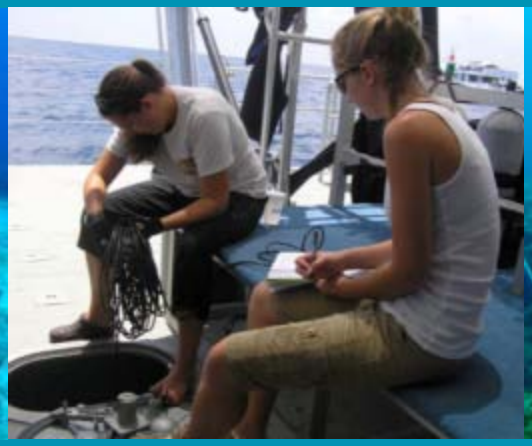
AMERICA'S UNDERWATER TREASURES

NATIONAL MARINE SANCTUARIES

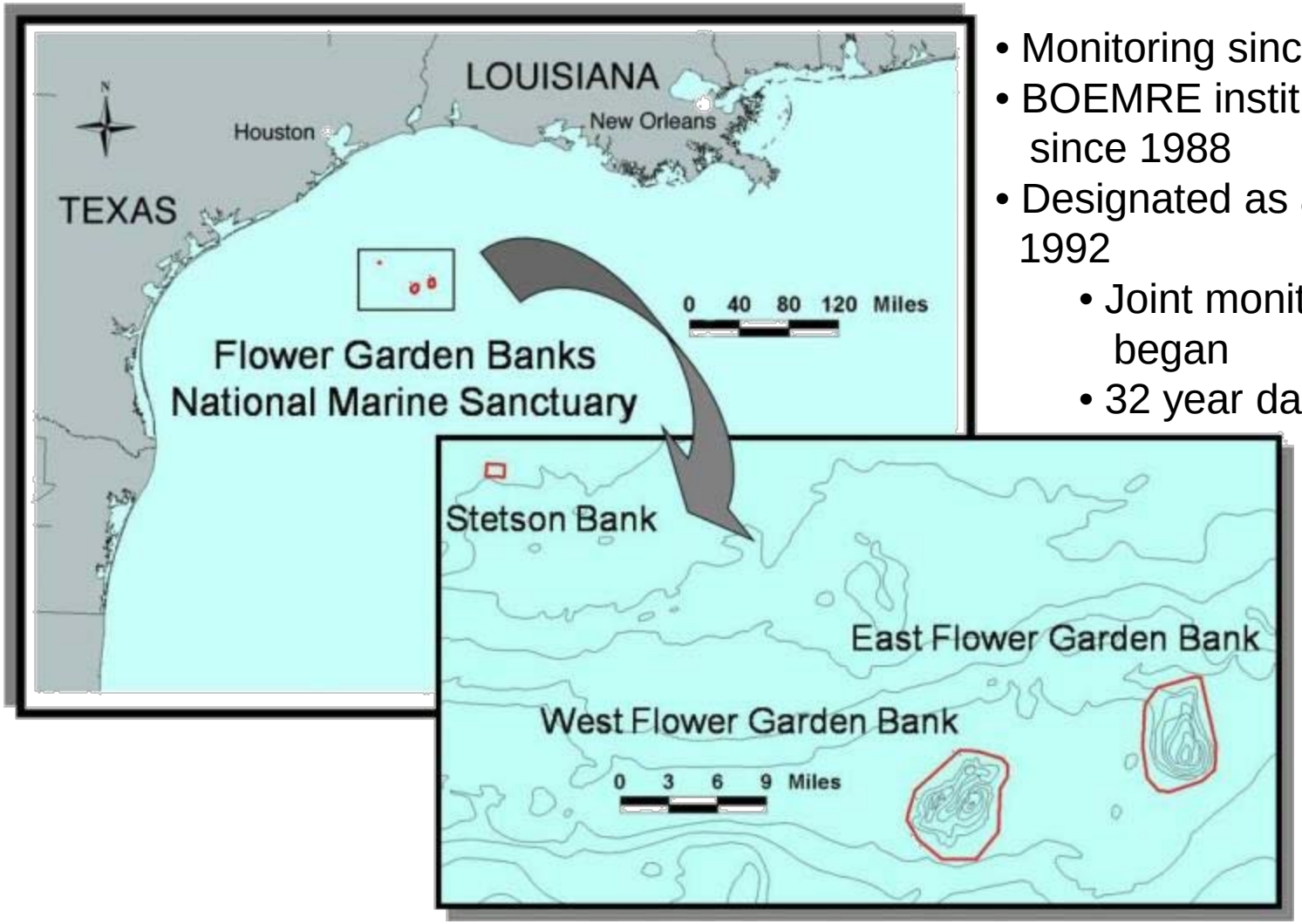
Long-Term Monitoring at Flower Garden Banks National Marine Sanctuary



Marissa F. Nuttall, Emma L. Hickerson, John A. Embesi, Ryan J. Eckert, & G.P. Schmahl

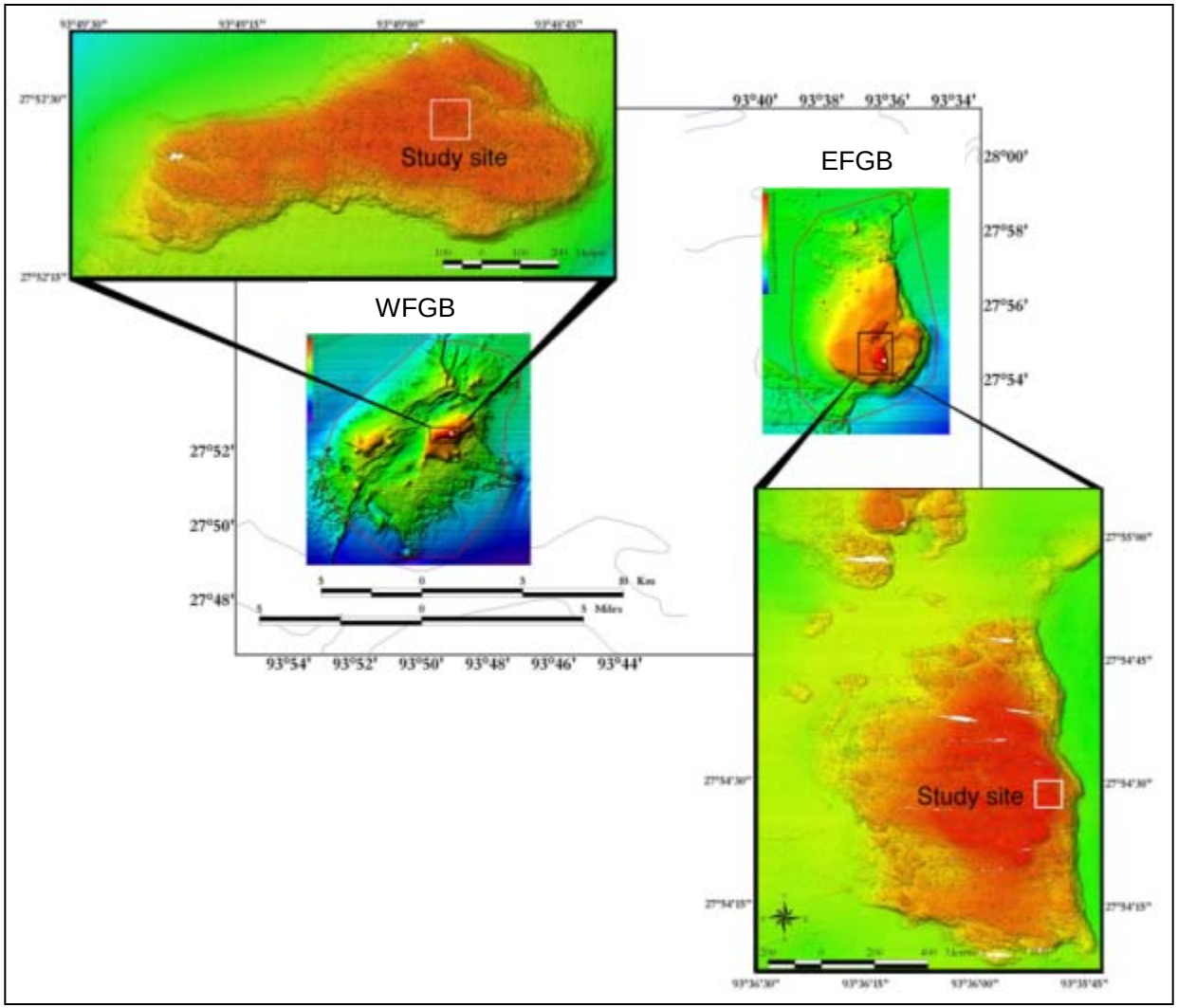
Flower Garden Banks National Marine Sanctuary

Flower Garden Banks NMS



- Monitoring since 1978
- BOEMRE instituted monitoring since 1988
- Designated as a Sanctuary in 1992
    - Joint monitoring effort began
    - 32 year dataset

