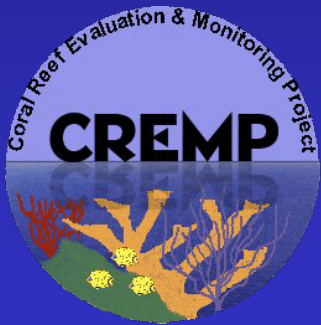


Coral Reef Evaluation and Monitoring Project US EPA Water Quality Protection Program Steering Committee Presentation March 11th, 2015

**Rob Ruzicka, Mike Colella, Jim Kidney,
Vanessa Brinkhuis, Lucy Bartlett,
Kevin Macaulay & Many Others**



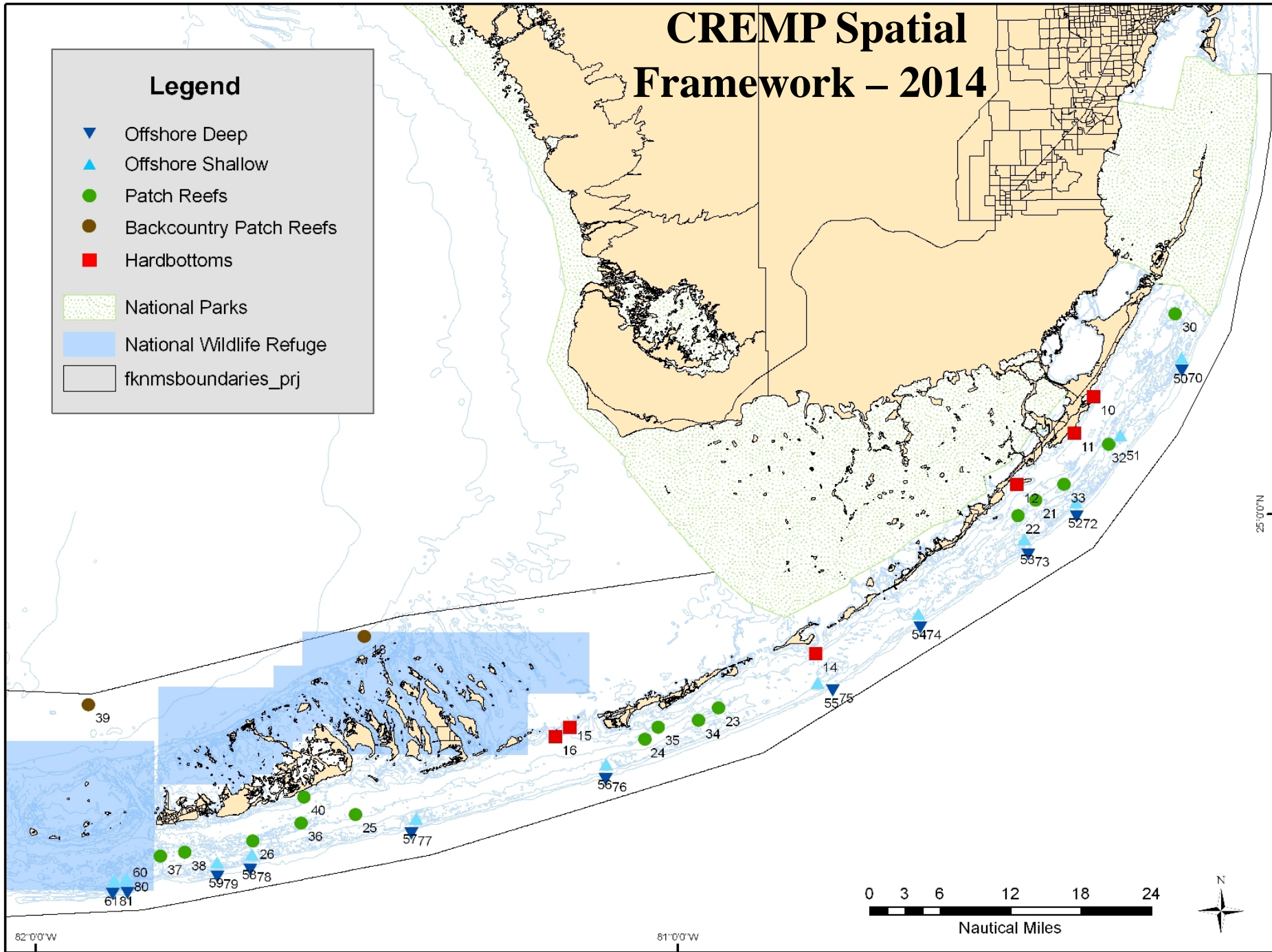
**CREMP is funded by US EPA Water Quality Protection Program
Federal Award No. X7-95447709**

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

CREMP Spatial Framework – 2014

Legend

- ▼ Offshore Deep
- ▲ Offshore Shallow
- Patch Reefs
- Backcountry Patch Reefs
- Hardbottoms
- ▨ National Parks
- ▨ National Wildlife Refuge
- ▭ fknmsboundaries_prj

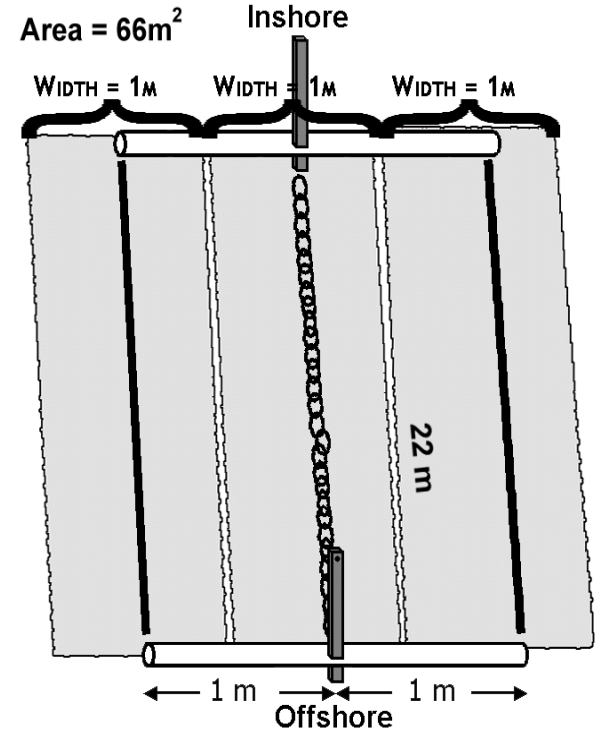
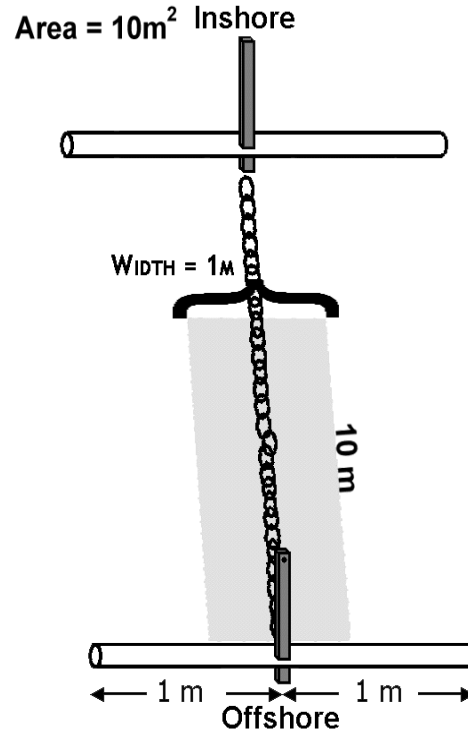
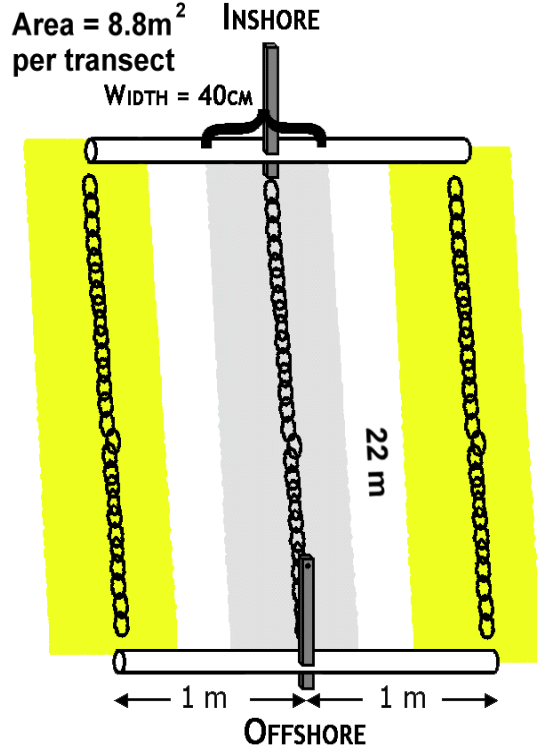


