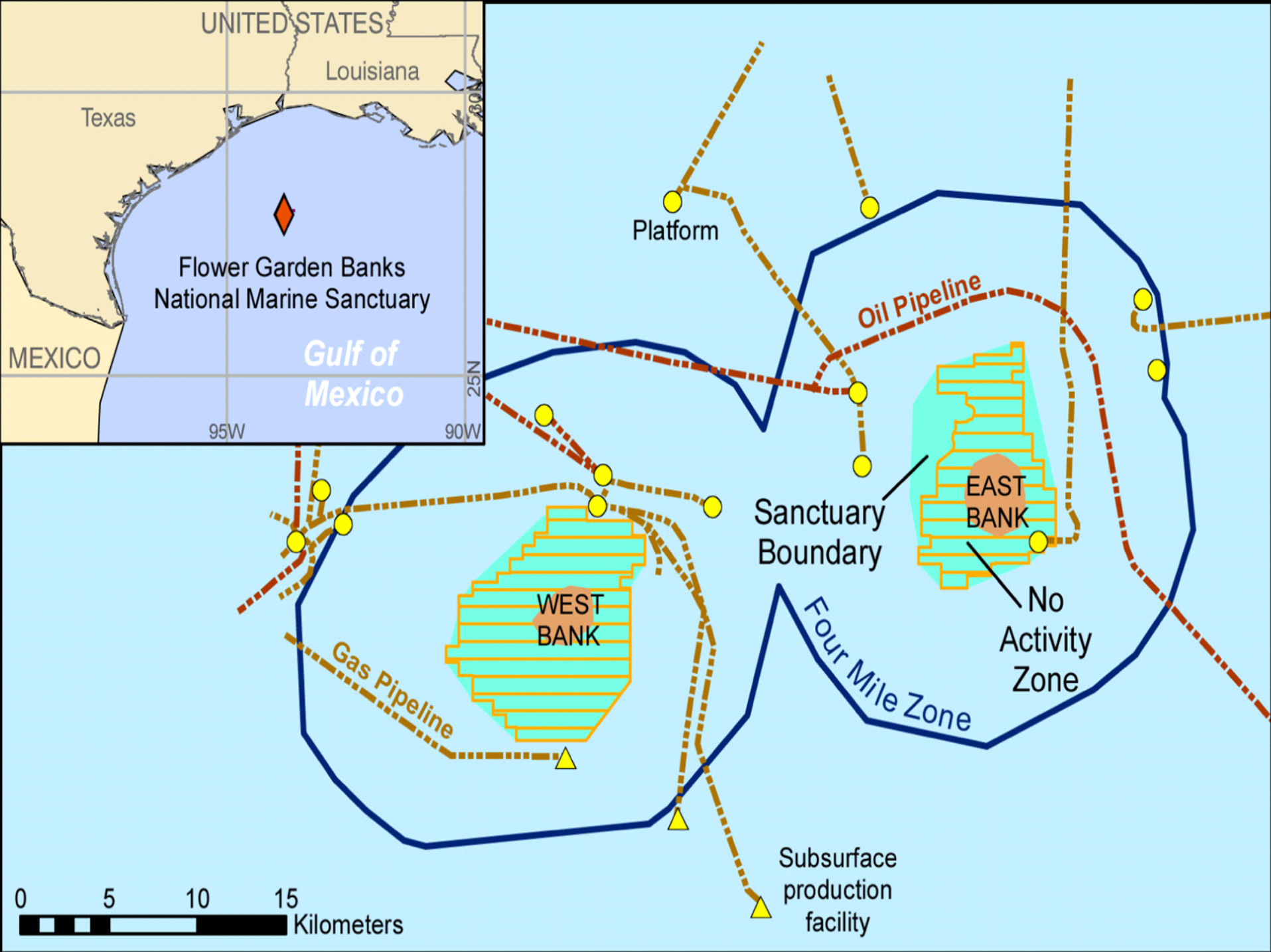
Long-Term Monitoring at the Flower Garden Banks National Marine Sanctuary, 2004–2008

K.J.P. Deslarzes
Geo-Marine, Inc. Plano, Texas
R.B. Aronson
Florida Institute of Technology, Department of Biological Sciences
W.F. Precht
NOAA FKNMS, Damage Assessment and Restoration Program
M.L. Robbart
Dial Cordy and Associates, Inc., Ft. Lauderdale, Florida
B. Zimmer and L. Duncan
PBS&J, Inc. Miami, Florida
L. Kaufman
Boston University Marine Program
G.P. Schmahl and E.L. Hickerson
NOAA/Flower Garden Banks National Marine Sanctuary
J. Sinclair
Minerals Management Service

Photo by G.P. Schmahl, NOAA FGBNMS

INTRODUCTION

- 25 years of Long-Term Monitoring
- Study Sites - Reef Cap
- Protective Measures
- Focus: Condition of the Coral Reef Cap
- 2004–2008 Report in Production


UNITED STATES
Louisiana
Texas
MEXICO
Flower Garden Banks
National Marine Sanctuary
Gulf of
Mexico
95W
90W
30N
25N
Platform
Oil Pipeline
Sanctuary
Boundary
EAST
BANK
WEST
BANK
No
Activity
Zone
Four Mile Zone
Gas Pipeline
Subsurface
production
facility
0
5
10
15
Kilometers

MATERIALS AND METHODS

- Random Transects
- Repetitive Quadrats – Still to Digital Images
- Lateral Growth – Still to Digital Images
- Perimeter Videography
- Sclerochronology
- Fish Surveys
- Sea Urchin and Lobster Surveys
- Water Quality