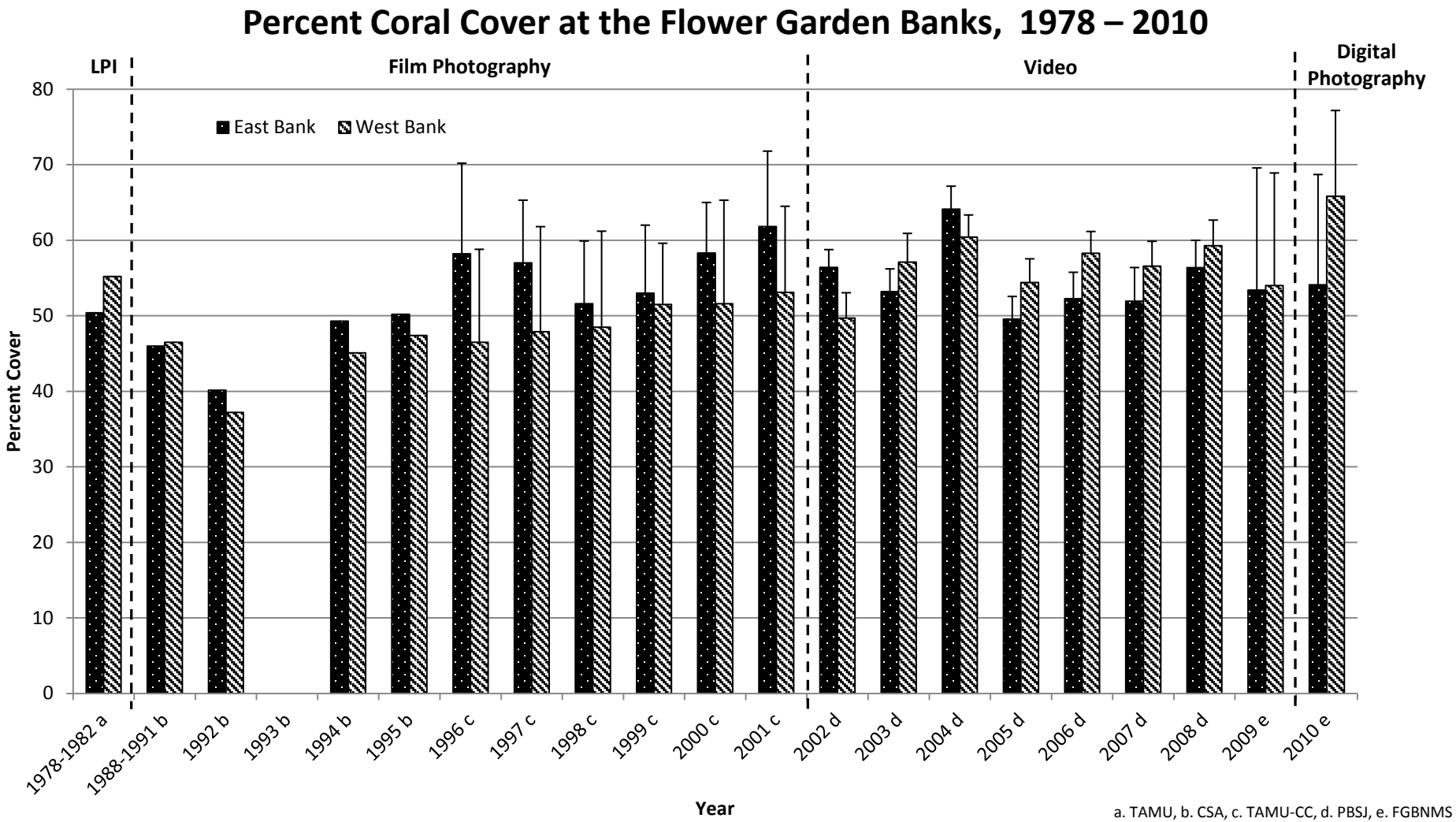
Flower Garden Banks NMS



Long-Term Monitoring Tasks

- Random Transects (10m)
- Repetitive Quadrat Photostations (8m^2)
- Lateral Growth Photostations (*Diploria strigosa*)
- Fish Surveys (Bohnsack-Bannerot 1986)
- Lobster and Urchin Surveys (100m)
- Perimeter Video
- Sclerochronology (*Montastraea faveolata*)
- Water Quality Analysis (temperature, salinity …, etc.)

Historical Dataset



a. TAMU, b. CSA, c. TAMU-CC, d. PBSJ, e. FGBNMS

Major Reefs Living Coral Cover

Flower Garden Banks	50.5%
Cayman Islands	21.0%
Cuba	15 - 23%
Bonaire	48%
Akumal, Mexico	16.8%
Netherlands Antilles	10 - 47%
St. Vincent Grenadines	29 - 44%
Turks and Caicos	up to 30%
Florida Keys	3 - 22%

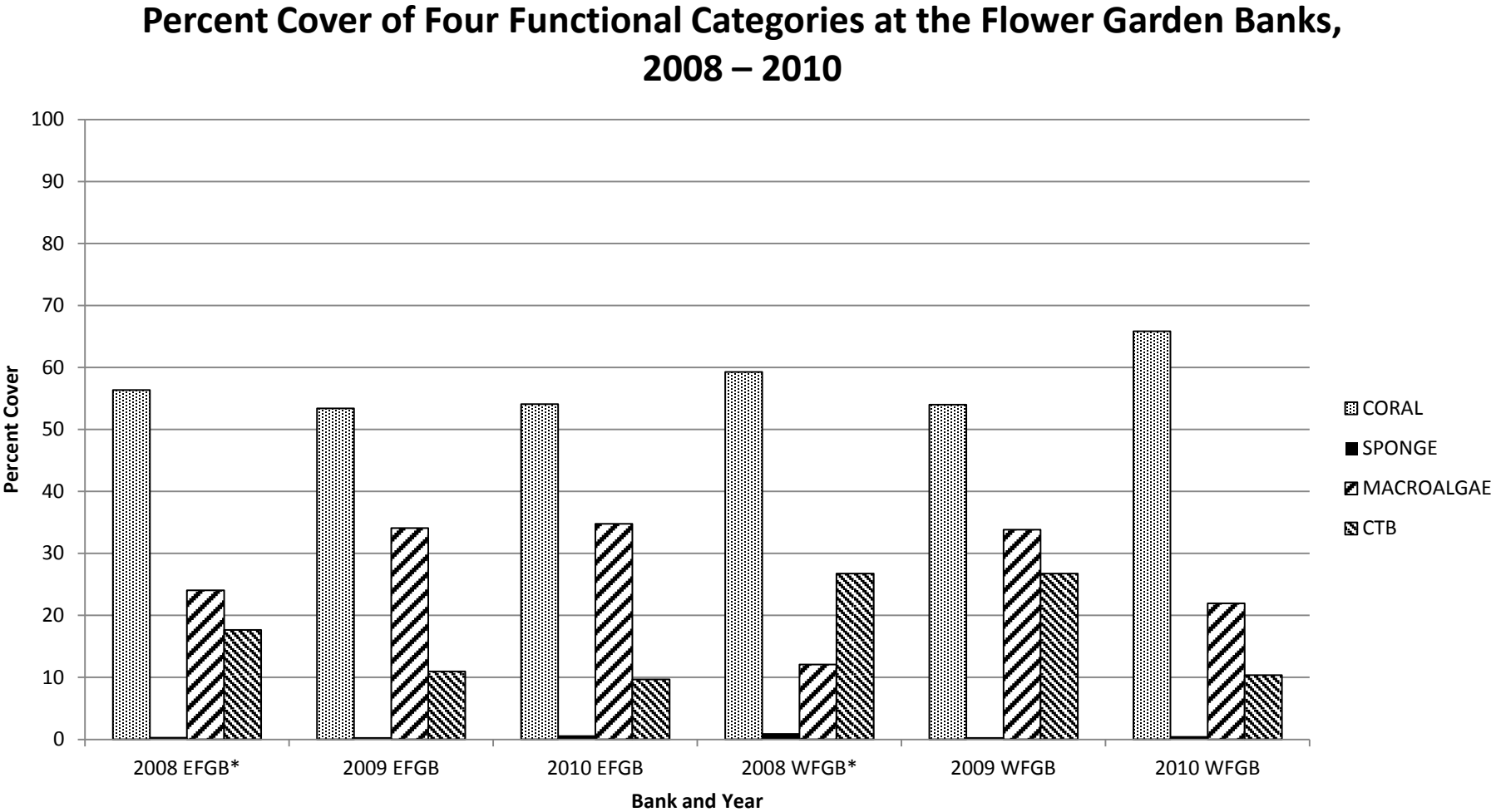
As determined by the Atlantic and Gulf Rapid Reef Assessment (AGRAA) in 2006

