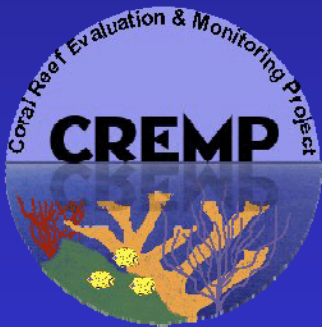


**Coral Reef Evaluation and Monitoring Project  
2012 US EPA Water Quality Protection Program  
Steering Committee Presentation  
February 20th, 2013**

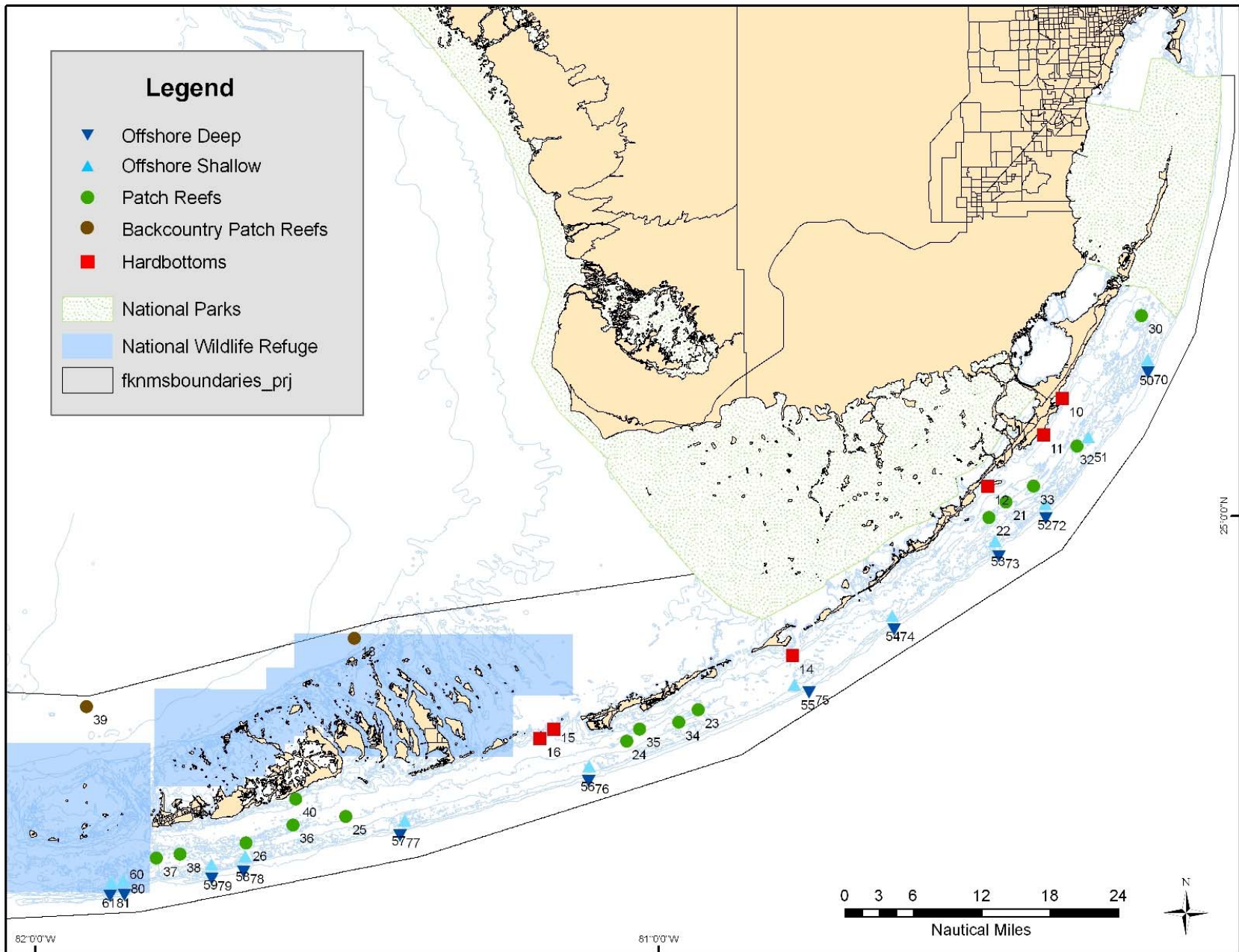
**Rob Ruzicka, Mike Colella, Jim Kidney, Vanessa Brinkhuis,  
Lucy Bartlett, Dr. Kate Lunz, Kevin Macaulay,  
Dr. Jim Porter, Meredith Meyers**



**CREMP is funded by US EPA Water Quality Protection Program  
Federal Award No. X7-95447709**

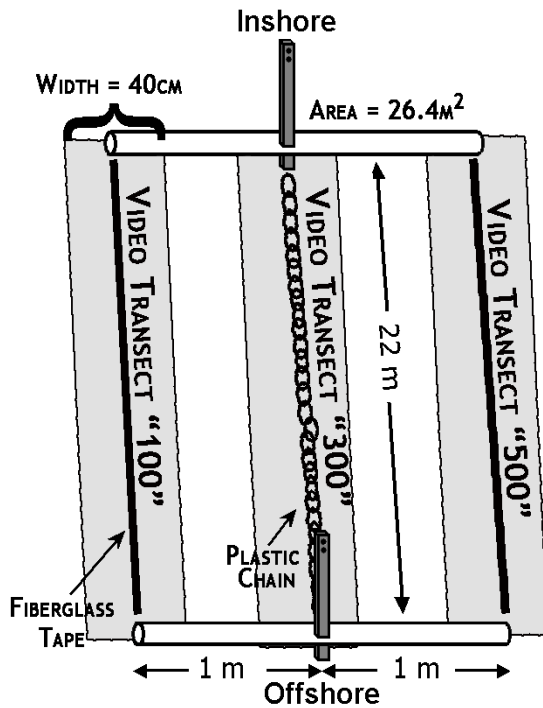
**A presentation of the Florida Fish and Wildlife Conservation Commission/  
Fish & Wildlife Research Institute**

