NOAA CIOERT Cruise Report

South Atlantic MPAs and Deepwater Coral HAPCs: Characterization of Benthic Habitat and Fauna

NOAA Ship *Pisces* Cruise 12-03
UNCW *Super Phantom* ROV
July 6-19, 2012

Funding: NOAA Coral Reef Conservation Program (CRCP)
South Atlantic Fishery Management Council (SAFMC)
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EXECUTIVE SUMMARY

A 14 day research cruise was conducted July 6-19, 2012, on the NOAA Ship *Pisces* with the UNCW *Super Phantom* ROV by NOAA National Marine Fisheries in collaboration with the Cooperative Institute for Ocean Exploration, Research, and Technology (CIOERT) at Harbor Branch Oceanographic Institute, Florida Atlantic University (HBOI-FAU), and other academic and federal partners (including NOAA NCCOS and University of North Carolina at Wilmington).

Recently, the South Atlantic Fishery Management Council (SAFMC) established eight deepwater Marine Protected Areas (MPAs) along the outer continental shelf off the southeastern U.S. This project is one of several research cruises to document and characterize the benthic habitat, benthic biota, and fish populations within and adjacent to these protected areas within the jurisdiction of the SAFMC. This monitoring program for the MPAs will ensure the Council remains well informed of changes within reef fish populations and coral habitats associated with these MPAs.

A Cruise Plan for the 2012 *Pisces* cruise was finalized and approved by the NOAA Office of Marine and Aviation Operations, detailing the operating area, research objectives, personnel, itinerary, equipment, data management, and the methods for each operation including ROV operations, multibeam sonar surveys, and CTD casts. A Preliminary Cruise Report was submitted to NOAA on August 8, 2012, and included the following data:

1. ROV and CTD station summary
2. Species List- benthic taxa collected
3. SEADESC I Report- detailed descriptions of each ROV dive site
4. ROV Dive Annotations- log of benthic habitat, biota and fish notes throughout each dive.

This Final Cruise Report provides a detailed characterization of the benthic habitat, benthic sessile biota, and fish populations for each ROV dive site. Appendices 1 and 2 provide the complete species list of benthic biota and fish, respectively, observed at each dive site. Appendix 3 provides a SEADESC Level II Report for each dive site, including: cruise and ROV dive metadata, figures showing each ROV dive track and habitat zones overlaid on multibeam sonar maps, dive track data (start and end coordinates and depth), objectives, general description of the habitat and biota, and images of the biota and habitat that characterize the dive site. This SEADESC Level II Report also provides quantitative analyses of each dive site including: 1) CPCe 4.1© Coral Point Count analysis of percent cover of benthic biota and substrate types, and 2) densities of fish populations (# individuals/km for each species). In addition, this report uses analysis of similarity (PRIMER) to compare the fish populations and benthic communities among the various shelf-edge MPA sites and sites outside but adjacent to the MPAs.

A total of 37 ROV dives were conducted, resulting in a total bottom time of 62.75 hours, covering 58 km, at depths from 42.4 to 250.9 m. A total of 65 hours of ROV video were recorded and 4,461 *in situ* digital images were taken which included quantitative transect images, general habitat, and species documentation images. Twelve sites were surveyed with multibeam sonar and covered a total area of 198.1 km^2. These sites had never been surveyed previously with multibeam sonar. Georeferenced maps were made for each of the sites and were ground-truthed with the ROV dives (Appendix 3).

Ultimately these data from the various cruises will be used to characterize and document the habitat, benthic communities, and fish populations within the shelf-edge MPAs along the southeastern U.S. from North Carolina to south Florida. These data may then be compared to future research cruises to better understand the long-term health and status of these important ecosystems. These data will be of value to the SAFMC, NOAA Fisheries, NOAA DSCRTP, NOAA CRCP, NOAA Mesophotic Reef Ecosystem Program, and NOAA Marine Sanctuaries for management decisions on these habitats and managed key species.

ACKNOWLEDGEMENTS

We gratefully acknowledge funding for research support and ROV operations by the NOAA Coral Reef Conservation Program (CRCP) and the South Atlantic Fishery Management Council (CRCP Fishery Management Council Coral Reef Conservation Cooperative Agreements- Grant #: NA11NMF4410061). We also acknowledge the NOAA Office of Ocean Exploration and Research (OER Grant #: NA09OAR4320073), the NOAA Deep Sea Coral Research and Technology Program (DSCRTP), and the NOAA Office of Marine and Aviation Operations (OMAO) which provided support for ship time.

We thank the NOAA Cooperative Institute for Ocean Exploration, Research, and Technology (CIOERT) at Harbor Branch Oceanographic Institute, Florida Atlantic University (HBOI-FAU), and the Robertson Coral Reef Research and Conservation Program at HBOI. The crews of the NOAA Ship *Pisces* and UNCW ROV are especially thanked for their support and efforts which made this cruise a success.

DELIVERABLES AND DATA MANAGEMENT

This Final Cruise Report and SEADESC Level II Report is a deliverable for this NOAA CRCP/SAFMC grant. To date, all data have been archived as required; these data include shipboard data, raw and processed multibeam sonar data, CTD, ROV navigation data, ROV video and digital images, ROV dive annotations, and HBOI Microsoft Access at-Sea Database (Table 1). A complete set of original data are archived by the Principal Investigators at NOAA Fisheries, Panama City (Stacey Harter) and HBOI-FAU (John Reed).

The NOAA Ship *Pisces* survey department, under the direction of the Operations Officer, has archived all multibeam data at the National Geophysical Data Center. This archive will be

conducted in consultation with the Principal Investigator to ensure there is no unintentional release of sensitive data.

Table 1. 2012 NOAA Ship *Pisces* cruise, July 6-19, 2012, data archives (Principal Investigators-Stacey Harter, Andrew David, NOAA NMFS, Panama Lab; John Reed, HBOI-FAU).

Source	Description	Format
Ship	Multibeam (MB) sonar- raw	PDS
Ship	MB- processed files (corrected for tides and sound velocity)	CARIS, HDCS,XYZ (ASCII)
Ship	MB- GeoTIFF	TIFF
Ship	CTD	CSV
ROV	ROV video- digital copies of all ROV dives	External hard drives, DVD
ROV	ROV digital still images	JPEG; External hard drives, DVD
ROV	Event log	CSV
Science	ROV dive track polygons	ArcGIS shapefile
Science	Cruise database	Access MDB

CIOERT/NOAA COLLABORATION

The primary focus of this research cruise is to advance NOAA OER goals while complementing the management objectives of NOAA CRCP, NOAA DSCRTP, NOAA Mesophotic Reef Ecosystem Program, NOAA CIOERT, and the South Atlantic Fishery Management Council.

For this cruise, collaborators included NOAA NMFS (Andrew David, Stacey Harter, Leigh Hedgepeth, Steven Mathews; Panama City), NOAA NCCOS (Laura Kracker), NOAA CIOERT at HBOI-FAU (John Reed, Stephanie Farrington), and UNCW (Lance Horn, Glenn Taylor).

SCIENTIFIC PARTICIPANTS

Stacey Harter	Chief Scientist, Principal Investigator	NMFS-Panama City Lab
Andrew David	Co-Principal Investigator	NMFS-Panama City Lab
John Reed	Co-Principal Investigator	HBOI-FAU, CIOERT
Stephanie Farrington	Biological Scientist, Data Manager	HBOI-FAU, CIOERT
Laura Kracker	Multibeam Sonar Specialist	NOAA/NCCOS
Steven Matthews	Scientist	NMFS-Panama City Lab
LTJG Leigh Hedgepeth	Scientist	NMFS-Panama City Lab
Lance Horn	Chief ROV Pilot	UNCW
Glenn Taylor	ROV Pilot	UNCW
Marsha Skoczek	Teacher-At-Sea	Olathe, Kansas

PROJECT OVERVIEW

The South Atlantic Fishery Management Council (SAFMC) and Department of Commerce through the Magnuson-Stevens Fishery Management Act has established eight deepwater Marine Protected Areas (MPAs) and five deepwater Coral Habitat Areas of Particular Concern (CHAPCs) in addition to the *Oculina* Coral HAPC along the outer continental shelf off the southeastern U.S. This project proposes to document and characterize the benthic habitat, benthic sessile biota, and fish populations within some of the these protected areas and within the jurisdiction of the SAFMC.

In February 2009, the SAFMC implemented eight Type II MPAs between Cape Hatteras, NC and the Florida Keys to protect seven species of the deepwater snapper-grouper complex. The closures, however, will provide ecosystem-level benefits to the entire complex as well as protect the shelf-edge reef habitat they utilize. These consist of five species of grouper: snowy grouper (*Hyporthodus niveatus*), yellowedge grouper (*H. flavolimbatus*), warsaw grouper (*H. nigritus)*, misty grouper (*H. mystacinus*) and speckled hind (*Epinephelus. drummondhayi*), and two species of tilefish: golden tilefish (*Lopholatilus chamaeleonticeps*) and blueline tilefish (*Caulolatilus microps*). The deepwater shelf-edge MPAs are known to contain reef habitat exploited by these five species of grouper as well as deep mud banks used by the two tilefish species. These species are considered to be at risk due to currently low stock densities and to life history characteristics which subject them to substantial fishing mortality.

Bottom-tending fishing gear has been shown to have deleterious effects upon reefs and is now prohibited in the MPAs. These sites were designated by the Council to protect spawning grounds of reef fish. As such, decisions to create future area closures will be based upon the efficacy of these areas and the lessons learned during their implementation. Additionally, the MPAs contain extensive areas infested with the invasive lionfish, whose population continues to rapidly expand. Future monitoring will assist in evaluating the effects of this invasion on the ecosystem. Area closures constitute a politically charged issue that is unlikely to retain support without evidence indicating increases in the target species. This project will benefit coral reef ecosystems directly by improving our understanding of the impact of fishing activities on both fish and invertebrate species.

The proposed monitoring program for the MPAs will ensure the Council remains well informed of changes within reef fish populations and coral habitats associated with these MPAs. NOAA NMFS conducted preliminary examinations of five of these potential MPA sites in April-May 2004, June 2006, August 2007 and July 2008. Post-closure data were also collected in November 2009 and May 2010. The MPAs afforded the opportunity to obviate the criticisms of comparing MPAs with adjacent open-to fishing areas by examining the MPAs for four years prior to the closures. Since monitoring began in 2004, this project has produced population density estimates of targeted reef fish species within the boundaries of five of the eight MPAs and adjacent control areas, before and after closure. This Final Cruise Report for the 2012 NOAA *Pisces* cruise will be one of three that are planned for 2012, 2013, and 2014 by NOAA CRCP and SAFMC.

GOALS

The primary goal of the cruise is to gather additional data on habitat and fish assemblages in the South Atlantic MPAs as part of a long term sampling program to document changes in these areas before and after implementation of fishing restrictions. Efficacy testing of this management tool will aid fishery managers in future use of area restrictions for the protection of valuable habitat and fishery resources.

This project is in direct support of Fishery Management Council activities associated with the characterization of protected shelf-edge and deepwater coral ecosystems and the efficacy testing of existing Marine Protected Areas. It directly addresses the following CRCP National Goals and Objectives: obtain ecological information for coral reef fishes and spawning aggregations. Activities may include: a) studies that identify, map and characterize fisheries habitat (including essential fish habitat, habitat areas of particular concern, and spawning aggregation sites) in U.S. coral reef ecosystems, and assess the condition of the habitat; b) studies associated with coral reef areas that are currently, permanently, or seasonally closed to fishing, or that may merit inclusion in an expanded network of no-take ecological reserves; and c) multi-beam or sidescan sonar mapping and ground-truthing, habitat characterization, and monitoring of such areas, including deeper coral reefs, bands and beds.

Ultimately the primary benefits of these data are to characterize and document the habitat, benthic and fish communities within the shelf-edge MPAs along the southeastern U.S. from North Carolina to south Florida. These data may then be compared to previous and future research cruises and to areas adjacent to the protected areas to better understand the long-term health and status of these important deepwater coral/sponge ecosystems. These data will be of value to the SAFMC, NOAA Fisheries, NOAA DSCRTP, NOAA CRCP, NOAA Mesophotic Reef Ecosystem Program, and NOAA Sanctuaries for management decisions on these habitats and managed key species.

OBJECTIVES

Objectives for this 2012 NOAA Ship *Pisces* cruise included:

1. Survey shelf-edge MPA sites and adjacent areas off southeastern U.S. with ROV and conduct photo/video transects to characterize and quantify the habitats, benthic communities, and fish populations at these sites.
2. Conduct ME-70 Multibeam Echo-sounder (MBES) surveys to provide new multibeam sonar maps of these areas.
3. Conduct water column CTD profiles to provide physical oceanographic data for the sites and for the sonar surveys (sound velocity).

OUTREACH AND EDUCATION

The goal of the expedition's education and outreach activities is to promote ocean literacy, knowledge of deep coral ecosystems and challenges of exploring and managing deep ocean frontiers for public and classroom audiences. Related outreach/education activities included: NOAA Teacher-at-Sea, Skype live-link with classrooms, and web materials.

METHODS

ROV video and photographic surveys were made at each site to ground-truth multibeam sonar maps, quantify and characterize the benthic habitats, sessile fauna, fish populations, and coral/sponge cover. Shipboard multibeam echo-sounder (ME70) surveys were conducted at dive sites where there were no previous multibeam sonar maps. Prior to each ROV dive the georeferenced sonar maps were uploaded to the ROV navigation software; the co-PIs then selected pre-dive waypoints which were overlaid on the map for ROV dive targets. Three to four ROV dives were made each day during daylight hours; CTD and multibeam operations were conducted at night.

ROV Operations

Surveys were conducted with the UNCW *Super Phantom S2* ROV which was equipped with standard definition digital video and digital still cameras mounted on tilt bar, parallel lasers for scale, and CTD.

ROV Navigation

The ROV uses an integrated navigation system consisting of Hypack Max software on a Dell 1.6 GHz computer, ORE Offshore 4410C Trackpoint II Underwater Acoustic Tracking System with an ORE Offshore 4377A transponder with depth telemetry, Northstar 951XD differential GPS, and Azimuth 1000 digital compass. This system provides real time tracking of the ROV and ship to the ROV operator and the support vessel's bridge for navigation. Ship and ROV positions are logged and processed after each dive and provided to the scientist in an Excel file. Geo-referenced TIFF files obtained with multibeam sonar can be entered into Hypack as background files to display target sites and features of interest to aid in ROV and support vessel navigation. All data documentation (digital images, video, dive annotations) are geo-referenced to ROV position by matching the time and date to the ROV navigation files.

ROV Survey Protocol

During each dive the primary objectives were to document benthic habitat, benthic sessile biota, and fish populations, and to conduct photo/video transects which were used for quantitative analyses of the habitat and biota. The general protocol included:

1. During the photo/video transects, we attempted to keep the ROV <1 m off bottom with a speed over ground of ~¼ knot. Variable, strong currents often made this difficult to impossible.

2. Underwater video was viewed in real time on the support vessel by PIs familiar with the local deep-water fauna; audio annotations describing habitat, benthic biota, and fish were recorded onto the video and transcribed into a Microsoft Access database.
3. Still images were captured with the digital still camera every 1-2 minutes throughout the dive.
4. Field notes and video images were reviewed and summarized to identify habitats and biota. These summaries were compiled in ArcGIS format and used to produce a habitat maps.
5. Still images captured from the photo transects were analyzed using CPCe© software to determine relative percent cover of benthic biota and habitat types.
6. Video transects were used for analysis of fish populations.

Fish Surveys

A Sony standard resolution, single-chip color video camera (410x380 pixels; 79^{o} diagonal angle in water) with 12:1 zoom, and auto/manual focus provided video documentation during ROV operations. An On-Screen Display (OSD) video overlay recorded time, date, ROV heading, and ROV depth. The video footage was recorded continuously throughout each dive from surface to surface and recorded to 2 TB hard drives and copies to DVDs. The camera was typically angled down ~30^{o} to view both near and far to the horizon for fish aggregations and habitat. A headset microphone was used for continuous audio annotations by the PIs describing events, habitat, and fauna which were recorded onto the video recordings and transcribed into a Microsoft Access 2010 database. Along with being used as the main "pilot" view, the video was the primary data source for the quantitative analysis of the fish populations. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The video camera angle precludes an accurate calculation of areal density of the fish (i.e., # km^{-2}); however, we estimate that the field of view width was generally about 10 m, and most fish were identified within a 5 m distance. So the densities listed in Appendix 2 could be multiplied by 0.1 to get an estimate of the number of fish km^{-2} (based on an average 10-m width field of view).

Benthic Surveys

Geo-referenced digital still images were acquired with an Insite Pacific Inc. Scorpio Plus digital still color camera and strobe. This camera features a 4X zoom lens; internal electronics and imaging device are a Nikon Coolpix 995. In fine resolution setting, the 1 gigabyte, compact flash card can store 664 images in JPG format (approximately 1.0 Mb per image), which were copied to DVD media. Quantitative photo transects were conducted during each ROV dive using the digital still camera pointing straight down (or perpendicular to the substrate as possible) with parallel lasers (10 cm) for scale. In general, digital images were taken every two minutes continuously throughout the dive. Each photo filename was coded with corresponding EDST time and date code (using Stamp 2.8 by Tempest Solutions©) which was imported into MS Access and linked to the ROV navigation data for site specific data of coordinates and depth and then imported into ArcGIS™ 10.0. Non-transect photos, such as to record a specific species, were not included in the quantitative analyses. Poor and unusable photos (blurred, black, off bottom) or overlapping photos were removed from the quantitative analyses.

Benthic Analyses

Percent cover of substrate type and benthic macro-biota was determined by analyzing the quantitative transect images with Coral Point Count with Excel extensions (CPCe 4.1©, Kohler and Gill, 2006), and following protocols established in part by Vinick et al. (2012) for offshore, deepwater surveys in this region. Random points overlaid on each image were identified as substrate type and benthic taxa. Substrate categories included: soft bottom (unconsolidated sand, mud) and hard bottom which was subdivided into rock (pavement, boulder, ledge), rock rubble/cobble (generally, 5-20 cm), and framework coral (standing coral colonies). All macro-benthic biota (usually >3 cm) were identified to the lowest taxa level possible.

For this report we used the following terminology: Hard bottom is sometimes referred to as live bottom due to the amount of living organisms attached to these substrates (SAFMC, 1998). Hard bottom provides anchorage for sessile or semi-sessile organisms (e.g., corals, octocorals, anemones, hydroids). Coral is defined by NOAA [Lumsden, S.E., T. Hourigan, A. Bruckner, and G. Dorr, eds., 2007, The State of Deep Coral Ecosystems of the United States. NOAA Technical Memorandum CRCP-3] as hard corals (stony corals- Scleractinia) and other taxa with solid calcareous skeletons (e.g., Stylasteridae), as well as non-accreting taxa such as octocorals (Alcyonacea- "gorgonacea") and black corals (Antipatharia).

Protocol for Benthic Habitat Characterization

This document defines the habitat categories that will be used to define and characterize the benthic habitats for the shelf-edge reefs and MPAs off southeastern U.S. and within the jurisdiction of the South Atlantic Fishery Management Council. These data are result of the ROV video observations and multibeam sonar maps where available. These habitat categories are then entered into the HBOI Microsoft Access at-Sea Database for each ROV dive site. These data are used along with the CPCe Point Count data from the photo transects to characterize the benthic habitat and distribution of benthic biota, and also used with the video data for the fish population analyses.

1. *[On/Off Reef]*: "On Reef" or "Off Reef"- Simple designation of when the dive is on some type of hard bottom (=On Reef) vs Soft Bottom (=Off Reef). This designation is not for any individual photo, but for a zonation within the dive.

2. *[Habitat_Zone= Geomorphology]*: This describes the geological feature; e.g., Ridge-West Slope, Ridge- East Slope, Ridge-Top, Soft Bottom. This category is used to plot the percent cover of benthic macro-biota for each habitat zone at each dive site and to plot the dive track overlay on multibeam sonar maps in ArcGIS.

3. [*Relief*]: LR= Low Relief (0- <1.0 m), MR= Moderate Relief (1-3 m), HR= High Relief (>3 m). This is modified from the SEAMAP designations of outer continental shelf benthic habitat. This category is dependent on the distance over which the depth change occurs. We define relief as the relative height of rock ledges, boulders, or rock outcrops. It can also indicate a region where a drop-off or slope of a mound or ridge occurs over a

relatively short distance. This distance should be in the range of 10-20 m, which could be within the field of view for observing fish schools. For example, most of the habitat for these shelf-edge MPAs are NE-SW oriented ridges. Typically the top of the ridge is low relief pavement with rubble and sand patches. The east or west slopes tend to be a jumble of eroded rock slabs. The individual slabs and ledges may only be 1 m or less in relief, but if the drop-off of 3-5 m occurs over a short distance of 10-20 m width; this would be designated as HR. In some areas smooth rock mounds or knolls are present. These may be 5 m tall or more, with a relatively steep 30-45^{o} slope over a relatively short horizontal distance, but few or no ledges. These also will be designated HR.

4. [*Rugosity*]: LRu= Low Rugosity, HRu= High Rugosity. Rugosity here is defined as a degree of ruggedness of the rock bottom. This will be relative to the size of rock ledges, holes, crevices, which tend to provide the greatest fish habitat. High Rugosity on these shelf-edge reefs occurs primarily along the edges of the rock ridges where there is a zone of fractured rock slabs, or zones of boulders or rock outcrops. Low Rugosity would be the flat rock pavement typically found top of the ridges or at the base of the mounds and ridges. Low Rugosity would also define the rounded rock mounds and knolls that are devoid of ledges and loose boulders. For the present, this will be an unquantified relative term. Most of our multibeam sonar maps are of relatively low resolution (5-10 m) and cannot be used to quantify rugosity at this scale; high resolution (<0.5 m) contour multibeam maps would be needed to quantify this characteristic in the future.

5. [*Seadesc Code= Substrate*]: SEADESC Habitat Categories (Table 2). This is a modified subset of SEADESC Habitat Categories which was developed by the NOAA Deep-Sea Coral Program for use in analysis of deep-sea coral surveys (Partyka et al. 2007). These categories which are useful for characterizing deep coral habitat were modified to make them useful for these shelf-edge habitats. The presence of fauna was not included as it is quantified in the Point Count analyses. In the region of this survey, the habitat types included: rock pavement, pavement with ledges, pavement with sediment veneer, rock ledges and boulders, rubble/cobble, and soft bottom. This category is also used to plot the dive track overlay on the multibeam sonar maps in ArcGIS.

Table 2. SEADESC Benthic Habitat Category Codes (Modified).