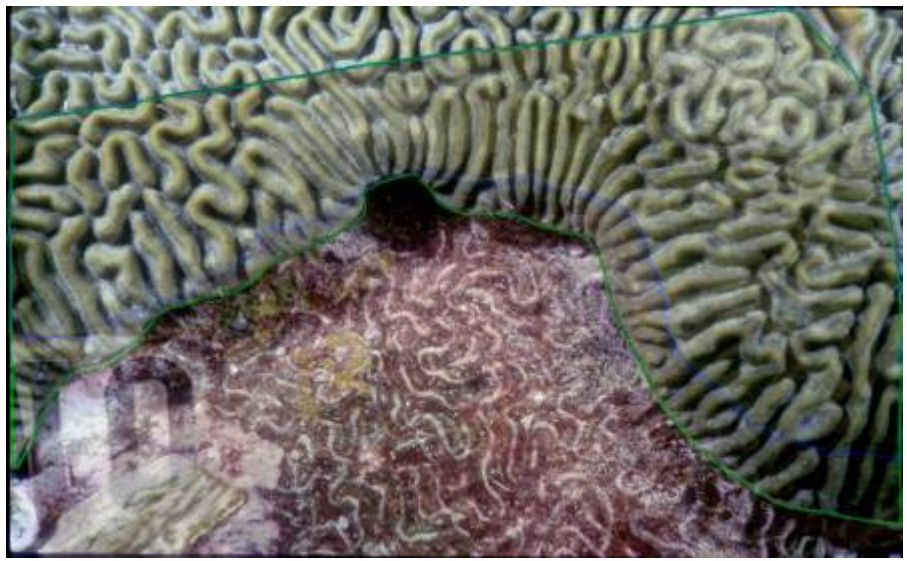
Film to Digital Conversion

- **The LTM project – Nikonos V film camera**
- **Need for conversion to digital imagery**
- **Is it feasible to transition from film to digital images at lateral growth and repetitive quadrat stations?**
- **August 2007 Trial Run**
  - **Lateral Growth stations: Olympus C4000 (4.0 MP) and Sea&Sea 5000G (5.1 MP)**
  - **Repetitive Quadrat stations: Olympus C4000 (4.0 MP)**

Digital Trial – Results & Conclusions

Lateral Growth Stations:

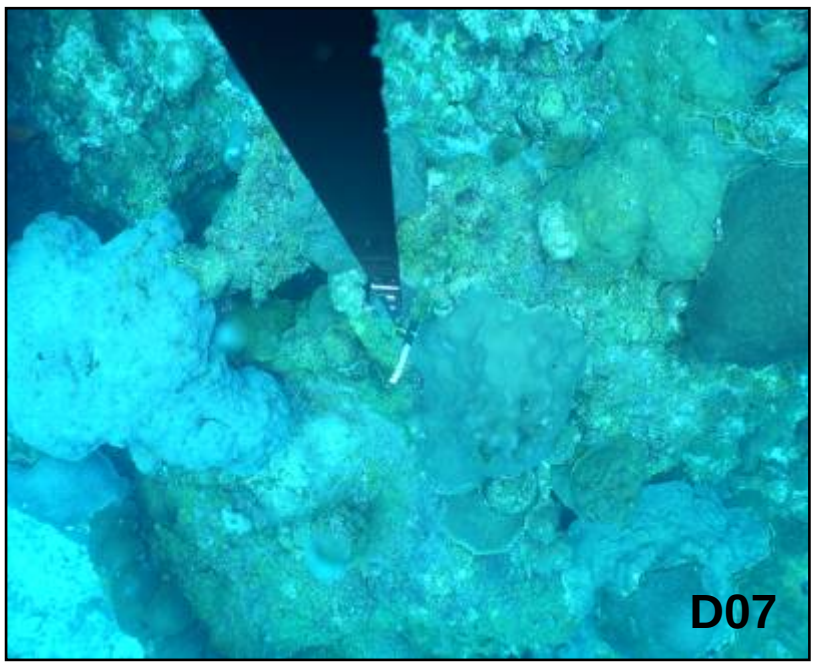
- **Did the F07 and D07 images capture the same area? No**
- **Did proportional annual changes in the area of indiv. colonies differ when comparing F06 to F07 and D07? Yes**
- **Did one digital setup perform better than the other? No**
- **Further refinement needed before conversion**
- **Achieve results within 2 to 3% of each other before switching to digital (trial results gave ~12% difference)**

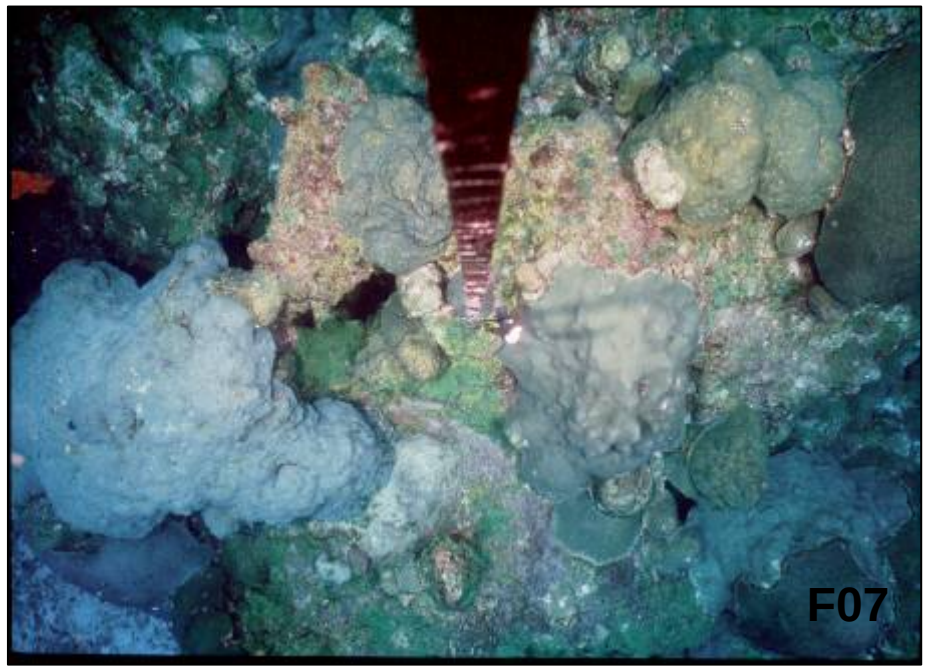


Digital Trial – Conclusions

<u>Repetitive Quadrat Stations</u>:

- **Did percent cover estimates differ between F07 and D07 images? No**
  - **No significant effect of Assessment**
  - **Significant effect of Quadrat**
- **Digital photography is feasible**
- **Requires digital camera with greater resolution**





RESULTS AND DISCUSSION

- Percent Coral and Algal Cover
- Infectious and Non-Infectious Coral Diseases
- Hurricanes Rita (2005) and Ike (2008)
- Temperature and Salinity - Trends