2009 – 2010 Field Seasons

2009	
EFGB	WFGB
August 16 – 19	August 19 – 21

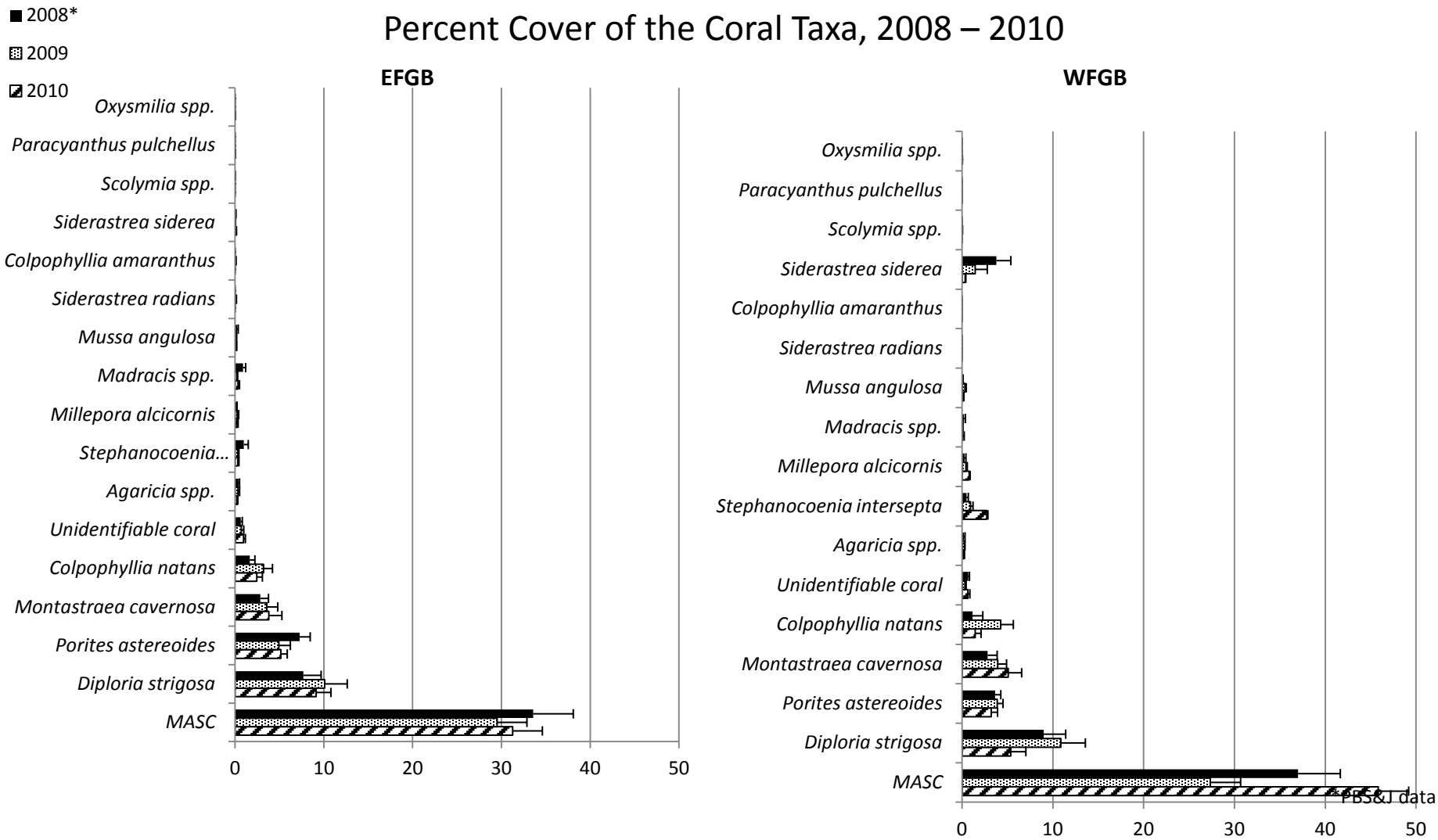
2010	
EFGB	WFGB
August 16 – 19	August 19 –20
	October 11 – 13
	November 8 – 10

Random Transects

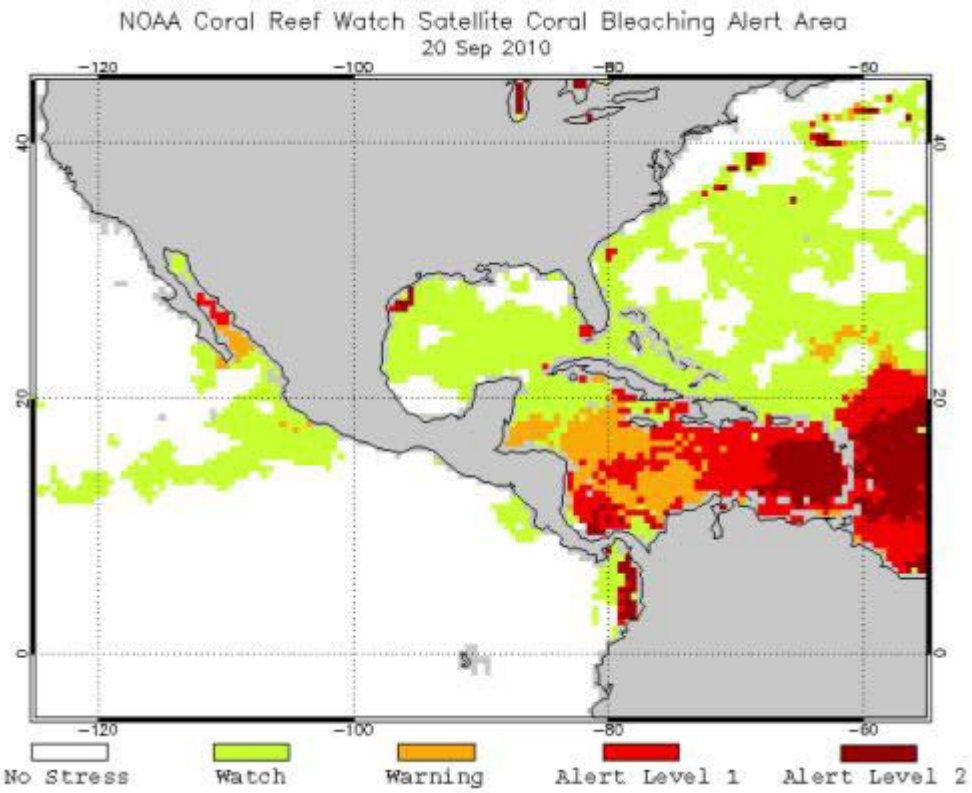


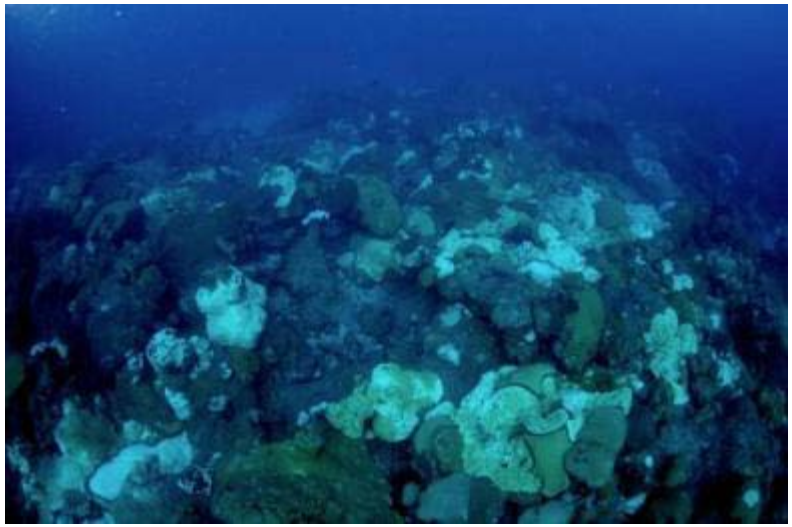
*PBS&J data

Coral Cover

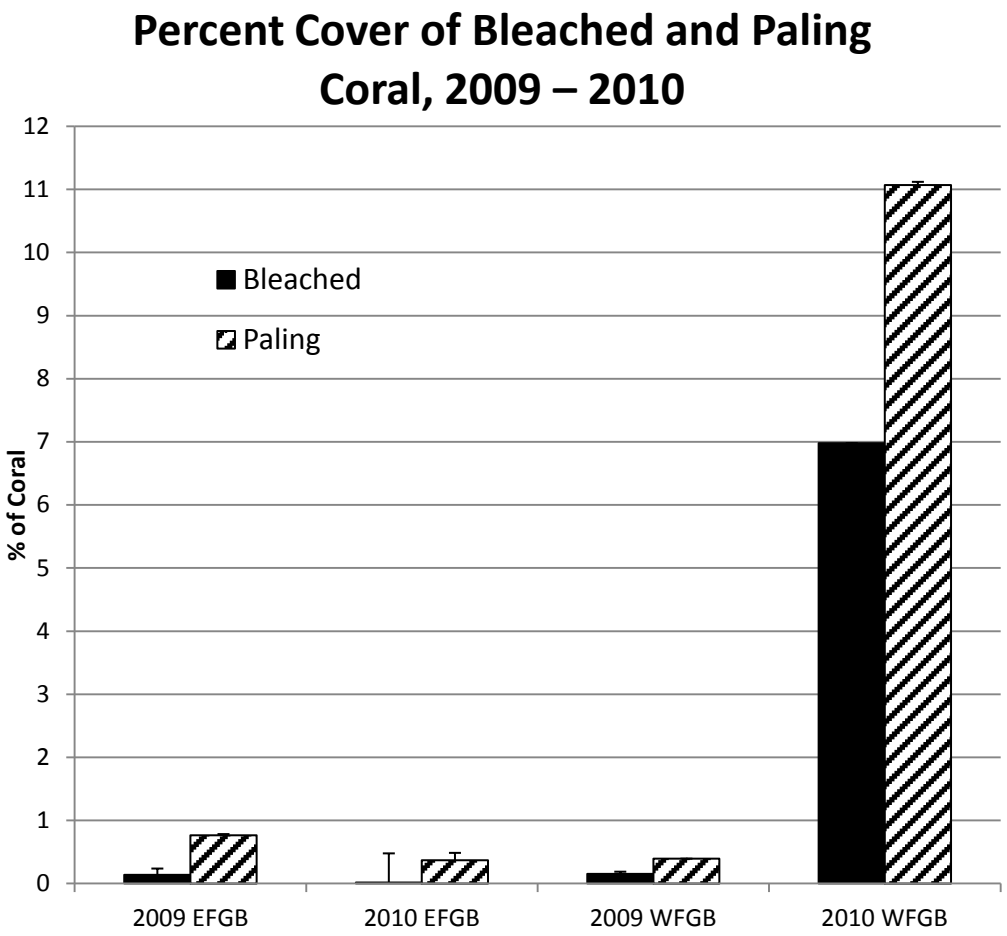

Percent Cover of the Coral Taxa, 2008 – 2010
2008*
2009
2010
EFGB
WFGB
Oxysmilia spp.
Paracyanthus pulchellus
Scolymia spp.
Siderastrea siderea
Colpophyllia amaranthus
Siderastrea radians
Mussa angulosa
Madracis spp.
Millepora alcicornis
Stephanocoenia…
Stephanocoenia intersepta
Agaricia spp.
Unidentifiable coral
Colpophyllia natans
Montastraea cavernosa
Porites astereoides
Diploria strigosa
MASC
0
10
20
30
40
50
PBS&J data