# CREMP Spatial Framework – 2011 & Beyond

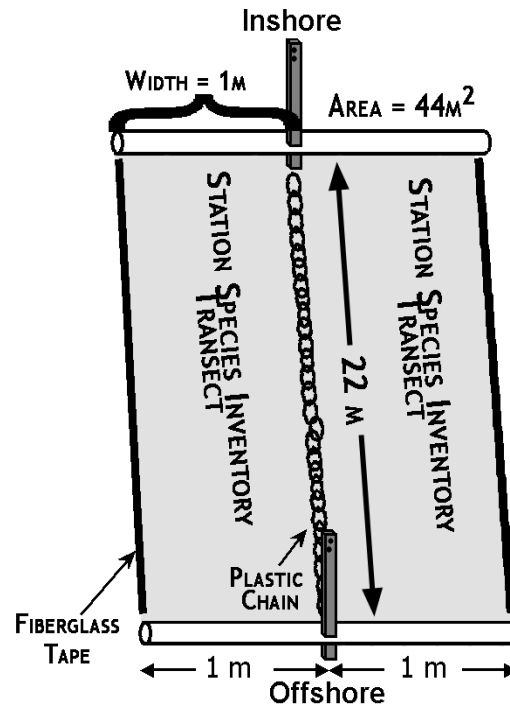


# Methods - Past

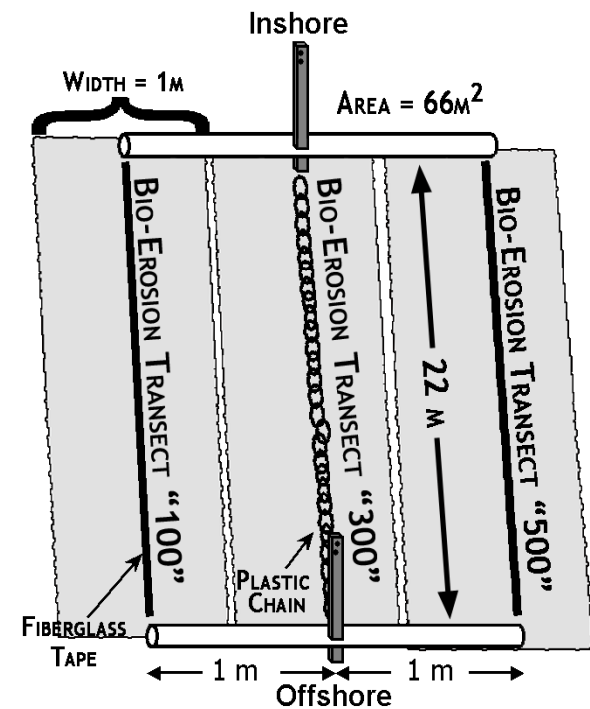
## BENTHIC COVER SURVEY



## STATIONS SPECIES INVENTORY SURVEY



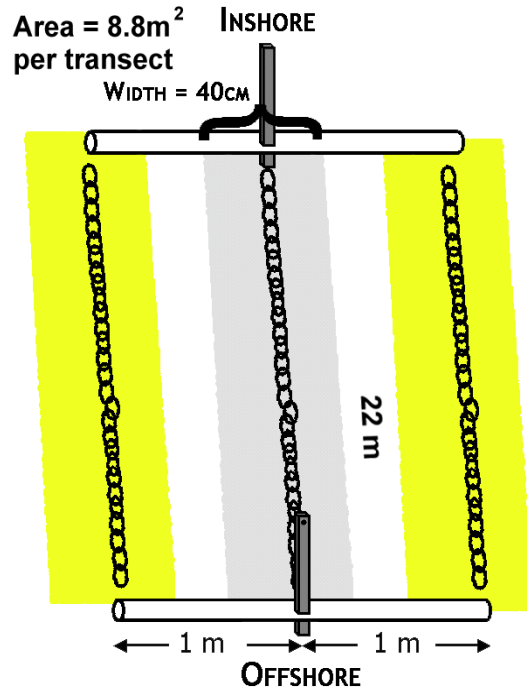
## BIO-EROSION SPONGE SURVEY



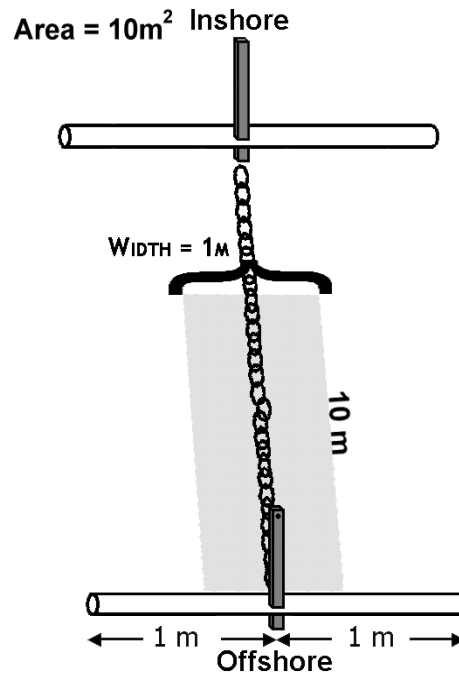
- Switched from video to still camera in 2010
- Traditional stony coral species richness inventory ceased in 2010
- Bioerosion/clioniad sponge survey concluded in 2009

