Fish Communities Associated with Benthic Biological Zones at the Flower Garden Banks National Marine Sanctuary and other Banks in the Northwestern Gulf of Mexico

Marissa F. Nuttall[1], Emma L. Hickerson[1], Ryan J. Eckert[1], John A. Embesi[1], Michelle A. Johnston[1], George P. Schmahl[1]

1. Flower Garden Banks National Marine Sanctuary, 4700 Ave U, Bldg 216, Galveston, TX 77551

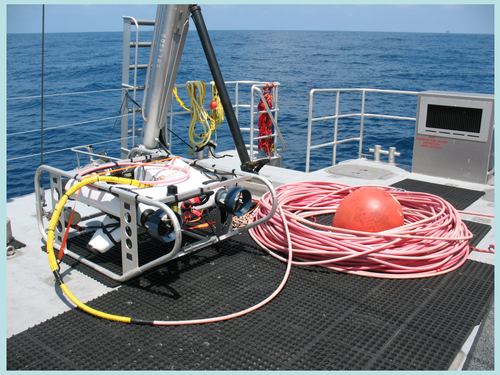
Introduction

The Flower Garden Banks National Marine Sanctuary (FGBNMS) has designated and characterized distinct biological zones describing the habitats within the FGBNMS. However, each of these zones have been designated based solely on the benthic community composition. Currently, these zones include coral reef, coral community, coralline algae (including coralline algae reefs and algal nodules), deep coral, soft bottom, brine seep, and mud volcano (Schmahl et al. 2008 and Hickerson et al. 2008). Each of these biological zones harbors a unique and distinct benthic community that had been used to characterize the habitat.

This study presents the addition of fish community data to each of the benthic biological zones, highlighting the unique fish assemblage that is associated with each zone.

These initial benthic habitat characterizations were based on data collected within the currently designated FGBNMS boundaries, including the East Flower Garden Bank (EFGB), West Flower Garden Bank (WFGB), and Stetson Bank. However, preliminary investigations indicate that these zones may have wider applicability to additional reefs and banks in the mesophotic zone of the northwestern Gulf of Mexico.

Methods



Historical ROV data from EFGB, WFGB, and Stetson Bank was used to obtain fish community information associated with each benthic biological zone, with the exception of the coral reef and coral community zones.

ROV data used in this study was gathered in 5-minute intervals, where the fish community composition, benthic community, and benthic biological zone were recorded. This information was gathered from 5 research cruises between 2005 and 2012, totaling over 80-hours of video footage. From this information, sighting frequency of each fish species for each benthic biological zone was calculated, treating each 5-minute interval as a transect.

For the coral reef and coral community benthic biological zones, fish data was complied from the annual long-term monitoring studies for the East and West FGB and Stetson Bank, between 2012 and 2013. Approximately sixteen Bohnsack-Bannerot (1986) visual fish surveys were conducted at each location on an annual basis within the coral reef zone (EFGB and WFGB) and the coral community zone (Stetson Bank). Sighting frequency was then calculated for each fish species in each benthic biological zone.

Sighting frequencies for all species in each benthic biological zone were ranked by highest to lowest sighting frequency. The species contributing to the top 50% of observed species were recorded (and presented, in order), and added to the biological zone descriptions.

Coral Reef

- *Orbicella* sp.
- *Stephanocoenia* sp.
- *Madracis* sp.
- *Agaricia* sp.
- Sponge
- Mixed Coral
- Leafy Algae

- *Clepticus parrae*
- *Thalassoma bifasciatum*
- *Chromis multilineata*
- *Stegastes partitus*
- *Canthigaster rostrata*
- *Paranthias furcifer*
- *Acanthurus coeruleus*
- *Bodianus rufus*
- *Scarus vetula*
- *Chromis cyanea*
- *Sphyraena barracuda*