Percent Coral and Algal Cover

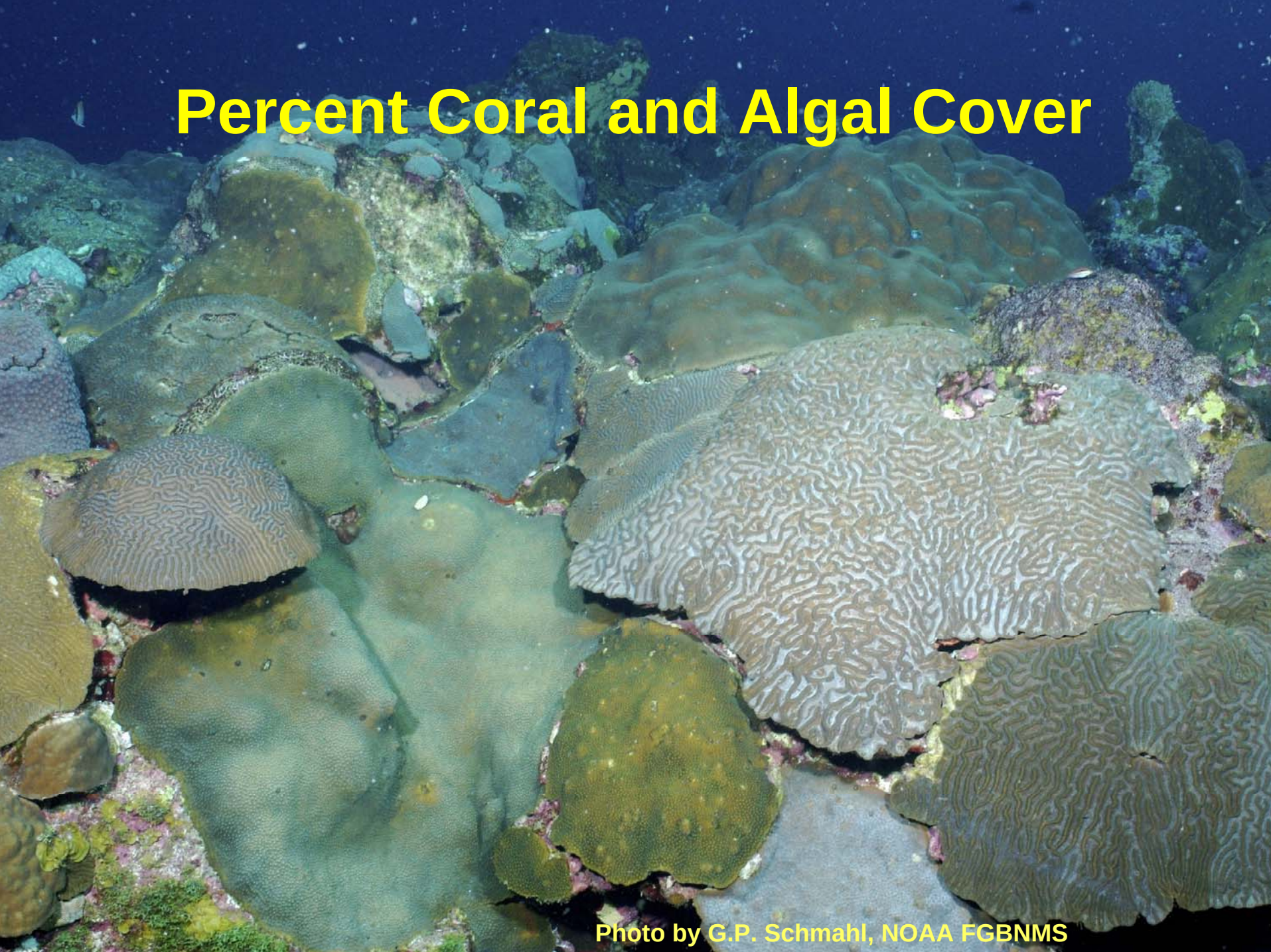