# Methods - Present

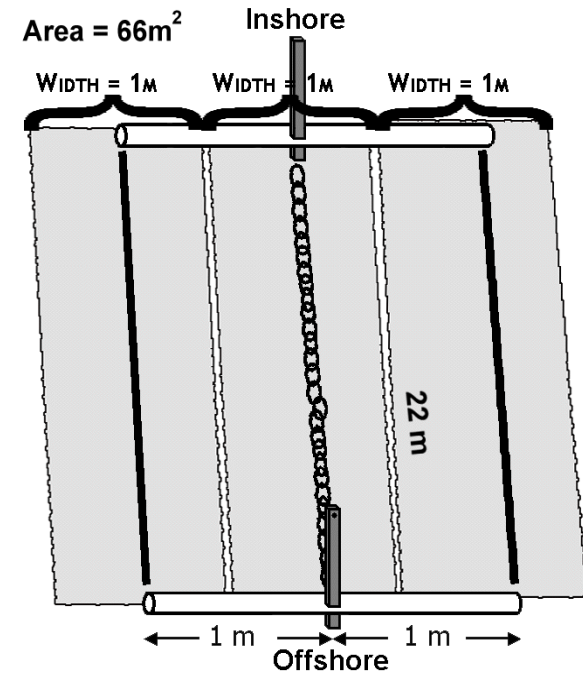
## Video Transects



## Demographic Surveys

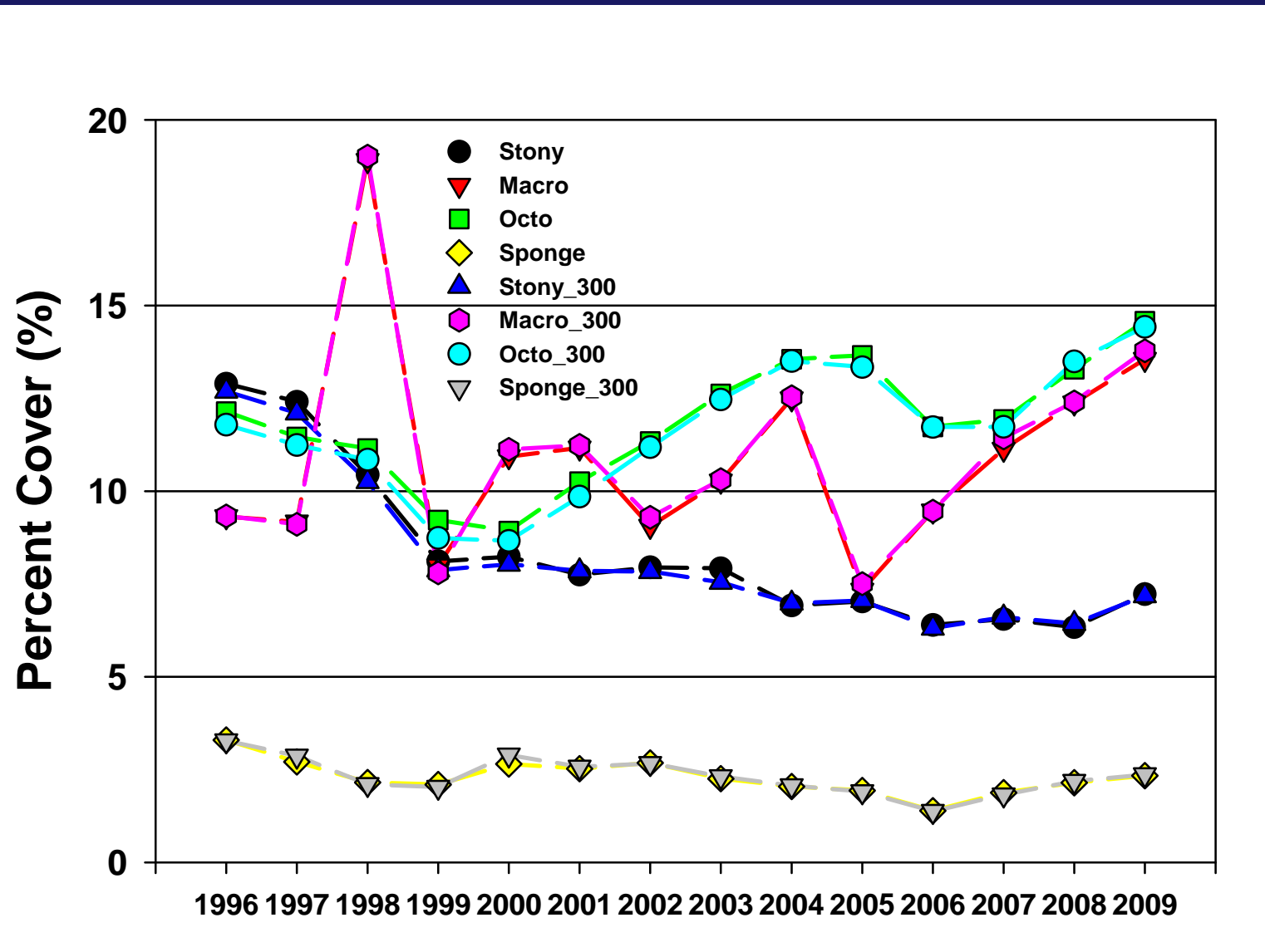


## *Xestospongia muta*



- Camera surveys only on 300 transect, whole station new patch reefs
- Stony coral demographics - 40 sites; all stations
- Octocoral demographics – 18 sites; all stations
- *Xestospongia* demographics – 11 sites; 2 stations per site

## Differences in Benthic Cover – 300 transect vs. whole station



- >90% of all sites showed same trend since 1996 for stony corals, octocorals, and macroalgae. >85% for sponges

## Benthic Cover Results 2010 vs. 2011 – Habitat\*Region Comparisons

	Stony Coral			Octocoral			Sponge			Macroalgae		
	2010	2011	Diff.	2010	2011	Diff.	2010	2011	Diff.	2010	2011	Diff.
LK BCP (2)	1.8±1.5	2.3±1.9	NC	0±0	0±0	NC	1.4±0.7	1.4±0.4	NC	42.2±20.2	45.6±6.8	NC
LK OD (5)	2.5±0.4	3.4±0.4	↑	12.2±1.1	13.3±1.4	NC	3.0±0.7	3.5±0.7	NC	33.7±2.3	25.8±3.2	↓
LK OS (5)	5.6±2.3	6.4±2.0	↑	11.6±1.8	12.6±0.9	NC	0.4±0.1	0.5±0.1	NC	9.0±1.2	7.8±2.4	NC
LK P (6)	22.2±3.6	23±4.0	NC	15.2±5.2	18.2±6.1	↑	3.9±0.9	6.1±1.3	↑	8±6.3	6.0±4.5	NC
MK OD (3)	2.7±0.8	3.5±1.8	NC	11.5±3.3	9.9±2.2	NC	7.7±2.7	6.9±1.5	NC	13.3±1.6	21.5±7.0	NC
MK OS (3)	1.9±0.4	2.2±0.4	NC	22.1±1.8	21.1±1.7	NC	1.6±0.5	1.4±0.3	NC	16±2.6	26.8±3.2	↑
MK P (4)	12.9±0.5	13±0.9	NC	12.3±2.7	10.5±2.4	↓	2.7±0.6	4.1±1.4	↑	7.1±0.8	18.4±5.5	↑
UK OD (3)	3.3±0.3	3.7±0.2	NC	14.9±2.1	13.4±2.5	NC	5.9±2.1	6.3±1.9	NC	31.8±13.8	23.8±1.5	NC
UK OS (4)	5.0±1.5	5.8±1.9	NC	17.2±2.6	17.3±2.3	NC	0.6±0.2	1.0±0.4	↑	12.7±5.8	14.5±4.0	NC
UK P (5)	5.5±1.8	5.3±1.5	NC	11.1±5.4	12±5.3	NC	1.0±0.5	1.8±0.6	↑	25.5±3.5	15.7±2.3	↓
OVERALL (40)	7.5±1.3	8.0±1.3	↑	13.2±1.3	13.6±1.3	NC	2.7±0.4	3.3±0.5	↑	18.4±2.4	18.1±1.9	NC

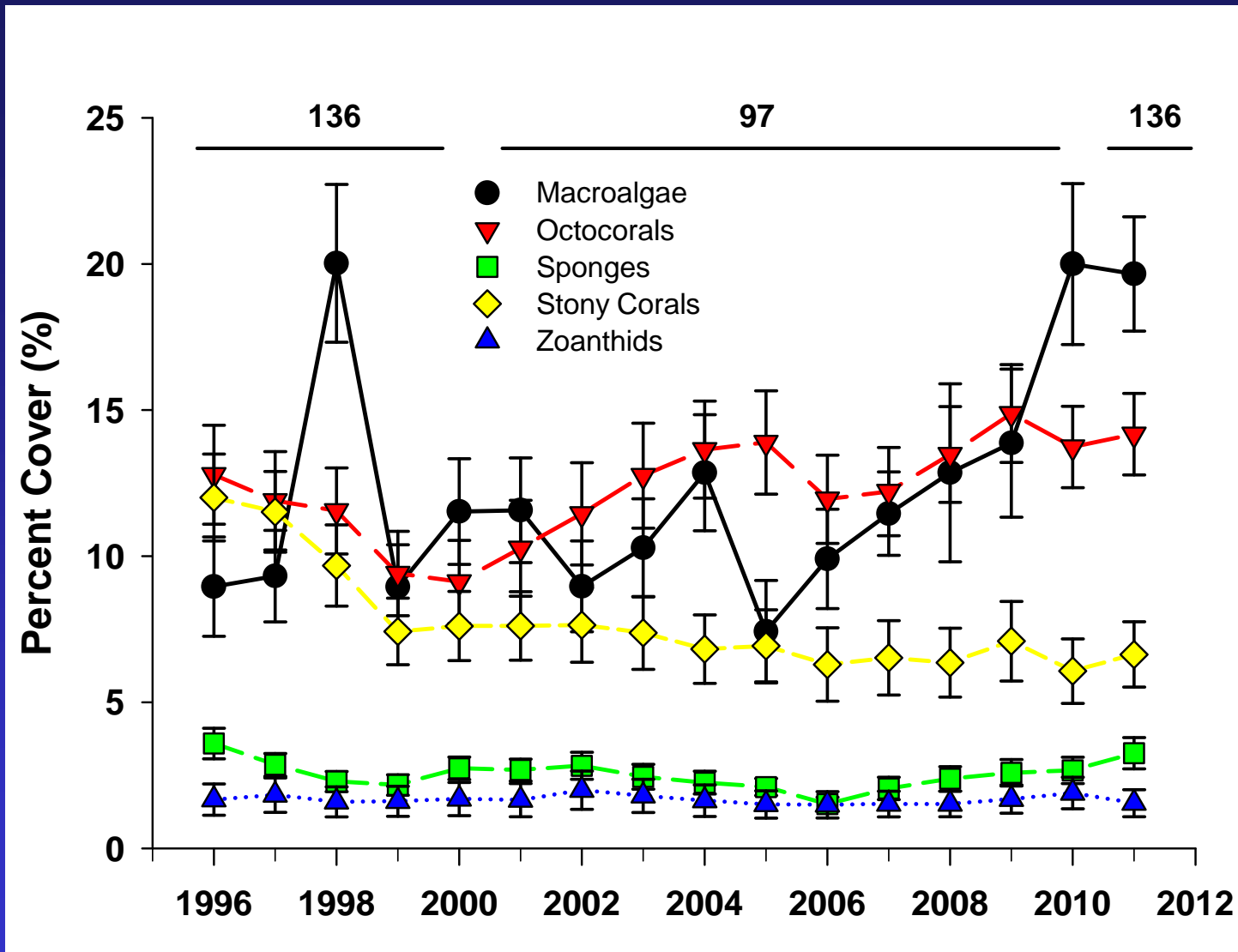
- Significant increases in green, decreases in red
- Increase in total stony coral and sponge cover
- $N = 40$  sites/109 stations