- *Kyphosus sectatrix*
- *Stegastes planifrons*
- *Chaetodon sedentarius*

Coral Community

- *Millepora* sp.
- Sponge
- Mixed Coral
- Leafy Algae

- *Sparisoma atomarium*
- *Thalassoma lucasanum*
- *Sphoeroides spengleri*
- *Acanthurus chirurgus*
- *Bodianus pulchellus*
- *Lactophrys triqueter*
- *Sphyraena barracuda*
- *Parablennius marmoreus*
- *Halichoeres maculipinna*
- *Canthigaster rostrata*
- *Epinephelus adscensionis*

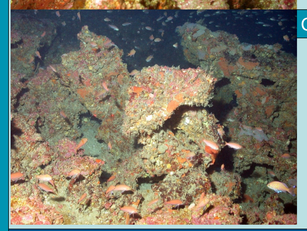
- *Holocentrus adscensionis*
- *Gymnothorax moringa*

Coralline Algae

Algal Nodule

- Madracis sp.
- Octocoral
- Antipatharian
- Sponge
- Mixed Coral
- Leafy Algae
- Algal Pavements
- Rhodolith Assemblage

- *Chromis insolata*
- *Centropyge argi*
- *Serranus annularis*
- *Holocentrus adscensionis*
- *Bodianus pulchellus*
- *Chaetodon sedentarius*
- *Sparisoma atomarium*
- *Chromis enchrysura*



Coralline Algae Reef

- Octocoral
- Antipatharian
- Sponge
- Mixed Coral
- Leafy Algae
- Algal Pavements

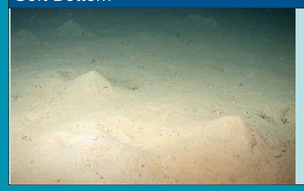
- *Pronotogrammus martinicensis*
- *Anthias tenuis*
- *Chromis enchrysura*
- *Bodianus pulchellus*
- *Chaetodon sedentarius*
- *Chromis insolata*

Deep Coral

- Octocoral
- Antipatharian
- Stony Coral
- Sponge
- Mixed Coral

- *Pronotogrammus martinicensis*
- *Anthias tenuis*
- *Lutjanus campechanus*
- *Mycteroperca phenax*
- *Decodon puellaris*
- *Chaetodon sedentarius*

Soft Bottom



- Bacterial Mats
- Octocoral
- Antipatharian Field
- Stony Coral

- *Lutjanus campechanus*
- *Decodon puellaris*
- *Serranus phoebe*

Brine Seep

- *Beggiotoa* sp.

- *Mycteroperca phenax*
- *Paranthias furcifer*
- *Seriola dumerili*

Mud Volcano

- *Beggiotoa* sp.
- Antipatharian

- *Decapterus* sp.
- *Seriola dumerili*
- *Pristipomoides aquilonaris*

Discussion

The addition of fish community data to these benthic habitat zones provides a more complete view of the biological components that comprise each zone. From this analysis, it is apparent that each zone harbors a unique fish assemblage that can be used as an identifying feature for the zone. With the addition of this fish community data, we suggest that these zones be referred to as biological zones henceforth, reflecting the more complete view of the biological community they now provide.

Since 2000, the FGBNMS has visited 16 additional banks in the northwestern Gulf of Mexico to conduct ROV surveys and exploration. Preliminary analysis indicates that these reefs and banks posses similar biological zonation to those identified within the FGBNMS. This suggests that the biological zones described from the FGBNMS may possess a wider applicability throughout the mesophotic zone in northwestern Gulf of Mexico.

Future studies are needed to develop a habitat zonation model for the FGBNMS, and other reefs and banks in the region. Once compiled, these maps would be able to identify where each of these habitats potentially exist, helping to guide research and management decisions in the region.

References and Acknowledgements

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Contact: Marissa F. Nuttall
Flower Garden Banks National Marine Sanctuary
4700 Avenue U, Bldg. 216, Galveston, TX 77551
Tel: (409) 621-5151 ext. 114
Marissa.Nuttall@noaa.gov