ID	Code	Habitat Name	Habitat Description
1	S	Soft Substrate	Unconsolidated sand/mud, unlithified
2	SR	Soft Substrate/Rubble/Rock	Soft substrate (>50% cover) with rubble and/or rock
3	R	Rubble	Rubble/cobble (~5-20 cm sized rock or coral)
4	RL	Rock/Ledges	Rocks and/or ledges
5	P	Pavement	Rock pavement

6	C	Hard Corals	Live and/or dead colonial scleractinian coral; standing individual colonies, bushes, or thickets.
7	TH	Tilefish (blueline or golden; not sand tile)	Soft bottom with visually identifiable burrows
8	A	Artificial Substrate	Any artificial structure that provides habitat for fishes and/or invertebrates

Statistical Analyses

Multivariate analyses were used to determine differences in benthic fauna assemblages and fish assemblages among dives. All analyses were conducted in PRIMER 6 and based on guidelines of Clarke and Warwick (2001) and Clarke and Gorley (2006). The dive sites were compared by their Management Status (within the MPA boundaries vs outside the MPAs, i.e., 'no protection'). For the benthic analysis, images were analyzed using CPCe for percent cover of benthic biota. The CPCe percent cover data were then averaged by location inside and outside the MPAs (e.g., Inside Snowy Wreck MPA and Outside Snowy Wreck MPA). Then these data were square root transformed to reduce the dominate influences of copious species to the similarity matrix.

For the fish analysis, fish species were counted within each transect, summed for the entire transect and then divided by the total distance examined with in each transect. This resulted in the sum of each species per km by transect. The counts were then averaged by site and fourth root transformed to reduce the dominate influences of copious species to the similarity matrix.

Similarities between samples for both fish and benthic biota (separately) were then calculated using S17 Bray-Curtis similarity. A non-metric multidimensional scaling ordination (MDS) plot and a dendrogram with group-average linking were created showing the results of a concurrently run SIMPROF 'similarities profile'. SIMPER: 'Similarity Percentages' was utilized to determine which species contributed to the dissimilarities among group pairs.

Multibeam Sonar Mapping

NOAA acoustic surveys using multibeam sonar (Simrad ME-70) for bathymetric data were conducted at ROV dive sites where multibeam maps were not available. The main objective of the sonar surveys was to provide background maps to guide ROV exploration at dive sites. The ME-70 as configured on the NOAA ship *Pisces* was not intended to be used for bathymetric mapping without the bathymetry software module. A MATLAB routine, developed and provided by Randy Cutter (NOAA, SWFSC), was applied to these data to detect and extract bottom depths. The output was then imported into Fledermaus 3D visualization software and converted to geoTIFF images.

Table 3. Multibeam sonar surveys conducted during 2012 *Pisces* cruise, July 6-19, 2012 (L. Kracker, NOAA).

Site	Total length of transects (nmi)	Extent (km^2)	Geographic Coordinate System
Cape Fear, North Carolina	39	3	WGS 1984; UTM 18N
Edisto MPA	221	25	WGS 1984; UTM 17N
Snowy Wreck MPA	56	6	WGS 1984; UTM 18N
Snowy Wreck MPA Wreck Site	6.5	1	WGS 1984; UTM 18N
South Carolina MPA	250	22	WGS 1984; UTM 17N
Georgia MPA	40	8.5	WGS 1984; UTM 17N
North Florida MPA	136	11	WGS 1984; UTM 17N

CTD Operations

A shipboard CTD cast provided profiles of conductivity, temperature, pH, dissolved oxygen, and depth at the multibeam sonar sites. These CTD data were used for the multibeam sonar surveys (sound velocity). The ROV also recorded CTD data at each dive site for site characterization. These data are summarized for each dive in Appendix 3.

RESULTS

Study Areas

Shelf-edge MPA sites and adjacent non-protected sites were surveyed from north Florida to North Carolina (Figs. 1-3).

Cruise Summary

A total of 37 ROV dives were conducted from July 6 to July 19, 2012 on the NOAA Ship *Pisces*, resulting in a total bottom time of 62.75 hours, covering 58 km, at depths from 42.4 to 250.9 m (Table 5, Figs. 1-3). A total of 65 hours of ROV video were recorded and 4,461 in situ digital images were taken which included quantitative transect images, general habitat, and species documentation images. Twelve sites were surveyed with multibeam sonar by L. Kracker (NOAA) and the *Pisces* survey team and covered a total area of 198.1 km^2 (Table 3; Figs. 1-3). These sites had never been surveyed previously with multibeam sonar. Georeferenced maps were made for each site and were ground-truthed with the ROV dives and described in Appendix 3.

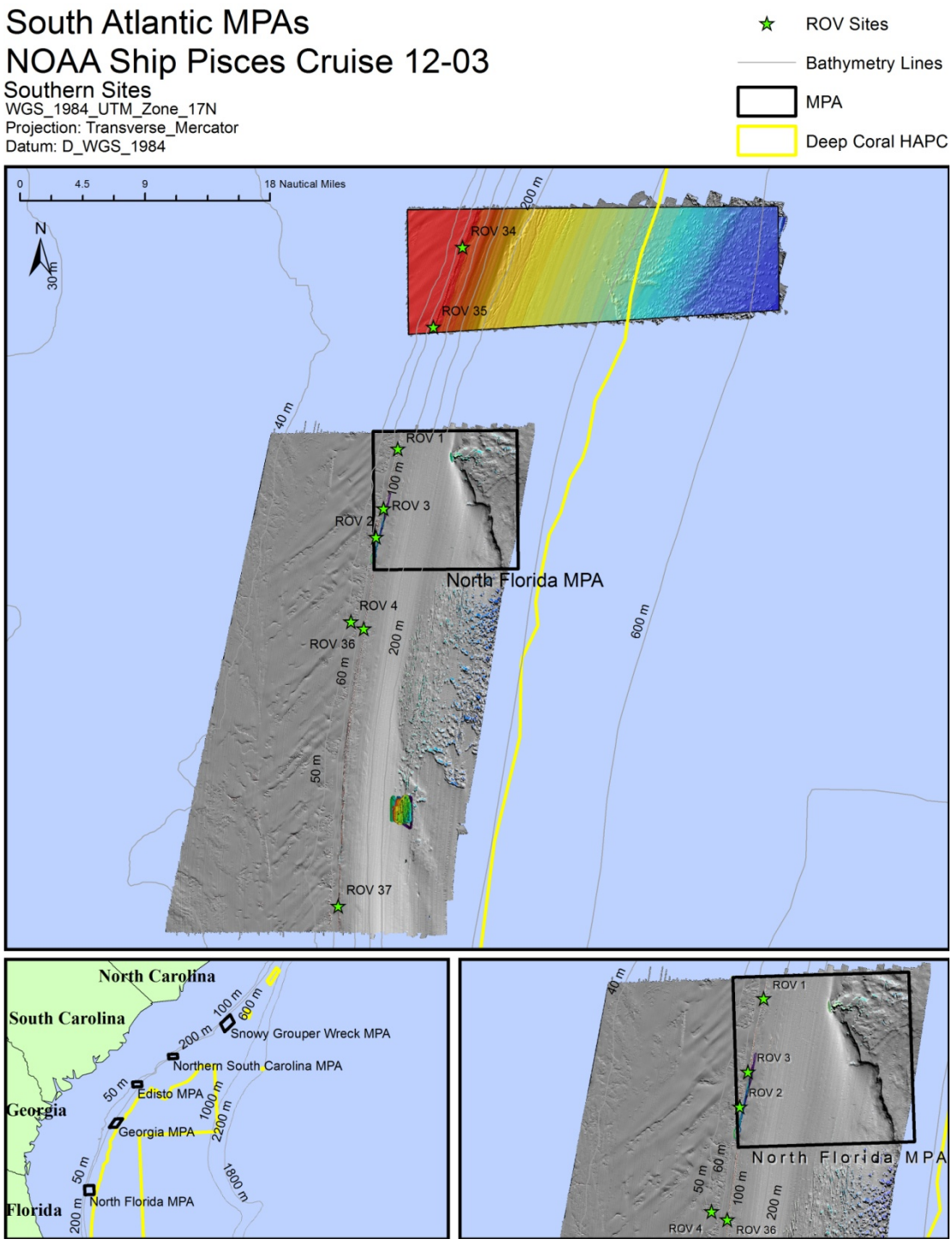

Figure 1. Locations of shelf-edge MPA sites and ROV dive sites off North Florida to North Carolina during 2012 NOAA Ship *Pisces* cruise, July 6-19, 2012. Southern area: north Florida.

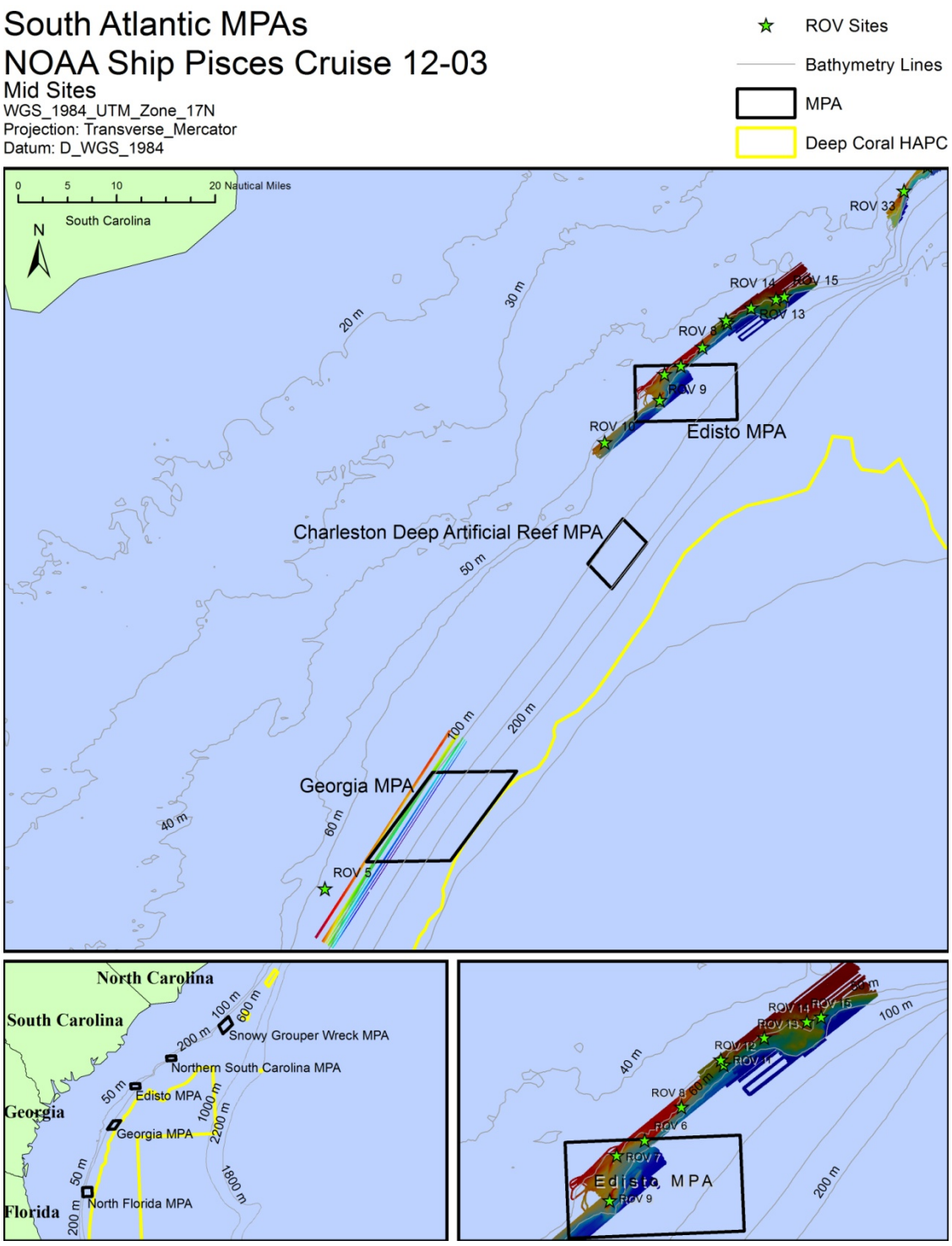

Figure 2. Locations of shelf-edge MPA sites and ROV dive sites off North Florida to North Carolina during 2012 NOAA Ship *Pisces* cruise, July 6-19, 2012. Central area: Georgia to southern South Carolina.

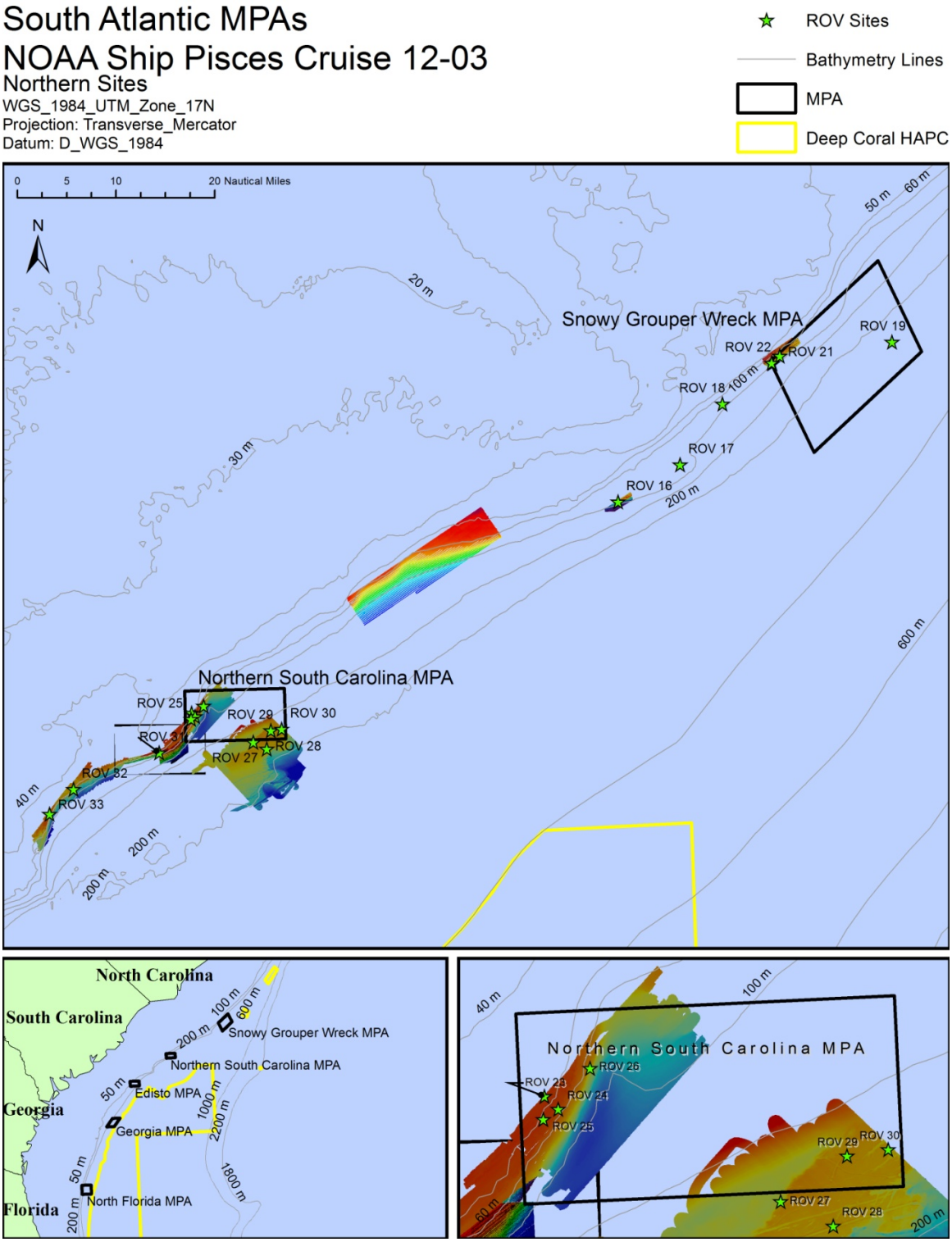

Figure 3. Locations of shelf-edge MPA sites and ROV dive sites off North Florida to North Carolina during 2012 NOAA Ship *Pisces* cruise, July 6-19, 2012. Northern area: northern South Carolina to North Carolina.

The ROV dives documented and characterized 37 sites including 16 inside the shelf-edge MPAs and 21 which were outside of the current MPAs but many of these were within areas being considered for future MPAs. (Table 4).

Table 4. Number of ROV dives inside and outside of shelf-edge MPA areas during 2012 NOAA *Pisces* cruise.

	Total Sites	**Inside MPA**	**Outside MPA**
Edisto MPA	10	3	7
Georgia MPA	1	0	1
North Florida MPA	8	3	5
Northern South Carolina MPA	11	6	5
Snowy Wreck MPA	7	4	3
Total	37	16	21

Table 5. ROV dive sites and CTD casts during 2012 NOAA Ship *Pisces* cruise, July 6-19, 2012. (Site Number= Day-Month-Year-Site).

Site Number	**Method**	**Latitude (on bottom)**	**Longitude (on bottom)**	**Latitude (off bottom)**	**Longitude (off bottom)**	**Depth Range (m)**	**Distance (km)**
7-VII-12-2	ROV 1	30.44°N	-80.21°W	30.48°N	-80.19°W	52 - 60	4.15
7-VII-12-1	CTD 1	30.56°N	-80.14°W	N/A	N/A	90	n/a
7-VII-12-3	ROV 2	30.36°N	-80.23°W	30.38°N	-80.22°W	57 - 59	3.1
7-VII-12-4	ROV 3	30.39°N	-80.22°W	30.43°N	-80.21°W	55 - 60	4.62
8-VII-12-1	CTD 3	30.49°N	-80.19°W	N/A	N/A	53	n/a
7-VII-12-5	CTD 2	30.42°N	-80.21°W	N/A	N/A	64	n/a
8-VII-12-2	ROV 4	30.25°N	-80.27°W	30.27°N	-80.26°W	52 - 54	2.37
8-VII-12-3	ROV 5	31.52°N	-79.73°W	31.54°N	-79.73°W	62 - 72	2.09
9-VII-12-1	CTD 4	32.42°N	-78.95°W	N/A	N/A	62	n/a
9-VII-12-2	ROV 6	32.4°N	-79.01°W	32.41°N	-79°W	47 - 51	1.59
9-VII-12-3	ROV 7	32.38°N	-79.05°W	32.4°N	-79.03°W	46 - 52	2.85
9-VII-12-4	ROV 8	32.43°N	-78.98°W	32.44°N	-78.96°W	48 - 54	2.32
10-VII-12-1	CTD 5	32.39°N	-79°W	N/A	N/A	62	n/a
10-VII-12-2	ROV 9	32.34°N	-79.05°W	32.35°N	-79.05°W	46 - 53	2.19
10-VII-12-3	ROV 10	32.27°N	-79.17°W	32.28°N	-79.16°W	54 - 51	1.35
10-VII-12-4	ROV 11	32.47°N	-78.91°W	32.48°N	-78.9°W	47 - 52	1.33
11-VII-12-2	ROV 12	32.48°N	-78.92°W	32.48°N	-78.91°W	45 - 48	1.06
11-VII-12-1	CTD 6	32.39°N	-78.92°W	N/A	N/A	84	n/a
11-VII-12-3	ROV 13	32.5°N	-78.87°W	32.5°N	-78.86°W	46 - 48	1.07

11-VII-12-4	ROV 14	32.51°N	-78.82°W	32.54°N	-78.81°W	51 - 46	2.96
11-VII-12-5	ROV 15	32.51°N	-78.8°W	32.52°N	-78.79°W	49 - 54	1.43
12-VII-12-1	CTD 7	33.19°N	-77.4°W	N/A	N/A	97	n/a
12-VII-12-2	ROV 16	33.19°N	-77.4°W	33.2°N	-77.38°W	67 - 81	1.94
12-VII-12-3	ROV 17	33.23°N	-77.27°W	33.25°N	-77.25°W	68 - 102	2.79
12-VII-12-4	ROV 18	33.35°N	-77.18°W	33.36°N	-77.18°W	78 - 91	0.71
13-VII-12-1	CTD 8	33.44°N	-76.84°W	N/A	N/A	244	n/a
13-VII-12-2	ROV 19	33.44°N	-76.83°W	33.44°N	-76.83°W	242 - 256	0.09
13-VII-12-3	ROV 20	33.41°N	-77.08°W	33.42°N	-77.09°W	85 - 118	1.12
13-VII-12-4	ROV 21	33.43°N	-77.06°W	33.43°N	-77.06°W	65 - 66	0.65
13-VII-12-5	ROV 22	33.42°N	-77.08°W	33.42°N	-77.07°W	83 - 123	0.69
14-VII-12-1	CTD 9	32.82°N	-78.26°W	N/A	N/A	101	n/a
14-VII-12-2	ROV 23	32.85°N	-78.27°W	32.86°N	-78.26°W	47 - 48	1.09
14-VII-12-3	ROV 24	32.84°N	-78.26°W	32.85°N	-78.26°W	48 - 52	1.23
14-VII-12-4	ROV 25	32.84°N	-78.27°W	32.86°N	-78.26°W	48 - 50	1.71
14-VII-12-5	ROV 26	32.87°N	-78.24°W	32.88°N	-78.24°W	63 - 70	1.18
15-VII-12-1	CTD 10	32.81°N	-78.25°W	N/A	N/A	119	n/a
15-VII-12-2	ROV 27	32.79°N	-78.13°W	32.8°N	-78.15°W	162 - 167	1.4
15-VII-12-3	ROV 28	32.79°N	-78.14°W	32.79°N	-78.13°W	157 - 169	1.1
15-VII-12-4	ROV 29	32.81°N	-78.12°W	32.82°N	-78.11°W	158 - 163	1.2
15-VII-12-5	ROV 30	32.82°N	-78.09°W	32.83°N	-78.1°W	160 - 170	1.31
16-VII-12-1	CTD 11	32.8°N	-78.23°W	N/A	N/A	140	n/a
16-VII-12-2	ROV 31	32.79°N	-78.33°W	32.79°N	-78.32°W	48 - 55	1.08
16-VII-12-3	ROV 32	32.73°N	-78.51°W	32.74°N	-78.5°W	45 - 55	0.75
16-VII-12-4	ROV 33	32.68°N	-78.56°W	32.68°N	-78.56°W	43 - 48	0.92
17-VII-12-1	CTD 12	31.17°N	-79.88°W	N/A	N/A	68	n/a
17-VII-12-2	ROV 34	30.7°N	-80.11°W	30.72°N	-80.1°W	51 - 64	1.36
17-VII-12-3	ROV 35	30.61°N	-80.15°W	30.62°N	-80.14°W	50 - 59	1.28
18-VII-12-1	CTD 13	30.49°N	-80.18°W	N/A	N/A	76	n/a
18-VII-12-2	ROV 36	30.23°N	-80.25°W	30.24°N	-80.25°W	54 - 61	1.99
18-VII-12-3	ROV 37	29.9°N	-80.29°W	29.91°N	-80.29°W	54 - 66	1.71

Benthic Macro-Biota

Appendix 1 lists all of the benthic macro-invertebrates and algae that were identified from the quantitative photo transects at each dive site and their percent cover based on CPCe Point Count of the photo images. These analyses are discussed in detail for each dive in Appendix 3. Some common taxa could be identified to genus or species level but many could only be identified to a higher level such as family, class, order or even phylum. Sponges, gorgonians, and black coral are especially difficult to identify without a specimen in hand. In these cases a general descriptive taxa was used, e.g., “brown lobate sponge” or “unidentified Demospongiae”, which could consist of numerous species. These designations should not be considered equivalent to

species level and should not be used for diversity (H') indices calculations. Many deepwater species in this region look nearly identical, such as fan sponges which are polyphyletic and may actually include different orders or classes.