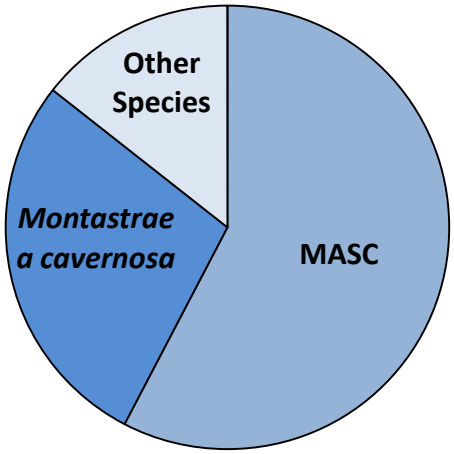
Coral Bleaching

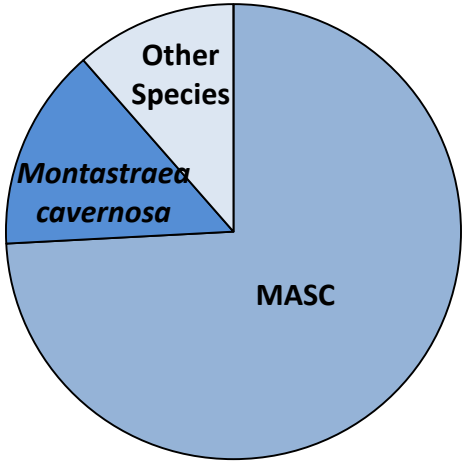




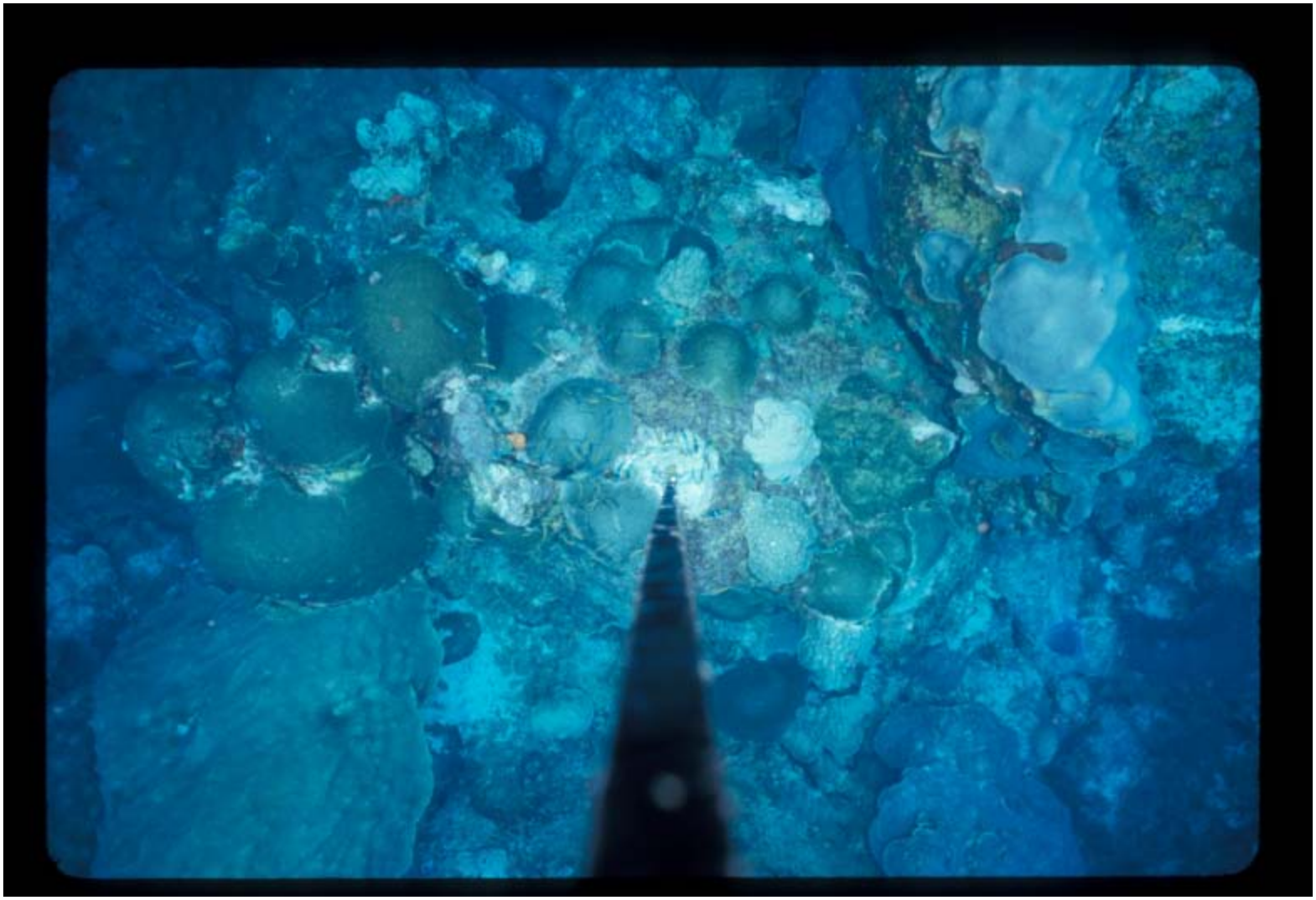
Coral Bleaching



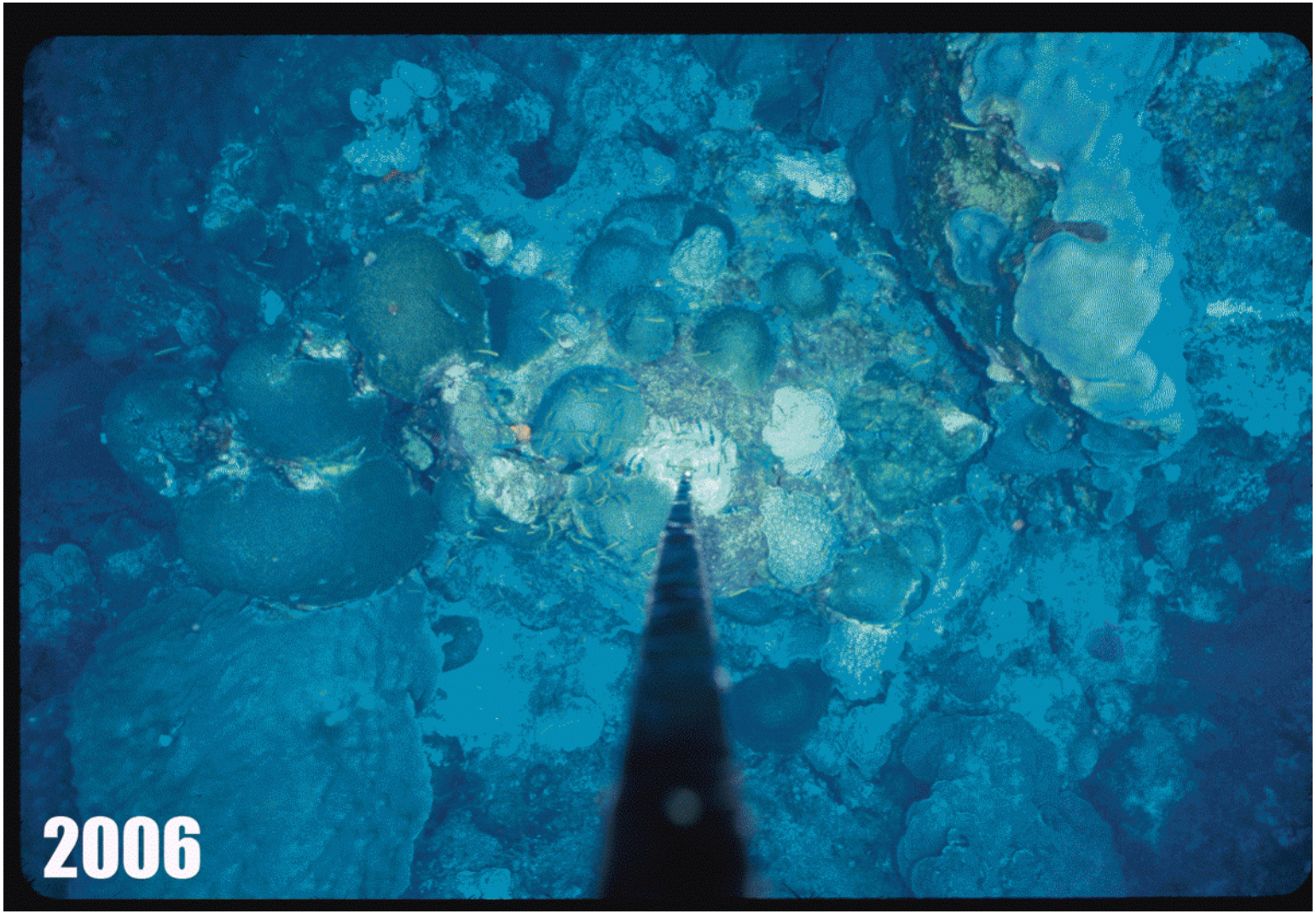




Repetitive Photostations

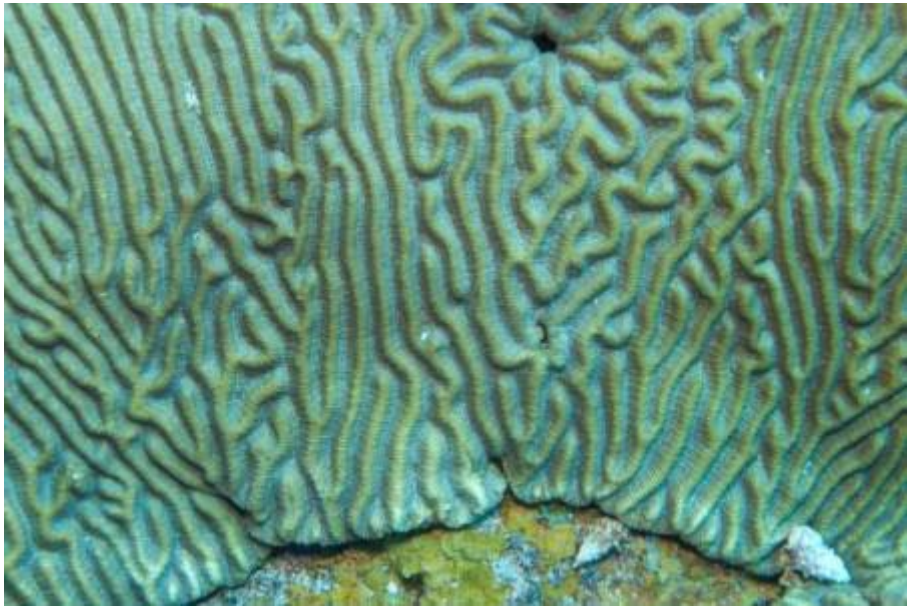


Repetitive Photostations



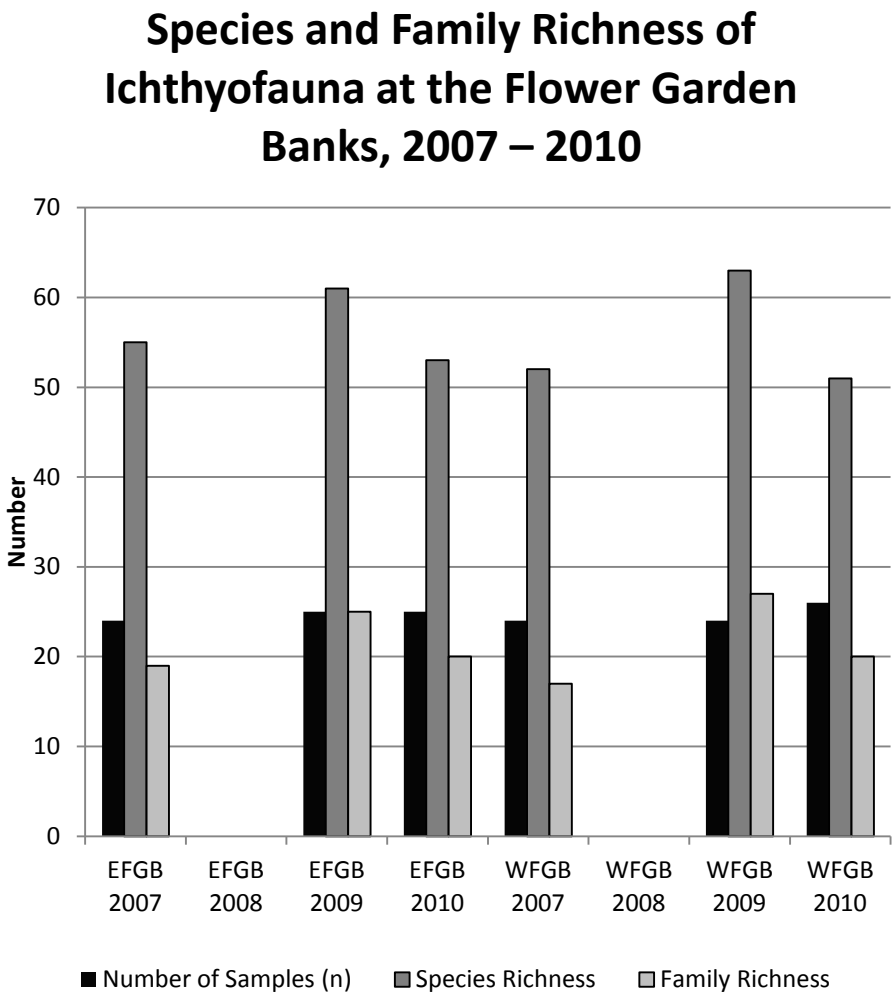
Lateral Growth Stations

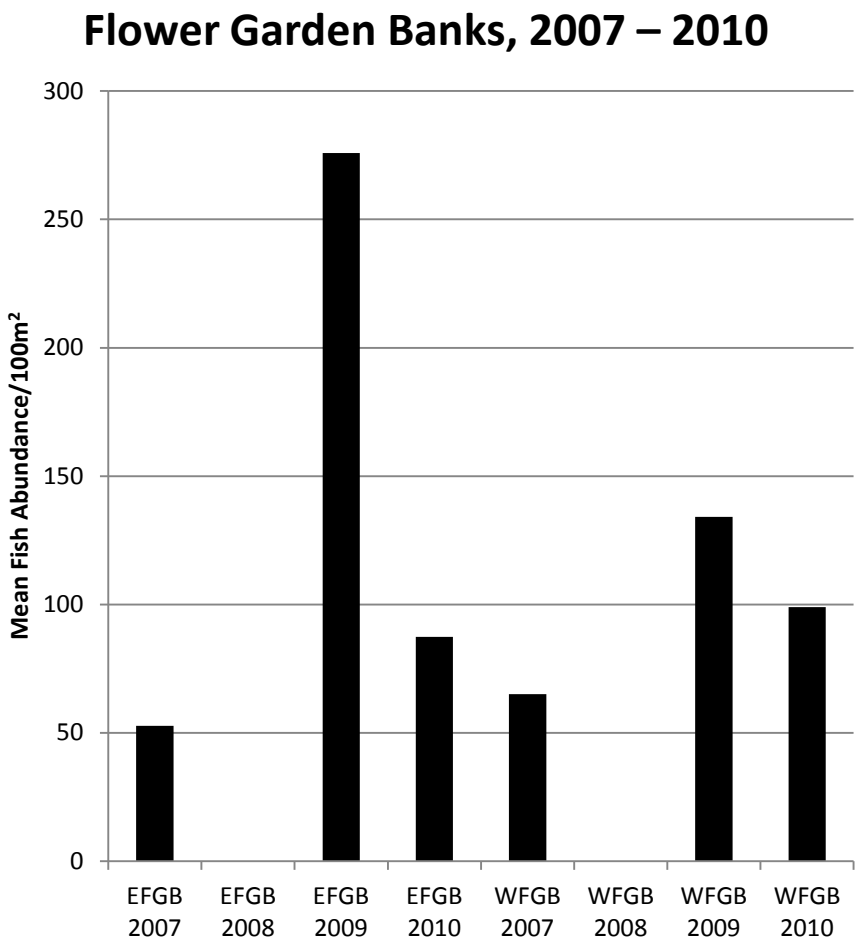
2009



2010

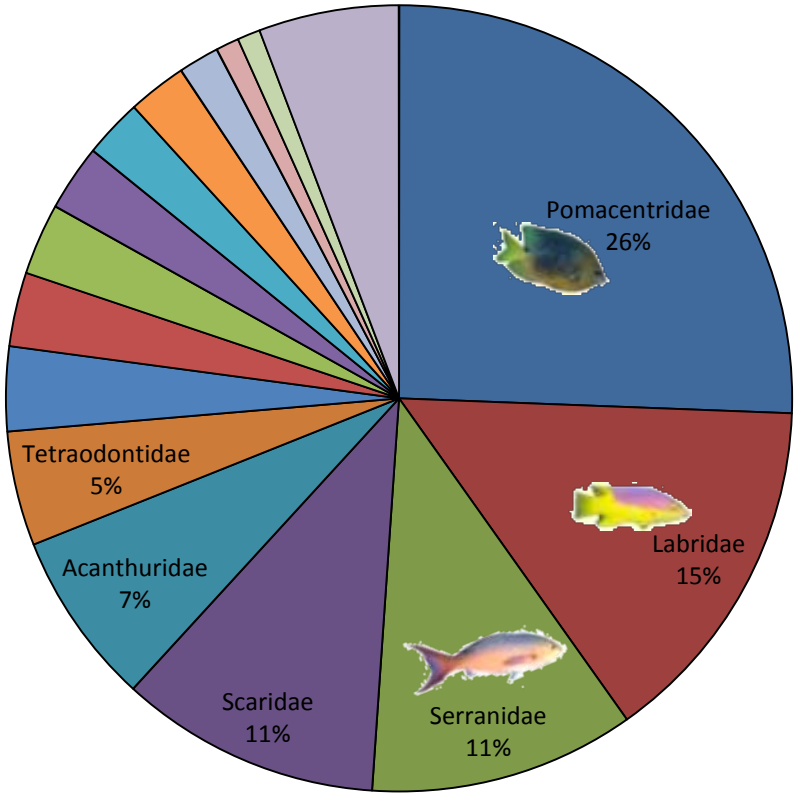