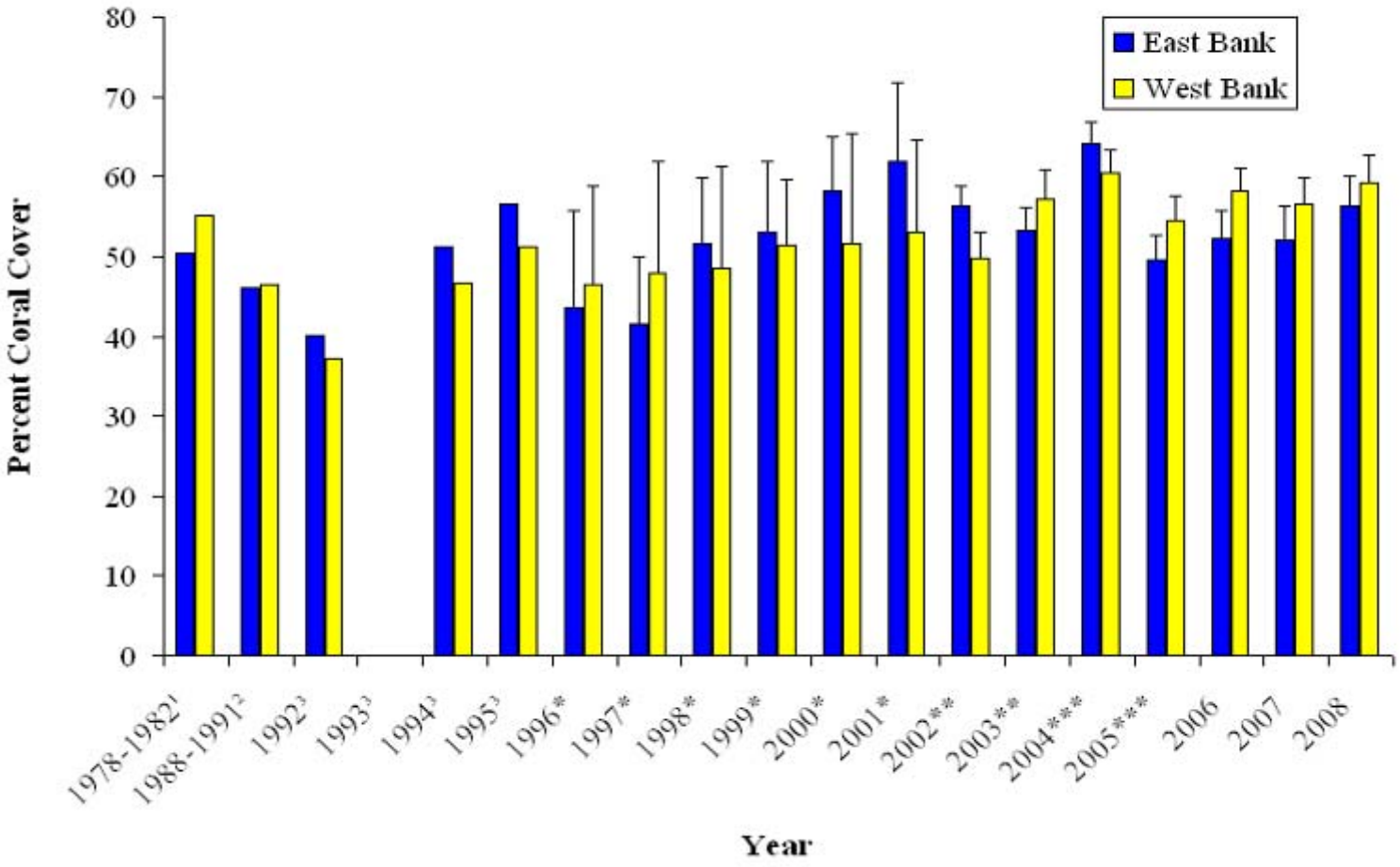
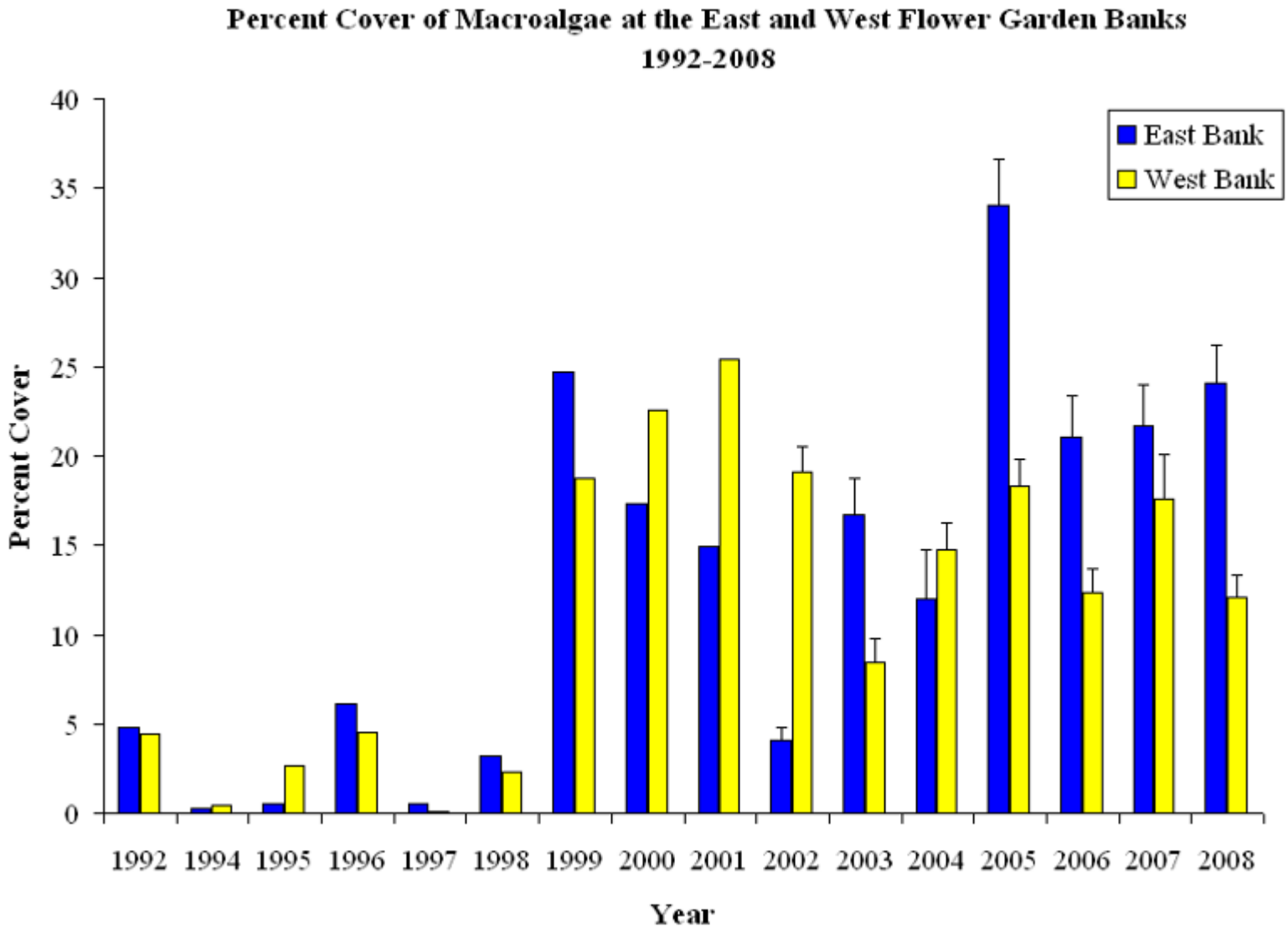