Methods - Present

Demographic Surveys

Xestospongia muta

Video Transects



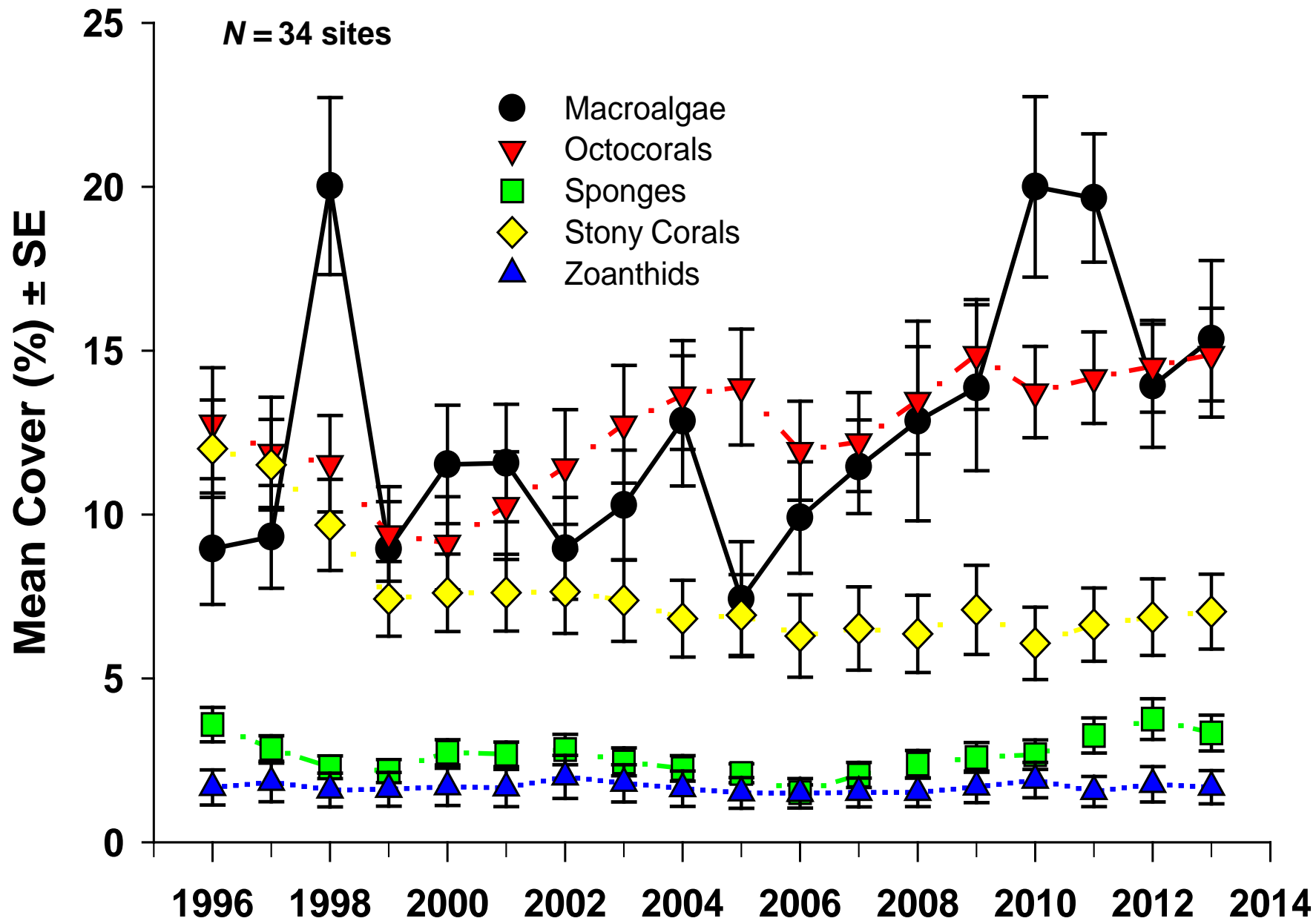
- Camera surveys on 300 transect
- Stony coral demographics - 40 sites; all stations
- Octocoral demographics – 18 sites; all stations
- *Xestospongia* demographics – 11 sites; 2 stations per site
- 2014 Add-ons – 2 additional stations at 6 patch reefs
- 2014 Add-ons – 6 historic and 3 canal restoration hardbottom sites

Benthic Cover Results 2012 vs. 2013 – Habitat Comparisons

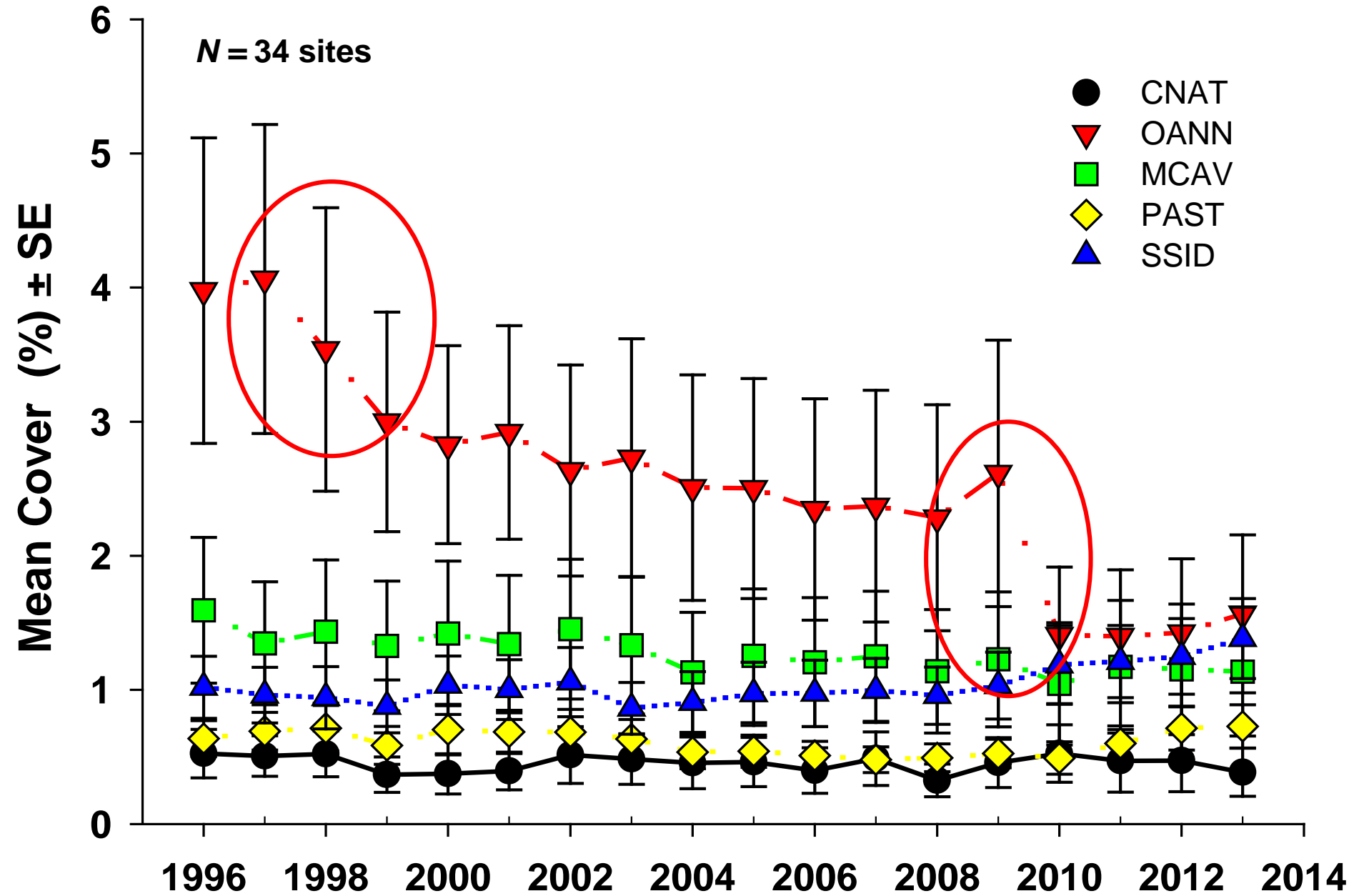
	Stony Coral			Octocoral			Sponge			Macroalgae		
	2012	2013	Diff.	2012	2013	Diff.	2012	2013	Diff.	2012	2013	Diff.
BCP (2)	2.4 [±] 0.8	2.1 [±] 0.8	NC	0.0 [±] 0.0	0.0 [±] 0.0	NC	2.0 [±] 0.8	1.3 [±] 1.0	NC	33.0 [±] 8.1	58.8 [±] 6.4	↓
OD (11)	3.4 [±] 0.4	3.7 [±] 0.4	NC	13.2 [±] 0.4	13.2 [±] 0.4	NC	6.0 [±] 1.1	5.2 [±] 0.3	↓	16.7 [±] 3.2	17.9 [±] 2.1	NC
OS (12)	5.4 [±] 1.1	5.4 [±] 1.2	NC	16.6 [±] 1.1	16.5 [±] 1.1	NC	1.2 [±] 0.3	1.0 [±] 0.8	NC	11.6 [±] 2.8	9.8 [±] 1.8	NC
P (15)	15.7 [±] 2.6	15.2 [±] 2.6	NC	14.5 [±] 3.0	15.2 [±] 2.7	NC	4.2 [±] 1.0	4.3 [±] 0.6	NC	10.7 [±] 2.9	9.3 [±] 2.0	NC
OVERALL (40)	8.5 [±] 1.3	8.5 [±] 1.3	NC	14.0 [±] 1.4	14.7 [±] 1.3	NC	3.7 [±] 0.6	3.4 [±] 0.5	NC	13.7 [±] 1.8	14.3 [±] 2.1	NC