Fish Survey Data





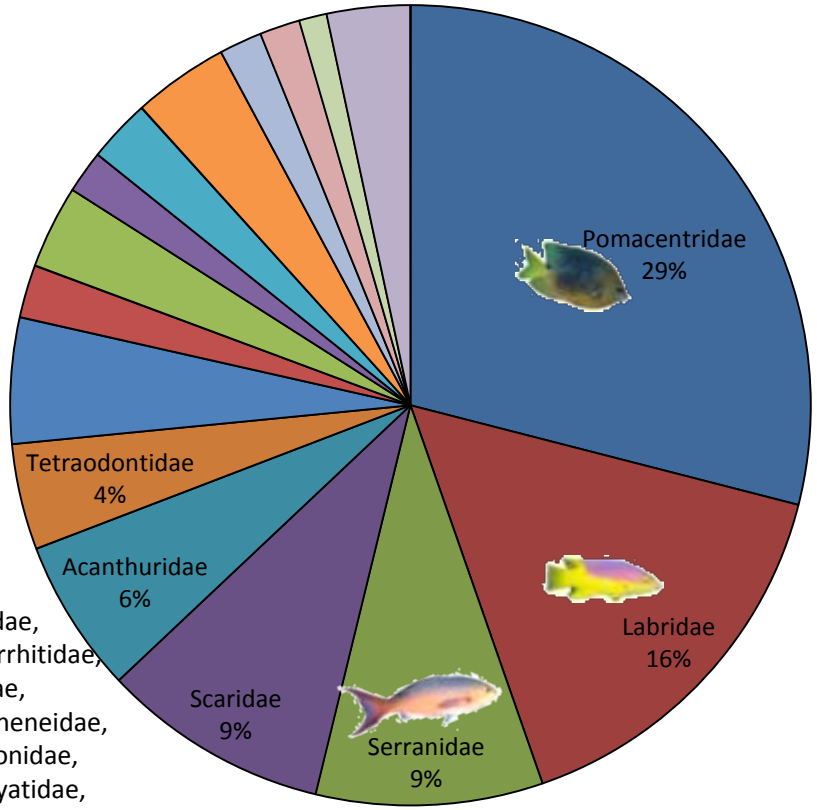
Fish Survey Data

Sighting Frequency of Ichthyofauna at the EFGB, 2009 – 2010

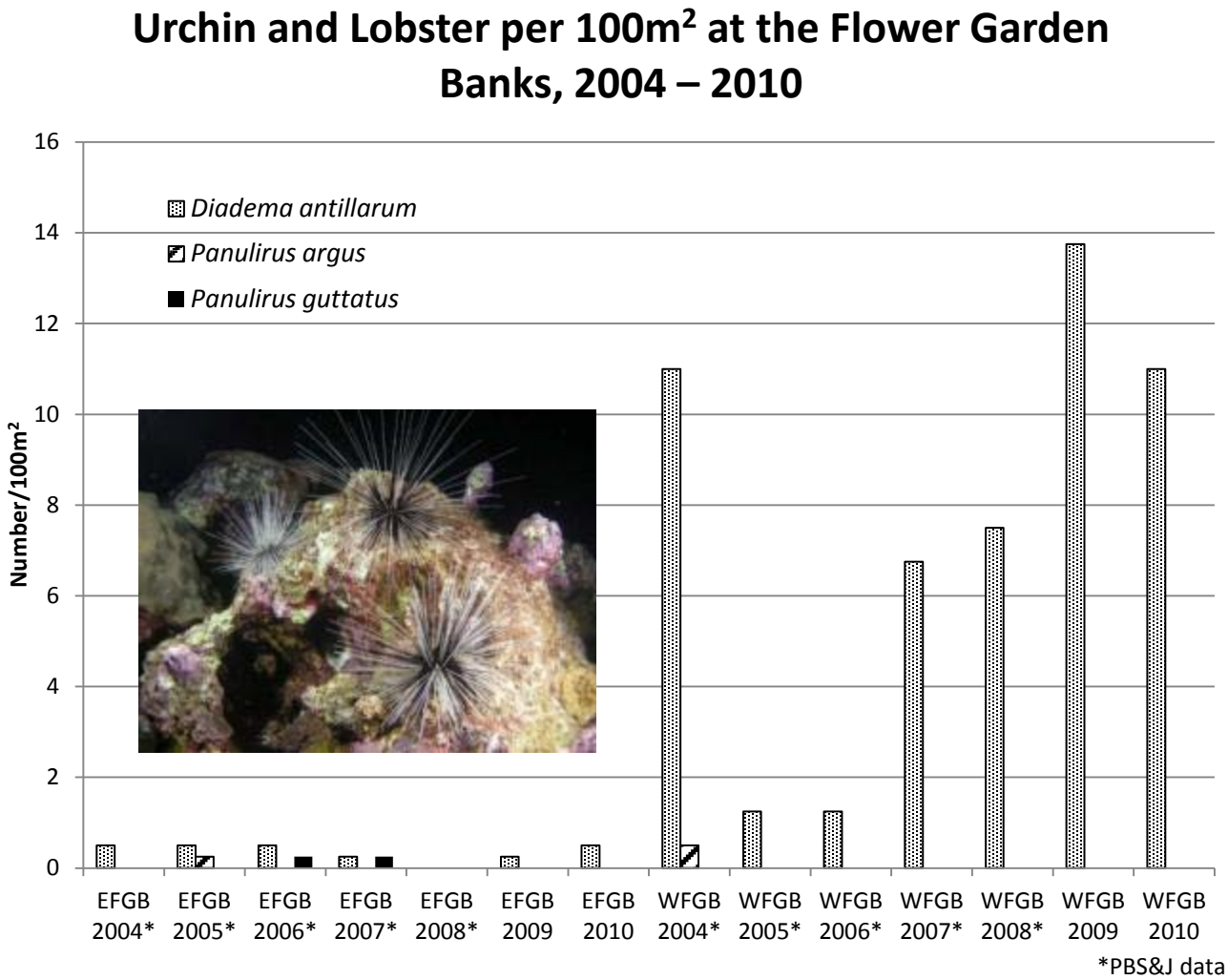


- Pomacentridae
- Labridae
- Serranidae
- Scaridae
- Acanthuridae
- Tetraodontidae
- Chaetodontidae
- Kyphosidae
- Balistidae
- Pomacanthidae
- Carangidae
- Sphyraenidae
- Ostraciidae
- Blenniidae
- Lutjanidae
- Gobiidae, Inermiidae, Monacanthidae, Cirrhitidae, Mobulidae, Mullidae, Atherinopsidae, Echeneidae, Muraenidae, Apogonidae, Aulostomidae, Dasyatidae, Diodontidae, and Holocentridae

Sighting Frequency of Ichthyofauna at the WFGB, 2009 – 2010



Urchin and Lobster Transects



- Caribbean wide Diadema die-off in 1983 – 1984
- Pre die-off numbers recorded at ~50 per 100m^2 at the WFGB and ~140 per 100m^2 at the EFGB (Gittings et al. 1988)
- Estimated FGBNMS numbers post die-off of <1 per100m^2 (Gittings et al. 1986)