Photo by G.P. Schmahl, NOAA FGBNMS

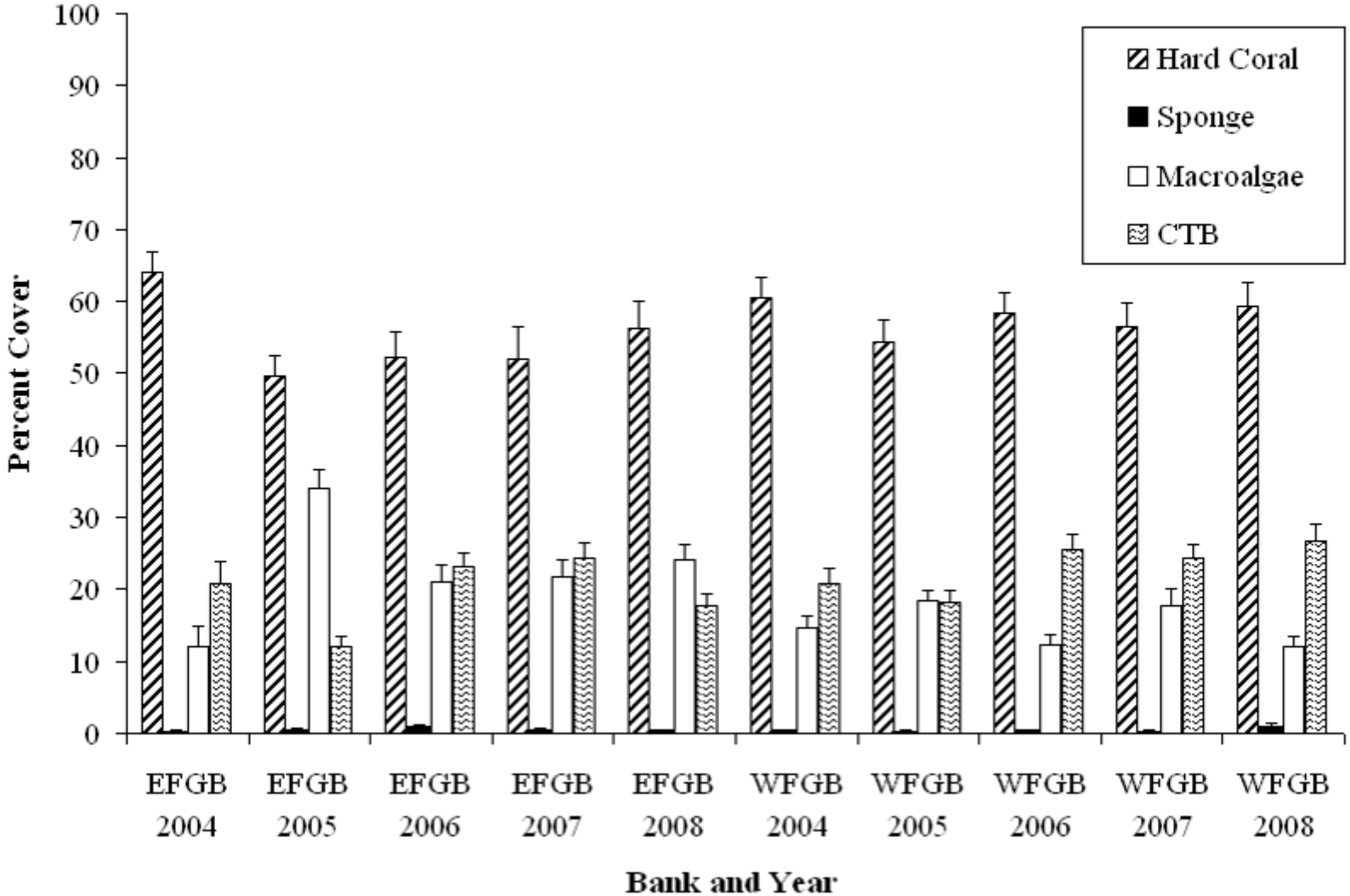
Percent Coral and Algal Cover



Percent Coral and Algal Cover

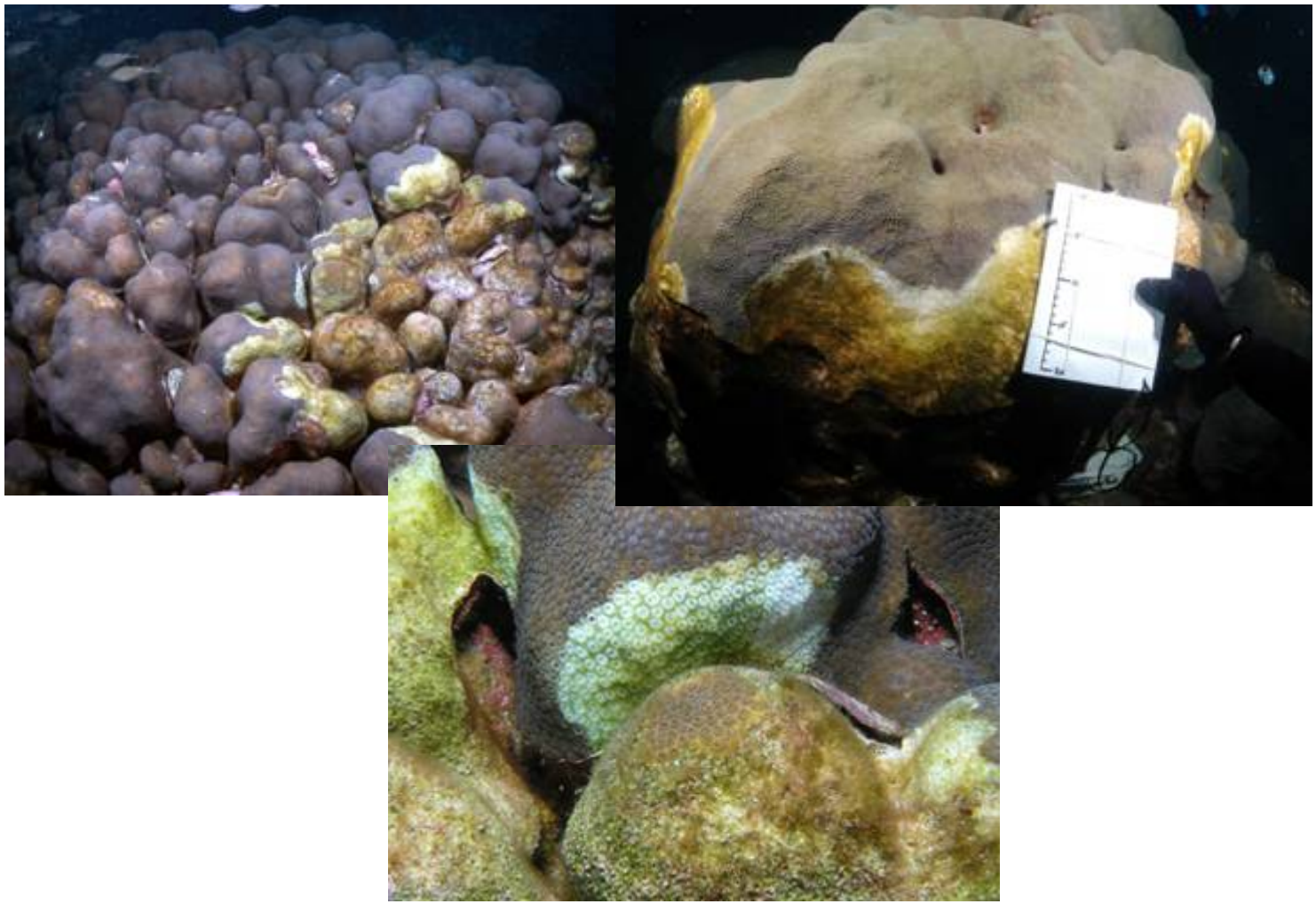


Percent Cover of Four Functional Categories at the Flower Garden Banks 2004-2008



Infectious Diseases