- Significant increases in green, decreases in red
- Overall coral cover was similar between years
- Differences between habitat types; no Keys-wide changes for any benthic groups
- $N = 40$ sites

Long Term Trends in Benthic Cover – Florida Keys

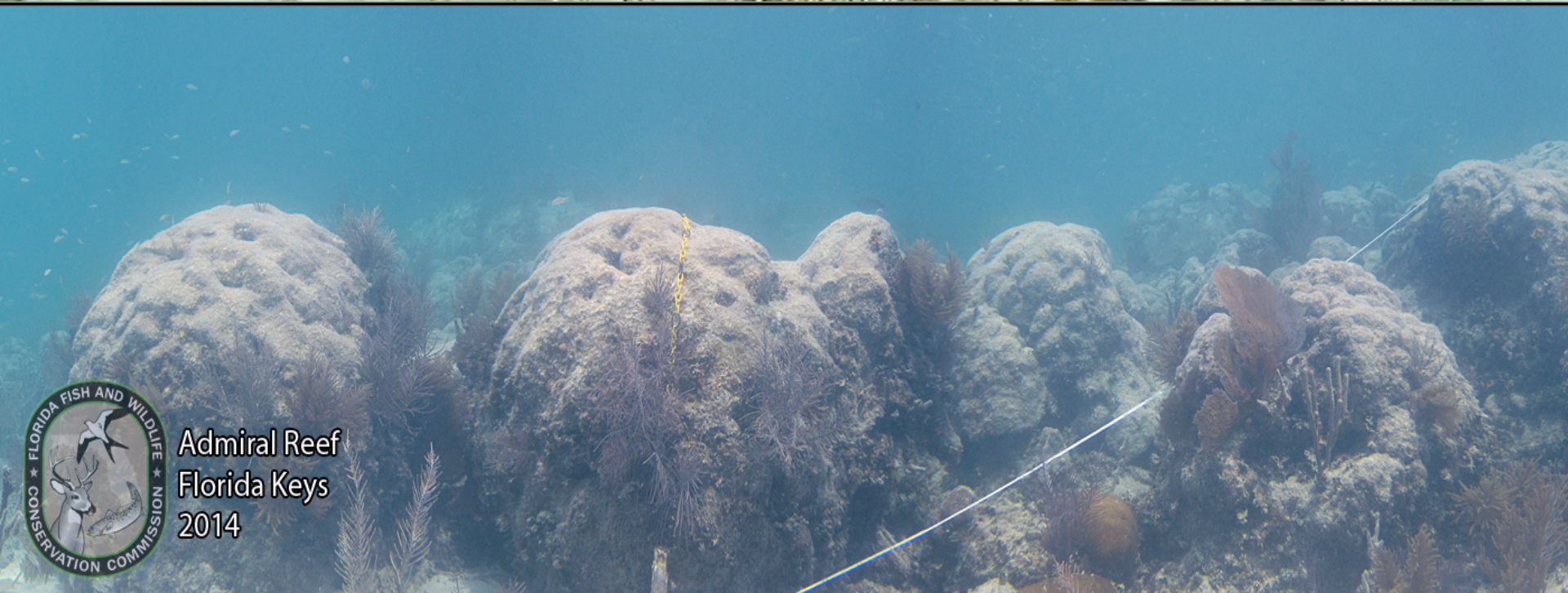


Long Term Trends in Benthic Cover – Coral Species





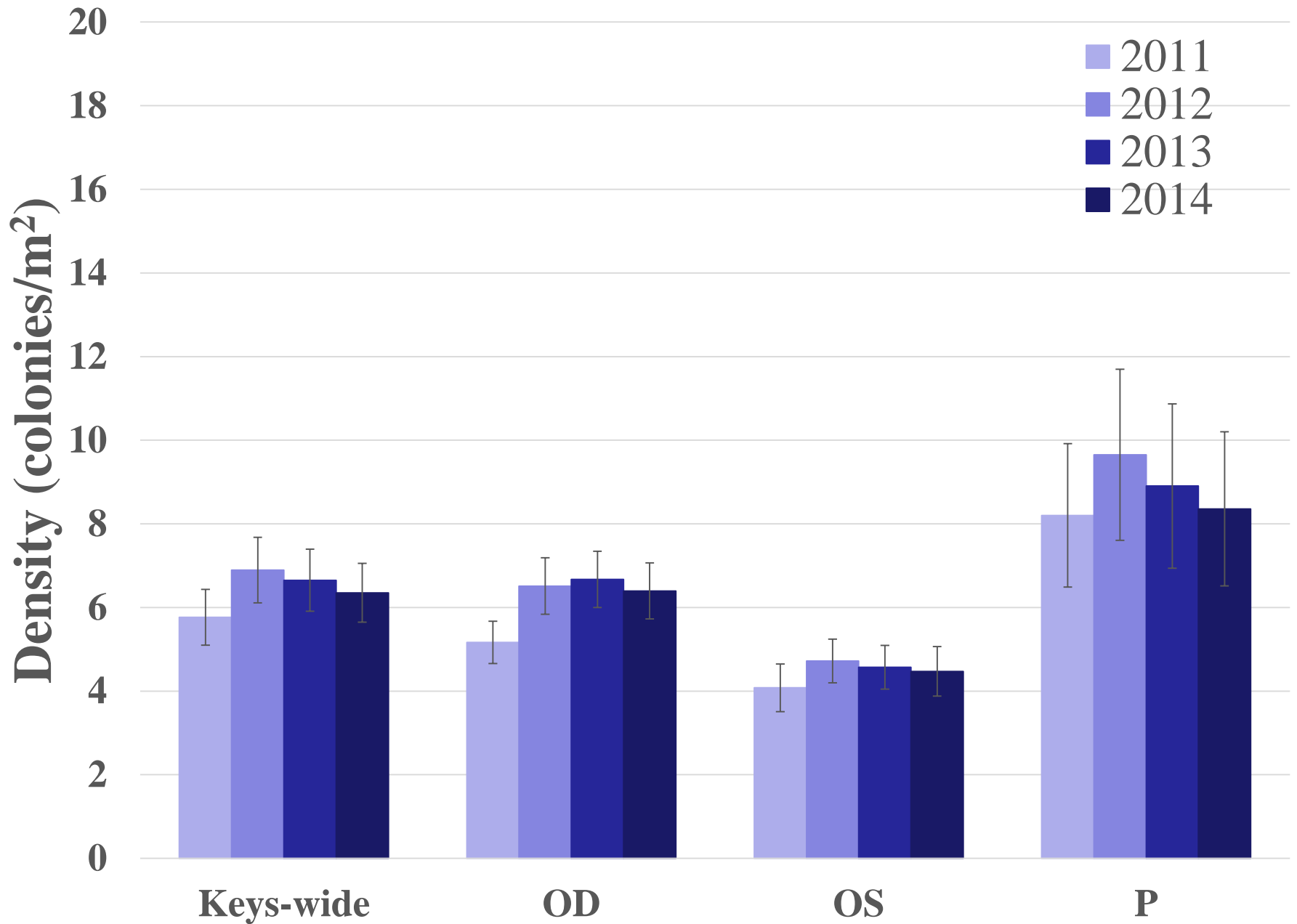
Admiral Reef
Florida Keys
2007



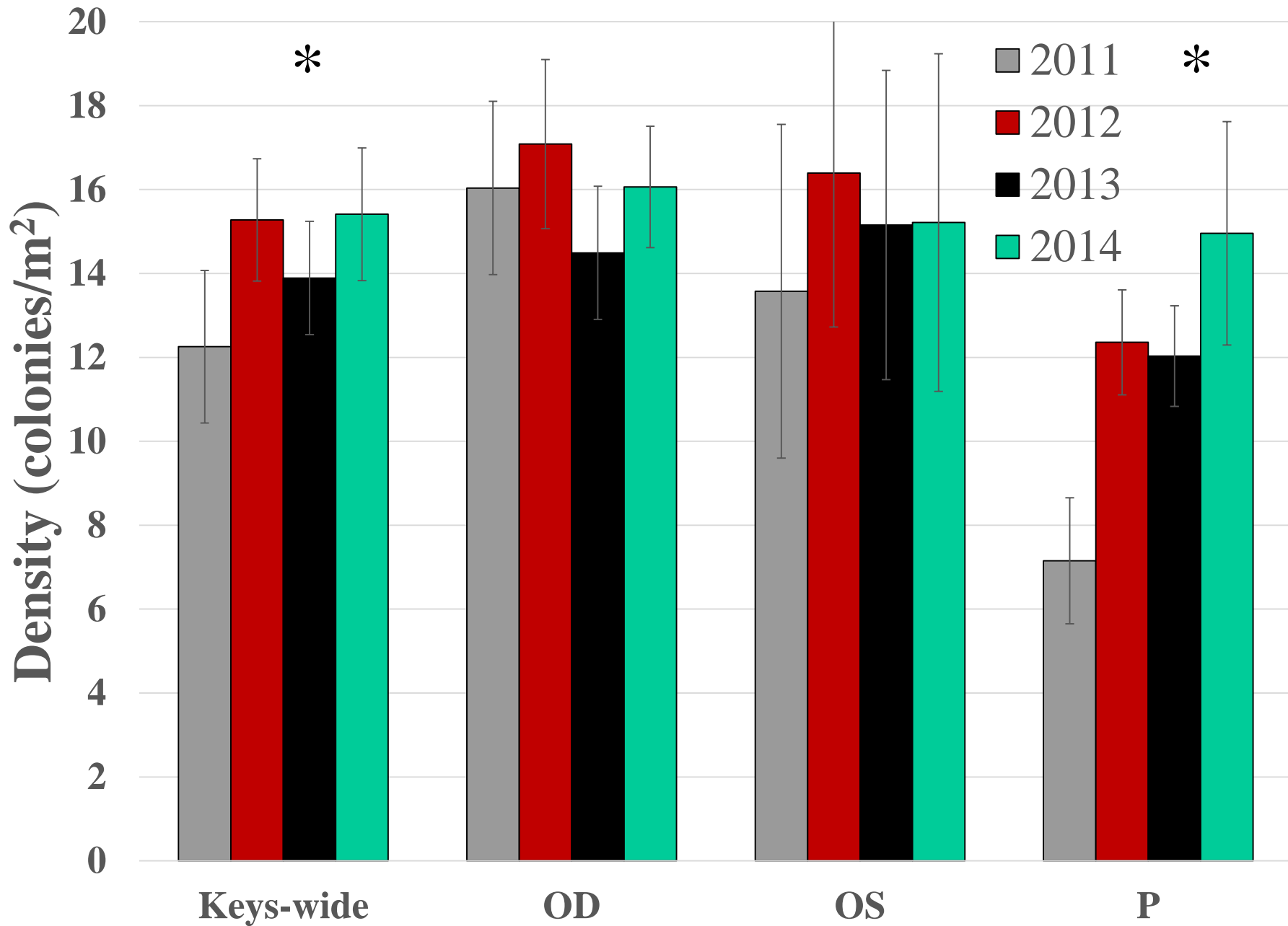
Admiral Reef