Perimeter Video

WFGB 2009

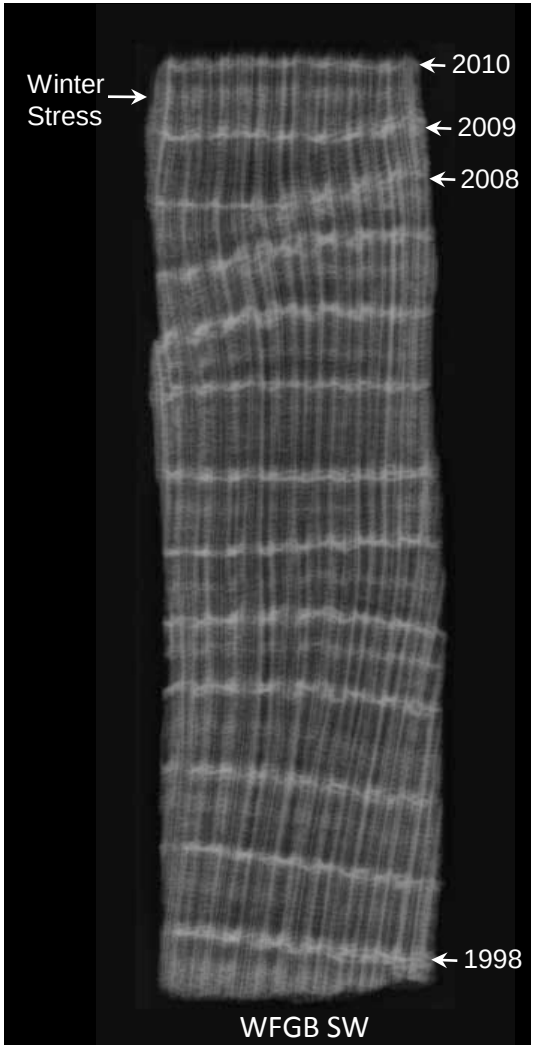
WFGB 2010

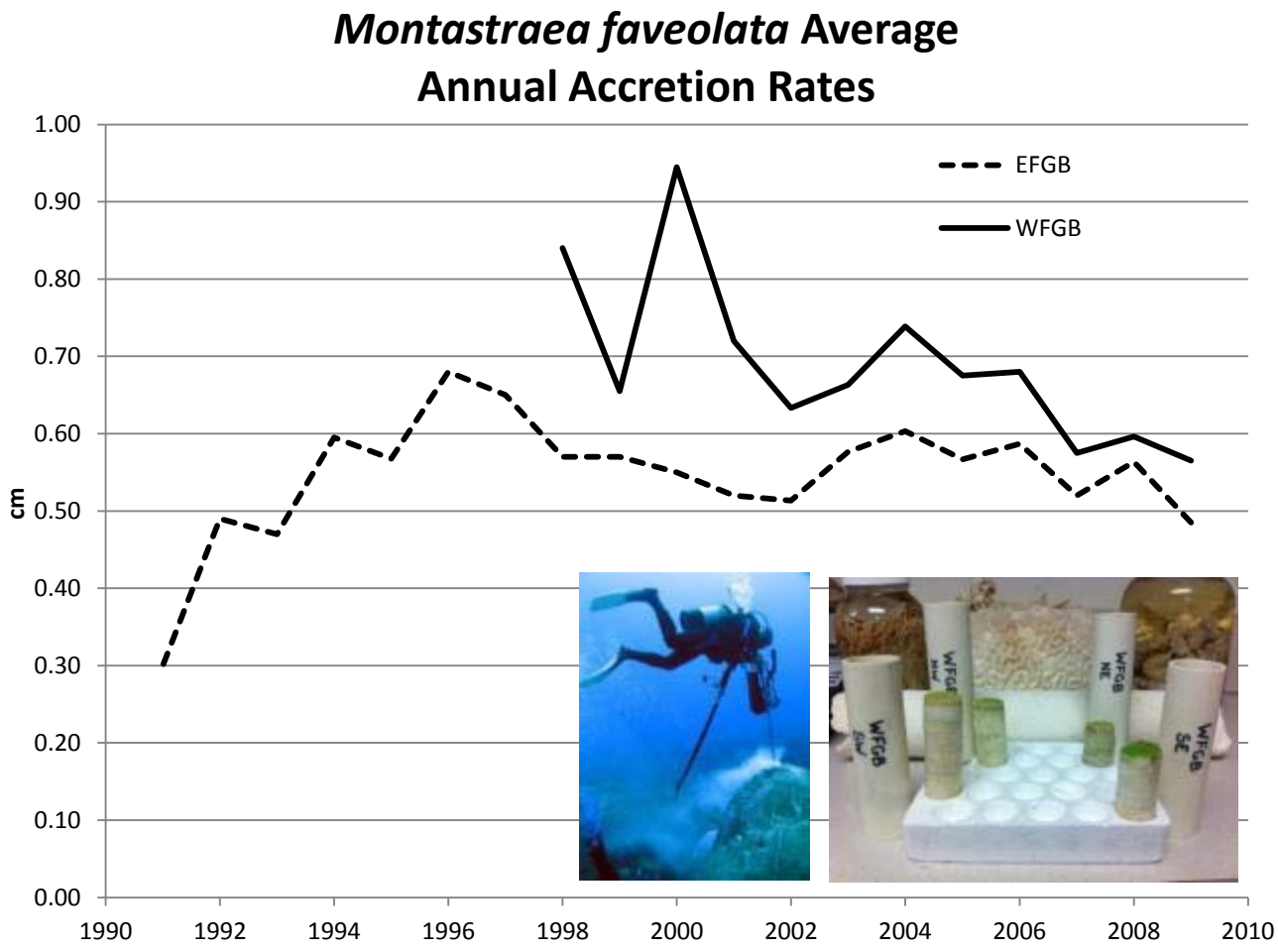
Data Summary

EFGB			
2009		2010	
Bleached	Pale	Bleached	Pale
1	0	6	1

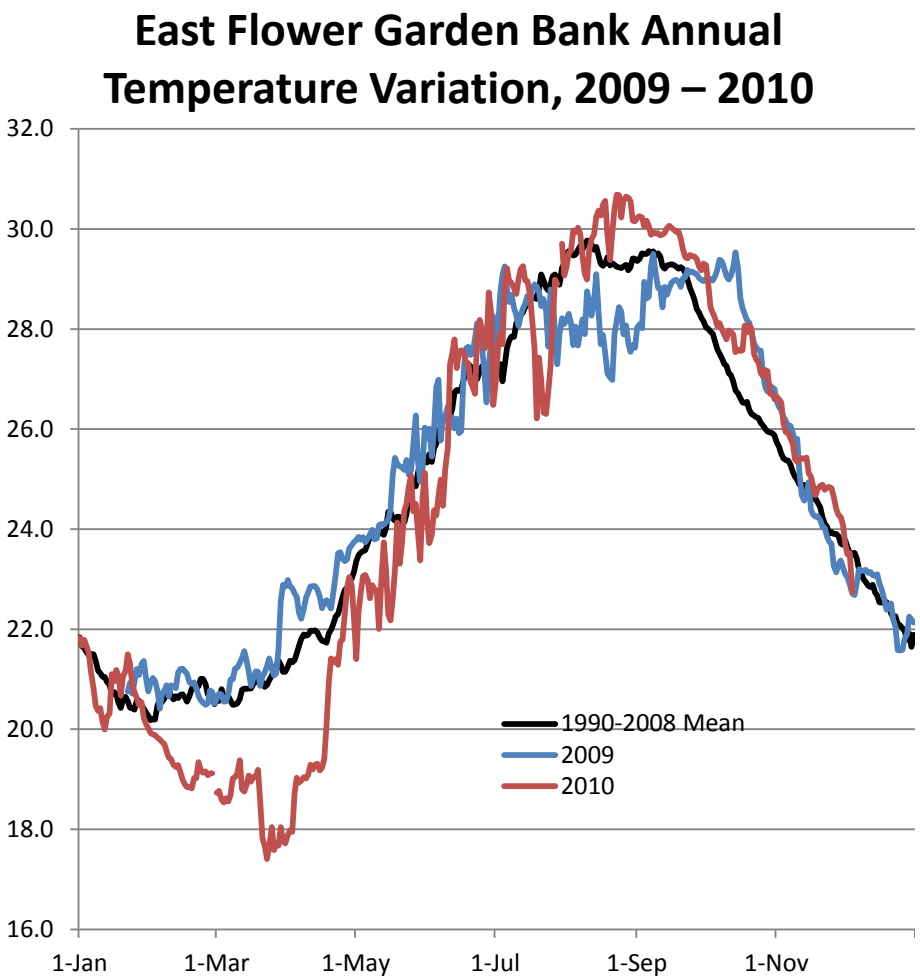
WFGB			
2009		2010	
Bleached	Pale	Bleached	Pale
0	3	97	27