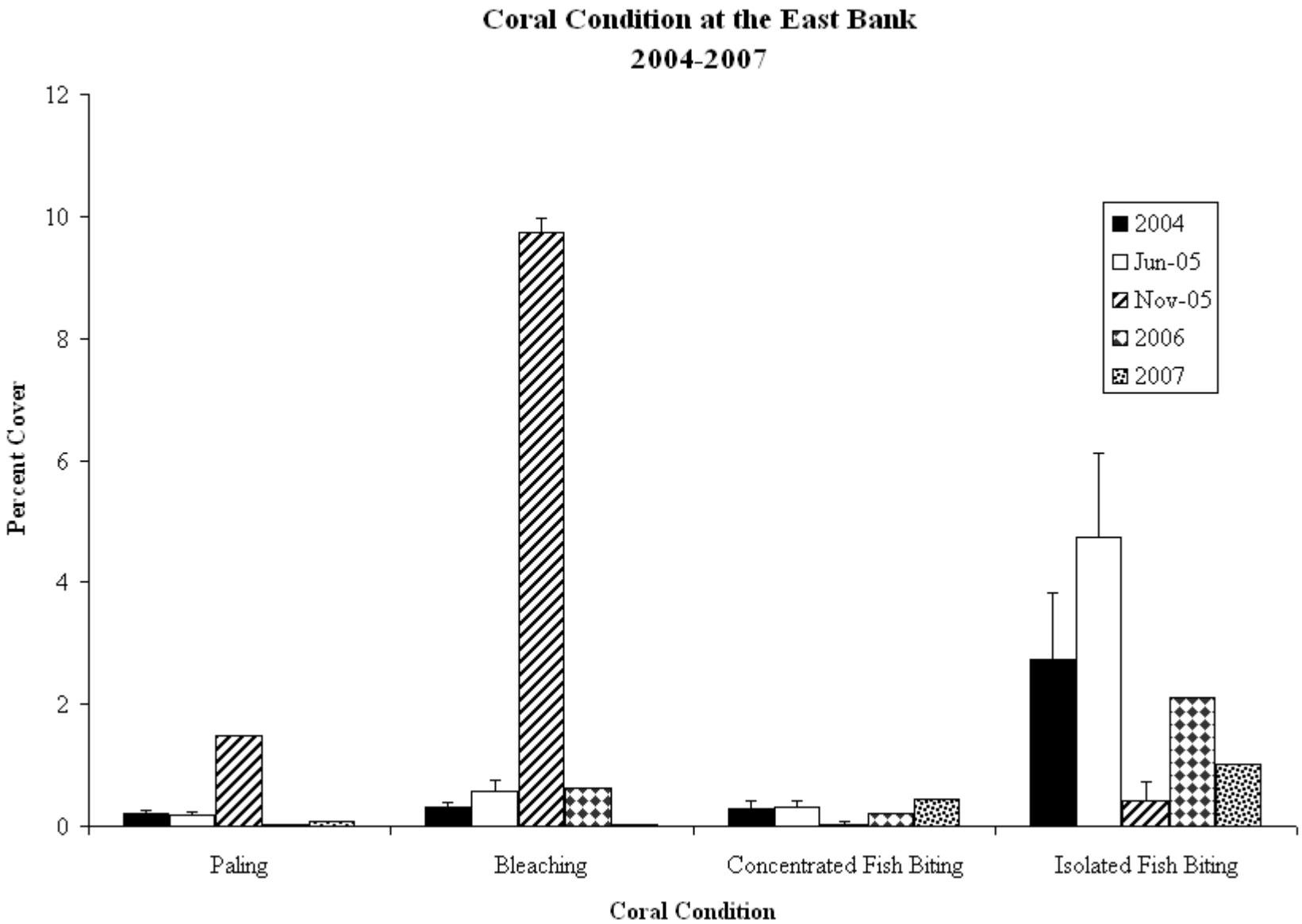
Plague-Like Coral Disease – Winters of 2005 to 2008

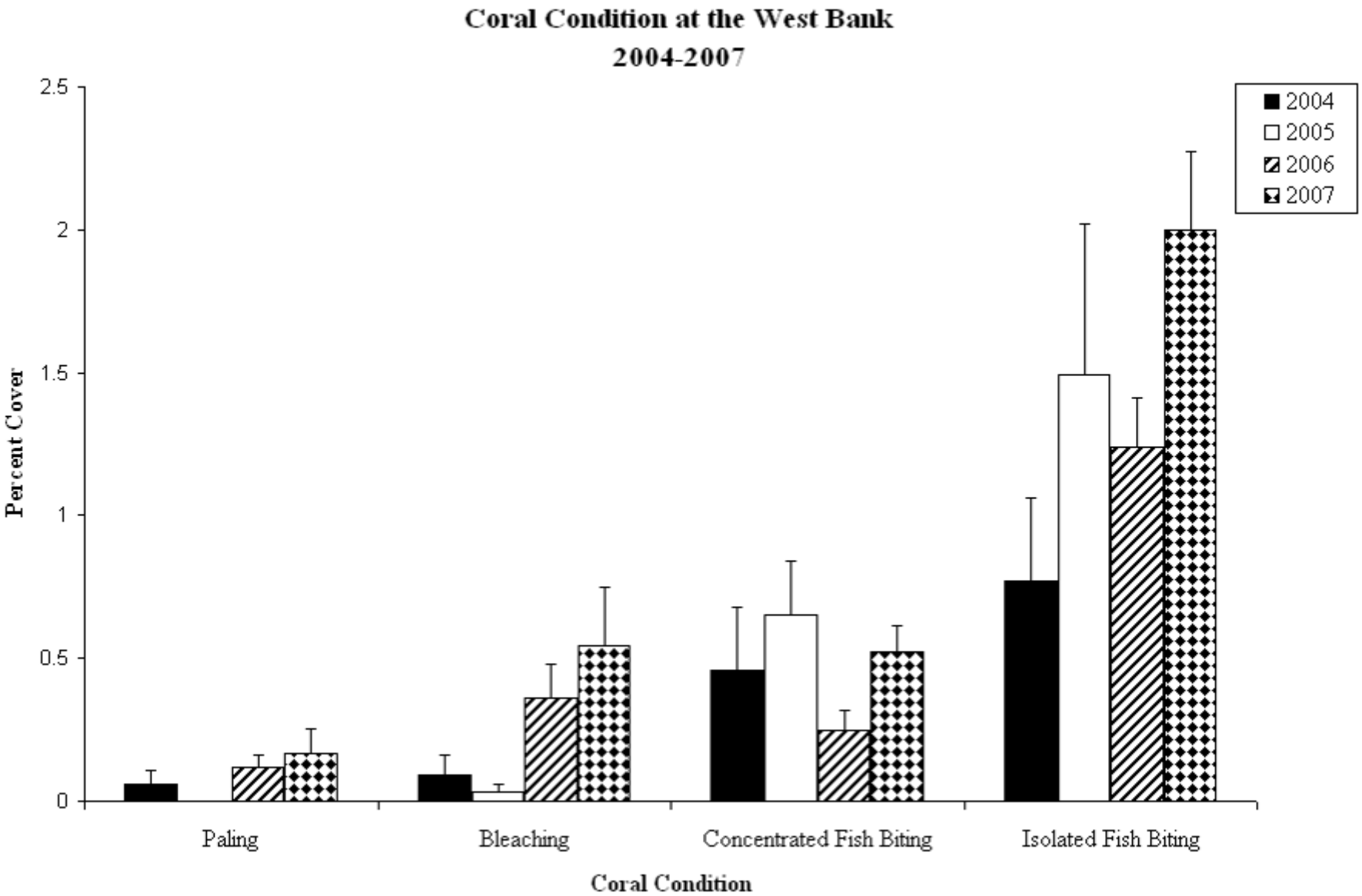


Photos by G.P. Schmahl and E.L. Hickerson, NOAA FGBNMS

Non-Infectious Diseases

- Coral Bleaching : Sep–Nov ’05, Jan and Mar ’06
- Invertebrate and Fish Predation: Year-round