Florida Keys
2014



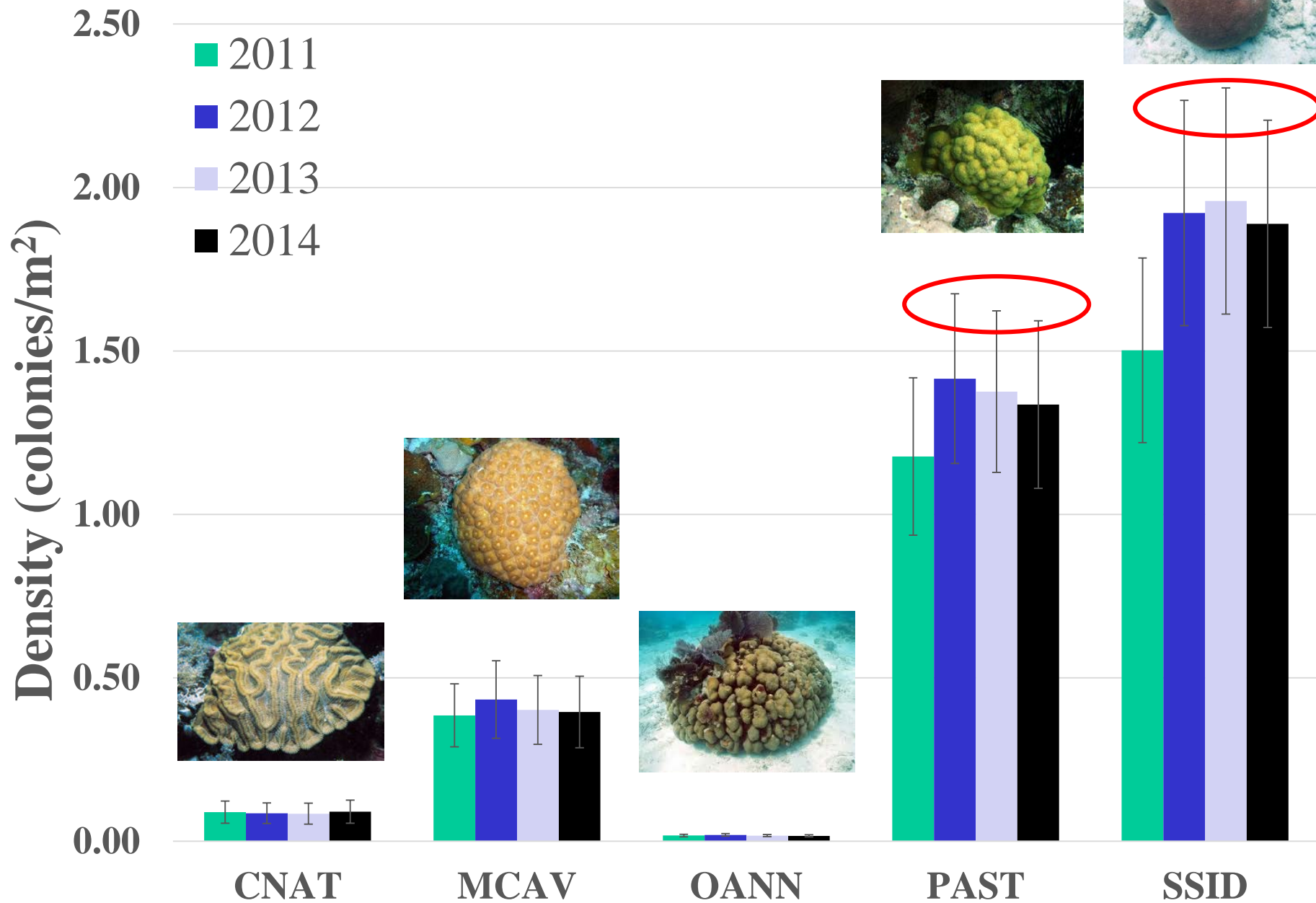
Stony Coral Density



Octocoral Density



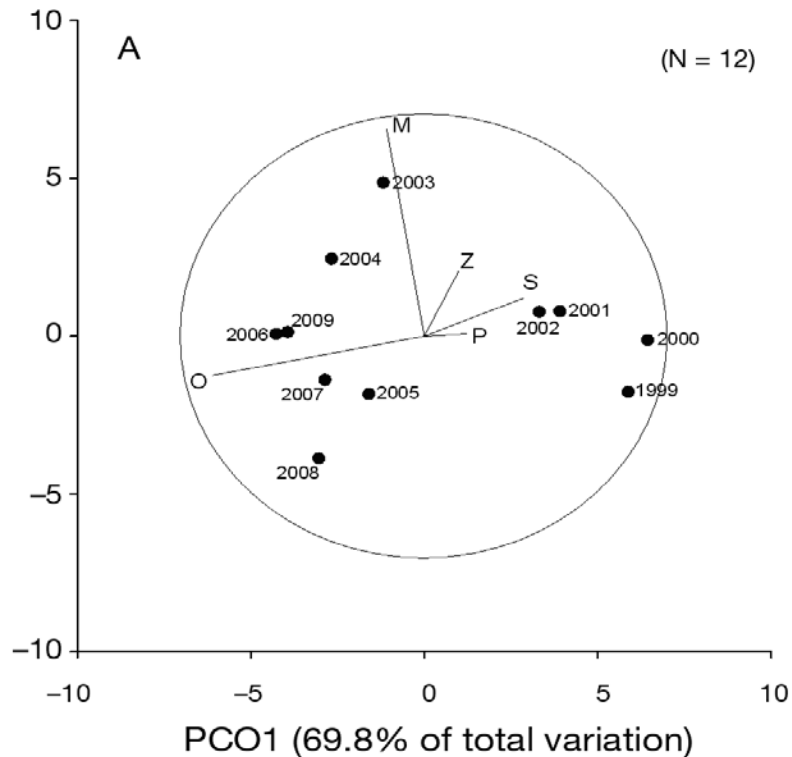
Coral Species Density





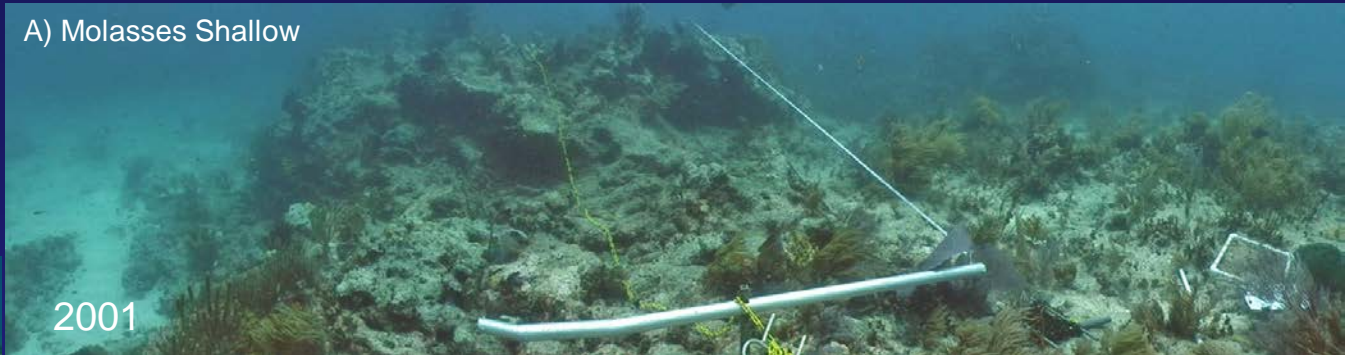
Temporal changes in benthic assemblages on Florida Keys reefs 11 years after the 1997/1998 El Niño

R. R. Ruzicka^{1,*}, M. A. Colella¹, J. W. Porter², J. M. Morrison³, J. A. Kidney¹, V. Brinkhuis¹, K. S. Lunz¹, K. A. Macaulay¹, L. A. Bartlett¹, M. K. Meyers², J. Colee⁴