## Benthic Cover Results 2010 vs. 2011 – Habitat Comparisons

	Stony Coral			Octocoral			Sponge			Macroalgae		
	2010	2011	Diff.	2010	2011	Diff.	2010	2011	Diff.	2010	2011	Diff.
<b>BCP (2)</b>	1.8±1.5	2.3±1.9	NC	0.0±0.0	0.0±0.0	NC	1.4±0.7	1.4±0.4	NC	42.2±20.2	45.6±6.8	NC
<b>OD (11)</b>	2.8±0.3	3.5±0.5	↑	12.7±1.1	12.4±1.1	NC	5.1±1.1	5.2±0.8	NC	27.6±4.4	24.1±2.2	NC
<b>OS (12)</b>	4.5±1.1	5.2±1.1	↑	16.1±1.7	16.3±1.3	NC	0.8±0.2	0.9±0.2	NC	12±2.1	14.8±2.8	NC
<b>P (15)</b>	14.2±2.4	14.4±2.6	NC	13.1±2.7	14.1±3.0	↑	2.6±0.5	4.2±0.8	↑	13.6±3.5	12.5±2.7	NC
<b>OVERALL (40)</b>	7.5±1.3	8.0±1.3	↑	13.2±1.3	13.6±1.3	NC	2.7±0.4	3.3±0.5	↑	18.4±2.4	18.1±1.9	NC

- Increase in total stony coral cover at deep and shallow forereefs
- Increase in octocoral and sponge cover at patch reefs
- $N = 40$  sites/109 stations

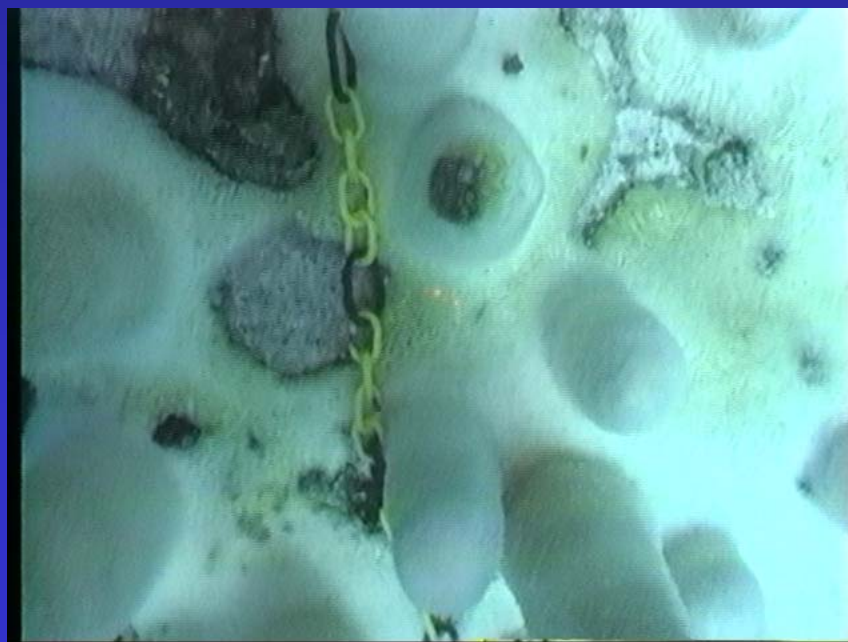
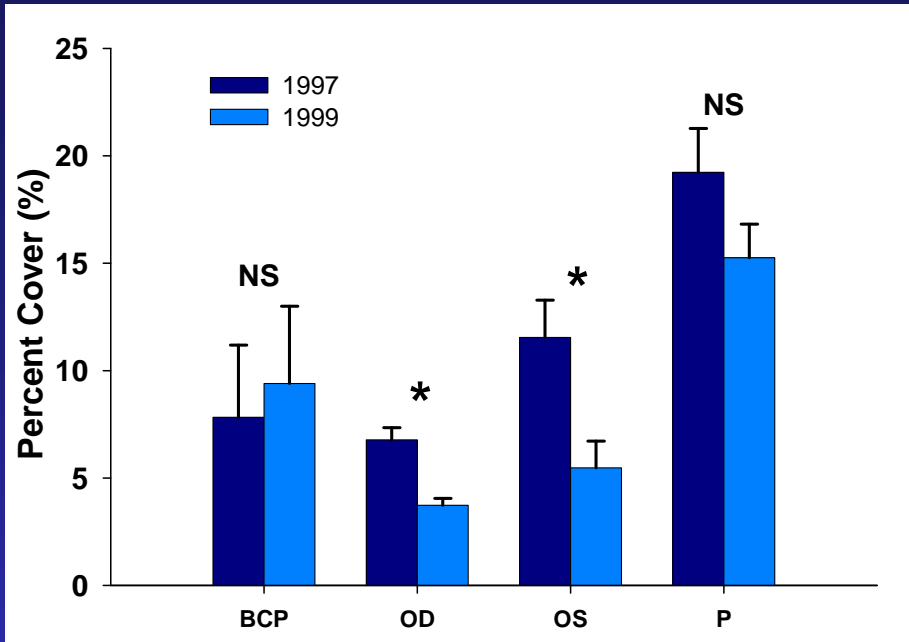
# Long Term Trends in Benthic Cover