A total of 103 taxa of benthic biota were identified from the quantitative photo transects and were used for CPCe percent cover analyses. These included 38 taxa of Porifera, and 28 Cnidaria which included the following corals: 6- Scleractinia (*L. pertusa, Madracis myriaster, Oculina varicosa, Phyllangia americana* and unidentified Scleractinia); 14- Alcyonacea (unidentified Alcyonacea, Bebryce sp., *Diodogorgia* sp., *Ellisella* spp., Ellisellidae, *Muricea sp., Nicella sp., Nidallia occidentalis, Pseudopterogorgia* spp., *Swiftia exerta, Telesto* sp., and *Titanideum frauenfeldii*); and 4 Antipathidae. Other non-coral Cnidaria included Actiniaria, Corallimorpharia, Zoanthidea, and Hydroidolina. The dominant sponges included the Demospongiae: *Agelas* sp., *Aiolochroia crassa, Aka* sp., *Aplysina* sp., Astrophorida, Axinellida, *Callyspongia* sp., *Callyspongia vaginalis, Chondrosia* sp., *Cinachyra* sp./*Cinachyrella* sp., *Clathria* sp., *Cliona* sp., Corallistidae, Dictyoceratida, *Diplastrella* sp., *Geodia* sp., *Haliclona* sp., *Holopsamma* sp., *Hymedesmia* (blue morph) sp., *Ircinia campana*, *Ircinia* sp., *Ircinia strobilina*, *Leiodermatium* sp., Lithistida, *Mycale* sp., *Niphates* sp., *Oceanapia* sp., *Polymastia* sp., *Ptilocaulis* sp., *Scopalina* sp., Spirastrellidae, and *Zyzzya* sp. Hexactinellida included *Farrea* sp. and several unidentified species. Other fauna included Annelida, Mollusca, Arthropoda, Bryozoa, Echinodermata, and Ascidiacea. Some of the shallower ridge tops also included algae: Cyanobacteria, Chlorophyta, and Rhodophyta (primarily crustose coralline algae).

Table 6 compares the percent cover of substrate and benthic biota for each dive site inside and outside of the MPAs. For unknown reasons the Edisto MPA sites had the greatest percent cover of biota (66%) compared to all other sites (24.6- 40.9%) but surprisingly had the smallest percent cover of bare hard substrate (7.9%).

Table 6. Percent cover (from CPCe Point Count) of benthic biota and bare substrate types for sites within the MPAs and all sites that are outside the MPAs (no protection).

Phylum/ Scientific Name	**No Protection**	**Edisto MPA**	**North Florida MPA**	**Northern South Carolina MPA**	**Snowy Wreck MPA**
Biota	39.80%	66.02%	25.34%	40.88%	24.61%
Natural detritus	0.02%	0.03%	0.00%	0.04%	0.09%
Human debris	0.01%	0.01%	0.00%	0.01%	5.91%
Hard bottom substrate	22.40%	7.99%	30.45%	14.05%	23.30%
Soft bottom substrate	37.77%	25.95%	44.21%	45.03%	46.09%
Total	100.00%	100.00%	100.00%	100.00%	100.00%

SEADESC II Report- Characterization of Habitat, Benthic Biota, and Fish Populations

The SEADESC Level II Report (Southeastern United States Deep-Sea Corals) is presented in Appendix 3. This provides the following data for each dive site: cruise and ROV dive metadata, figures showing each ROV dive track and habitat zones overlaid on multibeam sonar maps, dive track data (start and end latitude, longitude, depth), objectives, general description of the habitat and biota, and images of the biota and habitat that characterize the dive site. In addition, this SEADESC Level II Report provides quantitative analyses of each dive site including: 1) CPCe 4.1© analysis of percent cover of benthic biota and substrate types, and 2) densities of fish populations (# individuals/km for each species).

Site Summaries

Each ROV dive was divided into transects based on the habitat characteristics described above (Methods). Details of the habitat characterization for each ROV dive site are presented in Appendix 3. The following summarizes these data by MPA site and state.

North Florida MPA- Inside MPA
This site had three ROV dives: two on the main ridge at 60 m, and one dive west of the ridge.
ROV 1- North end of N-S oriented ridge. This transect is primarily low relief pavement on top and low relief, eroded rock slabs on the east and west slopes; 52-60 m depth range.
ROV 3- Central part of main ridge. Top is low relief ledges and pavement; the east and west slopes are moderate relief ledges, fractured rock slabs, and rugged fissures of high rugosity; 52-60 m.
ROV 2- Low relief, hard bottom about 500 m west of main ridge, with rubble and cobble on soft bottom; 54-59 m.

North Florida MPA- Outside MPA
Five dives were made at several sites outside the MPA.
ROV 4- 4 nmi SW of MPA. 1800 m west of main ridge; low relief, rock pavement with cobble and soft bottom; 52-53 m depth range.
ROV 34- 13 nmi north of MPA. Moderate to high relief ridge with rugged east and west slopes of fractured rock slabs; 49-63 m.
ROV 35- 7 nmi north of MPA. Moderate to high relief ridge with rugged east and west slopes of 4-m relief, fractured rock slabs and ledges; 49-59 m.
ROV 36- 4.3 nmi SW of MPA. Low relief pavement with low ledges and rock knolls; 54-61m.
ROV 37- 25 nmi south of MPA and 55 nmi east of St. Augustine. Moderate and high relief N-S ridge, with steep east and west slopes of boulders, ledges, and fractured rock slabs; 53-65 m.

Georgia MPA- Outside of MPA
No dives were inside the MPA; one was outside.
ROV 5- 5 nmi SW of MPA. Low relief rock pavement and sediment with sparse rubble and shell hash; 60-72 m depth range.

South Carolina, Edisto MPA, Inside MPA

Three dives were on the main ridge inside the MPA and seven dives were on various features outside the MPA.

ROV 6- NE-SW oriented ridge, transecting both inside and outside the north border of the MPA. Low relief pavement and ledges on top of ridge, and low to moderate relief west slope with 1-2 m ledges; 41-52 m depth range.

ROV 7- North end of NE-SW oriented ridge. Ridge top is 50-150 m wide, with ledges and boulders of moderate relief on pavement; the east and west slopes of the ridge are drop-offs of moderate to high relief and high rugosity with rock slabs and ledges; 45-51 m.

ROV 9- South end of main ridge. Ridge top is low relief pavement with rubble and low rock knolls; the west slope is a high relief drop-off of high rugosity with scattered rock slabs and ledges on 35^{o} slope; 46-56 m.

South Carolina, Edistio MPA, Outside MPA

ROV 8- 1.8 nmi north of MPA. Ridge top is rock pavement and east and west slopes are moderate relief but of high rugosity, with rock slabs and boulders on the slopes; 46-53 m depth range.

ROV 10- 3.7 nmi SW of MPA. The ridge is 50 m wide; east and west slopes of ridge are moderate to high relief drop-offs and high rugosity with large 3-4 m diameter rock slabs; 43-54 m.

ROV 11- 4.2 nmi NE of MPA. Ridge top is low relief pavement, 50 m wide; west slope is high relief and highly rugose rock slabs and boulders; the east slope is low relief slabs; 45-51 m.

ROV 12- 4.5 nmi NE of MPA. NE-SW oriented ridge is broken into four reef segments separated by 50-85 m sediment gaps; the east and west slopes are of moderate relief rock slabs, 2-4 m diameter, and very rugose; 42-48 m.

ROV 13- 5.9 nmi NE of MPA. Six sediment gaps of 45 to 320 m wide break up the 60-m wide NE-SW oriented ridge; the drop-off at the east and west slopes are moderate relief rock slabs with high rugosity at the southern part of the transect, and lower relief towards the north end; 40-48 m.

ROV 14- 7.7 nmi NE of MPA. Ridge top is low relief rock pavement, the west drop-off is a narrow slope of moderate relief and high rugosity rock slabs and ledges; 46-50 m.

ROV 15- 8.4 nmi NE of MPA. The narrow ridge is about 40 m wide and broken by four sediment gaps of about 100 m width; the east and west slopes are moderate to high relief and high rugosity drop-offs with rock slabs and ledges; 47-54 m.

South Carolina, Northern Carolina MPA, Inside MPA

Six dives were inside the MPA and five dives were at various sites outside the MPA.

ROV 23- Hard bottom near west border of MPA. The multibeam is very poor; this site is low relief hard bottom with pavement and few low relief boulders; 46-48 m depth range.

ROV 24- Hard bottom near west border of MPA. Fairly flat bottom with high relief rock knolls; some 3-4 m relief and 10-30 m diameter but of low rugosity with 35^{o} smooth rock slopes which have few ledges; 47-52 m.

ROV 25- Ridge near west border of MPA. Narrow NE-SW oriented ridge of rock pavement and low relief west slope; at the base is a series of 1-2 m tall rock knolls; 47-51 m.

ROV 26- Ridge near west border of MPA. East slope of the ridge is a 5-m drop-off of high rugosity; with 1-2 m ledges on a $10\text{-}20^{o}$ slope; 56-70 m.

ROV 29- Apparent ice-berg scar from last glacial period (~20,000 years B.P.) which is clearly visible in the multibeam map at the SE corner of the MPA. Transect along the east edge of the linear scour. The rim of the scour is high relief, rugged, eroded rock and boulders, from 158 m at the top edge to 163 m at the inside base of the scour which is mostly soft sediment.
ROV 30- Transect perpendicular to and crossing three ice-berg scars at the SE corner of the MPA. Between the scars is low relief hard bottom with rock cobble and rubble. The top rim of the scour marks is about 160 m and the sediment groove in the scour is 170 m.

South Carolina, Northern Carolina MPA, Outside MPA
ROV 27- 0.2 nmi S of MPA. Low relief hard bottom habitat, mostly rock pavement with rock cobble and small boulders (<0.5 m); 161-169 m depth range.
ROV 28- Apparent ice-berg scar 0.9 nmi S of MPA. The transect paralleled a linear scour mark which is ~140 m wide. The base of the scour is ~167 m of flat sand and cobble; the edges of the scour are rugged 30-45^{o} slopes with 1-2 m ledges, 1 m boulders and eroded rock; the top rims are 157-162 m.
ROV 31- 3 nmi SW of MPA. Transect along south slope of a E-W oriented ridge; the ridge is smooth rock, 10 m wide, and 3 m tall; the south slope drops off from 49 m at the top to 52-55 m and is of moderate to high relief but low rugosity, with few low ledges; small 1 m tall rock knolls along the base; 48-55 m,
ROV 32- 12.3 nmi SW of MPA. Transect along a NE-SW oriented ridge; the ridge top (45 m) is low relief, flat rock pavement with few ledges; the south wall of the ridge is high relief, very rugged drop-off of a jumble of rock slabs and boulders; 45- 55 m.
ROV 33- 15.6 nmi SW of MPA. Transect along NE-SW oriented ridge; ridge top is low relief rock pavement with rubble; the west slope is moderate relief with high rugosity rock slabs, boulders and ledges; the east slope is moderate relief and low rugosity; 42-48 m.

North Carolina MPA, Inside MPA
Four dives were inside the MPA, one on the shipwreck site, and three dives were outside the MPA on various features.
ROV 19- 'Snowy Grouper Shipwreck Site' at the eastern corner of the MPA. This is a steel ship of unknown age, 245-256 m depth range.
ROV 20- Inside and outside MPA near SW corner. Transect up steep, rugged rock wall, from 116 m to 76 m; upper slope from 75 m to 60 m is low relief patchy soft bottom, rock pavement and rubble; 56-116 m.
ROV 21- Near SW corner of MPA. Mostly featureless on the multibeam, low relief soft bottom with patches of cobble, rubble and some pavement; 63-65 m.
ROV 22- SW corner of MPA on the deep wall. High relief 45^{o} rock slope with high rugosity, eroded rock outcrops and low relief boulders; 83-124 m.

North Carolina MPA, Outside MPA
ROV 16- 20 nmi. SW of MPA. Transect over four multibeam features; mostly low relief soft bottom with patches of rubble, cobble and rock pavement; one area of low relief boulders; 63-81 m depth range.
ROV 17- 'The Steeples', 12.7 nmi SW of MPA. No multibeam available, waypoints selected from Ross and Quatrini publication; transects crossed seven moderate to high relief smooth rock

knolls, 2-12 m relief, with smooth rock slopes, and low relief rock slabs and boulders with low rugosity; 66-102 m.
ROV 18- 6.2 nmi SW of MPA. No multibeam available; waypoints selected from previous Harter and David dives; flat, low relief sand bottom with patches of rubble, and small 10-30 cm boulders; 76-92 m.

Benthic Biota and Habitat Relationships

Dive sites within and outside of each of the MPAs were compared using a multi-dimensional scaling plot of Bray-Curtis Similarity (with square root transformation) for benthic macro-faunal densities (Fig. 4). The letter designations in the plot show statistically different groups (SIMPROF, $p<0.05$). Each of the dive general locations statically clustered together in the SIMPROF dendrogram (Fig. 5). These plots clearly show the greatest similarity of sites is by region; i.e., Florida, Georgia, South Carolina and North Carolina each formed clusters that were significantly different. However, within each region, the dives sites inside and outside the MPAs were statistically similar. For example, Outside Edisto & inside Edisto MPA (Group C) split at 85.78 Similarity (Pi: 0 Sig(%): 87.1). Inside Northern South Carolina MPA & Outside Northern South Carolina MPA (Group D) split at 76.6 Similarity (Pi: 0 Sig(%): 100). Inside North Florida MPA & Outside North Florida MPA (Group B) split at 68.96 Similarity (Pi: 0 Sig(%): 100). Outside Snowy MPA & Inside Snowy Wreck MPA (Group A) split at 53.83 Similarity (Pi: 0 Sig(%): 94.4).

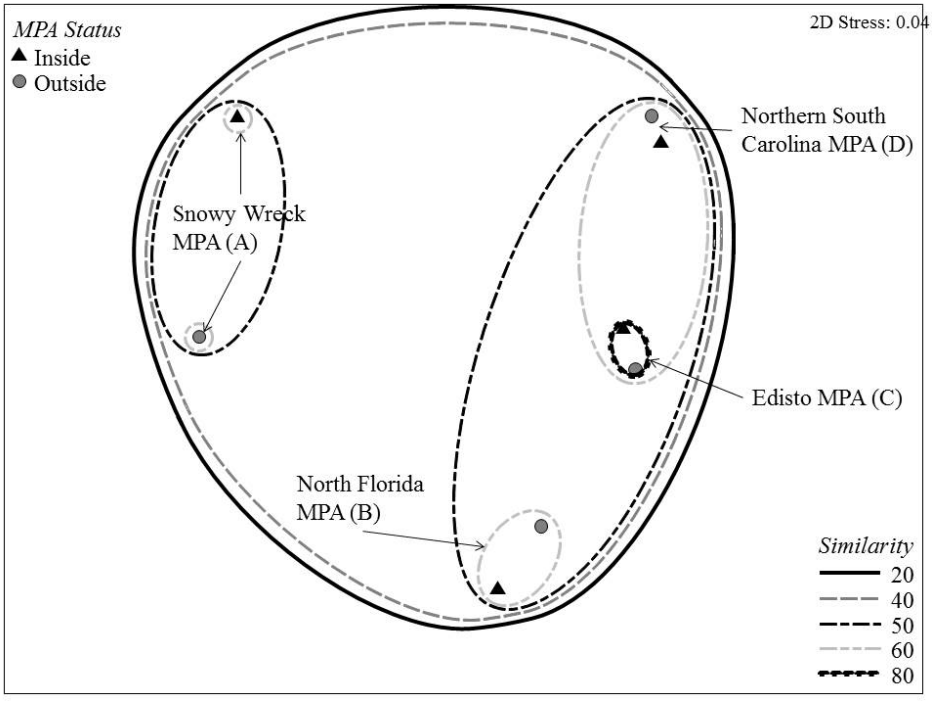

Figure 4. Multi-dimensional scaling (MDS) plot of ROV dive sites within and outside of the protected management areas (MPAs) based on Bray-Curtis similarity matrix calculated from square root transformation of benthic macro-faunal percent cover. Assemblage similarity at 20-80% are indicated. Statistically different groups (SIMPROF, $p<0.05$) are indicated by letters.

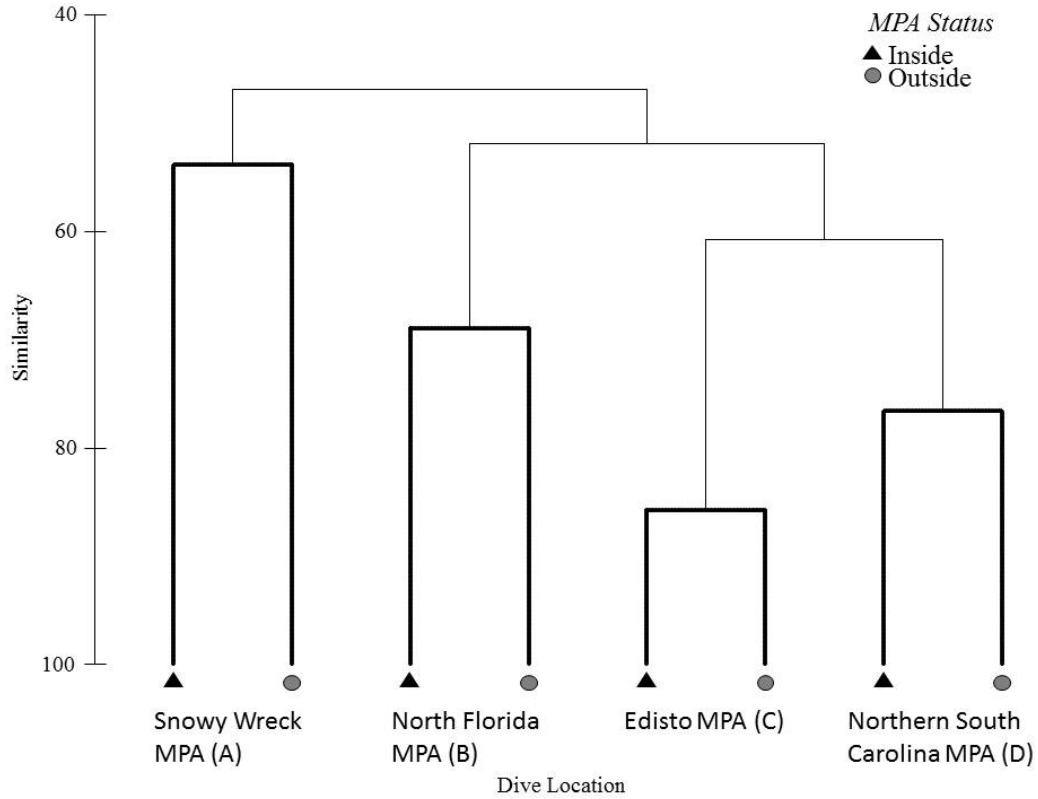

Figure 5. SIMPROF Dendrogram showing Bray-Curtis similarity of percent cover of benthic biota within and outside of MPA sites for the 2012 NOAA Ship *Pisces* cruise.

Analysis of Fish Video Surveys

Appendix 2 lists all of the fish that were identified from the quantitative video transects at each dive site and their densities (#/km). A total of 113 different species were observed. Dives 5, 19, and 36 were excluded from all analyses. Dive 5 was a short dive outside the Georgia MPA and was mostly soft sediment whereas all other dives were primarily hard bottom. Dive 19 was on the Snowy Wreck and was not a transecting dive like all the others. Almost all of dive 36 was too far off bottom to identify fish due to strong currents.

Dive sites inside and outside each MPA were compared using a multi-dimensional scaling (MDS) plot of Bray-Curtis Similarities using fourth root transformed data of fish species (Figure 6) (PRIMER 6.0). Four statistically different groups resulted from the SIMPROF test ($p<0.05$). The letters in the figure indicate statistically significant groups. Dive sites were more similar by geographic region than they were by level of protection (inside vs. outside). For example, fish assemblages were more similar inside and outside Edisto MPA compared to all other sites. The North Carolina sites clustered together at 60%, separate from all other sites indicating a distinct assemblage of fish species in that region.

SIMPER, Similarity Percentages, was utilized to determine which species contributed to dissimilarities inside and outside each MPA. There were several managed species that had higher densities inside the MPAs when compared to outside. Gray snapper, mutton snapper, snowy

grouper, and red snapper had higher densities inside the North Florida MPA. Yellowmouth grouper and snowy grouper had higher densities inside the Edisto MPA. Red grouper and gag grouper were more abundant inside the North Carolina MPA.

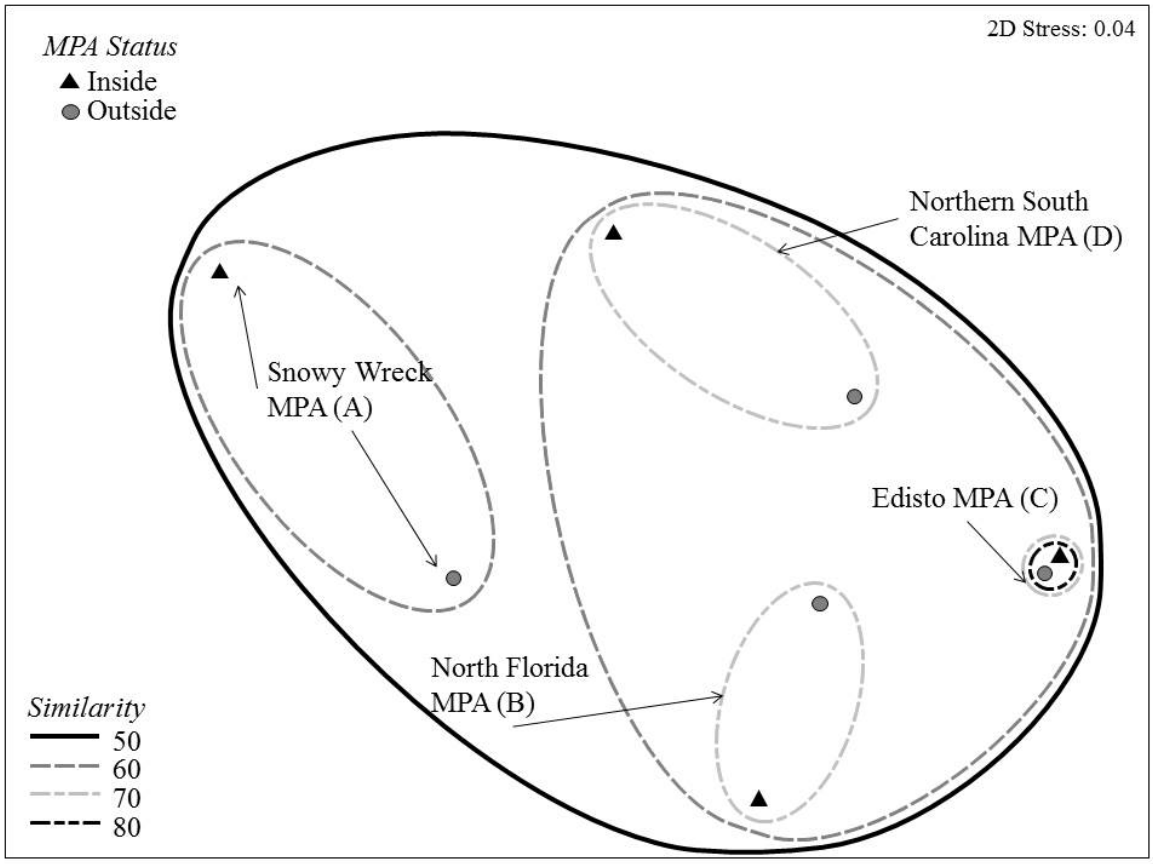

Figure 6. Multi-dimensional scaling (MDS) plot of ROV dive sites within and outside of the protected management areas (MPAs) based on Bray-Curtis similarity matrix calculated using fourth root transformed data of fish species. Assemblage similarity at 50-80% are indicated. Statistically different groups (SIMPROF, $p<0.05$) are indicated by letters.