Coral Condition at the East Bank
2004-2007
Percent Cover
12
10
8
6
4
2
0
2004
Jun-05
Nov-05
2006
2007
Paling
Bleaching
Concentrated Fish Biting
Isolated Fish Biting
Coral Condition


Coral Condition at the West Bank
2004-2007
2.5
2
1.5
1
0.5
0
Percent Cover
2004
2005
2006
2007
Paling
Bleaching
Concentrated Fish Biting
Isolated Fish Biting
Coral Condition

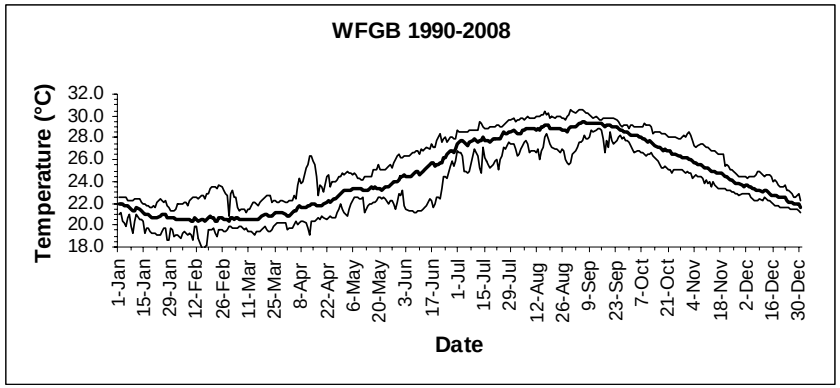
Hurricane Impacts on the EFGB

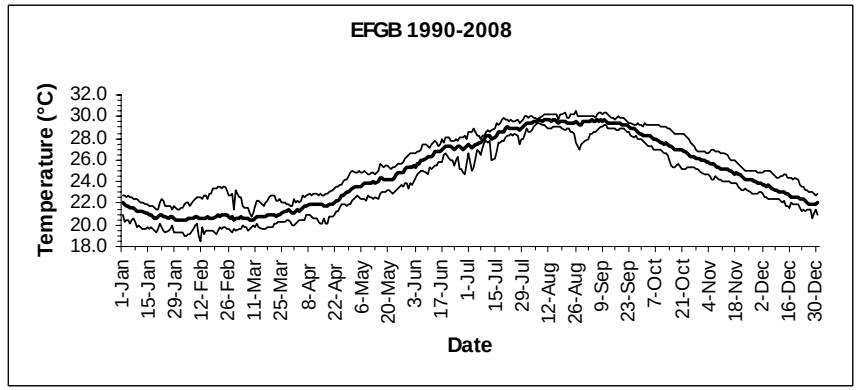
Hurricane Rita (23 Sep 2005, Cat 3)
Hurricane Ike (12 Sep 2008, Cat 2)

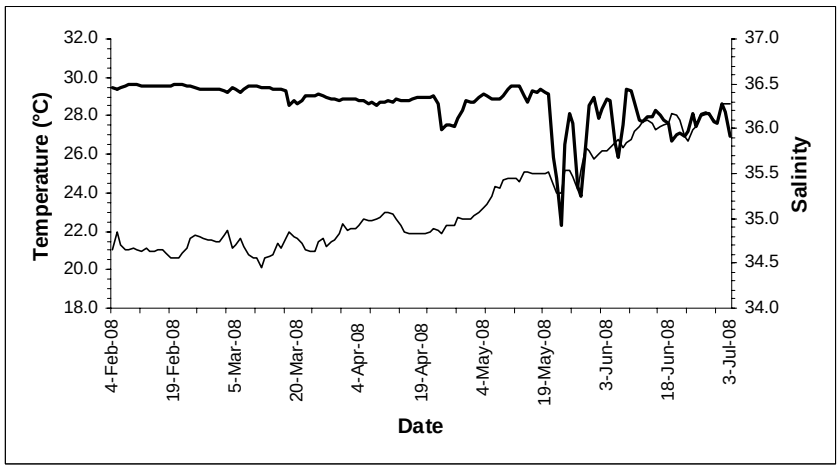
Mechanical injuries to corals
Mechanical injuries to sponges
Removal of coral colonies
Displacement of sediment

