

# Biogeographic Characterization of Fish Communities & Associated Benthic Habitats within the FGBNMS

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FGBNMS Research Area  
Monitoring Workshop 2008



# Historical Efforts

Citation	Technique	Period	Location	Sampling Frequency	Data
Bright & Cashman (1974)	hook and line; traps; divers; dipnets; trawls; towed camera; rotenone; submersible	1970 – 1972	WFGB	17 Cruises	size
Dennis & Bright (1988)	submersible transects from crest to depth; diving	1970 – 1972	EFGB & WFGB	unknown	abundance
Dennis (1985)	submersible transects; roving diver; hook and line; ichthyocides; spear; trawl	1970s – 1980s	EFGB & WFGB	unknown	size and abundance
Boland et al (1983)	hook and line; traps; divers; trawls; towed camera	1980 – 1982	EFGB & WFGB	8 cruises	size data
Gittings et al (1993)	video transects	1989 – 1991	EFGB & WFGB (plots)	6 cruises (2 transects/bank/cruise)	abundance of large bodied fish



# Historical Efforts

Citation	Technique	Period	Location	Sampling Frequency	Data
Pattengill (1986)	modified point count; roving diver	1994 – 1997	w/in 100m buoy 2 EFGB & buoy 5 WFGB	6 cruises (~24 surveys/bank/trip)	point count: abundance; roving: log abundance
Dokken et al (1999)	video transects	1996 – 1997	EFGB & WFGB (plots)	2 cruises (2 transects/bank/cruise)	abundance of large bodied fish
Pattengill-Semmens & Semmens (1998)	roving diver	1996 – present	EFGB & WFGB	Biannually to annually	log scale abundance
Pattengill Semmens et al (2000)	belt transects and roving diver	1999	EFGB & WFGB	1 cruise (12 transects/bank)	transect: size & abundance selected taxa; roving diver: log abundance
Precht et al (2006)	point counts	2003 – present	EFGB & WFGB (plots)	Annually (16 counts/bank)	size and abundance data



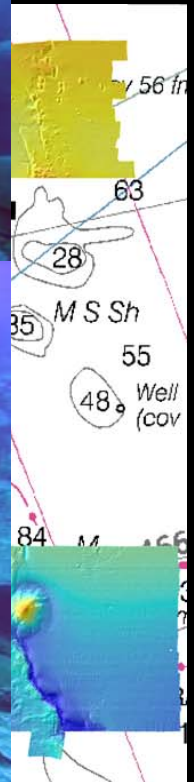
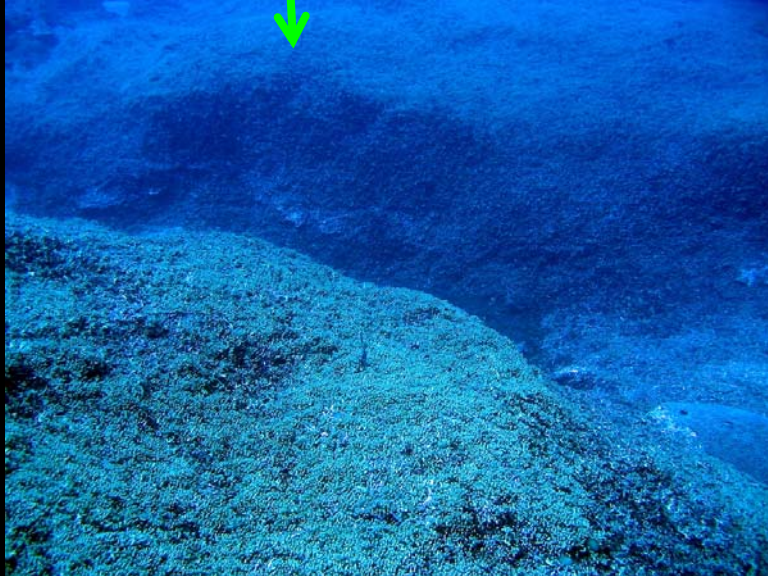
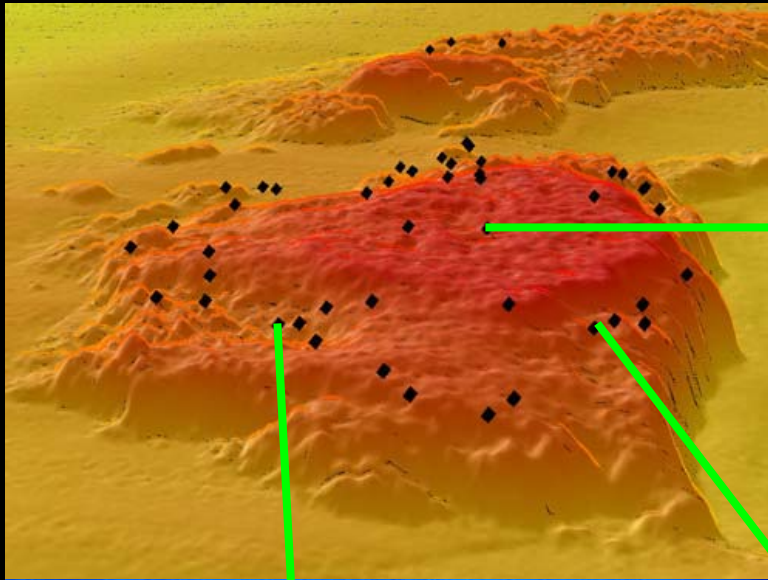