Snowy Wreck

The dive on Snowy Wreck was not a transecting dive, therefore, densities could not be calculated, however a fish species list was assembled and an estimate of abundances made. Fish species observed on the Snowy Wreck included: yellowfin bass (about a dozen of them), snowy grouper (at least 80-100 individuals at the bow area of the wreck, 40 mid ship, and 80-100 at the stern), one lizardfish out in the sand surrounding the wreck, two conger eels running along the base of the wreck, and about a dozen *Laemonema* spp.

Lionfish Populations

Lionfish continue to have a strong presence in and around the south Atlantic MPAs. Densities inside and outside each MPA can be seen in Figure 7. Densities were highest off South Carolina, both inside and outside the Edisto MPA, as well as outside the Northern South Carolina MPA

and lowest at Florida, both inside and outside the MPA, as well as outsi de the North Carolina MPA. An ANOVA was run to compare densities inside and outside with all MPAs combined which was marginally significant (P=0.08), with higher densities outside the MPAs (Fig. 8). Sites were abbreviated so that the first part denotes the MPA (FL=North Florida, ED=Edisto, SC=Northern South Carolina, and NC=North Carolina or Snowy Wreck MPA) and the second part denotes the level of protection (IN=inside the MPA and OUT=outside the MPA).

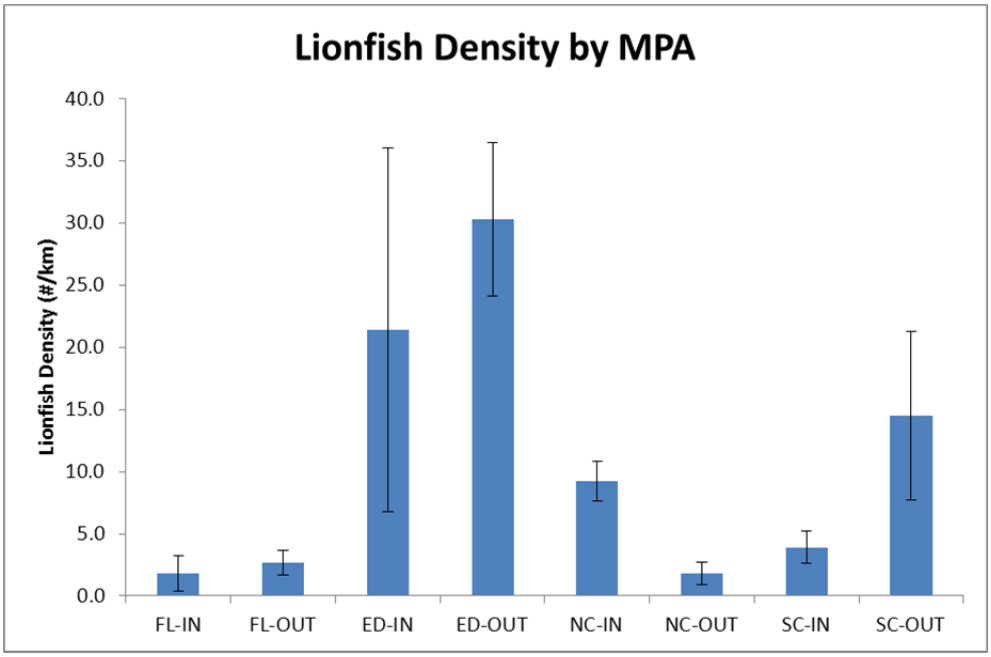

Figure 7. Density of lionfish from quantitative ROV video transects during 2012 NOAA Ship *Pisces* cruise at sites inside and outside of shelf-edge MPA boundaries.

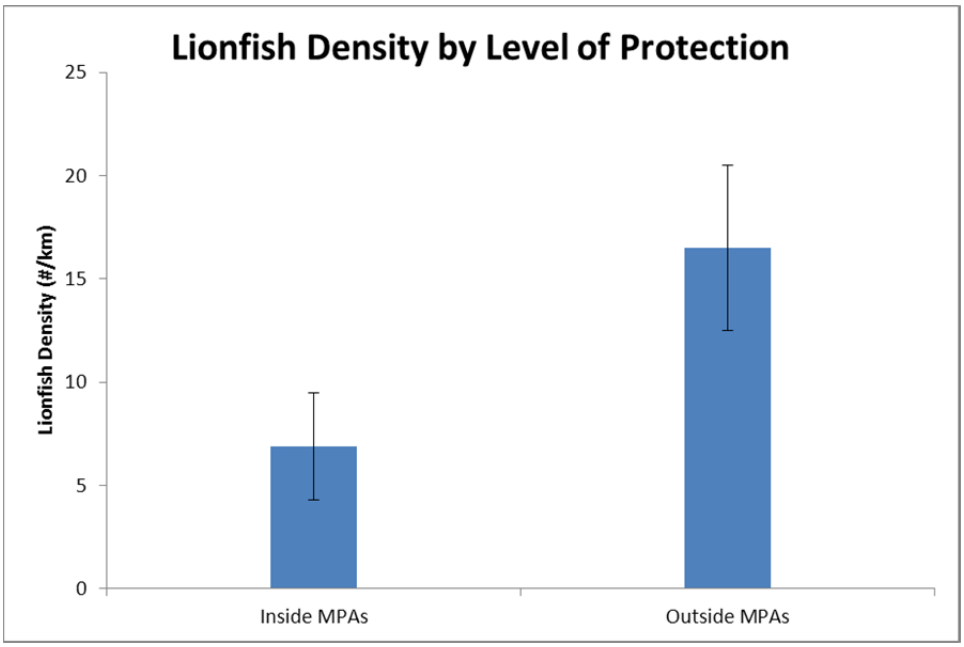

Figure 8. Lionfish densities based on quantitative ROV video transects summarized by all dives within and outside of the shelf-edge MPA sites during 2012 NOAA Ship *Pisces* cruise.

Human Debris

CPCe Point Count of the quantitative ROV photo transects was used to plot the amount of human debris at each dive site (Fig. 9). Bar far, the largest amount of fishing gear was found inside of Snowy Wreck MPA site (ledges at NW corner). Fishing gear was also present within the Northern South Carolina MPA (Site 29) and Edisto MPA (Site 7). Sites 15 (outside Edisto) and 37 (off St. Augustine) were outside any MPA boundaries.

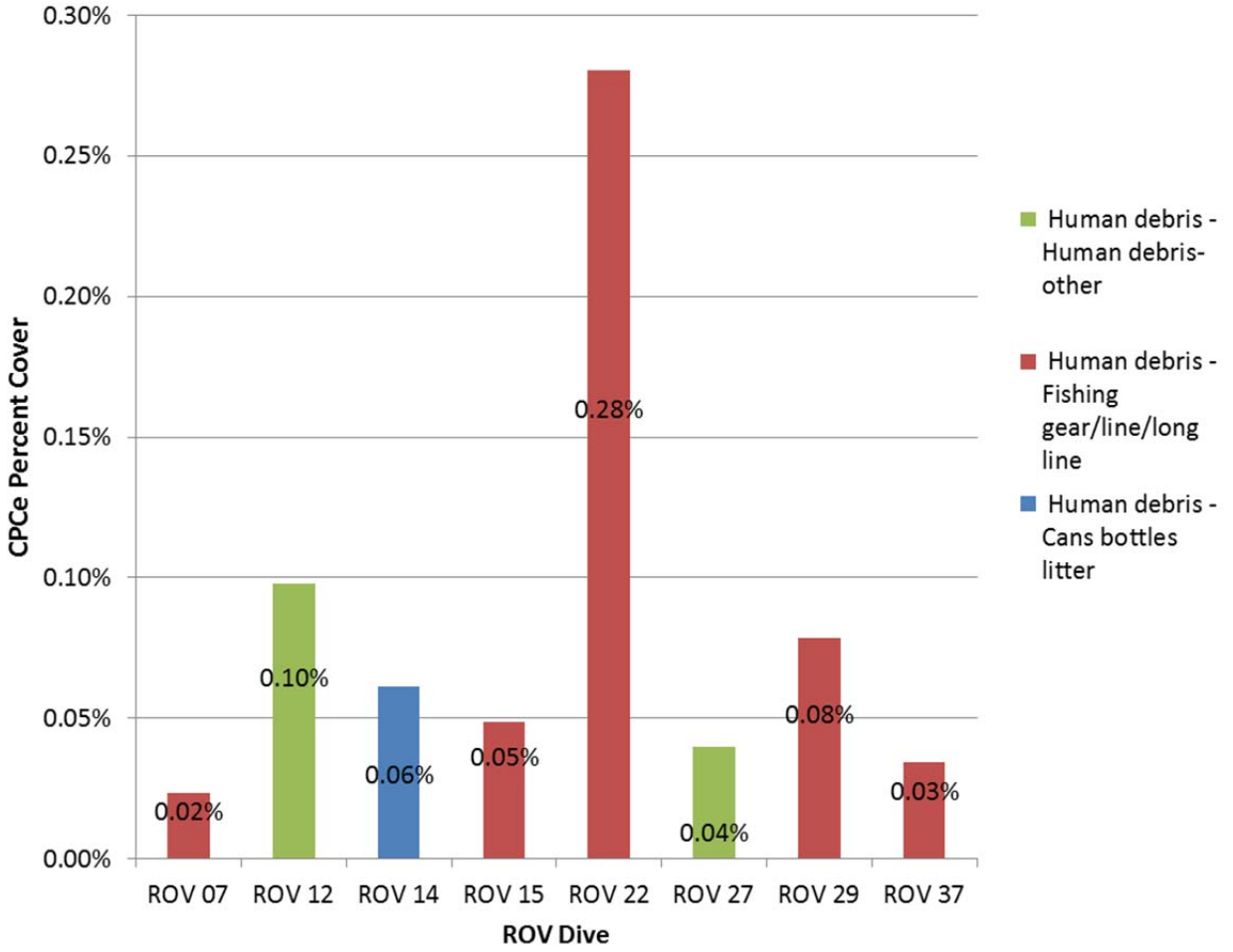

Figure 9. Percent cover of human debris calculated from the quantitative ROV photo transects at each site during 2012

FUTURE WORK AND CONCLUSIONS

This cruise and research has resulted in a rich set of new data discovering and characterizing deepwater MPA sites and fish populations off the southeastern United States within the jurisdiction of the South Atlantic Fishery Management Council. New sonar maps, ground-truthed by ROV dives, and CTD casts have provided data for characterizing these newly designated shelf-edge MPA sites and adjacent areas. The new multibeam maps provide a wealth of information for future ROV dives within the current MPA sites as well as proposed MPA sites. These data will be important for managers and scientists with NOAA Fisheries, the South Atlantic Fishery Management Council, NOAA DSCRTP, NOAA CRCP, and NOAA Mesophotic Reef Ecosystem Program. These data may then be compared to previous and future research cruises and to areas adjacent to the protected areas to better understand the long-term health and status of these important deepwater coral/sponge ecosystems.

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APPENDIX 1

Species List and Density of Benthic Macro-Biota

Appendix 1 lists all of the benthic macro-invertebrates and algae that were identified and counted from the quantitative photo transects for each dive. Density of each species (# organisms/m^2) was calculated based on the area of each digital image from the photo transects.

CPCe Percent Cover	Site																																			
Phylum/Scientific Name	**ROV 01**	**ROV 02**	**ROV 03**	**ROV 04**	**ROV 05**	**ROV 06**	**ROV 07**	**ROV 08**	**ROV 09**	**ROV 10**	**ROV 11**	**ROV 12**	**ROV 13**	**ROV 14**	**ROV 15**	**ROV 16**	**ROV 17**	**ROV 18**	**ROV 19**	**ROV 20**	**ROV 21**	**ROV 22**	**ROV 23**	**ROV 24**	**ROV 25**	**ROV 26**	**ROV 27**	**ROV 28**	**ROV 29**	**ROV 30**	**ROV 31**	**ROV 32**	**ROV 33**	**ROV 34**	**ROV 35**	**ROV 36**	**ROV 37**
Porifera	**8.82%**	**0.49%**	**9.74%**	**0.00%**	**0.42%**	**1.50%**	**3.99%**	**3.29%**	**1.83%**	**8.11%**	**5.58%**	**2.16%**	**1.40%**	**4.03%**	**4.29%**	**0.25%**	**2.62%**	**0.09%**	**2.20%**	**1.25%**	**0.40%**	**2.88%**	**1.85%**	**2.30%**	**0.71%**	**1.60%**	**5.00%**	**6.73%**	**6.35%**	**0.21%**	**2.77%**	**4.65%**	**3.06%**	**7.77%**	**8.77%**	**2.50%**	**4.94%**
Agelas sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.10%	0.05%	0.00%	0.00%	0.00%	0.11%	0.00%	0.00%	0.18%	0.00%	0.00%	0.00%	0.00%	0.00%	0.25%	0.00%	0.00%	0.09%	1.15%	0.11%	0.18%	0.00%	0.00%	0.00%	0.00%	2.05%	0.00%	0.30%	0.00%	0.00%	0.00%	0.00%
Aiolochroia crassa	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.22%	0.00%	0.00%
Aka sp.	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Aplysina sp.	0.34%	0.00%	0.00%	0.00%	0.00%	0.00%	0.26%	0.32%	0.00%	0.43%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Astrophorida	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.40%	0.31%	0.00%	0.00%	0.00%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%
Axinellida	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.05%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.44%	0.07%	0.09%	0.00%	0.00%
Callyspongia sp.	0.00%	0.00%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Callyspongia vaginalis	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.15%	0.44%	0.00%	0.00%	0.00%	0.00%	0.00%
Chondrosia sp.	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.07%	0.00%	0.00%	0.51%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.10%
Chondrosia sp.- lobate gray	0.00%	0.00%	0.32%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Cinachyra sp./Cinachyrella sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.25%	0.00%	0.00%	0.00%
Clathria sp.	0.13%	0.00%	0.09%	0.00%	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Cliona sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.09%	0.00%	0.06%	0.09%	0.98%	0.00%	0.13%	0.18%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Corallistidae	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.40%	0.63%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Demospongiae	3.10%	0.08%	1.33%	0.00%	0.36%	0.82%	1.42%	1.60%	0.78%	2.66%	2.01%	0.93%	0.61%	1.53%	1.07%	0.09%	1.67%	0.09%	0.00%	0.20%	0.13%	1.96%	0.42%	0.90%	0.11%	1.07%	1.27%	1.37%	1.41%	0.16%	0.27%	2.47%	0.79%	2.20%	2.97%	1.11%	1.28%
Demospongiae- ze tan starlet	0.67%	0.00%	0.32%	0.00%	0.00%	0.22%	0.35%	0.00%	0.11%	0.30%	0.11%	0.15%	0.04%	0.24%	0.44%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.11%	0.07%	0.00%	0.07%	0.13%	0.00%	0.00%
Dictyoceratida	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.22%	0.00%	0.00%	0.00%
Diplastrella sp.	0.00%	0.00%	0.28%	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Farrea sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.16%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Geodia sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.16%	0.00%	0.00%	0.21%	0.22%	0.00%	0.00%	0.00%	0.24%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.00%	0.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%
Haliclona sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.37%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hexactinellida	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.44%	0.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Holopsamma sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.19%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.06%	0.34%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hymedesmia- blue	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Ircinia campana	0.00%	0.00%	0.28%	0.00%	0.06%	0.17%	0.14%	0.00%	0.03%	0.00%	0.00%	0.20%	0.44%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.19%	0.00%	0.23%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.89%	0.40%	1.93%	0.00%	0.28%
Ircinia sp.	2.22%	0.24%	1.19%	0.00%	0.00%	0.00%	0.46%	0.24%	0.33%	0.64%	0.49%	0.29%	0.00%	0.49%	0.68%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.20%	1.77%	0.81%	0.28%	1.14%
Ircinia strobilina	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.11%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%
Leiodermatium sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.78%	3.90%	4.31%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Lithistida	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mycale sp.	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Niphates sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%	0.06%	0.04%	0.00%	0.10%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.15%	0.05%	0.00%	0.00%	0.00%	0.00%
Oceanapia sp.	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Polymastia sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Porifera	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.15%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.40%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%
Ptilocaulis sp.	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Scopalina sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.22%	0.00%	0.00%	0.09%	0.00%	0.00%
Spirastrellidae	2.02%	0.16%	5.51%	0.00%	0.00%	0.07%	0.67%	1.12%	0.39%	3.05%	1.63%	0.44%	0.18%	1.16%	1.22%	0.16%	0.91%	0.00%	2.07%	0.65%	0.27%	0.91%	0.19%	0.12%	0.00%	0.30%	0.00%	0.09%	0.00%	0.00%	0.00%	1.02%	0.40%	2.75%	2.47%	1.11%	2.14%
Spongia sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Zyzzya sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Coral	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.04%**	**0.05%**	**0.00%**	**0.00%**	**0.61%**	**0.00%**	**0.00%**	**0.11%**	**0.00%**	**4.68%**	**0.15%**	**0.00%**	**1.40%**	**0.05%**	**0.00%**	**0.00%**	**0.00%**	**0.04%**	**0.04%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.66%**
Lophelia pertusa	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.68%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Madracis myriaster	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Oculina varicosa	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.15%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.59%
Phyllangia americana	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.61%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%
Scleractinia colonial	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Scleractinia solitary	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%
Alcyonacea	**0.34%**	**0.08%**	**0.09%**	**0.00%**	**0.18%**	**2.25%**	**3.58%**	**0.48%**	**1.97%**	**1.54%**	**2.22%**	**3.28%**	**4.08%**	**2.57%**	**2.29%**	**0.50%**	**1.14%**	**0.00%**	**0.41%**	**0.05%**	**0.13%**	**0.91%**	**0.51%**	**1.93%**	**0.19%**	**3.27%**	**2.18%**	**0.13%**	**2.04%**	**0.31%**	**1.63%**	**1.16%**	**1.24%**	**0.76%**	**2.29%**	**0.00%**	**0.73%**
Alcyonacea	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.02%	0.00%	0.03%	0.09%	0.00%	0.00%	0.04%	0.12%	0.00%	0.00%	0.04%	0.00%	0.41%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Bebryce sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.25%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%
Diodogorgia sp.	0.34%	0.08%	0.05%	0.00%	0.12%	1.00%	1.18%	0.16%	0.55%	0.94%	1.73%	0.78%	0.31%	0.86%	0.34%	0.16%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.25%	0.00%	1.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.58%	0.79%	0.29%	0.13%	0.00%	0.10%
Ellisella sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.04%	0.00%	0.00%	0.05%	0.07%	0.00%	0.05%	0.12%	0.15%	0.06%	0.00%	0.00%	0.00%	0.00%	0.23%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Ellisellidae	0.00%	0.00%	0.00%	0.00%	0.00%	0.22%	0.19%	0.24%	0.97%	0.13%	0.27%	0.20%	0.04%	0.24%	0.15%	0.00%	0.04%	0.00%	0.00%	0.00%	0.07%	0.21%	0.14%	0.66%	0.04%	0.48%	0.00%	0.00%	0.00%	0.00%	0.00%	0.22%	0.05%	0.04%	0.00%	0.00%	0.07%
Gorgonacea	0.00%	0.00%	0.05%	0.00%	0.00%	0.30%	0.23%	0.00%	0.22%	0.26%	0.11%	0.29%	0.09%	0.06%	0.00%	0.00%	0.99%	0.00%	0.00%	0.00%	0.00%	0.70%	0.00%	0.86%	0.00%	1.43%	1.94%	0.13%	2.04%	0.31%	0.08%	0.15%	0.00%	0.11%	0.09%	0.00%	0.21%
Muricea sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.20%	0.28%	0.00%	0.00%	0.00%	0.11%	0.00%	0.22%	0.61%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.11%	0.40%	0.00%	0.21%
Nephtheidae	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Nicella sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.20%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Nidallia occidentalis	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.00%	0.00%	0.00%	0.05%	0.00%	0.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Pseudopterogorgia	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Swiftia exerta	0.00%	0.00%	0.00%	0.00%	0.06%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Telesto sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.65%	0.00%	0.00%	0.13%	0.00%	1.96%	3.38%	0.55%	1.81%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.99%	0.22%	0.40%	0.22%	1.66%	0.00%	0.07%
Titanideum frauenfeldii	0.00%	0.00%	0.00%	0.00%	0.00%	0.17%	0.02%	0.00%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Antipatharia	**2.15%**	**0.33%**	**2.62%**	**0.00%**	**0.48%**	**0.65%**	**1.53%**	**0.72%**	**0.80%**	**3.73%**	**0.92%**	**1.03%**	**0.70%**	**0.55%**	**1.17%**	**0.85%**	**0.84%**	**0.00%**	**0.00%**	**0.20%**	**0.54%**	**0.98%**	**0.00%**	**0.86%**	**0.08%**	**1.60%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.46%**	**0.36%**	**0.00%**	**2.10%**	**2.83%**	**1.39%**	**8.70%**
Antipatharia	1.35%	0.00%	0.09%	0.00%	0.00%	0.17%	0.91%	0.08%	0.28%	3.13%	0.49%	0.20%	0.13%	0.43%	0.98%	0.03%	0.30%	0.00%	0.00%	0.20%	0.00%	0.07%	0.00%	0.29%	0.08%	0.59%	0.00%	0.00%	0.00%	0.00%	0.15%	0.36%	0.00%	0.29%	0.45%	0.00%	0.14%
Antipathes sp. A	0.20%	0.00%	0.51%	0.00%	0.00%	0.05%	0.46%	0.00%	0.08%	0.30%	0.05%	0.59%	0.53%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	0.25%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.43%	1.39%	0.00%	0.24%
Stichopathes lutkeni	0.61%	0.33%	1.33%	0.00%	0.48%	0.40%	0.14%	0.56%	0.22%	0.30%	0.38%	0.24%	0.04%	0.06%	0.10%	0.78%	0.27%	0.00%	0.00%	0.00%	0.54%	0.63%	0.00%	0.33%	0.00%	1.01%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.51%	0.45%	1.39%	4.97%
Tanacetipathes hirta	0.00%	0.00%	0.69%	0.00%	0.00%	0.02%	0.02%	0.08%	0.22%	0.00%	0.00%	0.00%	0.00%	0.06%	0.10%	0.03%	0.27%	0.00%	0.00%	0.00%	0.00%	0.21%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.27%	0.00%	0.00%	0.87%	0.54%	0.00%	3.35%
Cnidaria non-coral	**13.39%**	**1.30%**	**9.93%**	**0.00%**	**0.00%**	**1.72%**	**5.29%**	**2.33%**	**0.91%**	**2.87%**	**0.65%**	**13.47%**	**4.70%**	**6.54%**	**11.47%**	**1.63%**	**3.23%**	**0.09%**	**37.60%**	**2.61%**	**2.97%**	**2.24%**	**0.65%**	**2.54%**	**0.56%**	**1.13%**	**0.28%**	**0.75%**	**0.31%**	**0.10%**	**0.49%**	**5.16%**	**1.63%**	**12.28%**	**11.74%**	**5.00%**	**1.52%**
Actiniaria	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	36.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Corallimorpharia	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hydroidolina	13.39%	1.30%	9.93%	0.00%	0.00%	1.70%	5.25%	2.33%	0.89%	2.87%	0.65%	13.47%	4.70%	6.41%	11.47%	1.63%	3.23%	0.09%	1.52%	2.61%	2.97%	2.24%	0.65%	2.54%	0.56%	0.95%	0.28%	0.75%	0.31%	0.10%	0.49%	5.16%	1.63%	12.17%	11.74%	5.00%	1.52%
Zoanthidea	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%	0.00%	0.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.11%	0.00%	0.00%	0.00%
Annelida	**3.16%**	**0.57%**	**1.19%**	**2.02%**	**4.45%**	**0.40%**	**0.37%**	**0.08%**	**0.53%**	**0.99%**	**0.00%**	**0.44%**	**0.09%**	**0.24%**	**0.10%**	**0.00%**	**0.49%**	**0.00%**	**13.64%**	**0.15%**	**0.00%**	**0.07%**	**0.00%**	**2.91%**	**0.45%**	**2.38%**	**2.30%**	**3.94%**	**3.06%**	**1.71%**	**0.00%**	**0.15%**	**0.15%**	**2.46%**	**1.71%**	**5.28%**	**0.24%**
Annelida	0.00%	0.33%	0.00%	2.02%	1.86%	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.14%	0.05%	0.00%	0.00%	0.00%	0.12%	0.00%	1.84%	0.00%	1.86%	1.02%	0.05%	0.00%	0.00%	0.00%	0.04%	0.00%	1.39%	0.00%
Filograna sp.	1.55%	0.24%	1.10%	0.00%	0.00%	0.40%	0.33%	0.08%	0.53%	0.99%	0.00%	0.44%	0.00%	0.24%	0.05%	0.00%	0.46%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	2.75%	0.45%	0.53%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.15%	2.42%	1.62%	3.89%	0.17%
Sabellidae	1.62%	0.00%	0.00%	0.00%	2.59%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.31%	0.00%	0.21%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Serpulidae	0.00%	0.00%	0.09%	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.09%	0.00%	0.05%	0.00%	0.00%	0.00%	13.50%	0.00%	0.00%	0.07%	0.00%	0.04%	0.00%	0.00%	2.30%	1.77%	2.04%	1.45%	0.00%	0.15%	0.00%	0.00%	0.09%	0.00%	0.07%
Mollusca	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.02%**	**0.00%**	**0.00%**	**0.04%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.05%**	**0.00%**	**0.56%**	**0.00%**	**0.00%**	**0.00%**	**0.06%**	**0.00%**	**0.00%**	**0.08%**	**0.05%**	**0.04%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**
Bivalvia	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.56%	0.00%	0.00%	0.00%	0.06%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Gastropoda	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mollusca	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Arthropoda	**0.00%**	**0.00%**	**0.14%**	**0.00%**	**0.00%**	**0.02%**	**0.00%**	**0.00%**	**0.03%**	**0.00%**	**0.11%**	**0.00%**	**0.00%**	**0.00%**	**0.05%**	**0.00%**	**0.00%**	**0.28%**	**0.41%**	**0.10%**	**0.00%**	**0.14%**	**0.00%**	**0.08%**	**0.00%**	**0.00%**	**0.59%**	**0.00%**	**0.24%**	**0.10%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.13%**	**0.00%**	**0.03%**
Cirripedia	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Decapoda	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.16%	0.00%	0.16%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Eumunida picta	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Majidae	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.36%	0.00%	0.00%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Paguridae	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.00%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Panulirus argus	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.00%	0.00%
Penaeidae	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Stenorhynchus seticornis	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.18%	0.00%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%
Bryozoa	**0.07%**	**0.00%**	**0.55%**	**0.00%**	**0.00%**	**0.05%**	**3.18%**	**2.17%**	**0.19%**	**0.77%**	**0.98%**	**0.34%**	**0.70%**	**0.37%**	**0.93%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**1.90%**	**1.72%**	**1.31%**	**2.91%**	**0.12%**	**0.00%**	**0.00%**	**0.00%**	**5.36%**	**2.47%**	**0.84%**	**0.54%**	**0.72%**	**0.00%**	**0.10%**
Bryozoa	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.04%	1.76%	0.08%	0.51%	0.54%	0.20%	0.26%	0.24%	0.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.85%	0.70%	1.20%	2.43%	0.12%	0.00%	0.00%	0.00%	4.90%	2.40%	0.79%	0.00%	0.31%	0.00%	0.00%
Schizoporella sp.	0.07%	0.00%	0.55%	0.00%	0.00%	0.05%	0.14%	0.40%	0.11%	0.26%	0.43%	0.15%	0.44%	0.12%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	1.03%	0.11%	0.48%	0.00%	0.00%	0.00%	0.00%	0.46%	0.07%	0.05%	0.54%	0.40%	0.00%	0.10%
Echinodermata	**0.00%**	**0.00%**	**0.18%**	**2.02%**	**0.00%**	**0.00%**	**0.16%**	**0.00%**	**0.00%**	**0.64%**	**0.05%**	**0.29%**	**0.13%**	**0.24%**	**0.24%**	**0.22%**	**0.08%**	**13.68%**	**0.00%**	**0.00%**	**0.00%**	**0.77%**	**0.00%**	**0.00%**	**0.00%**	**0.12%**	**1.31%**	**0.22%**	**0.16%**	**0.31%**	**0.08%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**1.80%**
Arbacia punctulata	0.00%	0.00%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.28%
Asteroidea	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Centrostephanus longispinus	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%
Crinoidea	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.16%	0.00%	0.00%	0.64%	0.05%	0.29%	0.09%	0.24%	0.24%	0.13%	0.04%	13.68%	0.00%	0.00%	0.00%	0.77%	0.00%	0.00%	0.00%	0.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Echinoidea	0.00%	0.00%	0.00%	2.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.18%	0.00%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Eucidaris tribuloides	0.00%	0.00%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.38%
Gorgonocephalidae	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Holothuria lentigenosa enodis	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Narcissia trigonaria	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Ophiuroidea	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Paracolochirus mysticus	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.11%	0.00%	0.16%	0.21%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Chordata	**0.27%**	**0.24%**	**0.55%**	**0.40%**	**0.06%**	**1.25%**	**0.81%**	**1.28%**	**0.83%**	**3.82%**	**1.30%**	**1.42%**	**1.05%**	**0.79%**	**0.93%**	**0.22%**	**0.00%**	**0.74%**	**0.41%**	**0.25%**	**0.67%**	**0.35%**	**0.88%**	**2.30%**	**0.94%**	**2.26%**	**0.63%**	**0.53%**	**0.00%**	**0.47%**	**0.46%**	**2.03%**	**0.79%**	**2.24%**	**2.29%**	**17.50%**	**0.48%**
Ascidiacea	0.00%	0.00%	0.14%	0.00%	0.00%	0.12%	0.23%	0.32%	0.03%	1.46%	0.16%	0.54%	0.88%	0.49%	0.49%	0.00%	0.00%	0.00%	0.28%	0.00%	0.00%	0.00%	0.05%	2.17%	0.86%	1.07%	0.00%	0.00%	0.00%	0.00%	0.15%	1.24%	0.10%	0.29%	0.27%	0.00%	0.03%
Didemnidae	0.27%	0.00%	0.23%	0.00%	0.06%	0.20%	0.46%	0.80%	0.36%	2.19%	0.05%	0.78%	0.13%	0.31%	0.34%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.08%	0.00%	0.83%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	1.34%	1.30%	17.50%	0.14%
Fish	0.00%	0.24%	0.18%	0.40%	0.00%	0.92%	0.12%	0.16%	0.44%	0.17%	1.08%	0.10%	0.04%	0.00%	0.10%	0.19%	0.00%	0.74%	0.14%	0.25%	0.67%	0.35%	0.70%	0.04%	0.08%	0.36%	0.63%	0.53%	0.00%	0.47%	0.30%	0.73%	0.69%	0.61%	0.72%	0.00%	0.31%