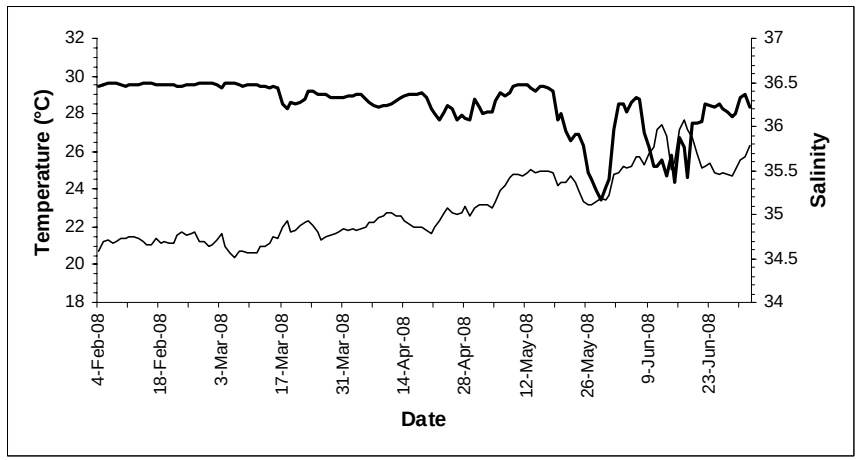
Photos by E.L.Hickerson, NOAA FGBNMS

Temperature and Salinity – Trends

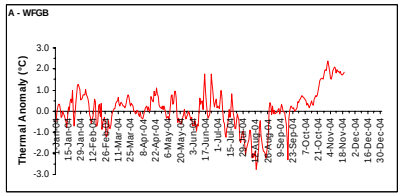


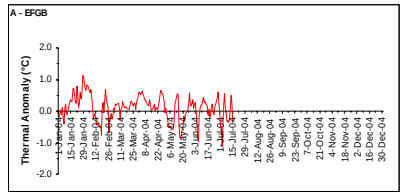


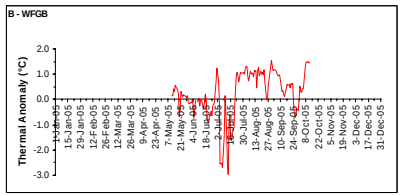


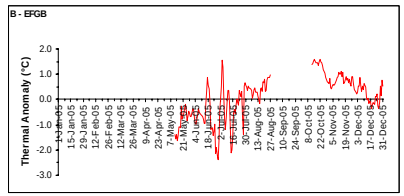


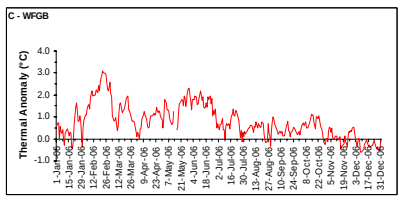
Thermal Anomalies 2004–2008

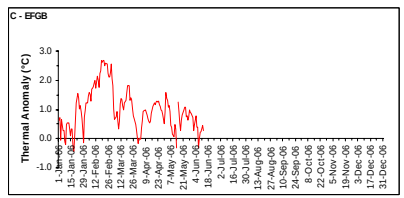


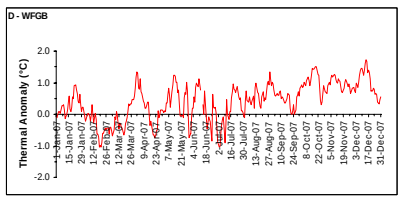


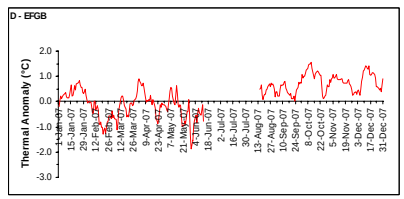


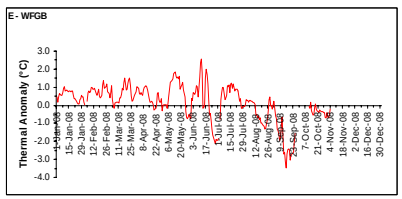


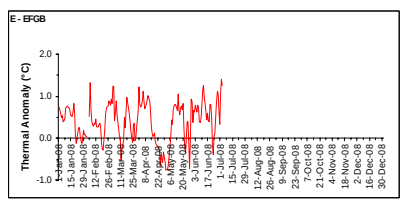




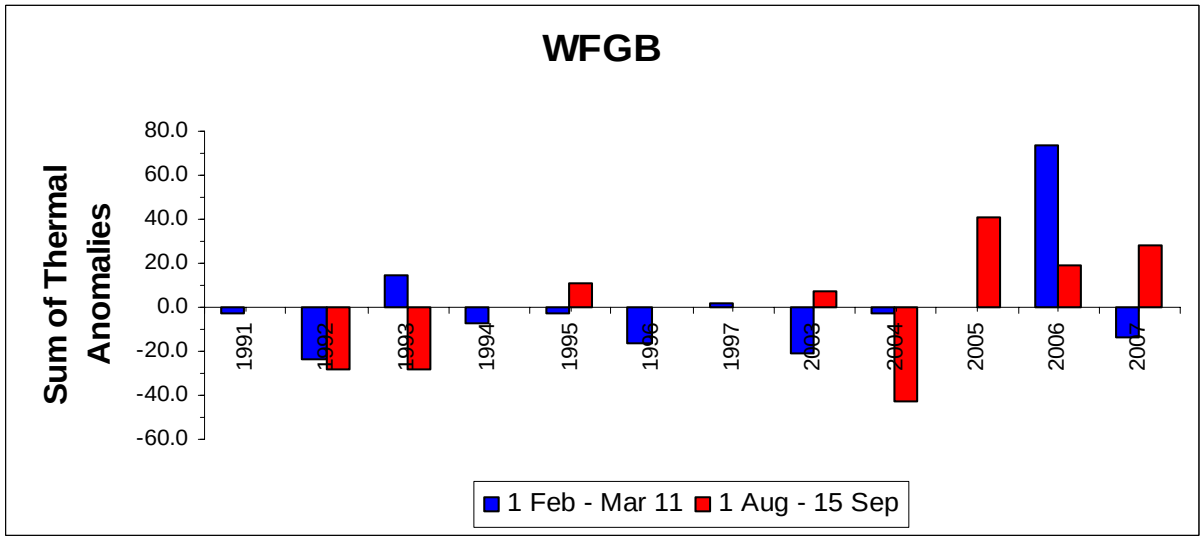


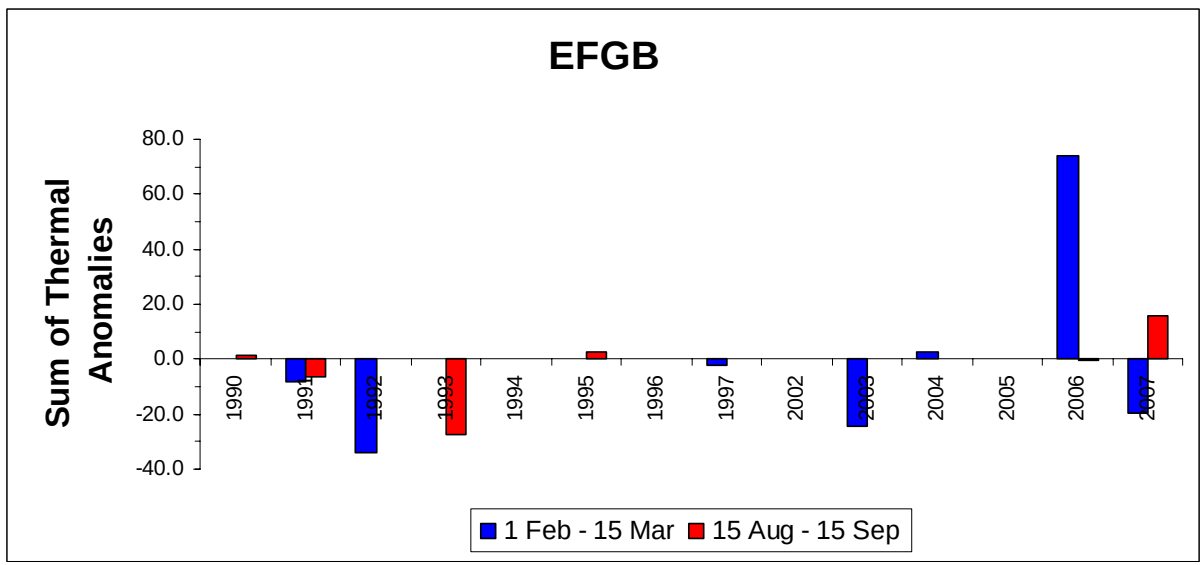






Winter and Summer Thermal Anomalies





RECOMMENDATIONS

- Protective Measures and Reef Resilience Policy Based on Best Science
- Continuation of the Long-Term Monitoring
  - Revisit Research Questions
  - Add Research Areas (e.g., coral calcification, feeding ecology of macroconsumers, disease assessments, coral predation)
  - Maintain Close Communication with Management Needs
- Develop Monitoring for Reef Slope and Deepwater Reef Ecosystems

Photo by E.L. Hickerson, NOAA FGBNMS