# Objectives

- To determine long-term changes in fish community structure using metrics of diversity, density, and trophic ratios
- To determine long-term changes in density and mean-size of selected economically important taxa
- To determine the relationship between physical measures such as habitat type, depth, slope, and geographic locations with the associated fish community using metrics of diversity, density, and biomass



# Flower Garden Banks NMS

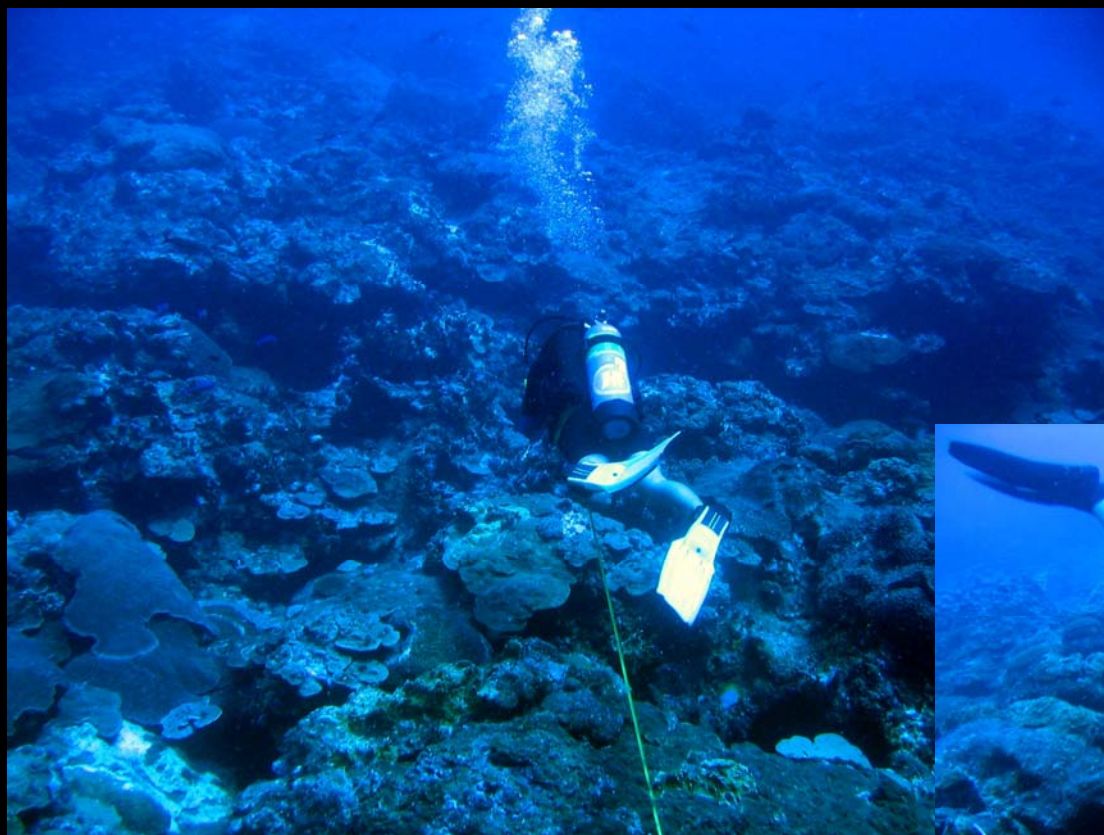




# Field Methodology

## Fish Transect (25 X 4 m)

- identification
- abundance
- size



## Benthic Composition (1m<sup>2</sup> quadrats)

- % cover of corals, algae, sponges
- auxiliary data – marine debris, macroinvertebrates