CPCe Percent Cover	Site																																		
Phylum/Scientific Name	ROV 01	ROV 02	ROV 03	ROV 04	ROV 05	ROV 06	ROV 07	ROV 08	ROV 09	ROV 10	ROV 11	ROV 12	ROV 13	ROV 14	ROV 15	ROV 16	ROV 17	ROV 18	ROV 19	ROV 20	ROV 21	ROV 22	ROV 23	ROV 24	ROV 25	ROV 26	ROV 27	ROV 28	ROV 29	ROV 30	ROV 31	ROV 32	ROV 33	ROV 34	ROV 35	ROV 36	ROV 37
Algae	**2.15%**	**1.30%**	**5.10%**	**0.00%**	**0.00%**	**52.66%**	**54.55%**	**55.49%**	**47.52%**	**18.58%**	**64.99%**	**44.98%**	**26.56%**	**38.79%**	**49.10%**	**1.03%**	**5.50%**	**1.29%**	**0.00%**	**8.32%**	**11.74%**	**1.12%**	**29.62%**	**29.86%**	**50.43%**	**2.08%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**32.08%**	**25.22%**	**55.34%**	**15.93%**	**13.94%**	**1.67%**	**6.98%**
Chlorophyta	0.00%	0.00%	0.00%	0.00%	0.00%	0.72%	0.35%	0.48%	0.47%	0.64%	0.22%	0.24%	0.18%	1.41%	1.32%	0.06%	0.08%	0.09%	0.00%	0.15%	0.27%	0.00%	0.88%	0.57%	0.79%	0.12%	0.00%	0.00%	0.00%	0.00%	0.95%	0.00%	0.35%	0.22%	0.18%	0.00%	0.00%
Corallinales/crustose coralline	0.54%	1.14%	2.11%	0.00%	0.00%	1.75%	2.46%	1.76%	1.86%	6.01%	2.87%	0.54%	0.35%	2.75%	0.73%	0.63%	3.26%	0.37%	0.00%	2.41%	2.43%	0.14%	0.23%	1.48%	0.26%	1.54%	0.00%	0.00%	0.00%	0.00%	1.14%	3.20%	0.69%	4.77%	2.79%	1.39%	6.73%
Cyanophyta	0.00%	0.00%	0.00%	0.00%	0.00%	37.40%	38.57%	40.26%	36.38%	11.54%	41.25%	36.21%	19.58%	19.85%	40.65%	0.22%	1.90%	0.09%	0.00%	0.45%	0.07%	0.00%	8.76%	10.09%	6.12%	0.30%	0.00%	0.00%	0.00%	0.00%	4.79%	5.09%	5.93%	5.27%	6.12%	0.00%	0.00%
Phaeophyta	0.00%	0.08%	0.09%	0.00%	0.00%	6.02%	9.78%	6.74%	5.54%	0.04%	9.76%	2.55%	3.99%	7.03%	2.98%	0.00%	0.04%	0.74%	0.00%	2.76%	2.90%	0.35%	17.66%	9.93%	38.98%	0.00%	0.00%	0.00%	0.00%	0.00%	20.37%	8.79%	45.90%	0.65%	0.36%	0.00%	0.00%
Rhodophyta	1.62%	0.08%	2.90%	0.00%	0.00%	6.77%	3.39%	6.26%	3.27%	0.34%	10.89%	5.44%	2.46%	7.76%	3.42%	0.13%	0.23%	0.00%	0.00%	2.56%	6.07%	0.63%	2.09%	7.79%	4.28%	0.12%	0.00%	0.00%	0.00%	0.00%	4.83%	8.14%	2.47%	5.02%	4.50%	0.28%	0.24%
Other organism	**0.61%**	**0.81%**	**2.80%**	**0.00%**	**0.12%**	**2.40%**	**3.79%**	**1.52%**	**1.22%**	**2.10%**	**0.54%**	**0.69%**	**0.53%**	**0.86%**	**0.83%**	**0.22%**	**0.53%**	**0.00%**	**6.34%**	**1.60%**	**6.34%**	**2.03%**	**4.59%**	**20.26%**	**13.97%**	**10.33%**	**2.10%**	**1.11%**	**0.63%**	**0.16%**	**17.10%**	**17.44%**	**0.94%**	**0.76%**	**0.76%**	**1.11%**	**0.48%**
Other organism	0.61%	0.81%	2.80%	0.00%	0.12%	2.40%	3.79%	1.52%	1.22%	2.10%	0.54%	0.69%	0.53%	0.86%	0.83%	0.22%	0.53%	0.00%	6.34%	1.60%	6.34%	2.03%	4.59%	20.26%	13.97%	10.33%	2.10%	1.11%	0.63%	0.16%	17.10%	17.44%	0.94%	0.76%	0.76%	1.11%	0.48%
Natural detritus	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.05%**	**0.05%**	**0.00%**	**0.00%**	**0.04%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.04%**	**0.00%**	**0.00%**	**0.20%**	**0.07%**	**0.00%**	**0.05%**	**0.00%**	**0.00%**	**0.12%**	**0.00%**	**0.00%**	**0.00%**	**0.10%**	**0.11%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**
Natural detritus	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.05%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.20%	0.07%	0.00%	0.05%	0.00%	0.00%	0.12%	0.00%	0.00%	0.00%	0.10%	0.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Human debris	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.02%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.10%**	**0.00%**	**0.06%**	**0.05%**	**0.00%**	**0.00%**	**0.00%**	**34.30%**	**0.00%**	**0.00%**	**0.28%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.04%**	**0.00%**	**0.08%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.03%**
Cans bottles litter	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Fishing gear/line/long line	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%
Human debris- other	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	34.30%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hard bottom substrate	**27.93%**	**19.22%**	**38.51%**	**14.92%**	**10.94%**	**10.16%**	**8.15%**	**10.59%**	**5.85%**	**43.11%**	**9.59%**	**8.97%**	**5.00%**	**17.23%**	**13.08%**	**8.97%**	**19.21%**	**10.54%**	**0.00%**	**25.06%**	**13.09%**	**42.01%**	**4.54%**	**10.42%**	**3.12%**	**20.13%**	**38.34%**	**55.21%**	**37.15%**	**23.72%**	**11.25%**	**20.64%**	**10.18%**	**25.04%**	**32.73%**	**50.83%**	**55.49%**
Bare rock- pavement boulder ledge	22.61%	14.90%	35.62%	8.87%	9.08%	9.19%	7.59%	10.34%	5.15%	38.70%	9.43%	7.25%	4.87%	17.04%	12.84%	7.37%	18.91%	4.81%	0.00%	19.40%	12.75%	41.30%	4.50%	10.34%	3.12%	19.12%	36.84%	55.03%	35.82%	23.15%	6.99%	18.97%	10.08%	23.16%	29.18%	50.28%	55.28%
Bare rubble- coral	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Bare rubble- rock	5.32%	4.32%	2.90%	6.05%	1.86%	0.95%	0.56%	0.24%	0.69%	4.38%	0.16%	1.71%	0.13%	0.18%	0.24%	1.60%	0.30%	5.73%	0.00%	5.66%	0.34%	0.49%	0.05%	0.08%	0.00%	1.01%	1.51%	0.18%	1.33%	0.57%	4.26%	1.67%	0.10%	1.88%	3.55%	0.56%	0.21%
Standing dead coral	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Soft bottom substrate	**41.12%**	**75.65%**	**28.58%**	**80.65%**	**83.34%**	**26.89%**	**14.49%**	**22.05%**	**38.32%**	**13.60%**	**13.01%**	**22.83%**	**55.05%**	**27.12%**	**15.47%**	**86.11%**	**66.21%**	**73.29%**	**0.00%**	**60.00%**	**64.04%**	**44.25%**	**55.35%**	**24.82%**	**28.24%**	**52.02%**	**47.07%**	**31.32%**	**49.92%**	**72.76%**	**28.16%**	**20.71%**	**25.84%**	**30.13%**	**22.08%**	**14.72%**	**17.82%**
Bare soft bottom substrate	41.12%	75.65%	28.58%	80.65%	83.34%	26.89%	14.49%	22.05%	38.32%	13.60%	13.01%	22.83%	55.05%	27.12%	15.47%	86.11%	66.21%	73.29%	0.00%	60.00%	64.04%	44.25%	55.35%	24.82%	28.24%	52.02%	47.07%	31.32%	49.92%	72.76%	28.16%	20.71%	25.84%	30.13%	22.08%	14.72%	17.82%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

APPENDIX 2

Species List and Density of Fish Observations

Appendix 1 lists all of the fish that were identified and counted from the quantitative video transects for each dive. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The estimated field of view width was ~10 m, and most fish were identified within a 5 m distance.