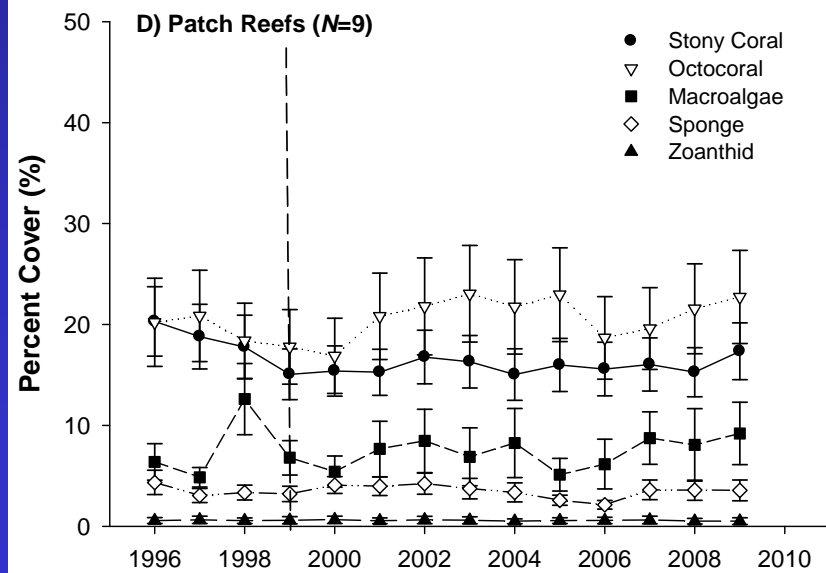
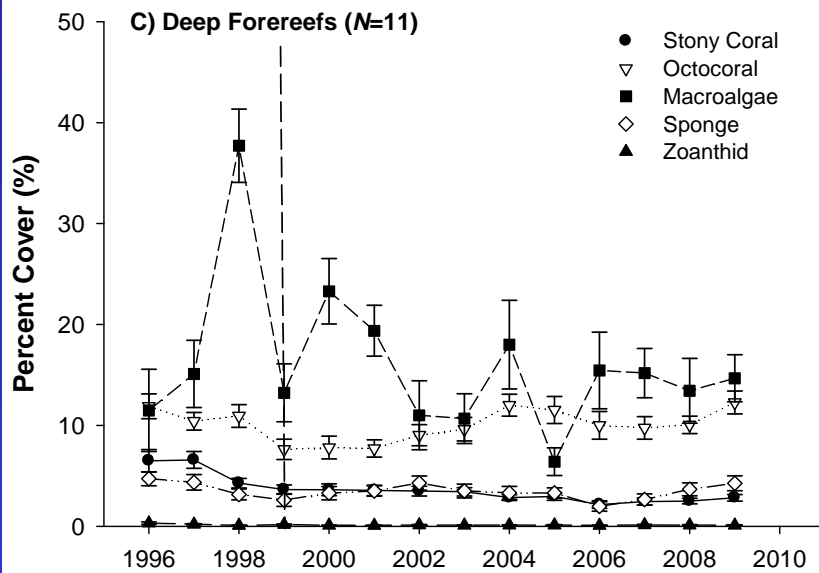
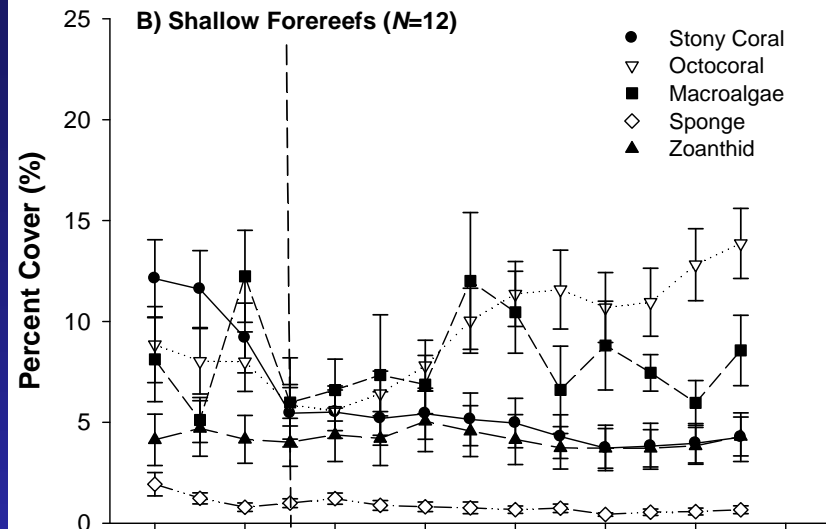
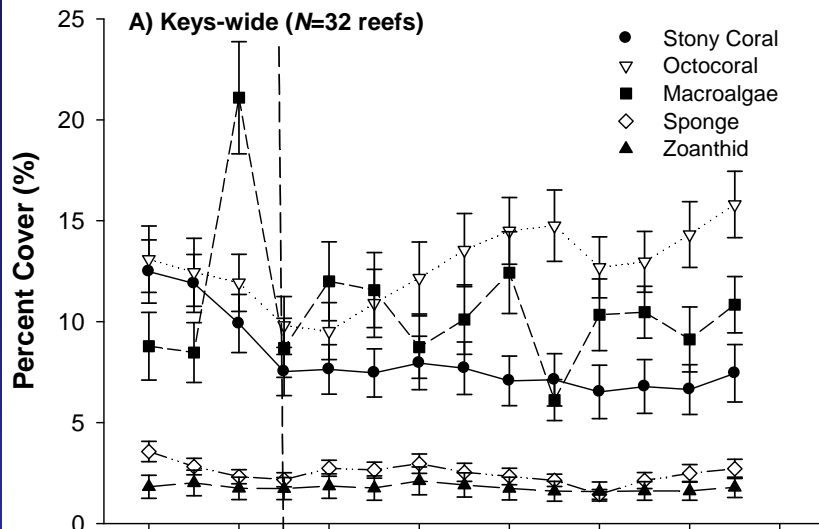
- $N = 34$  sites in the Florida Keys