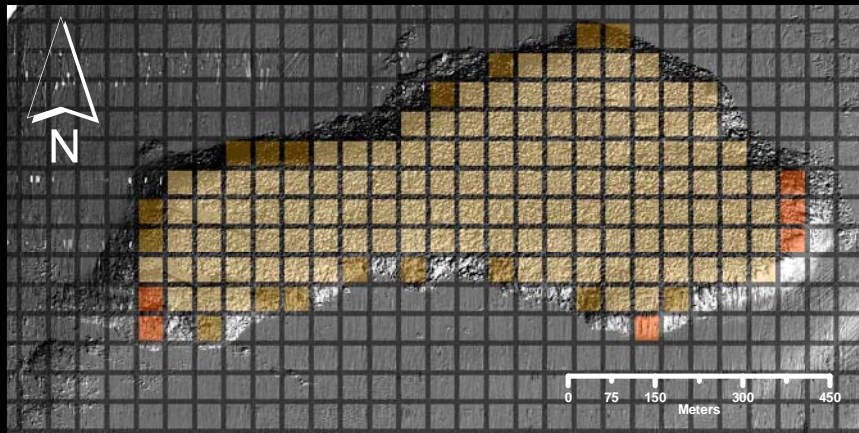


# Sampling Design

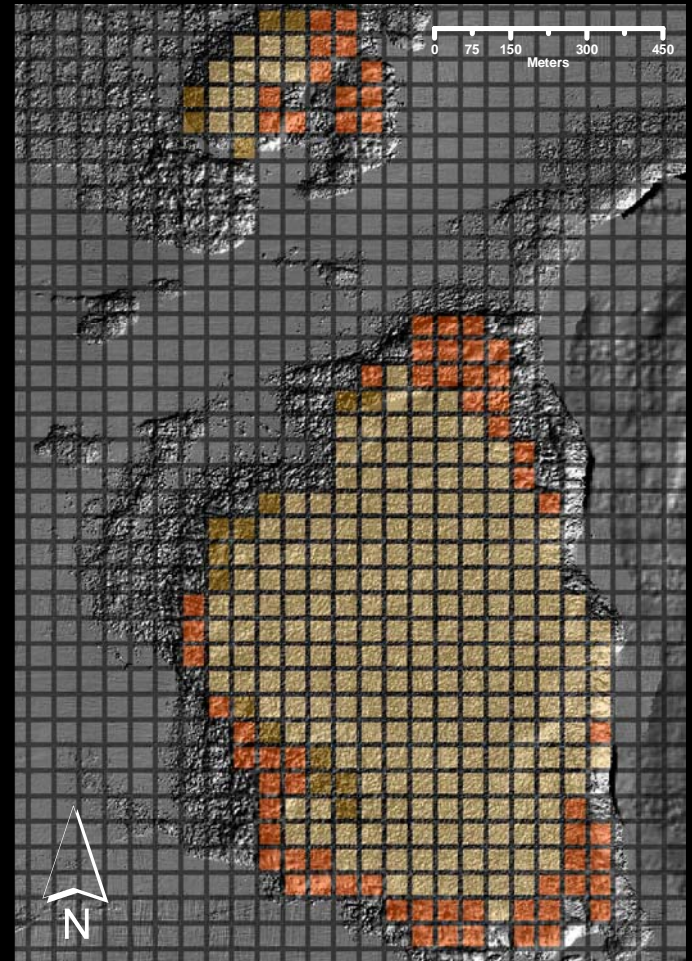
Community Index	SRS	StRS 2006	StRS Bank	StRS Depth	StRS Habitat	StRS Comp
<b># Species</b>	2	2	2	2	2	2
<b>Density</b>						
All Species	37	32	<b>30</b>	37	36	34
Groupers	74	76	74	72	76	<b>70</b>
H:P Ratio	121	123	119	<b>90</b>	127	109
Grey Snapper	730	710	764	727	825	<b>574</b>
Yellowmouth Grouper	158	167	157	167	155	<b>143</b>
Tiger Grouper	234	239	242	252	239	<b>216</b>
Marbled Grouper	676	741	704	861	<b>703</b>	731
<b>Average Size</b>						
All Groupers	36	36	<b>35</b>	54	48	45
<b>Biomass</b>						
All Species	186	456	146	130	446	<b>129</b>
Groupers	842	<b>145</b>	455	455	1465	425
H:P Ratio	817	550	588	<b>237</b>	913	530