Scientific Name	ROV 01	ROV 02	ROV 03	ROV 04	ROV 04	ROV 05	ROV 06	ROV 07	ROV 08	ROV 09	ROV 10	ROV 11	ROV 12	ROV 13	ROV 14	ROV 15	ROV 16	ROV 17	ROV 18	ROV 22	ROV 23	ROV 24	ROV 25	ROV 26	ROV 27	ROV 28	ROV 29	ROV 30	ROV 31	ROV 32	ROV 33	ROV 34	ROV 35	ROV 37
Acanthostracion polygonius					0.2			0.2	0.3	0.3				6.0																0.6	0.5	0.3	
Acanthurus bahianus						0.1			0.8			0.3		0.7															1.8	1.3	1.9	0.5		
Acanthurus sp.	0.3	0.3	0.2		6.6	2.5		0.3	0.8	0.6	1.0	0.9	5.3	1.5	2.3	0.4					5.9		7.5						2.1	1.9	5.7	0.2	0.5	
Anthias nicholsi																									2.1	0.4	37.0	5.0						
Anthias woodsi																										0.2	0.4	0.5						
Anthiinae																71.1		124.8		194.4				10.7	20.3	556.7	327.5	21.0						
Antigonia sp.																									34.0	3.6	69.4	39.2						
Apogon pseudomaculatus											0.3		1.0		0.1																			
Aulostomus maculatus										0.6			0.7	1.2																	1.9			
Balistes capriscus	1.2	1.6	1.2	0.7	0.7	4.5				2.8	1.7	0.6	3.7		0.3	0.2	3.4	0.3					0.2	0.3						0.6	5.0	2.2	1.3	
Balistes sp.		0.5	0.2		0.2		0.4		0.5																						0.6			
Balistes vetula	0.3	0.5	0.2	0.4	0.3																											0.2		
Bodianus pulchellus	4.7	1.1	21.4		11.6	30.2	26.1	5.0	21.8	22.8	33.8	31.8	27.6	23.9	2.3	3.5		5.1		3.2	3.1	3.9	10.1	2.6				13.0	46.5	38.4	6.5	17.4	15.2
Bodianus rufus						0.1		0.2		0.3																					1.3			
Calamus sp.	0.9	0.3	0.2		6.4	10.2	23.5	3.4	6.3	4.9	8.9	9.6	6.6	5.9	1.7	0.9				2.0	7.5	4.5	9.9	6.7				3.9	24.5	14.5	1.2	3.5	0.5
Canthigaster rostrata	3.1	0.5	9.1		43.9	38.7	49.1	11.6	25.1	33.5	35.8	35.9	42.2	77.8	20.8	4.4	3.4	3.9	5.1	7.2	39.6	54.7	70.4	27.5					51.8	174.2	70.4	24.6	13.6	5.7
Caulolatilus microps																									1.2	0.4	1.5	2.1						
Centropristis ocyurus	1.7	0.8	1.7			0.1					0.3	0.3							5.7				1.0									1.2	1.1	2.5
Centropristis philadelphica																	0.6																	
Centropyge argi																						0.6							1.1					
Chaetodipterus faber									5.4																									
Chaetodon aculeatus						0.1				0.3																						0.2		
Chaetodon ocellatus	1.6	0.5	2.6		3.8	4.2	3.0	2.9	6.0	3.4	8.9	5.0	7.6	1.0	4.2	1.3	2.3	1.0	3.8	4.0	4.0	3.2	6.5	2.9					4.6	4.5	6.9	4.6	3.7	6.6
Chaetodon sedentarius	10.9	9.0	28.4	0.7	33.5	27.1	26.1	14.9	22.3	16.9	18.8	19.5	31.9	20.7	8.4	8.1	6.3	5.1	6.3	8.4	6.2	14.5	9.6	15.7					31.3	60.0	44.7	28.4	30.7	15.7
Chaetodon striatus						0.8				0.6																								
Chilomycterus schoepfi	0.3																																	
Chilomycterus sp.		0.3					0.4	0.2		0.3				0.5																				
Chromis cyanea																							2.7											
Chromis enchrysurus	9.9	91.8	36.1	4.6	33.2	10.0	8.5	3.4	6.0	4.6	0.3	4.1	7.3	1.5	1.6	2.4	0.6	20.6	29.7	0.8	2.2	7.1	1.9	53.6					5.6	36.1	11.3	15.9	24.9	72.0
Chromis insolatus	0.2		1.6		1.0	2.3	7.3	0.2	3.8	2.5		1.7	1.0	1.0	1.0	0.9						10.6	1.0	2.3					8.8	9.7	8.2	0.5	0.3	
Chromis scotti	0.8		20.2		7.1	38.1	18.4	6.7	58.0	18.8	24.2	36.4	31.9	20.7						0.4		6.4	6.7	0.6					3.5	56.8	83.0	2.4	2.7	6.1
Chromis sp.	3.1	1.1	13.4		1.2	13.4	10.7	2.2	1.1	0.9	0.7	0.3	0.3	0.5	1.4	2.4			2.5			16.7	2.4	1.4					9.9	7.7	3.1	1.2	2.1	
Cookeolus boops																									0.2		0.4	0.2						
Dactylopterus volitans	0.2				0.2			0.2																										
Decodon puellaris																				0.4					3.3	3.1	8.3	9.0						
Diodon sp.						0.8			0.5	0.3			0.3								0.3										0.6	0.2		
Epinephelus adscensionis										0.3		0.3	1.0		0.1								0.2								1.3			
Epinephelus cruentatus					1.9	1.6	3.0	1.2	2.7	3.1	3.8	2.6	9.3	4.9	0.3	0.2		0.3			0.9	0.6	1.0	0.6					0.4	3.9	3.8			
Epinephelus drummondhayi																0.2																1.9	0.3	
Epinephelus morio									0.3							0.2		0.6	1.9	0.4	0.9		0.5						0.4		0.6	0.2		
Epinephelus nigritis																																0.5		
Epinephelus niveatus			0.2			0.1			0.3								2.3						0.2		2.6	14.0	3.8	1.7						
Epinephelus sp.																										0.2								
Equetus lanceolatus		0.5			0.7			0.3					1.0				0.6	0.3			0.3		3.6									0.2		0.2
Equetus umbrosus	0.3		2.3		7.3	3.2	0.9	2.6	4.1	2.5	2.7	6.1	22.9	5.4	13.0	7.9		12.2		100.8	18.4		26.7	14.8				14.1	3.2	98.1	6.7	9.1	2.2
Scientific Name	1	2	3	4	6	7	8	9	10	11	12	13	14	15	16	17	18	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	37
Fistularia sp.					0.2	0.6		0.5		0.6				0.5																				
Fistularia tabacaria						0.1		0.2	1.6		0.3		0.3	0.2																	1.3			
Gephyroberyx darwinii																									0.2	2.2	6.4	0.5						
Gonioplectrus hispanus																0.7				0.4														
Gymnothorax moringa											0.3																							
Gymnothorax ocellatus																	0.6																	
Haemulon album																																		0.2
Haemulon aurolineatum	14.1		621.8		193.6	319.8	1232.5	394.9	2708.4	1928.0	605.5	441.7	2469.4	273.6		6.1		91.6		105.6	1137.7		345.3						24.6	2300.6	7499.4	777.1	169.0	463.9
Haemulon plumierii						0.6					0.3		2.3								0.6		3.4	0.3							2.5			
Haemulon sp.							74.8	128.6		0.9		0.3	191.0	106.2							48.3									129.0				
Haemulon striatum	3.6		14.1					5.4		37.5		0.3		27.3		120.4															424.5		0.5	
Halichoeres bathyphilus		0.3																4.2														2.7		0.7
Halichoeres garnoti	0.3		0.3		0.3	0.6	0.4	0.5						1.0							1.2	1.0	3.4						1.1	0.6	9.4		0.3	0.2
Halichoeres sp.	27.0	57.4	39.5		64.4	16.7	35.0	27.7	16.1	7.1	9.2	35.3	35.5	3.2	17.7	22.1	22.7	30.9	38.6	6.8	36.8	45.7	34.7	133.9					65.8	70.3	78.6	50.1	36.9	16.5
Hemanthias vivanus																12.0											0.8	0.2						
Hemicaranx amblyrhynchus								0.8																										
Holacanthus bermudensis	3.9	3.2	17.8		8.3	28.2	20.5	6.7	35.1	16.9	20.5	12.5	27.2	21.4	1.7	3.5	4.0	1.0	0.6	0.4	4.4	3.9	4.6	3.8					6.3	29.7	27.0	18.3	15.2	10.3
Holacanthus tricolor					0.3	0.3		0.2		0.3		0.3	0.3	0.5	0.9	1.5		0.3		0.4	0.3	1.6	2.7						2.1		5.7		0.5	
Holocentridae			0.2			0.7		0.3		1.2				0.2		0.4		3.5		8.8	3.1				1.4	1.3	0.4		0.4	0.6			0.8	0.2
Holocentrus sp.		7.1	8.9	0.7	4.5	8.2	6.0	9.3	4.6	9.5		2.0	22.6	3.2	1.3	0.7			3.2			4.2	7.2	2.9					4.2	5.2	43.4	10.1	16.8	9.1
Hypoplectrus aberrans									0.3																									
Lachnolaimus maximus			0.2		0.3	0.3	3.4	0.5		0.6	0.3	0.3	2.3		1.0	0.9		0.3		0.8	1.2	1.3	0.7	1.4					0.7	5.8	3.8	0.2		1.2
Lactophrys quadricornis	0.3				0.2				0.3			0.6			0.1																	0.2		0.5
Lactophrys sp.	0.3	0.3	1.4		1.2	2.0	1.3	1.4	3.0	1.5	2.7		2.7	1.5		0.2		1.0			0.6		0.5	0.3					0.4	1.9	1.3	0.5	1.9	0.5
Lactophrys trigonus	0.2		0.2																															
Laemonema sp.																									1.9	2.7	7.9	1.2						
Liopropoma eukrines			0.2		0.2		0.4		0.3		0.3			1.0	0.1	1.3		1.0		3.2	0.3	1.0	1.0	1.2	0.2		0.4	0.2			1.9	1.7	1.1	0.2	
Lutjanidae						0.4																												0.2
Lutjanus analis		0.3																																
Lutjanus buccanella																																0.7		
Lutjanus campechanus			0.2																															
Lutjanus griseus	0.2		0.5			0.7				2.5	3.1	13.4																			8.2	0.2		
Lutjanus sp.			0.2																				0.5											
Macroramphosus scolopax		1.6																							0.9		4.2	3.1						
Malacanthus plumieri							0.9								0.1	0.7		1.0			0.3												0.8	
Monacanthus sp.						1.0			1.4																				0.4					
Mulloidichthys martinicus									0.5																						1.9			
Muraenidae															0.4		1.1			0.4														0.2
Mycteroperca interstitialis						0.1																												
Mycteroperca microlepis			0.9		0.2	1.6	2.1	0.5	0.8	0.9	0.7	0.3	1.3	0.7						0.4				0.6					0.6	1.9	0.7			
Mycteroperca phenax	0.2		2.4	0.4	1.4	26.3	13.2	6.8	33.2	7.1	9.6	15.7	31.2	27.8	0.3	2.0	0.6	0.6		3.6	6.5	0.6	2.9	2.3					1.1	16.8	8.8	10.6	1.3	4.2
Mycteroperca sp.						0.1				0.7				0.7																	0.6			
Myrichthys acuminatus																																	0.3	

Scientific Name	ROV 01	ROV 02	ROV 03	ROV 04	ROV 04	ROV 05	ROV 06	ROV 07	ROV 08	ROV 09	ROV 10	ROV 11	ROV 12	ROV 13	ROV 14	ROV 15	ROV 16	ROV 17	ROV 18	ROV 22	ROV 23	ROV 24	ROV 25	ROV 26	ROV 27	ROV 28	ROV 29	ROV 30	ROV 31	ROV 32	ROV 33	ROV 34	ROV 35	ROV 37
Myrichthys ocellatus																						0.3	0.2											
Myripristis jacobus	2.0		10.6		0.2	3.1			2.7	2.2	6.1	2.9	7.0	3.2									0.2						0.4	1.9	16.4	8.2	1.9	
Scientific Name	1	2	3	4	6	7	8	9	10	11	12	13	14	15	16	17	18	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	37
Ocyrus chrysurus							0.4																											
Ophichthidae						0.1								0.2																				
Opsanus pardus												0.3																						
Opsanus sp.																																0.2		
Ostichthys trachypoma																										1.1	2.3	0.5						
Pagrus pagrus	3.3	2.9	3.3		0.7	8.9	2.6	0.2	11.2	2.8	20.8	25.4	0.7	0.2	0.4			4.8		22.5	2.2		0.5	4.6	0.7		17.0	7.1		3.9	0.6	1.7	2.7	1.0
Paranthias furcifer	1.4		0.7		0.5										4.8	2.2		0.6											2.8	3.2	1.9	1.7	1.1	
Pareques iwamotoi																		0.3			0.6				1.2	1.6	9.1	2.6				0.5		1.0
Plectranthias garrupellus																									9.2	0.7	10.6	1.7						
Pomacanthus arcuatus						0.7		0.3			1.0			1.0																				
Pomacanthus paru			0.2		0.7	0.7			3.3			0.3	0.7								1.2		0.5						0.7	3.2	0.6	0.2		
Pomacanthus sp.						0.1					0.3	1.5																						
Priacanthus arenatus	0.3	0.3	0.5			0.3	1.3		0.8	0.6	1.0	0.3	1.3	1.5	0.1	0.4		0.3		0.4			0.5		0.2	1.8	10.6				0.6	0.5	2.9	2.7
Priacanthus cruentatus	0.2																																	
Pristigenys alta	0.5	5.6			9.4	3.1	4.3	0.6	5.4	1.5	10.2	5.8	4.7	9.1	40.3		29.0	2.3	18.4	6.4	0.9			4.9	4.0		1.5	8.0		2.6	0.6			
Prognathodes aya	0.5		2.4		1.7	1.8	0.4	0.6	7.1	1.5	1.0	0.3	6.6	2.5	0.4	1.5		1.6		6.0	0.6		0.7	6.1	0.2					10.3	1.3	0.5	1.9	4.4
Prognathodes guyanensis																									0.2	0.2								
Pronotogrammus martinicensis																63.2		35.7		241.4				3.2										
Pseudupeneus maculatus					0.7	0.4	1.3	0.2	0.5	0.3	0.3		1.7	0.5	0.1						0.3		2.2						1.3	6.3				
Pterois volitans		0.8	4.5			36.0	19.2	6.8	42.2	14.2	52.2	33.5	44.2	36.5	3.2	2.2		10.9	7.6	10.8	5.0	7.4	6.3	4.9					12.0	31.6	28.9	4.3	2.7	3.7
Rhomboplites aurorubens	12.1		1189.5	1.4		192.7	519.7	45.0	683.7	536.9	262.8		147.5	36.2		66.3	56.8	1.3											127.7	166.7	309.6	402.1	1185.7
Rypticus maculatus						0.1					0.3																							
Rypticus saponaceus													1.7		0.1			0.3											1.4	0.6				
Rypticus sp.			0.2			0.3			0.5	0.3	1.0	0.9		0.5		0.2	0.6	0.3		0.4	0.3	0.3	0.2						1.4		0.6	0.2		
Rypticus subbifrenatus																				0.4														
Scarus sp.					2.3																													
Scorpaenidae					0.2	0.6		0.2	1.1	0.3	1.0	0.3	0.7	1.5				0.3		2.0	1.2				11.3	7.3	22.6	16.8	0.4	1.3				
Seriola dumerili					0.2	0.1	0.4	0.8			0.3	5.0	7.3		0.3	1.8	1.1	0.3						1.4								33.3	1.3	1.0
Seriola rivoliana						0.6		0.9			0.7		1.3			0.9							0.2	0.6					0.7	0.6		2.4	0.3	
Seriola sp.	0.2	0.8	0.7		2.1	5.2	8.5	2.8	30.2	3.1	10.9	4.1	3.7	7.1	30.3	5.3	6.8	16.7				0.3		1.7		13.3	0.4				1.3	7.5	0.8	0.2
Serranus annularis			0.2		1.6	0.1	0.4								0.1							3.9	1.2	1.2					2.5	0.6		0.7	0.8	
Serranus chionariaia															0.1																			
Serranus notospilus																	0.6								5.9	0.4	4.2	9.7						
Serranus phoebe	11.5	13.8	6.8	1.1	6.4	2.5	3.4	2.8			0.3	0.6	2.7	1.7	26.6	3.3	19.3	18.6	20.9	3.2	4.4	10.3	4.6	24.1			0.4		2.8	14.8	5.7	16.6	15.8	3.9
Serranus sp.													0.3				0.6																	
Serranus tigrinus														0.5																				
Sparidae	0.6		0.3			2.0		0.9		0.9	13.0	10.5	0.7	0.5	0.1	1.1					0.3			0.3						3.2		1.2		1.0
Sparisoma atomarium								0.2		5.5												5.8	9.2						12.7	11.0	5.0			
Sphoeroides spengleri					2.4	1.0	0.9		0.3	0.3	3.1			1.0							0.3								0.4					0.7
Sphyraena barracuda		0.3						0.2		0.3																								
Stegastes partitus	0.6	2.4	4.7	0.4	0.7	1.3	0.9	0.2		0.9	0.3	1.7	5.0									4.2	2.7	0.3					1.4	2.6	9.4	2.9	2.9	
Stephanolepis hispidus					0.2																													
Thalassoma bifasciatum						0.1						0.3	0.3																					
Xanthichthys ringens															1.6																			

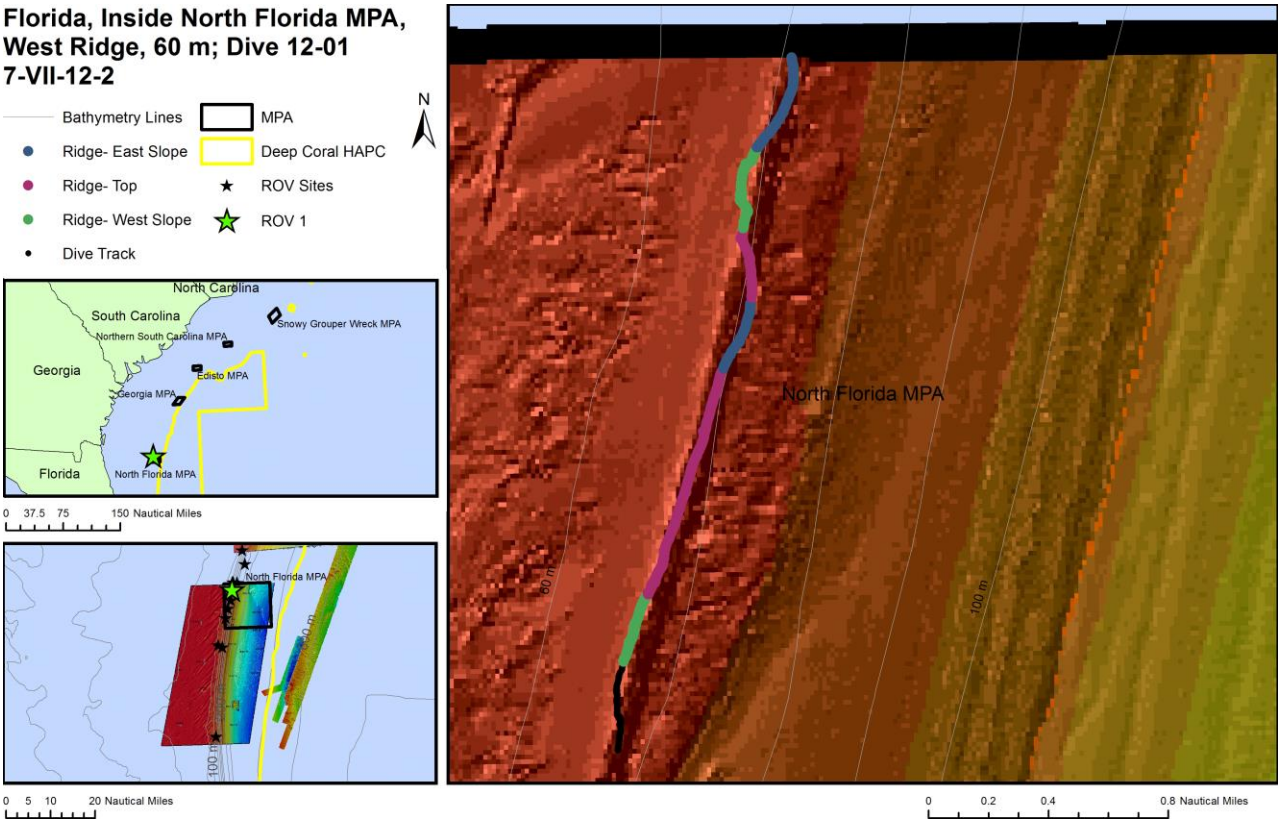
APPENDIX 3

SEADESC II REPORT
Characterizations and Quantitative Analyses of Habitat, Benthic Biota, and Fish Populations

Provides the following data for each dive site: cruise and ROV dive metadata, figures showing each ROV dive track and habitat zone overlaid on multibeam sonar maps, dive track data (start and end latitude, longitude, depth), objectives, general description of the habitat and biota, and images of the biota and habitat that characterize the dive site. In addition, this SEADESC Level II Report provides quantitative analyses of each dive site including: 1) CPCE 4.0© Coral Point Count analysis of percent cover of benthic biota and substrate type, 2) densities of fish populations (# individuals/km for each species).

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-01

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	USWTR Bathy with ROV (Navy)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/7/2012
Specimens:	
Digital Photos:	124
DVD:	2
Hard Drive:	1

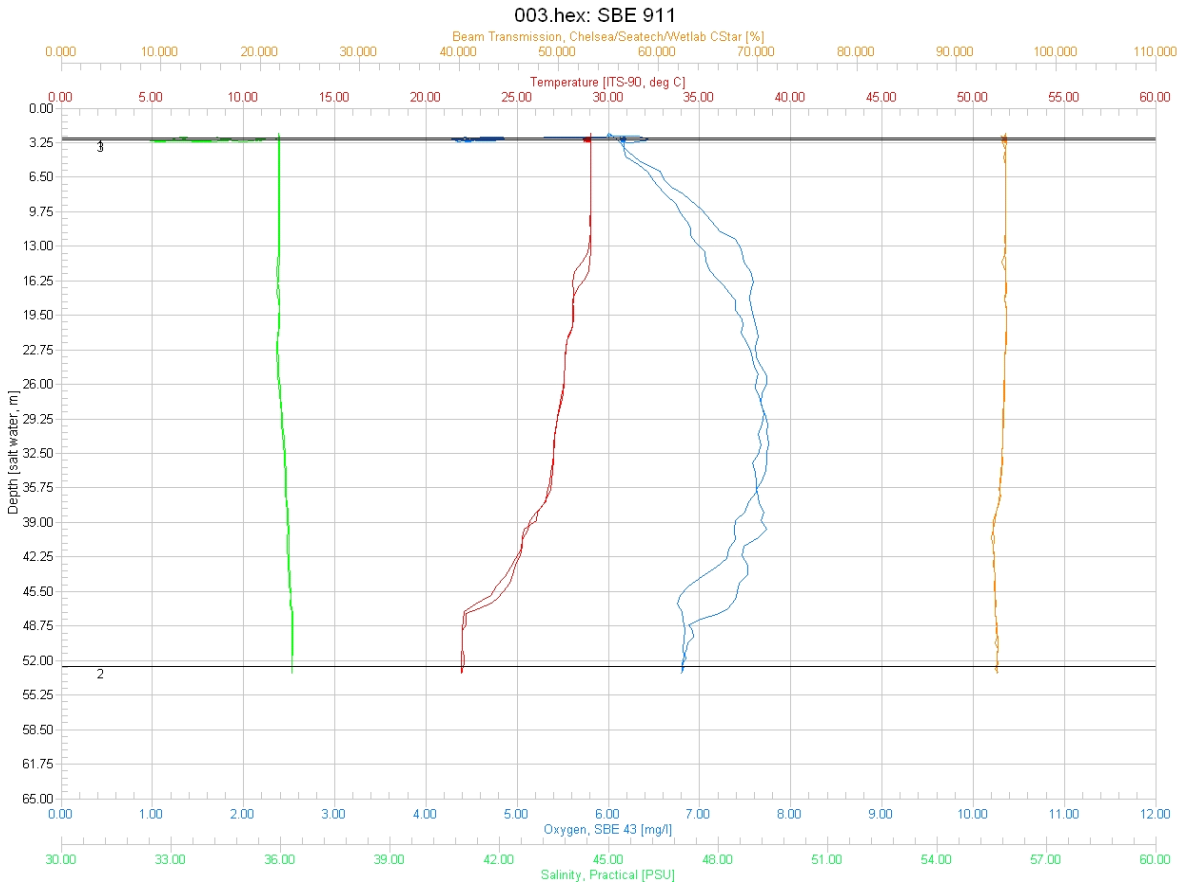
Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-01

Dive Data:

Minimum Bottom Depth (m):	52	**Total Transect Length (km):**	6.439
Maximum Bottom Depth (m):	60	**Surface Current (kn):**	2
On Bottom (Time- GMT):	9:27	**On Bottom (Lat/Long):**	30.44°N; -80.21°W
Off Bottom (Time- GMT):	11:16	**Off Bottom (Lat/Long):**	30.48°N; -80.19°W
Physical (bottom); Temp (°C):	25.26	**Salinity:** 36.20 **Visibility (ft):** 50	**Current (kn):** 1.2

Physical Environment:

Distance from Dive Site(km): 3.11



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (53 m): temperature- 22, salinity- 36.2, and dissolved oxygen- 6.8. Surface temperature was 28.7 and there was a thermocline near 45 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 29 m. Visibility was estimated at 50 ft from the ROV video.

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-01

Dive Imagery:

Figure 1: -55.1 m
Demosponges and hydroids on rocky hardbottom habitat.

Figure 2: -56.6 m
Tanacetipathes black coral on rock pavement hardbottom.

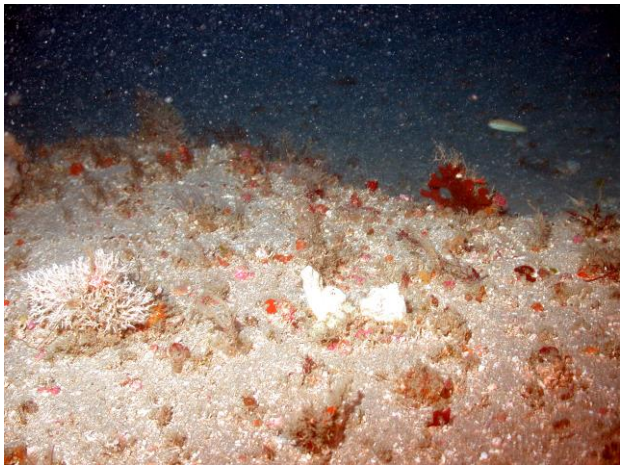


Figure 3: -57.2 m
Low relief hardbottom habitat with *Filograna* worm colonies, hydroids, sponges, and greenband wrasse.

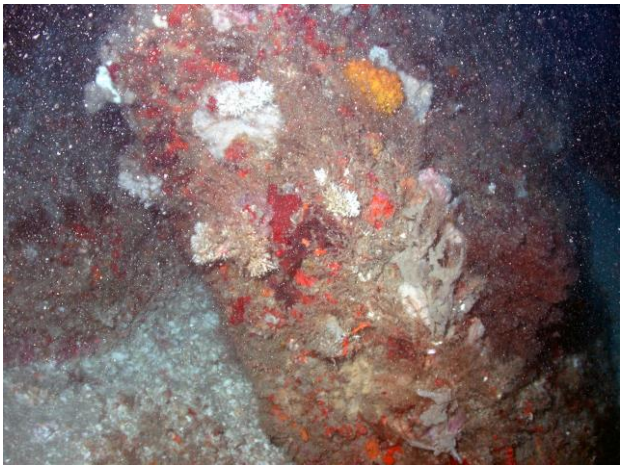


Figure 4: -57.4 m
Rock outcrops with dense cover of *Filograna* polychaete tubes, demosponges and Rhodophyta.

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-01

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 1, Site #- 7-VII-12-2. Target Site - North Florida MPA; 70 m. ROV survey inside MPA; ground truth Navy multibeam sonar of site. Conduct video/photo transect S to N, zigzag along main ridge oriented SW-NE.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database (Dive 1: time is -2 hours off EDT then reset to correct time at 8:44 am). Dive 1: No Quantitative photos taken; all photos random forward pointing; lasers 10 cm. Surface current approx. 2.0 kn, bottom current ~1.2 kn; unable to station keep or stop the ROV for habitat or still photos.

