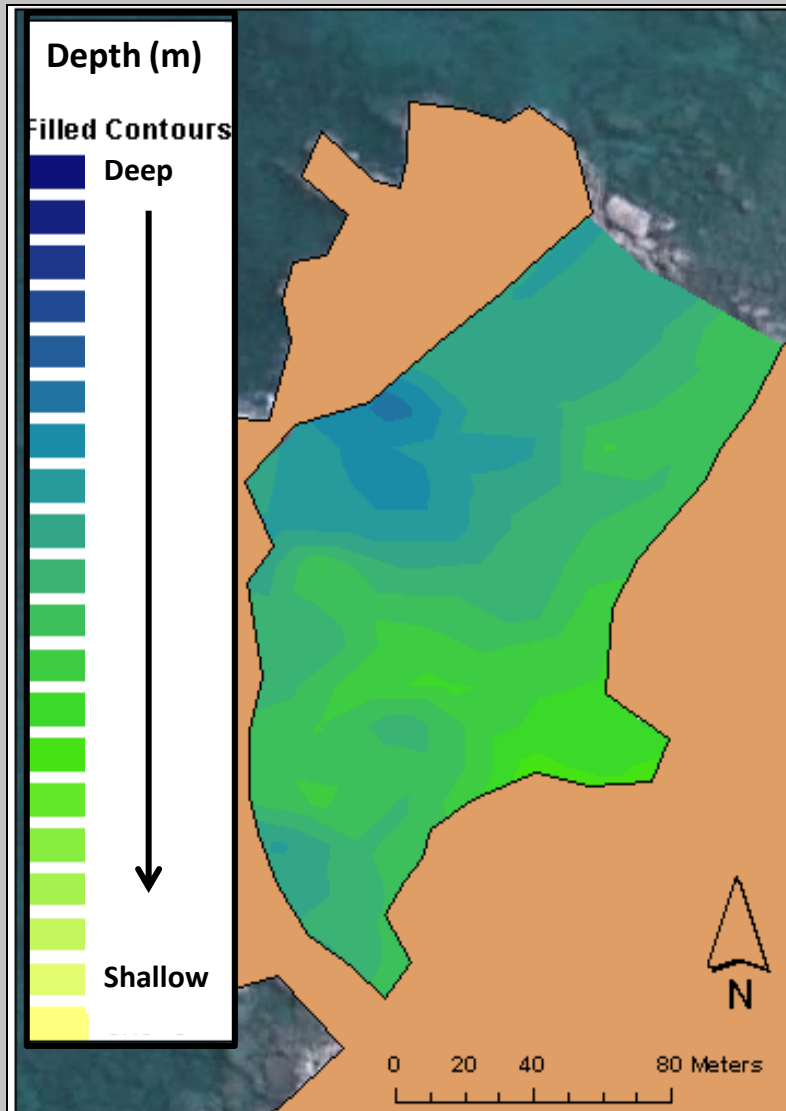


# Results: Environmental Variables

## Temperature and Salinity Grid



# Results: Depth Measurements





# Results: Relationships

Fish Abundance increases:

Shallow water

Rising/falling tide

Total (fish + invertebrate) Abundance increases:

Deeper water

Lower salinity



# Results: Site Comparisons

## Pūpūkea tide pools compared to...

### Shark's Cove

- \* Similar fish abundance and number of species per transect

### 1975 Baseline

- \* 14% increase in fish species observed, similar salinity range

### Other Tide Pools on Oahu

- \* Highest number of fish species observed, different fish composition, lower avg. salinity

# Important Biological Findings

- Depth and tide relationship similar to other research

(Mahon & Mahon 1994, Gibson & Yoshiyama 1999, Davis 2000, Castellanos-Galindo et al. 2005, Rojas & Ojeda 2010)

- Unique Salinity and fish composition
- Āholehole and Manini
- Evidence of juvenile fish habitat





# Legal Options



1. Community meeting
2. Public hearing with DAR
3. HAR §13-1-26 Petitions for adoption, amendment, or repeal of rules
4. Continue education and outreach activities

# Life Update: Future Involvement

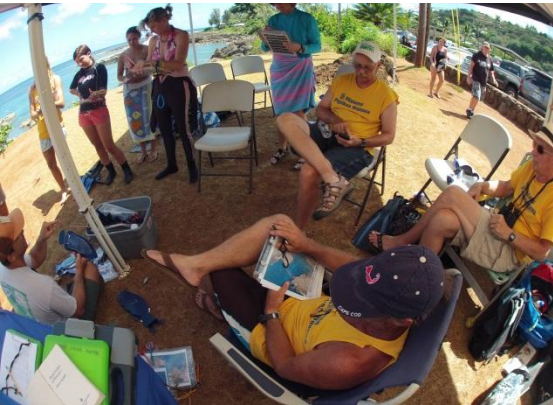


- Graduation from  
**U. Miami**
- NOAA Coral Reef  
Management  
Fellowship: Hawaii DAR
  - Makai Watch Biological  
Monitoring Guidelines
- Hawaii Conservation  
Conference
- MPW Tide Pool  
Monitoring training



# Mahalo!

## Committee, Colleagues, Family, and Friends





# Questions

UNIVERSITY OF MIAMI  
ROSENSTIEL  
SCHOOL of MARINE &  
ATMOSPHERIC SCIENCE