# Temporal Trends Since 1997/1998 Mass Bleaching Event

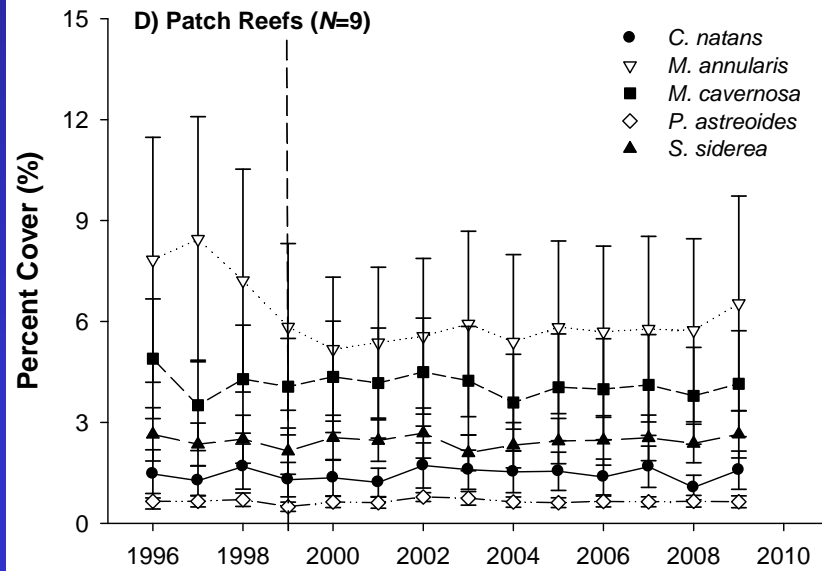
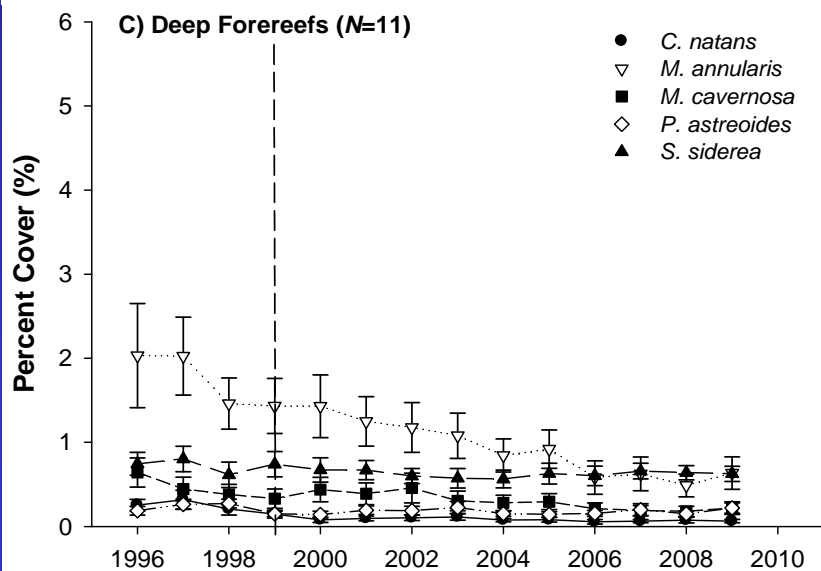
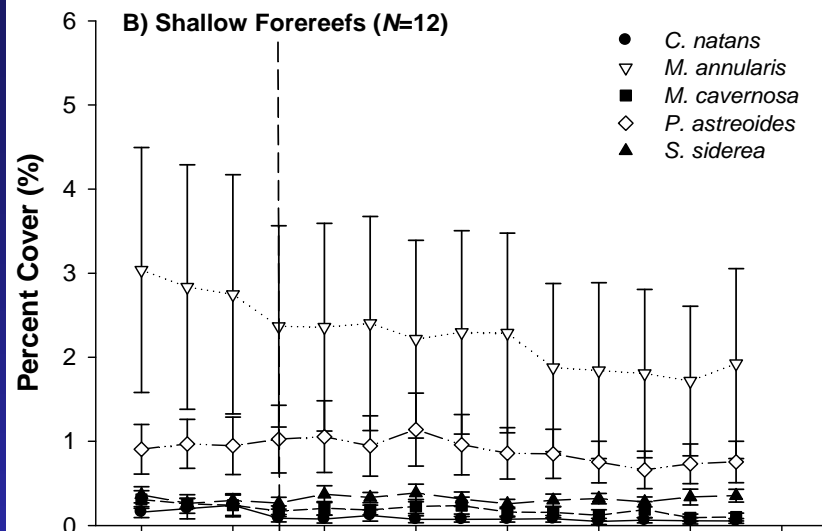
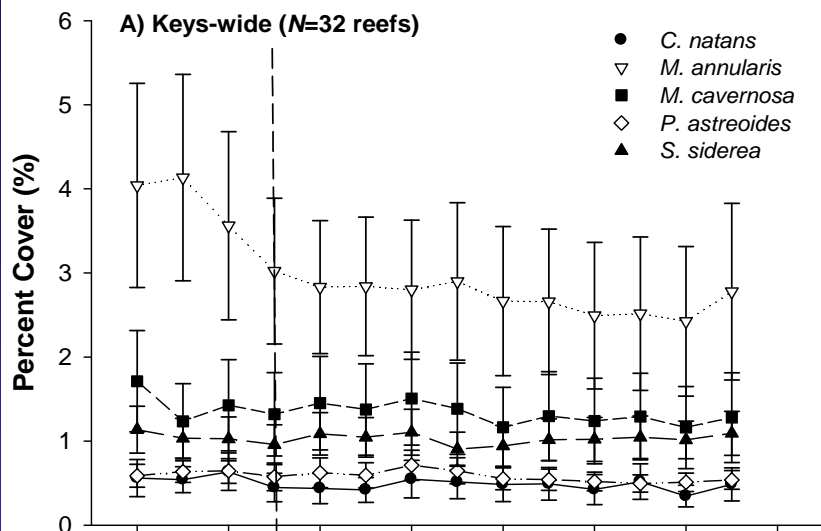


# Benthic Variable Trends 1999 - 2009



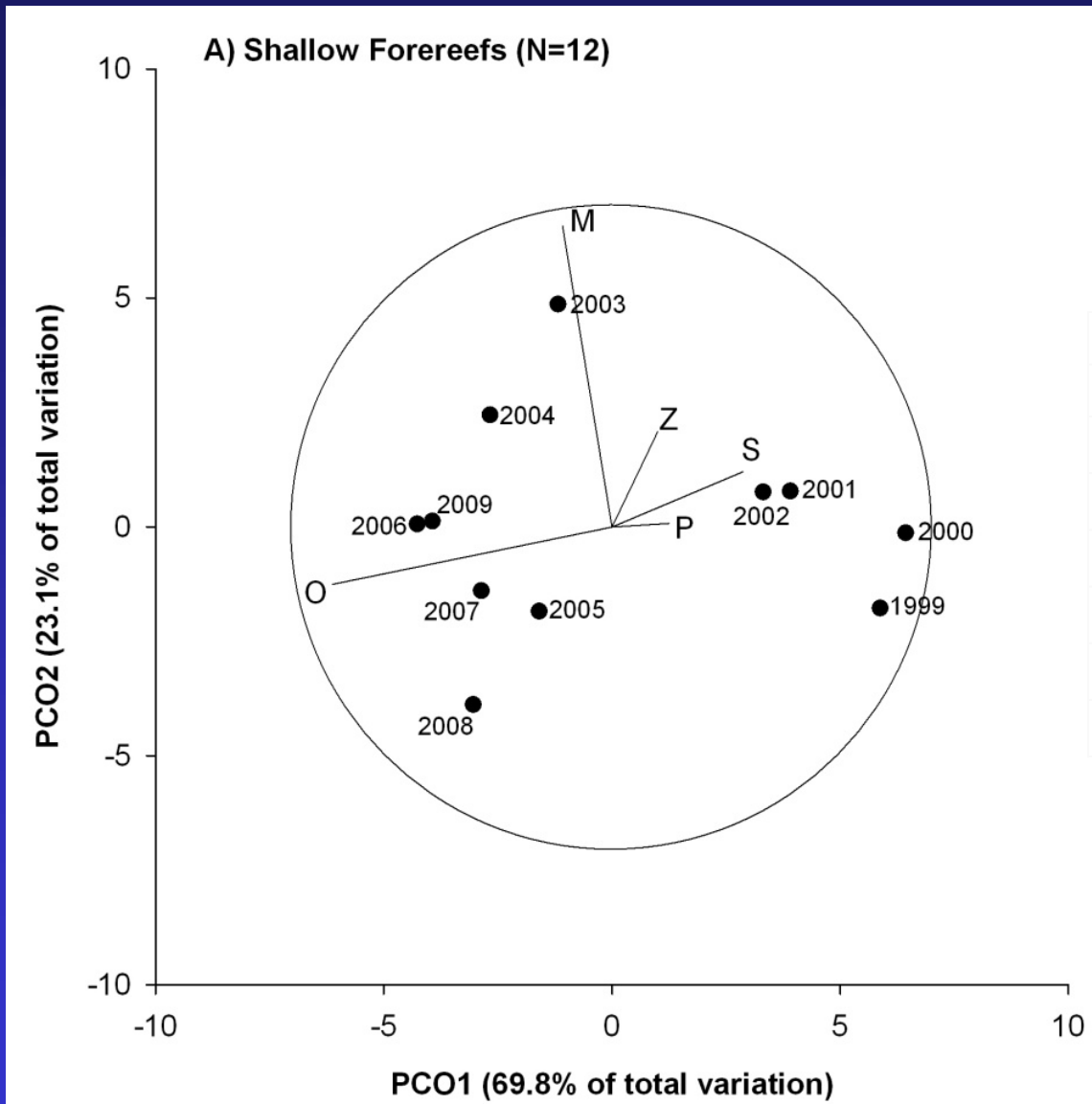
• Ruzicka et al. *MEPS* 2013 (in review)

# Stony Coral Trends 1999 - 2009



• Ruzicka et al. *MEPS* 2013 (in review)