Site Description/Habitat/Biota:
West base of main ridge ~54 m; east base 60 m. Ridge is low to moderate relief rock slabs and boulders 1/2 m to 1 m relief, rock pavement, low ledges <1 m relief. Off ridge is rock pavement with sediment veneer and sand sediment with rubble.

Dominant Benthic Biota: Dense sessile biota on exposed rock dominated by Demospongiae- *Ircinia campana*, *I. strobilina*, Axinellida; Hydroida; Antipatharia- *Tanacetipathes*, *Stichopathes lutkeni*; Gorgonacea- purple Plexauridae; Polychaeta- *Filograna*; Ascidiacea- Didemnidae mounds; no algae; no hard coral.
Fish: yellowtail reeffish, reef butterfly, blue angelfish, red porgy, puffer, cowfish, tattler, few scamp.

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-01

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-01 conducted a survey of the northern part of the 60-m ridge within the MPA. A zig-zag transect from SW to NE was made along the ridge which is evident in the multibeam sonar map. Dive transects were divided into three habitat zones: Ridge Top, East Slope and West Slope. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This dive site was primarily low relief pavement on top of the ridge and low relief, eroded rock slabs on the east and west slopes; depth range 52-60 m.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-01. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 1	Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-01				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	Transect Zig-Zag Across N end of West ridge, Narrow Ridge. Xs on E&W slopes and Top - xs was west slope of main ridge, scattered 1-2 m boulders 0.5 m relief.				
	Ridge- West Slope	On Reef	LRu	LR	RLF
Transect 2	Rock slabs, soft bottom pavement, 0.5 m relief				
	Ridge- Top	On Reef	LRu	LR	RLF
Transect 3	60.5 m base of E slope, Sed. Pvmt, series of knolls, low relief shell hash, cobble patchy HB				
	Ridge- East Slope	On Reef	LRu	LR	RLF
Transect 4	57 m rock slabs 0.5 m relief				
	Ridge- Top	On Reef	LRu	LR	RLF
Transect 5	54 m low relief outcrops, sediment shell hash				
	Ridge- West Slope	On Reef	LRu	LR	RLF
Transect 6	100 % HB top ridge 56-58 m cobble rubble pvmt, east slope 60.5 m rock slabs				
	Ridge- East Slope	On Reef	LRu	LR	RLF

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-01

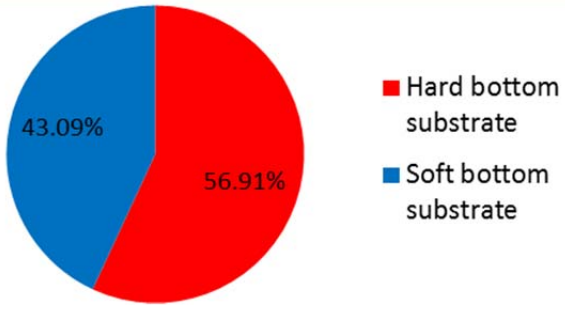


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-01. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-01 was predominately hard bottom (56.9% cover) consisting of rock pavement with patchy rock rubble and cobble, 1-2 m rock boulders, rock slabs, and small rounded rock knolls.

Bare rock substrate without biota covered 27.93% of the bottom and bare soft bottom was 41.12% (Fig. 2, Table 2). Benthic macro-biota covered 30.96% of the bottom and consisted of 13.39% non-coral Cnidaria (Hydrozoa), 8.82% Porifera, 2.15% Antipatharia, 0.34% Alcyonacea ("gorgonacea"), and 2.15% red algae. No hard coral was present.

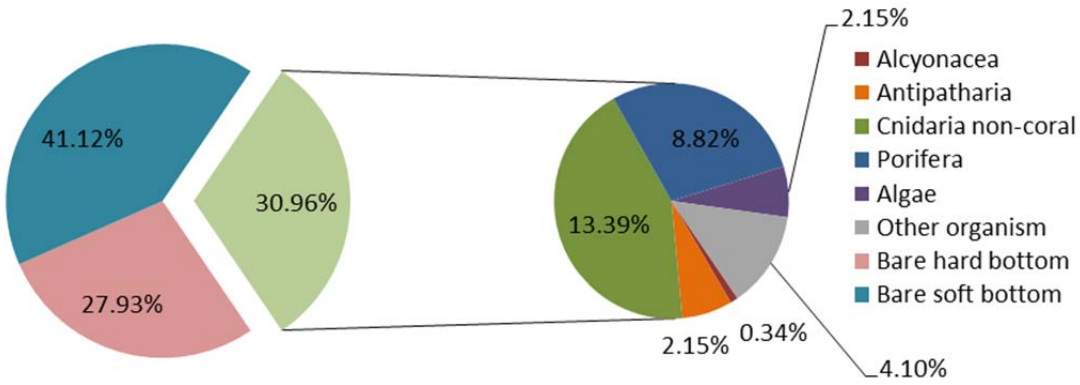


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-01. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-01.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**131**	**8.82%**
Porifera	**131**	**8.82%**
Aka sp.	1	0.07%
Aplysina sp.	5	0.34%
Axinellida	1	0.07%
Clathria sp.	2	0.13%
Demospongiae	46	3.10%

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-01

Demospongiae- ze tan starlet	10	0.67%
Ircinia sp.	33	2.22%
Oceanapia sp.	1	0.07%
Ptilocaulis sp.	2	0.13%
Spirastrellidae	30	2.02%
Cnidaria non-coral	**199**	**13.39%**
Cnidaria non-coral	**199**	**13.39%**
Hydroidolina	199	13.39%
Antipatharia	**32**	**2.15%**
Antipatharia	**32**	**2.15%**
Antipatharia	20	1.35%
Antipathes sp. A	3	0.20%
Stichopathes lutkeni	9	0.61%
Algae	**32**	**2.15%**
Algae	**32**	**2.15%**
Corallinales/crustose coralline	8	0.54%
Rhodophyta	24	1.62%
Alcyonacea	**5**	**0.34%**
Alcyonacea	**5**	**0.34%**
Diodogorgia sp.	5	0.34%
Other organism	**61**	**4.10%**
Annelida	**47**	**3.16%**
Filograna sp.	23	1.55%
Sabellidae	24	1.62%
Bryozoa	**1**	**0.07%**
Schizoporella sp.	1	0.07%
Chordata	**4**	**0.27%**
Didemnidae	4	0.27%
Other organism	**9**	**0.61%**
Other organism	9	0.61%
Hard bottom substrate	**415**	**27.93%**
Hard bottom substrate	**415**	**27.93%**
Bare rock- pavement boulder ledge	336	22.61%
Bare rubble- rock	79	5.32%
Soft bottom substrate	**611**	**41.12%**
Soft bottom substrate	**611**	**41.12%**
Bare soft bottom substrate	611	41.12%
Grand Total	**1486**	**100.00%**

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-01

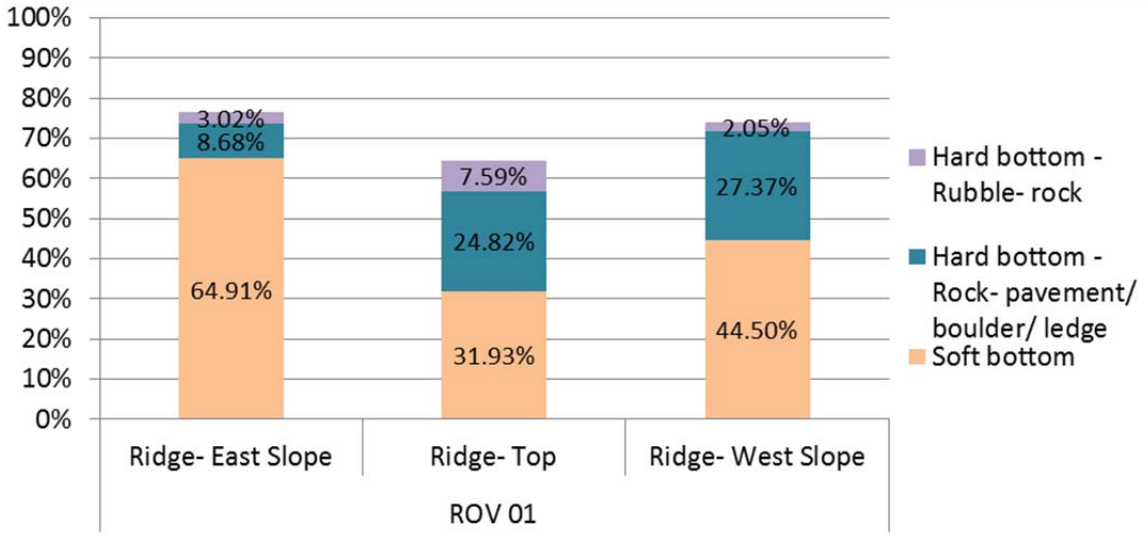


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-01.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The ridge top and west slope drop-off had the greatest cover of bare rock pavement, ledges and boulders (24.8-27.3%). Barren soft bottom was predominate along the east slope. Figure 4 shows that the ridge top had the greatest cover of biota (36%) dominated by Porifera (13.8%), non-coral Cnidaria (hydroids, 12.4%), and Antipatharia (3.61%). The east and west slopes had similar cover of biota (~25%), but red algae were more common on the west slope (4.86%).

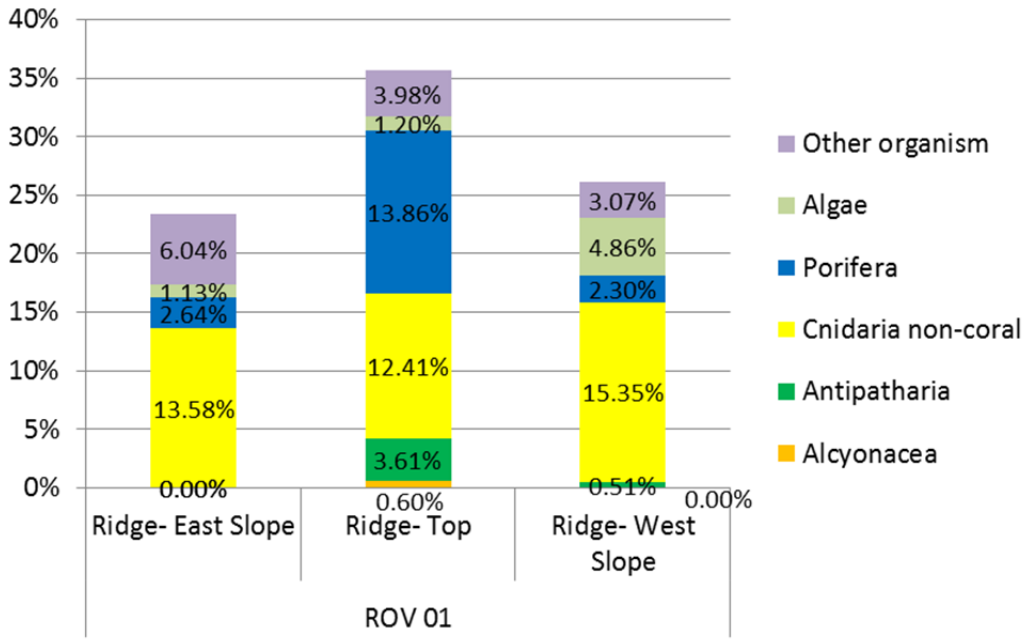


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-01.

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-01

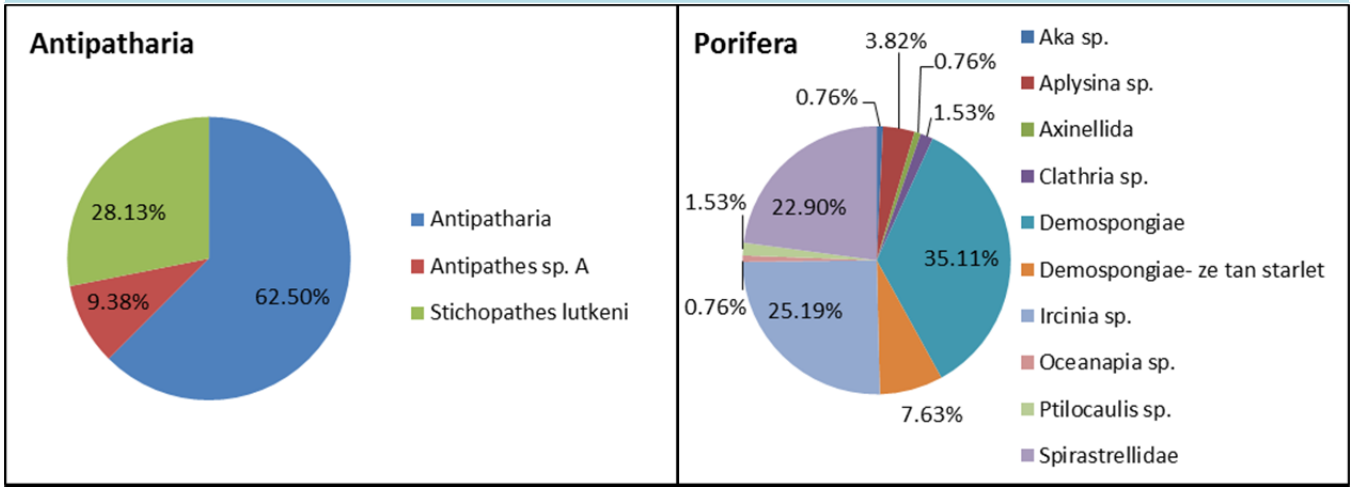


Figure 5. Diversity of corals and sponges at dive site ROV 12-01; CPCe analysis showing percent of total for each taxa category. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Porifera are Demospongiae.

No hard coral was present at the dive site. *Diodogorgia* sp. was the only alcyonacean identified. Antipatharia consisted of many unidentified species (Antipatharia unidentified spp. = 62.5% of the total Antipatharia), *Stichopathes lutkeni* (28.1%), and an unidentified sp. A (9.3%). Porifera consisted of 10 taxa, including Spirasteridae (22.9% of all Porifera), *Ircinia* sp. (25.1%), tan starlet encrusting Demospongiae (7.6%), and numerous taxa of unidentified Demospongiae (35.1%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 39 taxa of fish were identified from dive ROV 1 for a total density of 122 individuals/km (Table 3). These were dominated by: wrasse (27.0/km), tomtate (14.0) and vermilion snapper (12.1). Managed species included vermilion snapper (12.1/km), scamp (0.2), amberjack (0.2), and red porgy (3.3).

Table 3. Density of fish for all transects at dive site ROV 12-01 (number individuals/km).

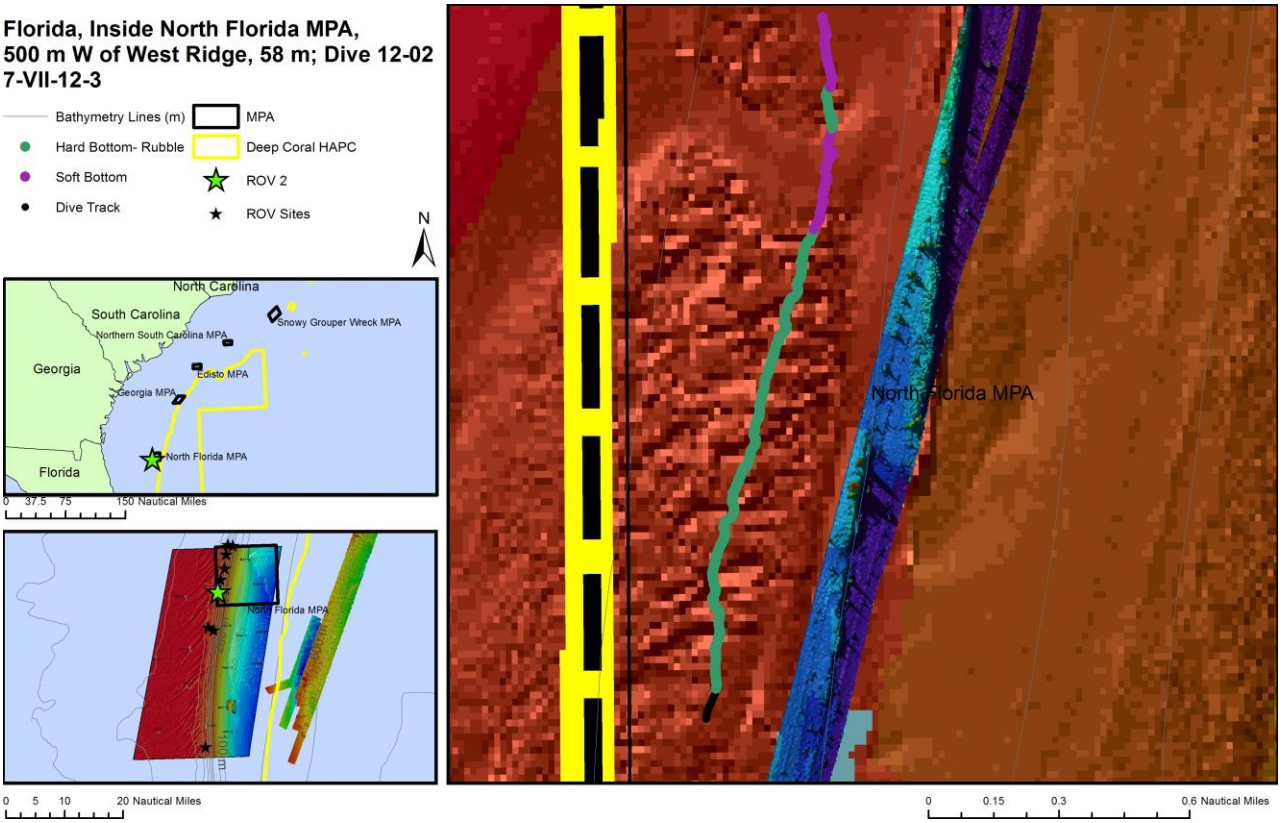
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus sp.	doctorfish	2	6.44	0.3
Balistes capriscus	grey triggerfish	8	6.44	1.2
Balistes vetula	queen triggerfish	2	6.44	0.3
Bodianus pulchellus	spotfin hogfish	30	6.44	4.7
Calamus sp.	porgy	6	6.44	0.9
Canthigaster rostrata	sharpnose puffer	20	6.44	3.1
Centropristis ocyurus	bank sea bass	11	6.44	1.7
Chaetodon ocellatus	spotfin butterflyfish	10	6.44	1.6
Chaetodon sedentarius	reef butterflyfish	70	6.44	10.9
Chilomycterus schoepfi	striped burrfish	2	6.44	0.3

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-01

Chromis enchrysurus	yellowtail reeffish	64	6.44	9.9
Chromis insolatus	sunshinefish	1	6.44	0.2
Chromis scotti	purple reeffish	5	6.44	0.8
Chromis sp.	damselfish	20	6.44	3.1
Dactylopterus volitans	flying gurnard	1	6.44	0.2
Equetus umbrosus	cubbyu	2	6.44	0.3
Haemulon aurolineatum	tomtate	91	6.44	14.1
Haemulon striatum	striped grunt	23	6.44	3.6
Halichoeres garnoti	yellowhead wrasse	2	6.44	0.3
Halichoeres sp.	wrasse	174	6.44	27.0
Holacanthus bermudensis	blue angelfish	14	6.44	2.2
Holocentrus sp.	squirrelfish	11	6.44	1.7
Lactophrys quadricornis	scrawled cowfish	2	6.44	0.3
Lactophrys sp.	cowfish	2	6.44	0.3
Lactophrys trigonus	trunkfish	1	6.44	0.2
Lutjanus griseus	grey snapper	1	6.44	0.2
Mycteroperca phenax	scamp	1	6.44	0.2
Myripristis jacobus	blackbar soldierfish	13	6.44	2.0
Pagrus pagrus	red porgy	21	6.44	3.3
Paranthias furcifer	creole-fish	9	6.44	1.4
Priacanthus arenatus	bigeye	2	6.44	0.3
Priacanthus cruentatus	glasseye snapper	1	6.44	0.2
Pristigenys alta	short bigeye	3	6.44	0.5
Prognathodes aya	bank butterflyfish	3	6.44	0.5
Rhomboplites aurorubens	vermilion snapper	78	6.44	12.1
Seriola sp.	amberjack	1	6.44	0.2
Serranus phoebe	tattler	74	6.44	11.5
Sparidae	porgy	4	6.44	0.6
Stegastes partitus	bicolor damselfish	4	6.44	0.6
Total		789		122.5

Dive Site: Florida, Inside North Florida MPA, 500 m W of West Ridge, 58 m; Dive 12-02

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	USWTR Bathy with ROV (Navy)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	No Sensors Used
Date of Dive:	7/7/2012
Specimens:	
Digital Photos:	33
DVD:	2
Hard Drive:	1

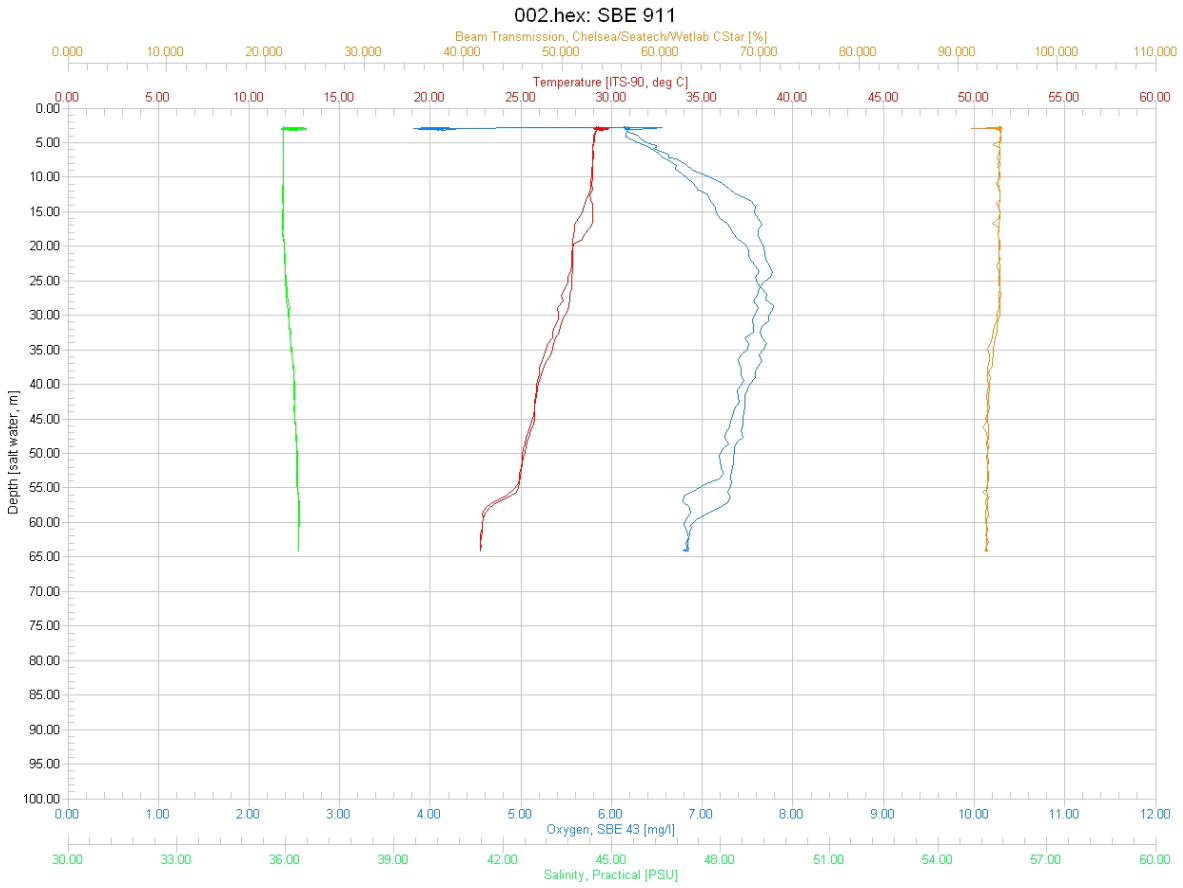
Dive Site: Florida, Inside North Florida MPA, 500 m W of West Ridge, 58 m; Dive 12-02

Dive Data:

Minimum Bottom Depth (m):	57	**Total Transect Length (km):**	3.783
Maximum Bottom Depth (m):	59	**Surface Current (kn):**	2
On Bottom (Time- GMT):	13:15	**On Bottom (Lat/Long):**	30.36°N; -80.23°W
Off Bottom (Time- GMT):	14:25	**Off Bottom (Lat/Long):**	30.38°N; -80.22°W
Physical (bottom); Temp (°C):	24.00	**Salinity:** 36.20 **Visibility (ft):** N/A	**Current (kn):** 1

Physical Environment:

Distance from Dive Site(km): 7.74



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (64 m): temperature- 22, salinity- 36.2, and dissolved oxygen- 6.8. Surface temperature was 29.34 and there was a thermocline near 55 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 25 m.