# Site Selection



**West Bank**



**East Bank**





# Sampling Design Tool

Sampling Design Tool

Create Point Samples

Simple Random

Stratified Random

Multistage Simple

Analyze Existing Data

Select sample frame

Select strata field

Run

Sampling Strategy

Define Parameters

Coefficient of Variation

Confidence Interval

Confidence Interval Test

Type I Error

Type I and Type II Error

Finite Population Correction

Type I Error Rate: 0.01

Type II Error Rate: 0.95

1000 Sampling Unit Size

0.10 Precision

Recalculate

Sample Size Estimates

Type	0.01	0.025
0.95	2027.56	1771.43
0.9	1696.38	1471.43
0.8	1337.68	1085.71
0.7	1094.14	867.14
0.6	911.85	705.71
0.5	757.86	571.43

Highlight maximum sample size

Statistics from Sample Data

Standard Coefficient of Variati

Export Statistics

Next Cancel

Select Stratified Inputs

Define the number of sample units to create in each stratum

Strata	# of samples
Unknown	282
Hard	483
Soft	127

Allocation Method

Proportional

893 Sample units to allocate

892 total samples allocated

Optimal

Import values from table

Reset values

Export values to table

Run Cancel



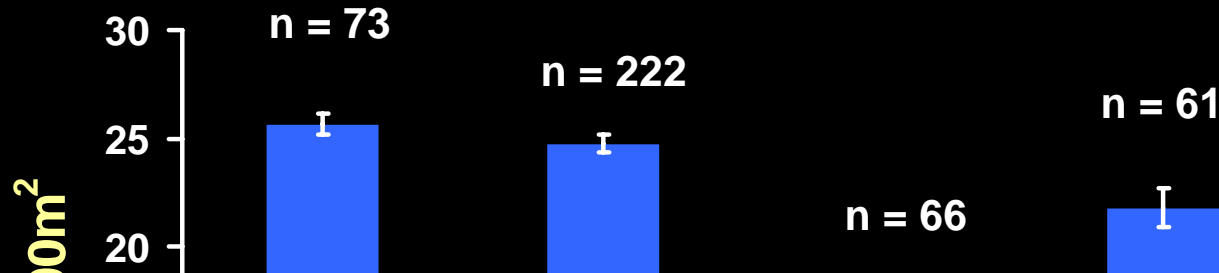
# Not always a good story



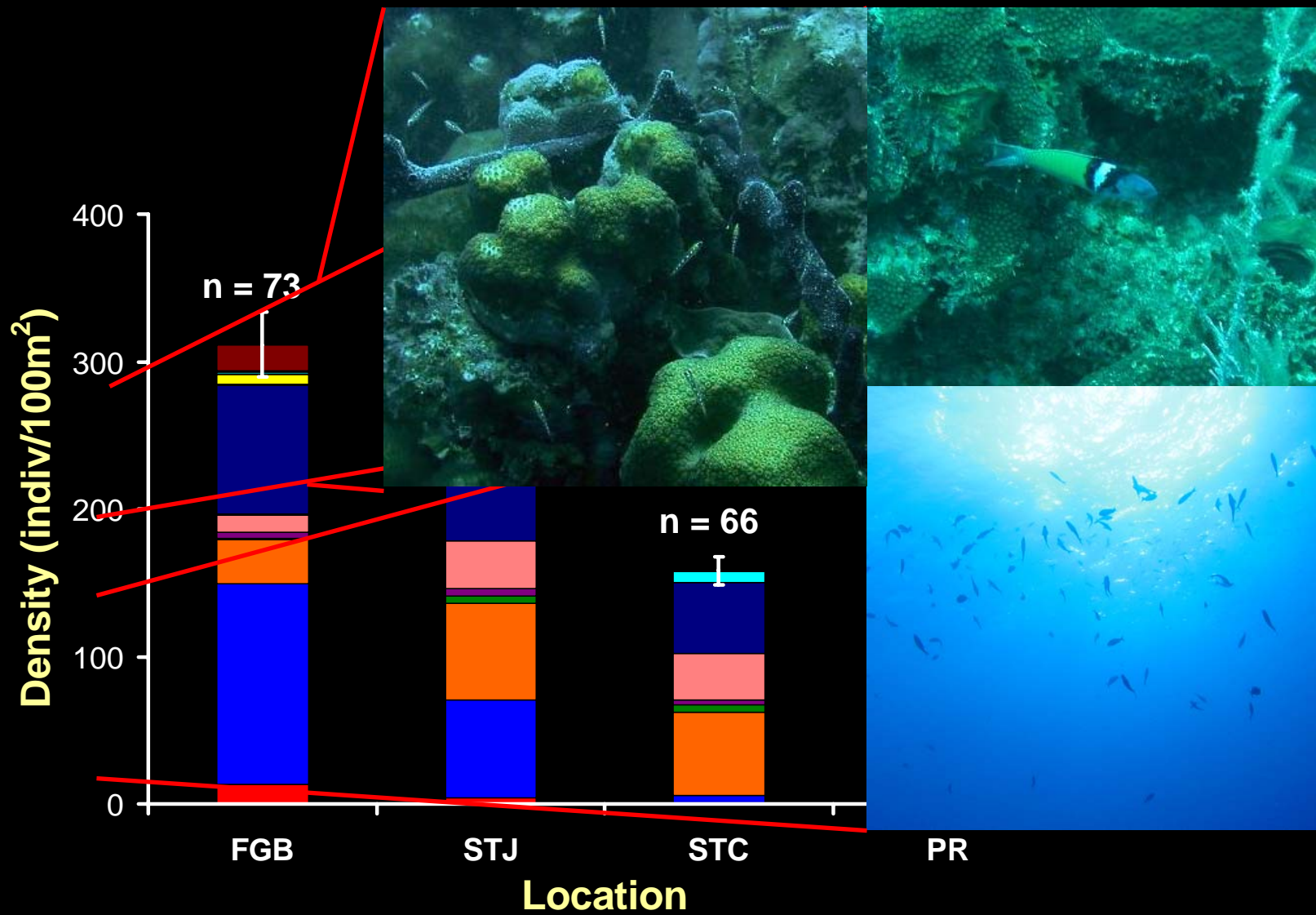


# Mean Richness

Sites > 60 ft depth

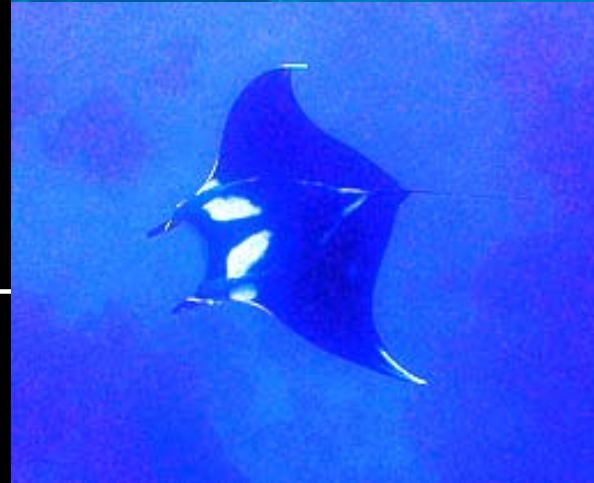
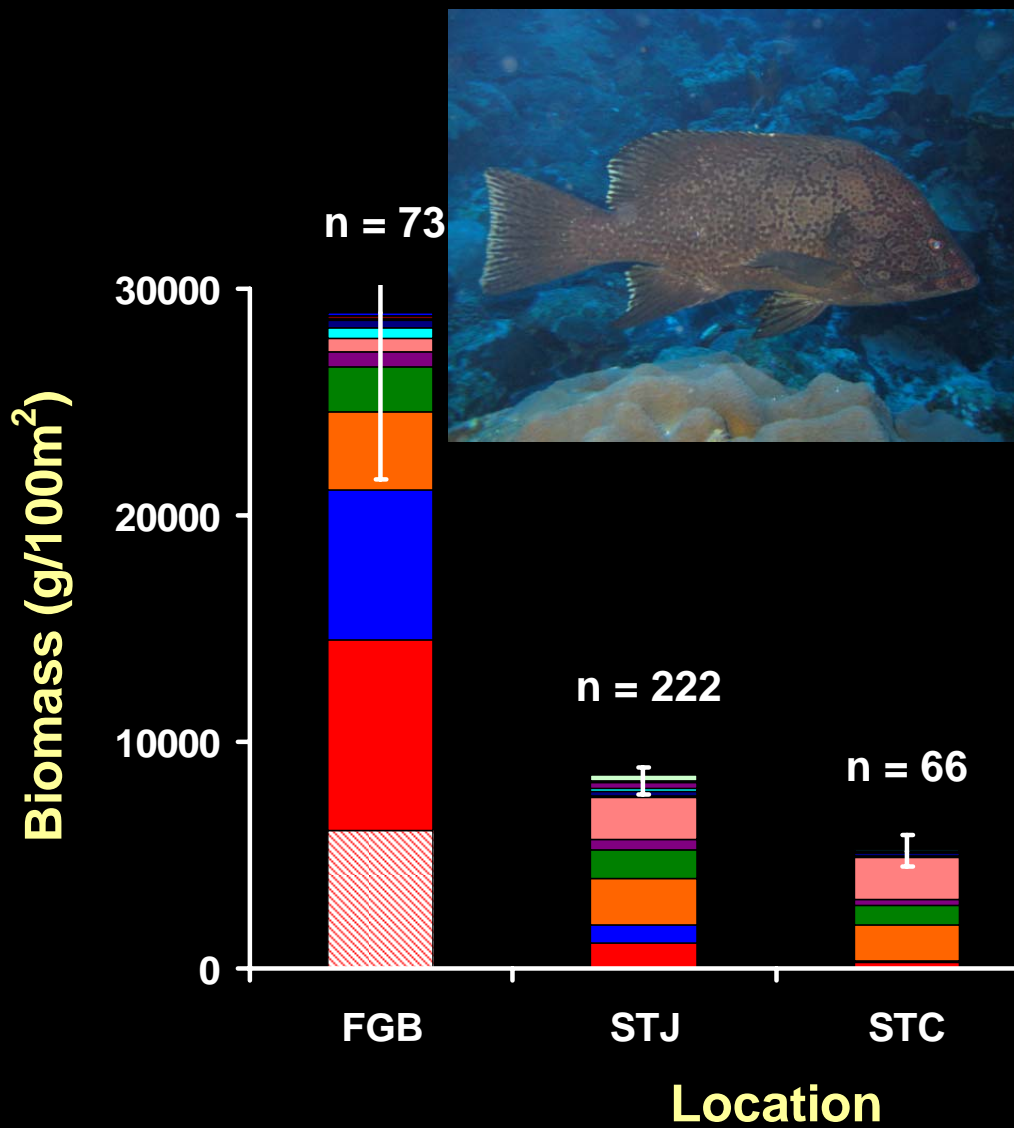


# Mean Density





# Mean Biomass



# Conclusions

- A comparatively pristine ecosystem
  - Coral cover > 50%
    - High topographic complexity
  - Removed from impacts
    - Natural (hurricanes)
    - Anthropogenic (fishing, disease, anchoring)
  - Fish community structured differently
    - 3 dimensional
    - high biomass & high trophic level
- Implications for designation of “Research Area”
  - Baseline for areas beyond just the Sanctuary



Burek





# Acknowledgements

- NOAA's National Center for Coastal Ocean Science
- NOAA's Biogeography Branch
- Flower Garden Banks National Marine Sanctuary
- Crew of NOAA ship Nancy Foster



[http://ccma.nos.noaa.gov/ecosystems/sanctuaries/fgb\\_nms.html](http://ccma.nos.noaa.gov/ecosystems/sanctuaries/fgb_nms.html)



# Research Area Delineation

Boundary Options for a Research Area within  
Gray's Reef National Marine Sanctuary

by  
Matthew S. Kendall and Katherine A. Eschelbach  
In partnership with Gray's Reef National Marine Sanctuary  
and the Research Area Working Group

May 2006



NOAA Technical Memorandum NOS NCCOS 31

- Goals & Objectives of effective RA
- RA characteristics
  - Amount of key habitats
  - Representative habitats
  - Prior research
  - Impact to users
  - Comparable area outside
- Determine potential boundary configurations and placement options
- Developed novel approach and GIS tool to aid in decision process