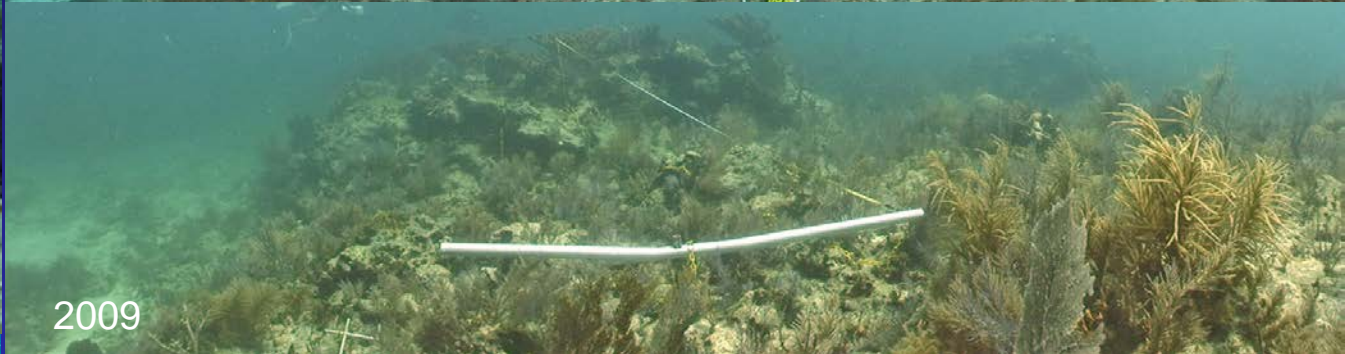




A) Molasses Shallow

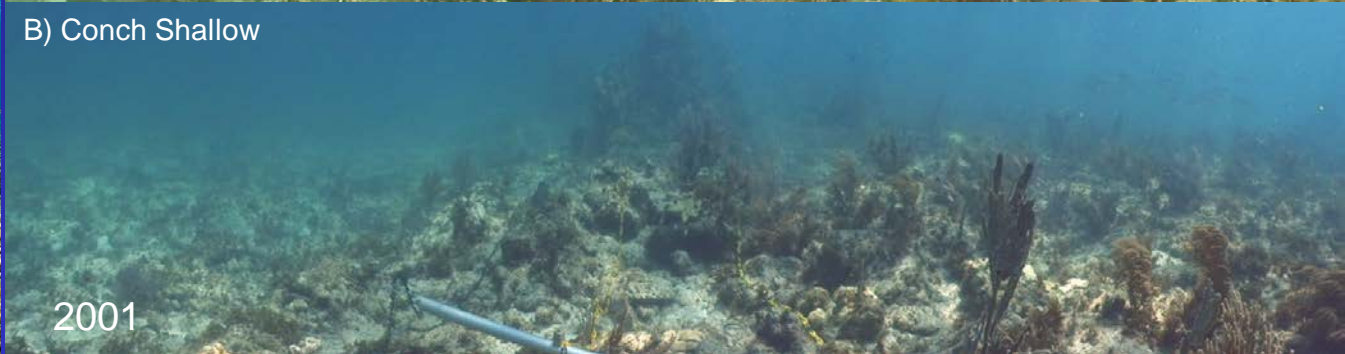


2001

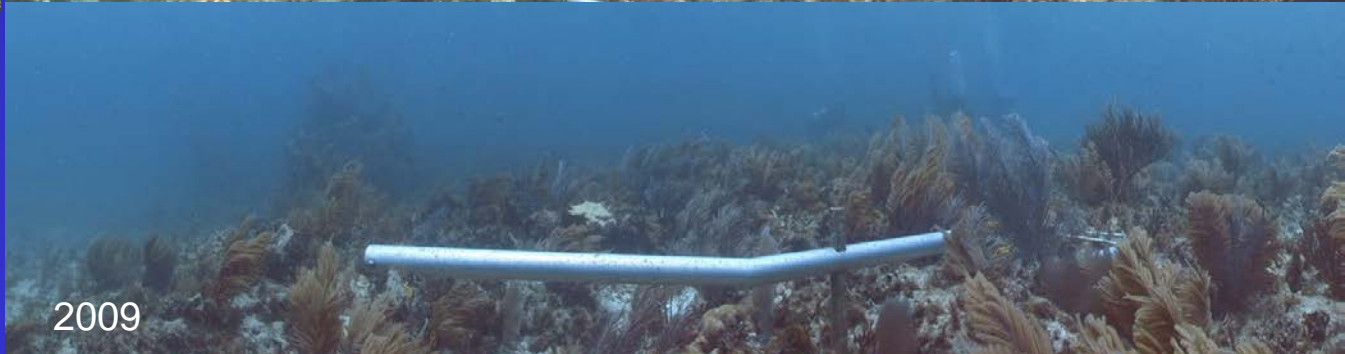


2009

B) Conch Shallow



2001



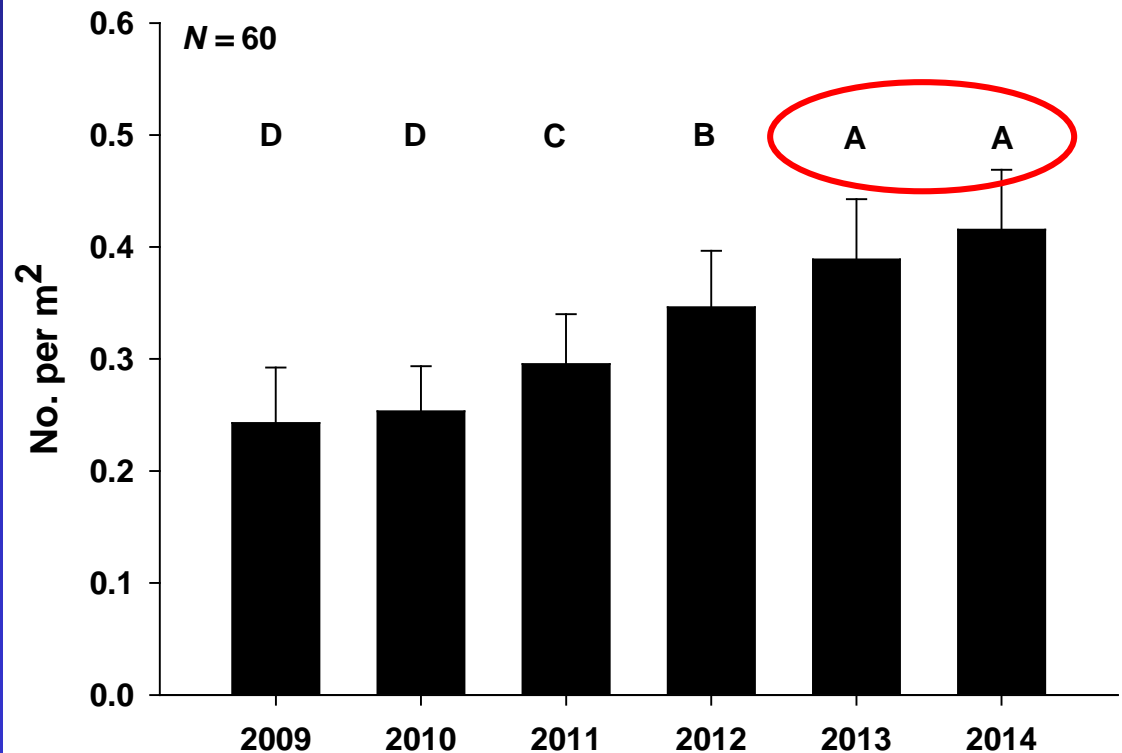
2009

Keys-Wide *X. Muta* Density

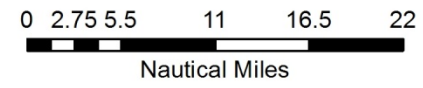
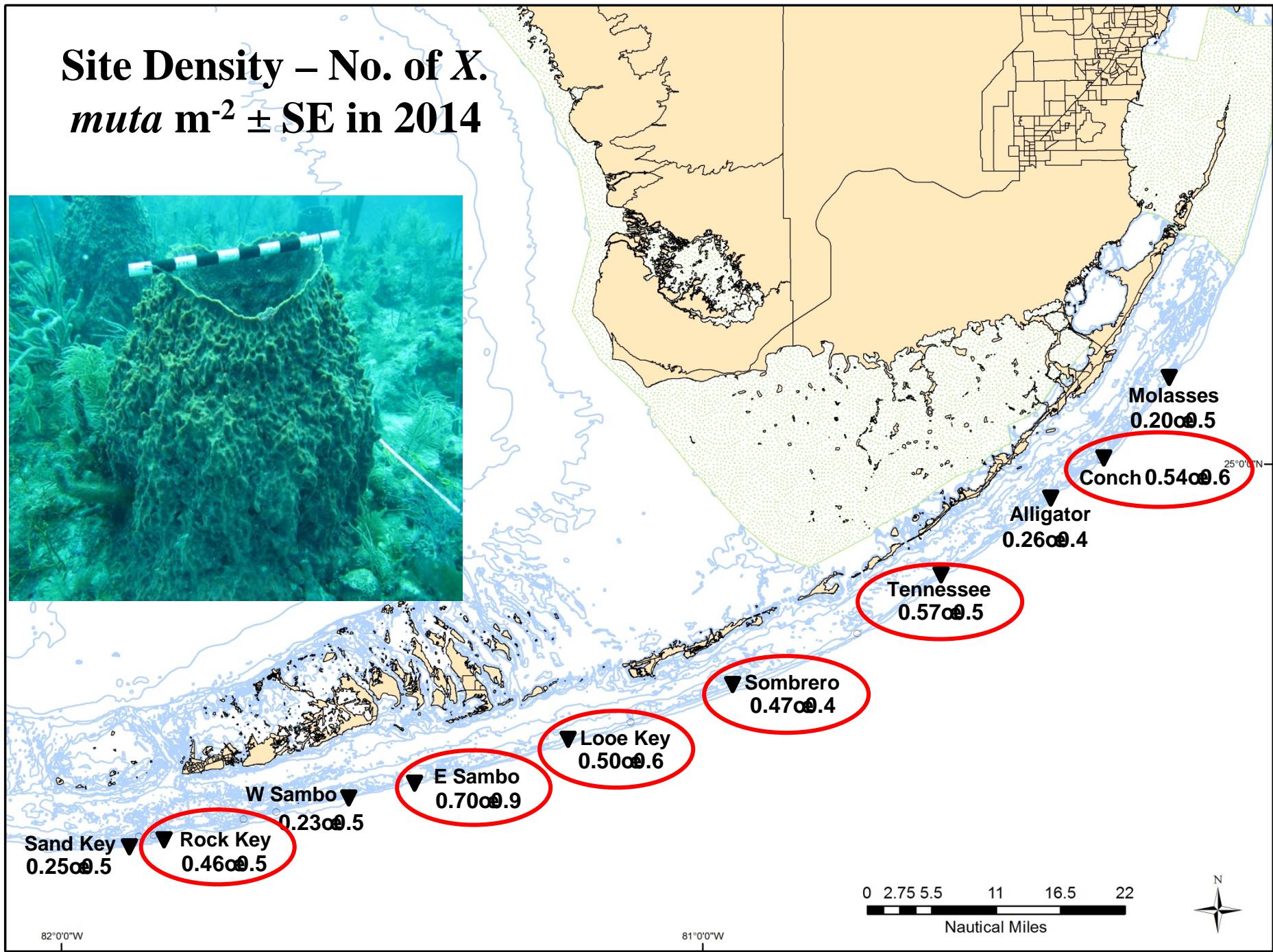
Source of Variation	DF	Sum of Squares	Mean Square	F	P
Site	9	102.949	11.439	6.454	<0.001
Transect	50	88.612	1.722		
Year	5	27.758	5.552	91.419	<0.001
Site x Year	45	7.823	0.174	2.863	<0.001
Residual	250	15.182	0.0607		
Total	359	242.323	0.675		



1. Density in 2013 and 2014 higher than other years
2. Interaction effect because density not increasing at all sites
3. $N = \sim 650$ colonies