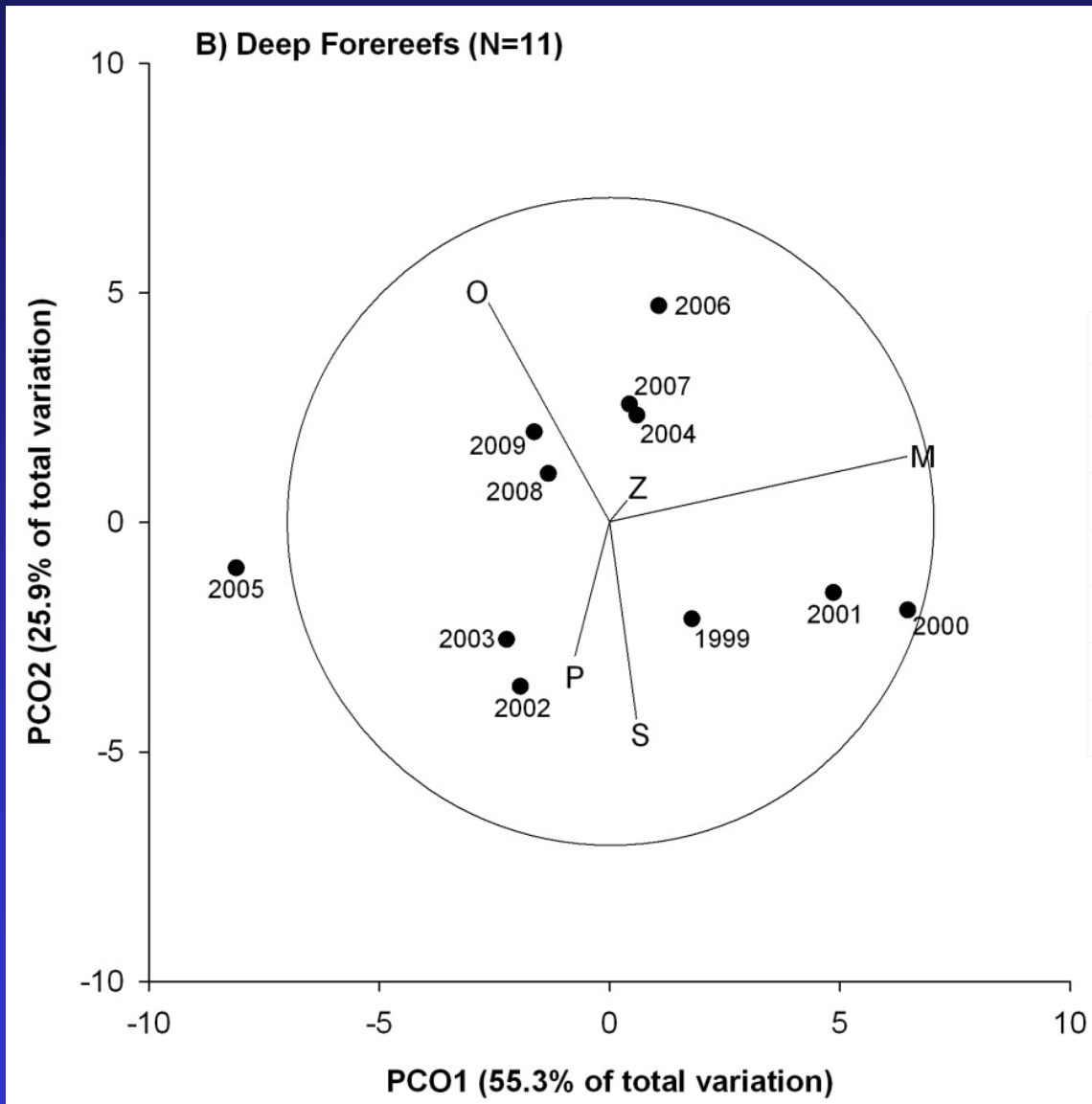
# Change in Community Structure 1999 – 2009



Shallow Forereefs		
Variable	Axis 1	Axis 2
Macroalgae	-0.2980	<b>0.9086</b>
<b>Octocoral</b>	<b>-0.8513</b>	-0.1905
Sponge	0.1908	0.0250
<b>Stony Coral</b>	<b>0.3625</b>	0.1943
Zoanthid	0.1263	0.2787
Variance Explained	69.8%	23.1%

- Ruzicka et al. *MEPS* 2013 (in review)

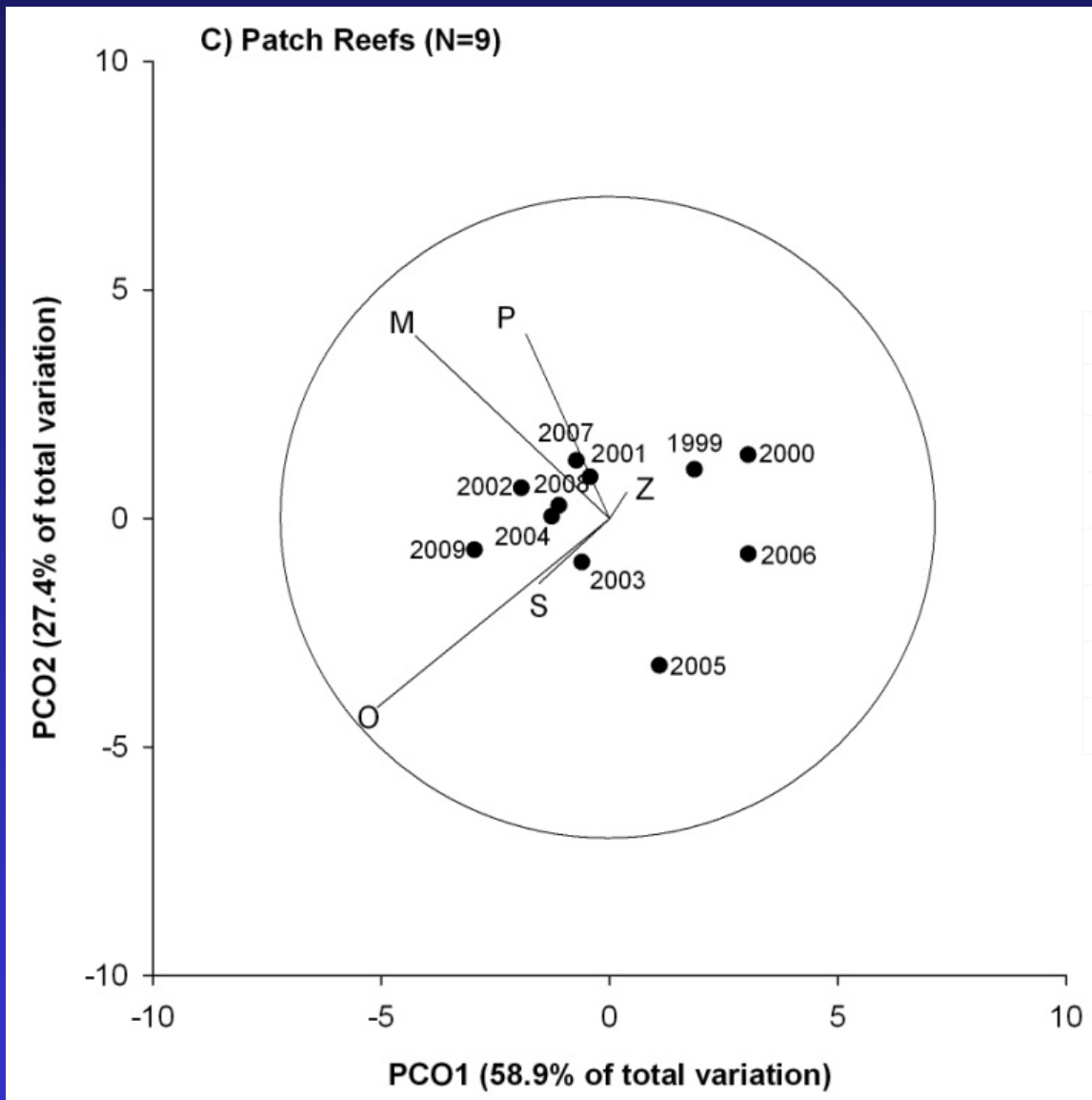
# Change in Community Structure 1999 – 2009