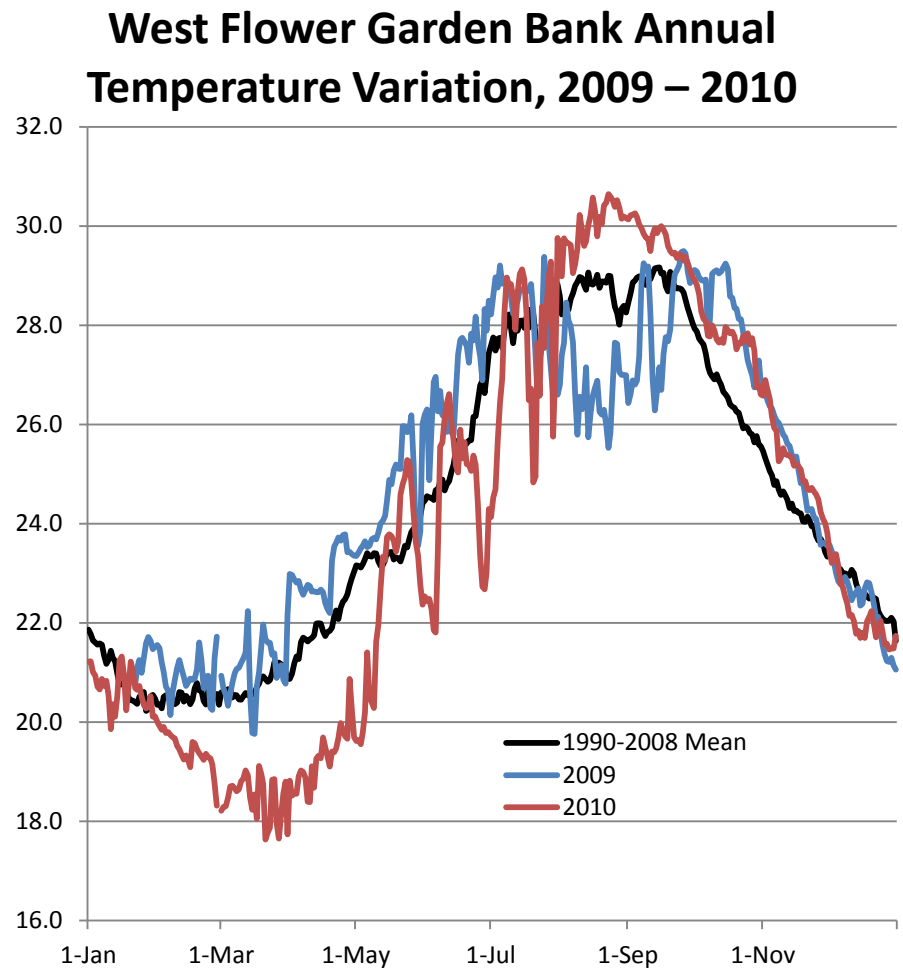
Sclerochronology: Coral Coring



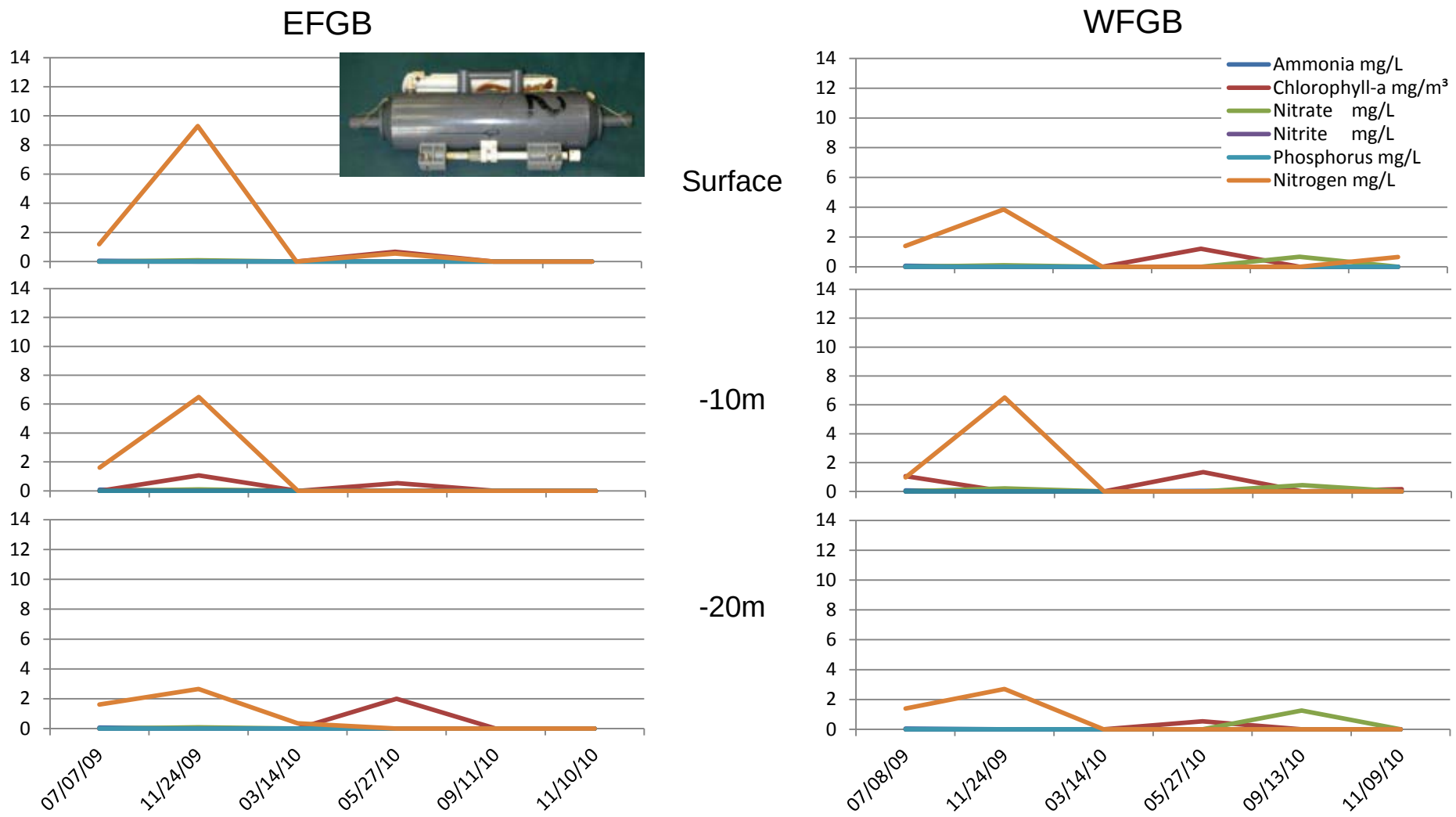


Water Quality Analysis

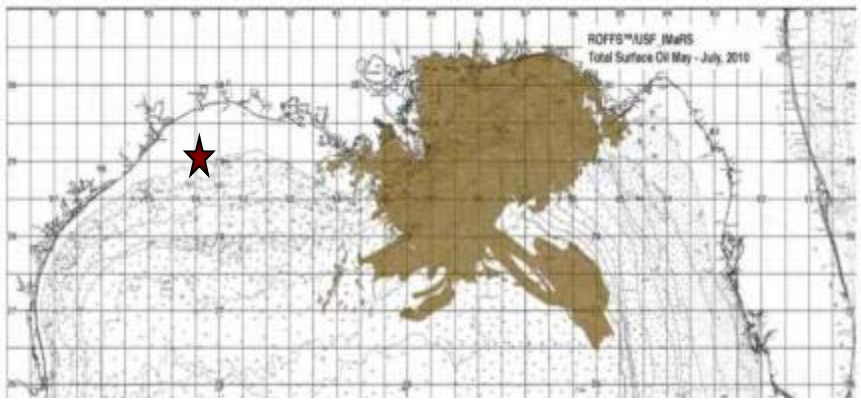




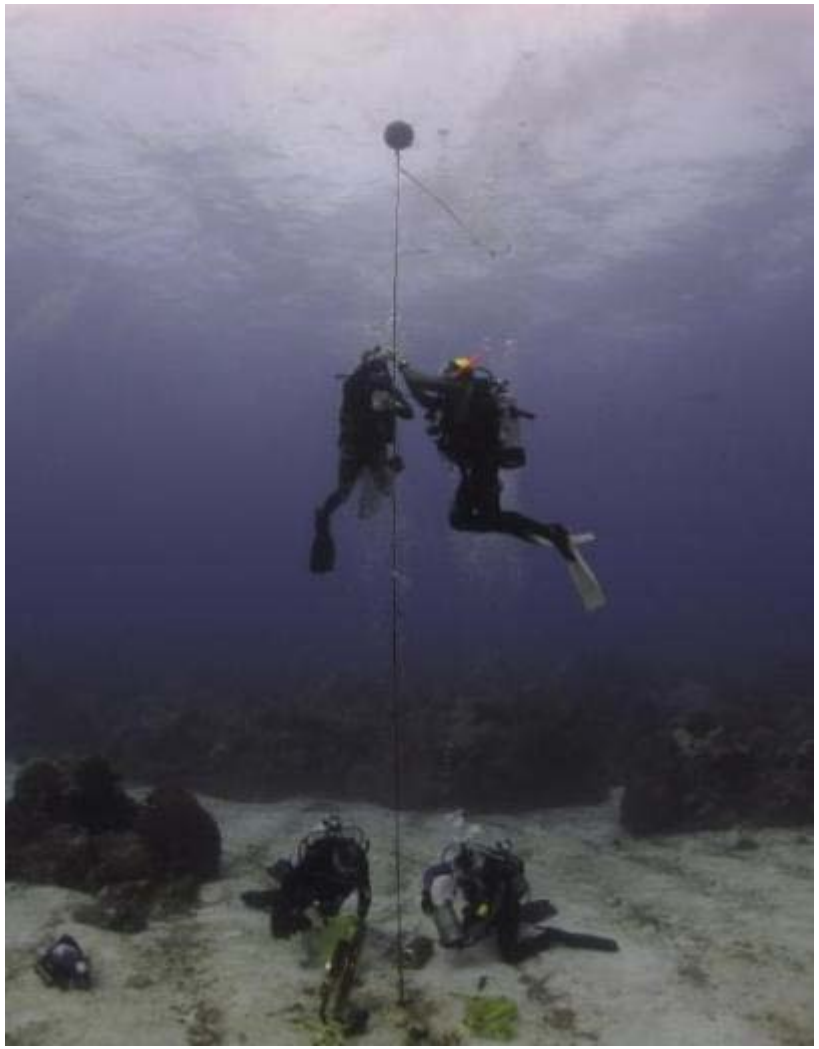
Water Quality Analysis



Oil Spill Response and Monitoring



Data courtesy of: ROFFER'S OCEAN FISHING FORECASTING SERVICE, INC.



- April 20, 2010: Deep Water Horizon Oil Spill
- Shallow Water Coral Natural Resource Damage Assessment (NRDA)
  - Semi-Permeable Membrane Devices (SPMDs)
  - Sediment Samples
- Baseline Total Petroleum Hydrocarbons (TPH)
  - Water and Sediment

Summary

- FGBNMS represents a relatively stable coral reef environment
  - Consistent high coral cover ~50%
  - Consistent fish species and family abundance
- Lengthy historical dataset
- Continued monitoring is needed to monitor the environment for changes that may threaten the health of the reef

Thanks to …

FGBNMS Research Team

John Embesi

Emma Hickerson

Ryan Eckert

G.P. Schmahl

BOEMRE

James Sinclair

Kate Winters

Texas A&M University at Galveston

Research Divers

References

Bohnsack, J.A. and S.P. Bannerot. 1986. A stationary visual census technique for quantitatively assessing community structure of coral reef fishes. NOAA Technical Report NMFS 41, U.S. Dept. of Commerce. 15 pp.

Gittings, S.R. and T.J. Bright. 1986. Assessment of the coral recovery following an incident of anchoring damage at the Flower Garden banks, northwestern Gulf of Mexico, Draft final report to NOAA National Marine Sanctuaries Division, Washington, D.C. 45 pp.

Gittings, S.R., T.J. Bright, and G.D. Dennis. 1988. Mass Mortality of *Diadema antillarum* in the northwestern Gulf of Mexico: Effect on algae and coral cover. Unpublished manuscript, Dept. of Oceanography, Texas A&M University, College Station, TX.

NATIONAL MARINE SANCTUARIES

FLOWER GARDEN BANKS

http://flowergarden.noaa.gov