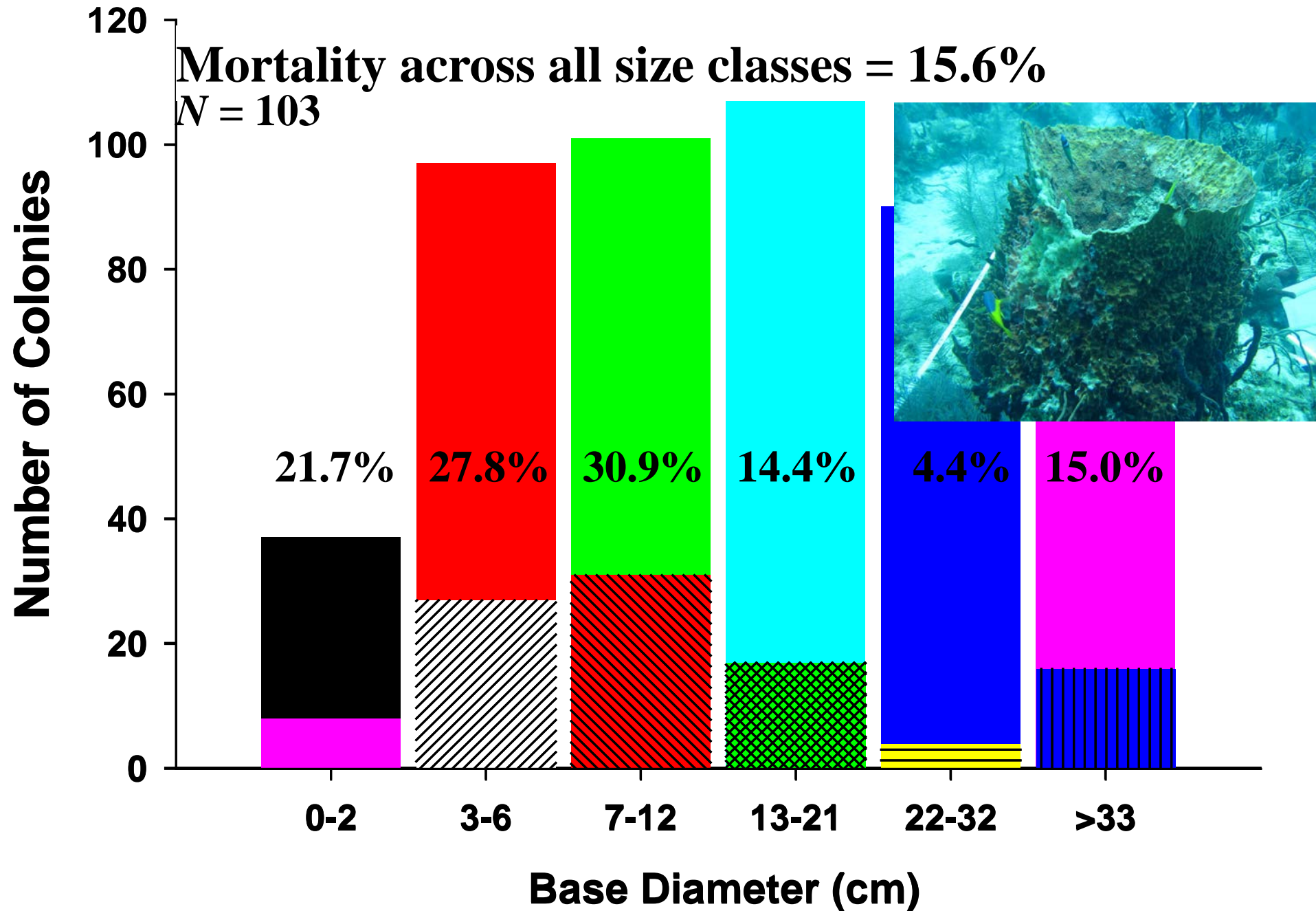
Site Density – No. of *X. muta* m⁻² ± SE in 2014



82°0'0"W

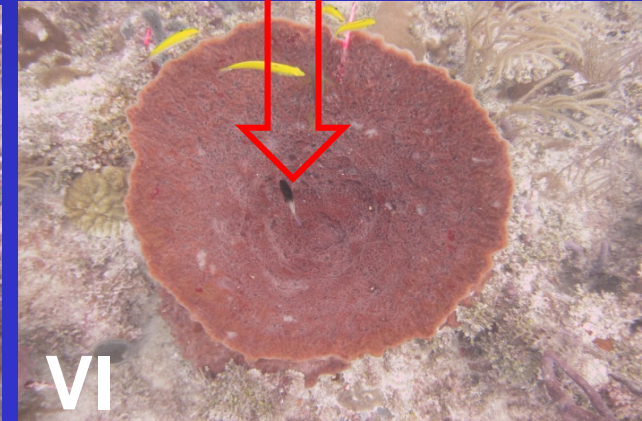
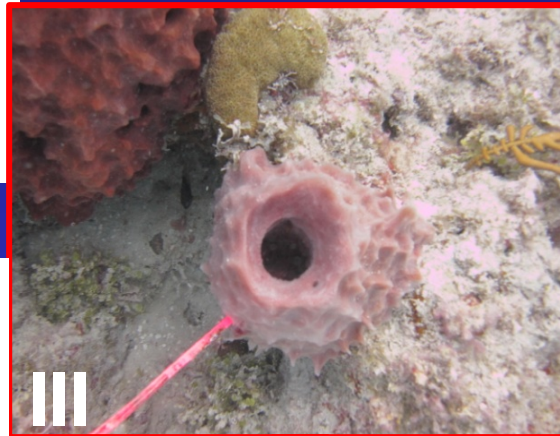
81°0'0"W

Keys-Wide *X. muta* Mortality



Growth

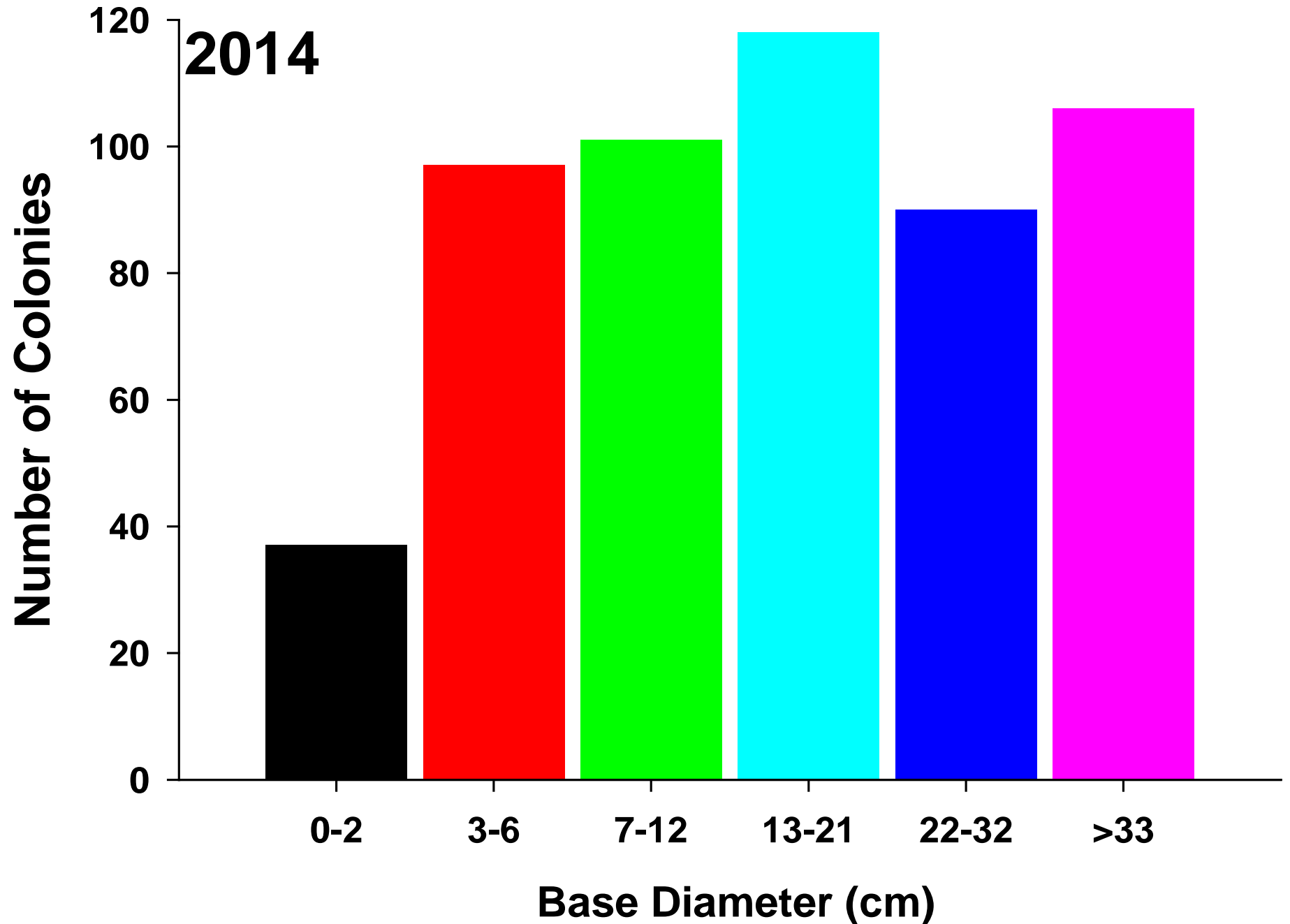
Size Class	2009	2014
I	6	1
II	31	7
III	78	19
IV	64	75
V	60	74
VI	50	112