Deep Forereefs		
Variable	Axis 1	Axis 2
<b>Macroalgae</b>	<b>0.8867</b>	0.2402
<b>Octocoral</b>	<b>-0.4234</b>	<b>0.5672</b>
Sponge	-0.0891	-0.4085
<b>Stony Coral</b>	0.0497	<b>-0.6490</b>
Zoanthid	0.0377	0.0308
Variance Explained	55.3%	25.9%

- Ruzicka et al. *MEPS* 2013 (in review)

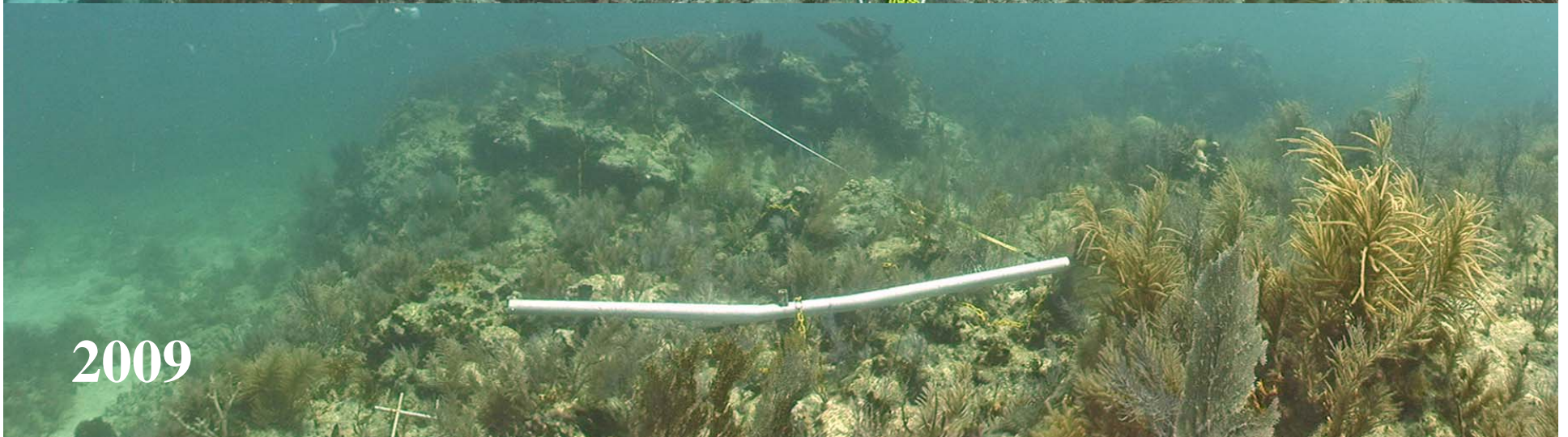
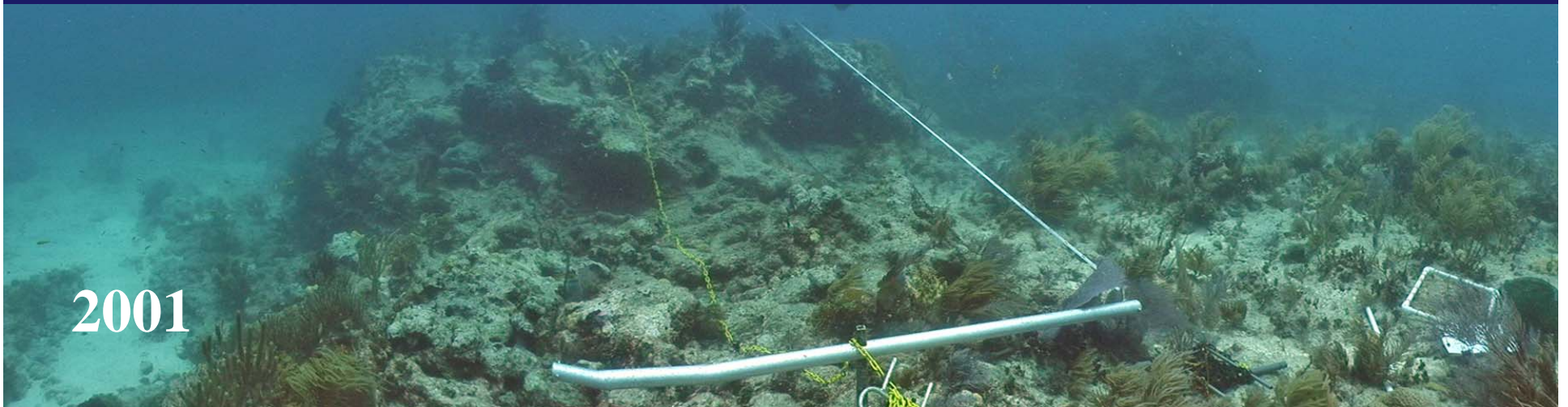
# Change in Community Structure 1999 – 2009



Deep Forereefs		
Variable	Axis 1	Axis 2
<b>Macroalgae</b>	<b>-0.6972</b>	0.4906
<b>Octocoral</b>	<b>-0.6387</b>	-0.6693
Sponge	-0.2555	0.5091
Stony Coral	-0.1737	-0.1961
Zoanthid	0.0523	0.0796
Variance Explained	58.9%	27.4%

- Ruzicka et al. *MEPS* 2013 (in review)

## Changes in Octocoral Cover – Molasses Shallow



- Ruzicka et al. *MEPS* 2013 (in review)

## Changes in Octocoral Cover – Conch Shallow

2001



2009



- Ruzicka et al. *MEPS* 2013 (in review)





- Images from Gene Shinn in Tropical Treasures - South Florida Marine Environments

- Nearly 4x increase in hardbottom habitat occupied by octocorals spanning a century in the Dry Tortugas (Davis 1982)

# Temporal changes in benthic assemblages on Florida Keys reefs 11 years after the 1997/1998 El Niño

1. No overall significant decline in total stony coral cover Keys-wide between 1999 and 2009
  - Total stony coral cover did decline at deep and shallow forereefs
  - Decline in stony coral cover associated with loss of *M. annularis* complex
  - No decline detected for 4 of the other 5 most spatially common stony corals
2. Significant increase in octocoral cover Keys-wide between 1999 and 2009
  - Increase in all three habitats
  - Clear shift in community structure at shallow forereefs; less clear on deep forereefs; transition may start at patch reefs following the 2010 winter event
  - Shift is likely to continue because octocorals have demonstrated more resilience to stressors than other benthic fauna
3. No change in macroalgal cover between 1999 and 2009
  - Macroalgal values on par with 1996 values
  - Management strategies (e.g., fisheries regulations and advanced wastewater treatment) have likely helped to reduce macroalgal proliferation

**CREMP is funded by US EPA Water Quality Protection Program  
Federal Award No. X7-95447709**



**CREMP 2009 Final Report Available at  
<http://research.myfwc.com/>**