Change in Size Class	No. of Colonies
0	98
1	152
2	39

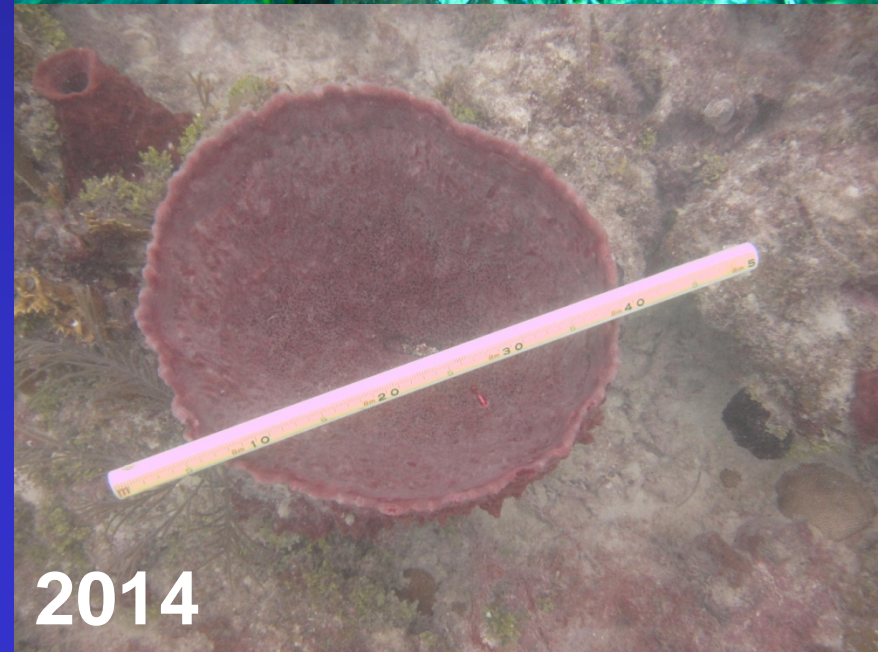
$N = 289$

Keys-Wide *X. muta* Population Structure



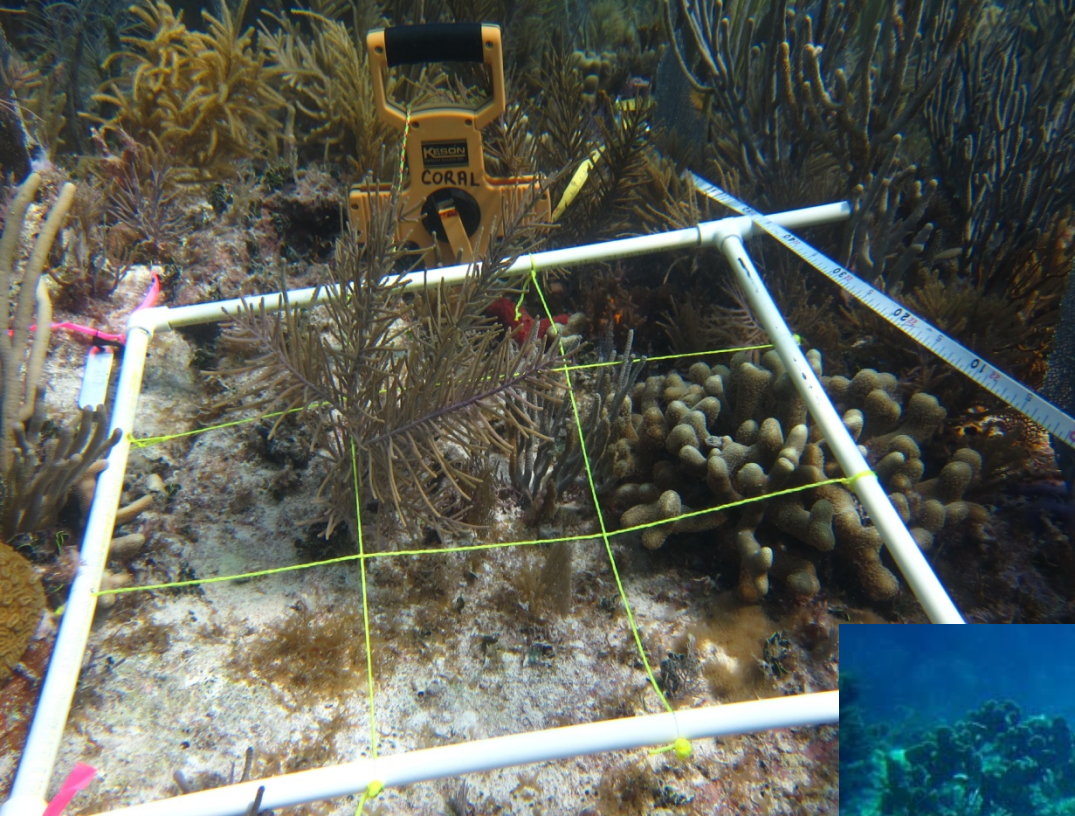
Has growth and survivorship in *X. muta* led to an increase in sponge cover on deep reefs?

1. Used the formula of a circle to estimate the basal coverage of *X. muta* $A = 3.14r^2$
2. Total cover in 2009 $\sim 1,850\text{m}^2$
3. Loss in cover between 2009 and 2014 due to mortality $\sim 417\text{m}^2$
4. Total cover in 2014 after growth and recruitment $\sim 2768\text{m}^2$
5. Net gain in 5 years $\sim 500\text{m}^2$



CRCP Coral Recruitment Study

Juvenile Census and Survivorship

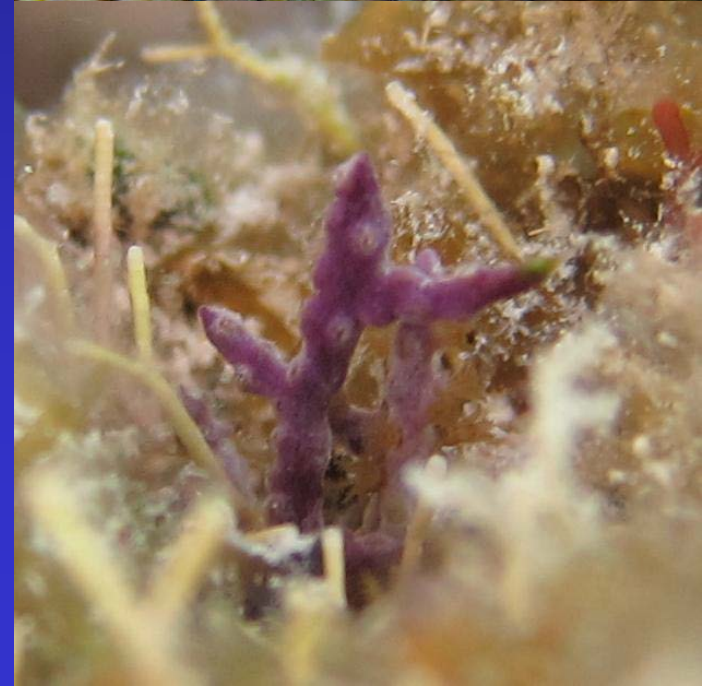


Settlement on tiles



CRCP Coral Recruitment Study

- Three Year Study
 - First tile deployment in 2015
 - Focuses on both stony and octocorals
- Goals:
 - Create an annual index of recruitment success across a broad spatial scale
 - Identify recruitment hotspots in FL
 - Determine if early life history processes are limiting recovery (e.g., larval settlement, juvenile survivorship)



Summary

1. Little change between 2012 & 2013 for all taxa groups
2. Octocoral density in most habitats 2x stony coral density
3. Density of large framework building corals unchanged since 2011
4. Small increases in coral cover due to smaller, weedier corals
5. Density of octocorals and *X. muta* increasing
6. Findings by CREMP has been leveraged into additional projects
 - Assessing effects of 2014 bleaching – working with TNC Disturbance Response Monitoring Team
 - Coral Recruitment & Juvenile Survivorship Study – Georgia Southern and Nova Southeastern Universities
 - Water temperature monitoring network – NOAA, University of South Florida, FWRI

CREMP Publications and Reports available at
<http://research.myfwc.com/>