Dive Site: Florida, Inside North Florida MPA, 500 m W of West Ridge, 58 m; Dive 12-02

Dive Imagery:

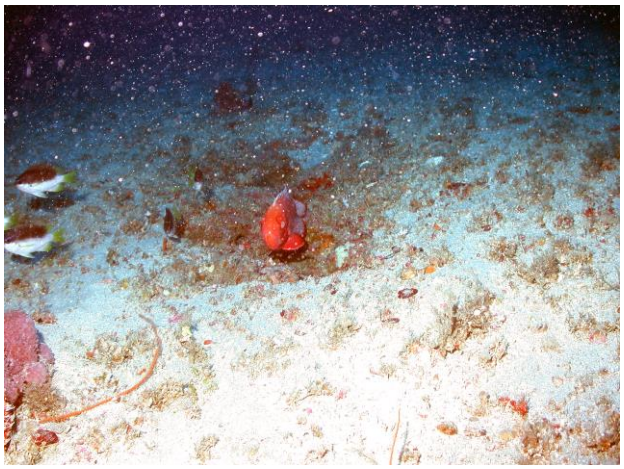


Figure 1: -56.8 m
Short bigeye and yellowtail reeffish on patchy hardbottom habitat.

Figure 2: -57.2 m
Lionfish on rock outcrop and ledge habitat.

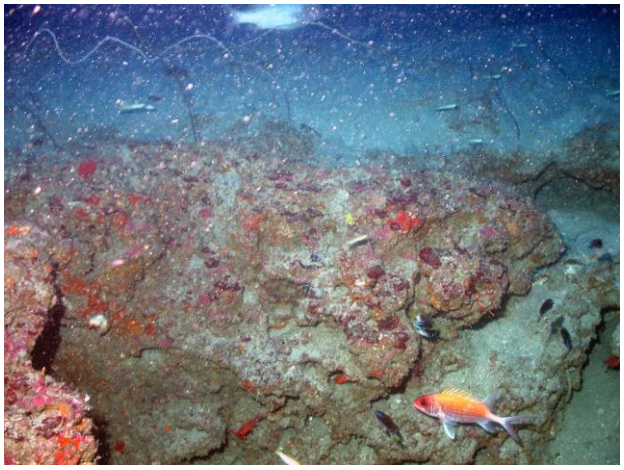


Figure 3: -58.5 m
Squirrelfish, yellowtail reeffish, greenband wrasse, bank sea bass and twospot cardinal on moderate relief hardbottom habitat.

Figure 4: -58.5 m
Short bigeye, yellowtail reeffish and bank sea bass on pavement habitat.

Dive Site: Florida, Inside North Florida MPA, 500 m W of West Ridge, 58 m; Dive 12-02

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 2, Site #- 7-VII-12-3. Target Site - North Florida MPA; 56-59 m. ROV survey inside MPA; ground truth Navy multibeam sonar of site. Conduct video/photo transect S to N on low relief, hard bottom west of main ridge on sonar.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. No CTD. Surface current approx. 2 kn, bottom current ~1 kn. Difficult to stop ROV with current.

Site Description/Habitat/Biota:
Low relief rock rubble, cobble and sediment from 56 to 59 m. Patchy hard bottom areas 10-20 m wide with rubble and some exposed rock, and scoured rock burrows. Sediment and rubble between hard bottom areas.

Dominant Benthic Biota: Relatively sparse sessile epifauna. Demospongiae- *Ircinia campana*, *I. strobilina*; Hydroida; Antipatharia- Tanacetipathes, *Stichopathes lutkeni*; Gorgonacea- purple Plexauridae; Polychaeta- Filograna; Ascidiacea- Didemnidae; no algae; no hard coral.
Fish: sand tilefish and tilefish rubble mounds common, yellowtail reeffish, reef butterfly, blue angelfish, red porgy.

Dive Site: Florida, Inside North Florida MPA, 500 m W of West Ridge, 58 m; Dive 12-02

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-02 conducted a survey in the SW corner of the MPA, 500 m west of the main ridge. The multibeam shows a low relief, hardbottom area. Dive transects were divided into two habitat zones: Hard Bottom-Rubble and Soft Bottom. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This site was primarily low relief, hard bottom with rubble and cobble, patchy rock pavement with few low-relief ledges, and soft bottom; depth range 54-59 m.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-02. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 2	Florida, Inside North Florida MPA, 500 m W of West Ridge, 58 m; Dive 12-02				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	MB shows low relief HB west of ridge: 56-69 m low relief HB, cobble 5-10 cm cobble rubble, pvmt, no ledges patches of rubble on SB				
	Hard Bottom- Rubble	On Reef	LRu	LR	R
Transect 2	Soft Bottom, 57-59 m				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 3	57-58 m rubble, cobble, pvmt				
	Hard Bottom- Rubble	On Reef	LRu	LR	R
Transect 4	57-58 m				
	Soft Bottom	Off Reef	LRu	LR	S

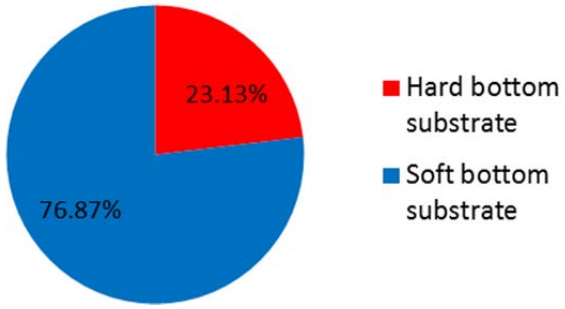


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-02. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Dive Site: Florida, Inside North Florida MPA, 500 m W of West Ridge, 58 m; Dive 12-02

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-02 was predominately soft bottom (76.8% cover) and hard bottom consisting of rock pavement with patchy rock rubble and cobble.

Bare rock substrate without biota covered 19.2% of the bottom and bare soft bottom was 75.6% (Fig. 2, Table 2). Benthic macro-biota covered 5.1% of the bottom and consisted of 1.3% non-coral Cnidaria (Hydrozoa), 0.5% Porifera, 0.3% Antipatharia, and 1.3% algae. No hard coral was present.

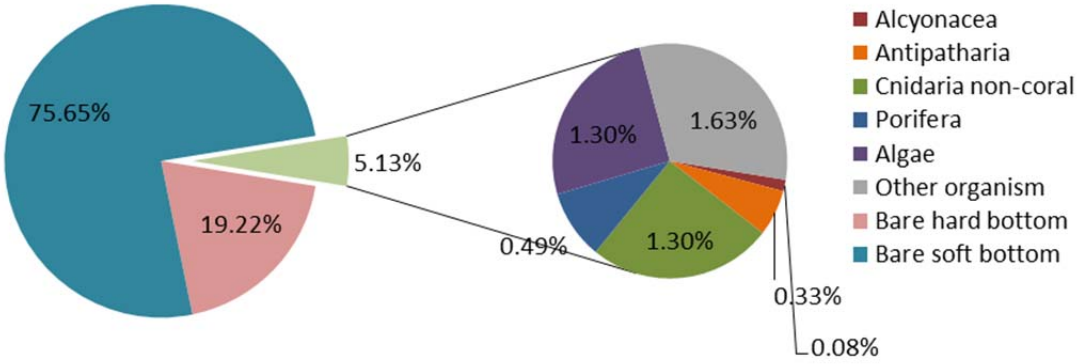


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-02. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-02.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**6**	**0.49%**
Porifera	**6**	**0.49%**
Demospongiae	1	0.08%
Ircinia sp.	3	0.24%
Spirastrellidae	2	0.16%
Cnidaria non-coral	**16**	**1.30%**
Cnidaria non-coral	**16**	**1.30%**
Hydroidolina	16	1.30%
Antipatharia	**4**	**0.33%**
Antipatharia	**4**	**0.33%**
Stichopathes lutkeni	4	0.33%
Algae	**16**	**1.30%**
Algae	**16**	**1.30%**
Corallinales/crustose coralline	14	1.14%
Phaeophyta	1	0.08%
Rhodophyta	1	0.08%

Dive Site: Florida, Inside North Florida MPA, 500 m W of West Ridge, 58 m; Dive 12-02

Alcyonacea	**1**	**0.08%**
Alcyonacea	**1**	**0.08%**
Diodogorgia sp.	1	0.08%
Other organism	**20**	**1.63%**
Annelida	**7**	**0.57%**
Annelida	4	0.33%
Filograna sp.	3	0.24%
Chordata	**3**	**0.24%**
Fish	3	0.24%
Other organism	**10**	**0.81%**
Other organism	10	0.81%
Hard bottom substrate	**236**	**19.22%**
Hard bottom substrate	**236**	**19.22%**
Bare rock- pavement boulder ledge	183	14.90%
Bare rubble- rock	53	4.32%
Soft bottom substrate	**929**	**75.65%**
Soft bottom substrate	**929**	**75.65%**
Bare soft bottom substrate	929	75.65%
Grand Total	**1228**	**100.00%**

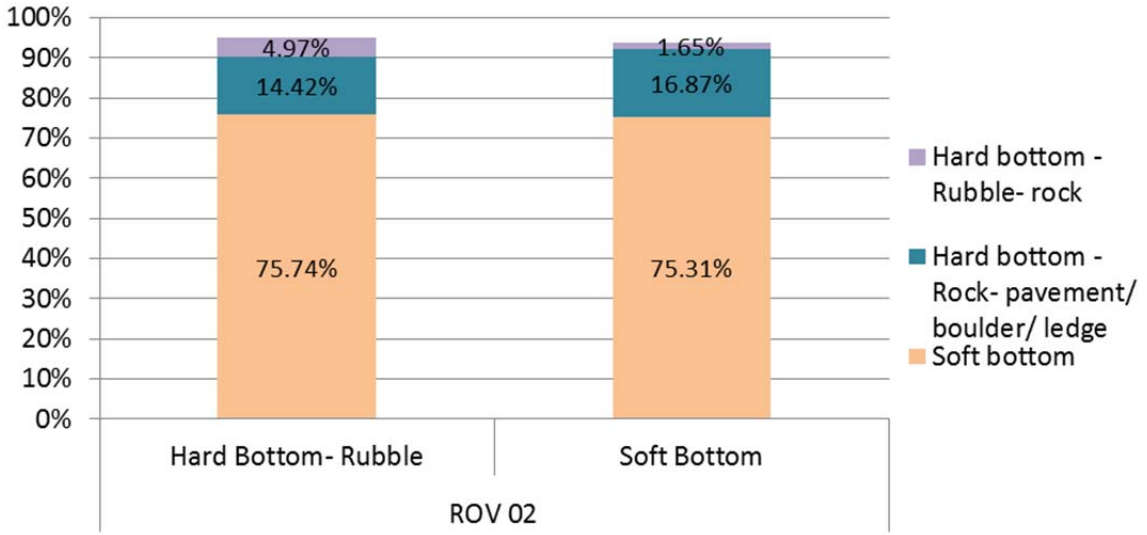


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-02.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. Regions that appeared to be hard bottom were interspersed with soft bottom or pavement covered by a veneer of sediment, so the point count showed a high cover of soft bottom (75%). Overall, bare hard bottom substrate only covered about 18.5-19.4% of the bottom.

Dive Site: Florida, Inside North Florida MPA, 500 m W of West Ridge, 58 m; Dive 12-02

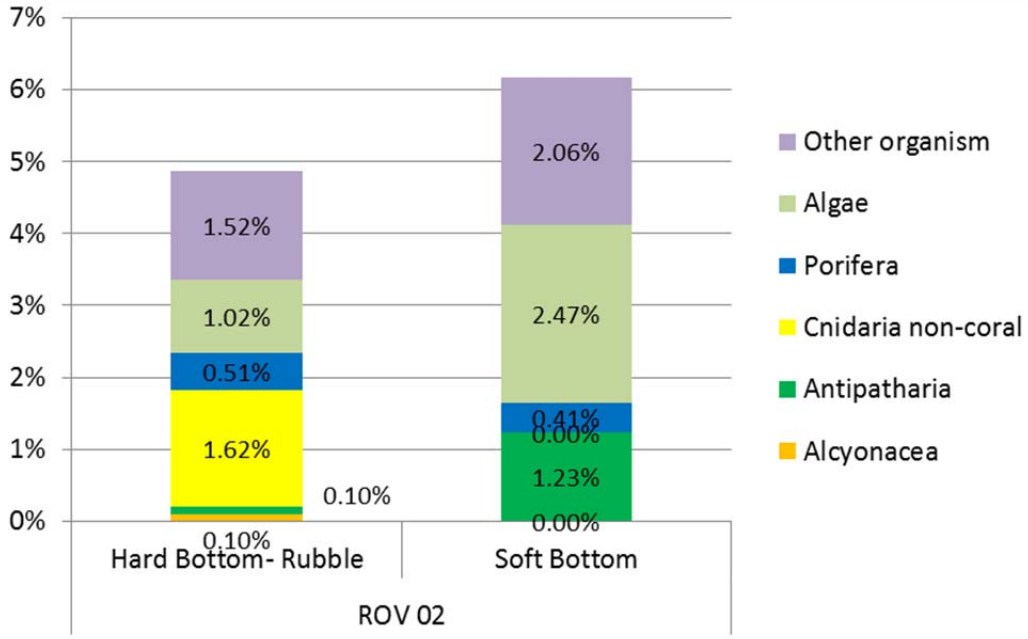


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-02.

Figure 4 shows the rubble hard bottom areas to be dominated by Cnidaria non-coral (hydroids- 1.6%), Porifera (0.5%), algae (1.0%), and other invertebrates (1.5%). In comparison the areas dominated more by soft sediment had greater cover of algae (2.4%) and even Antipatharia (1.2%), which illustrates that the areas of apparent soft bottom were in fact rock pavement with sediment veneer.

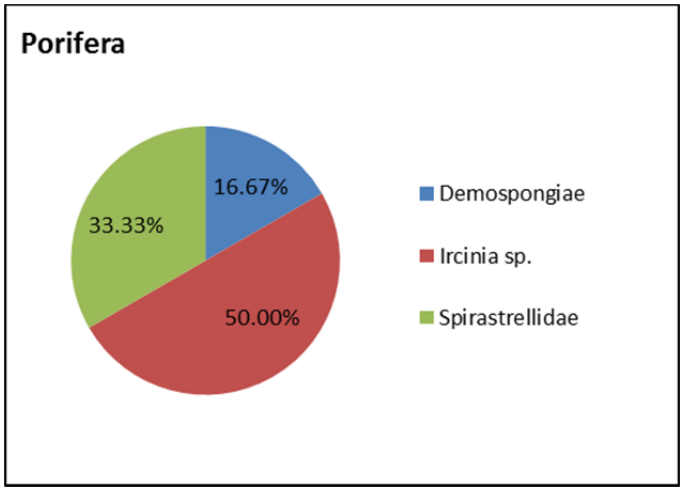


Figure 5. Diversity of sponges at dive site ROV 12-02; CPCe analysis showing percent of total for each taxa category.

No hard coral was present at the dive site. Other corals only consisted of one species of Antipatharia (*Stichopathes lutkeni*) and one Alcyonacea (*Diodogorgia* sp.). Demosponges were dominated by species of *Ircinia* (50% of the total Porifera), encrusting Spirastrellidae (33.3%), and other unidentified sponges (16.6%).

Dive Site: Florida, Inside North Florida MPA, 500 m W of West Ridge, 58 m; Dive 12-02

Fish Data Analysis:

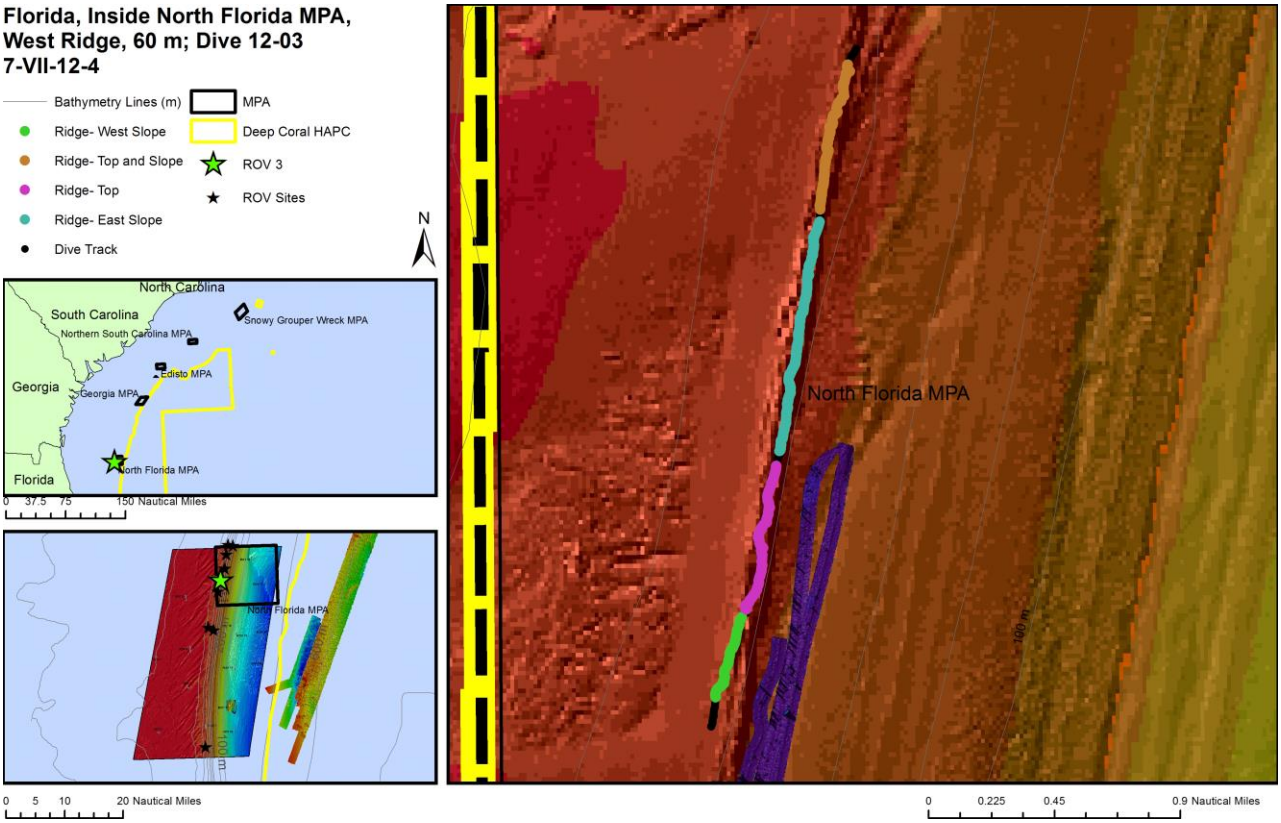
Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 29 taxa of fish were identified from dive ROV 2 for a total density of 205.6 individuals/km (Table 3). These were dominated by yellowtail reeffish (9.18/km), wrasse (57.4) and tattler (13.8). Managed species included red porgy (2.9), amberjack (0.8), and mutton snapper (0.3).

Table 3. Density of fish for all transects at dive site ROV 12-02 (number individuals/km).

Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus sp.	doctorfish	1	3.78	0.3
Balistes capriscus	grey triggerfish	6	3.78	1.6
Balistes sp.	triggerfish	2	3.78	0.5
Balistes vetula	queen triggerfish	2	3.78	0.5
Bodianus pulchellus	spotfin hogfish	4	3.78	1.1
Calamus sp.	porgy	1	3.78	0.3
Canthigaster rostrata	sharpnose puffer	2	3.78	0.5
Centropristis ocyurus	bank sea bass	3	3.78	0.8
Chaetodon ocellatus	spotfin butterflyfish	2	3.78	0.5
Chaetodon sedentarius	reef butterflyfish	34	3.78	9.0
Chilomycterus sp.	burrfish	1	3.78	0.3
Chromis enchrysurus	yellowtail reeffish	347	3.78	91.8
Chromis sp.	damselfish	4	3.78	1.1
Equetus lanceolatus	jack-knife fish	2	3.78	0.5
Halichoeres bathyphilus	greenband wrasse	1	3.78	0.3
Halichoeres sp.	wrasse	217	3.78	57.4
Holacanthus bermudensis	blue angelfish	12	3.78	3.2
Holocentrus sp.	squirrelfish	27	3.78	7.1
Lactophrys sp.	trunkfish	1	3.78	0.3
Lutjanus analis	mutton snapper	1	3.78	0.3
Malacanthus plumieri	sand tilefish	6	3.78	1.6
Pagrus pagrus	red porgy	11	3.78	2.9
Priacanthus arenatus	bigeye	1	3.78	0.3
Pristigenys alta	short bigeye	21	3.78	5.6
Pterois volitans	lionfish	3	3.78	0.8
Seriola sp.	amberjack	3	3.78	0.8
Serranus phoebe	tattler	52	3.78	13.8
Sphyraena barracuda	barracuda	1	3.78	0.3
Stegastes partitus	bicolor damselfish	9	3.78	2.4
Total		777		205.6

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-03

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	USWTR Bathy with ROV (Navy)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/7/2012
Specimens:	
Digital Photos:	88
DVD:	2
Hard Drive:	1

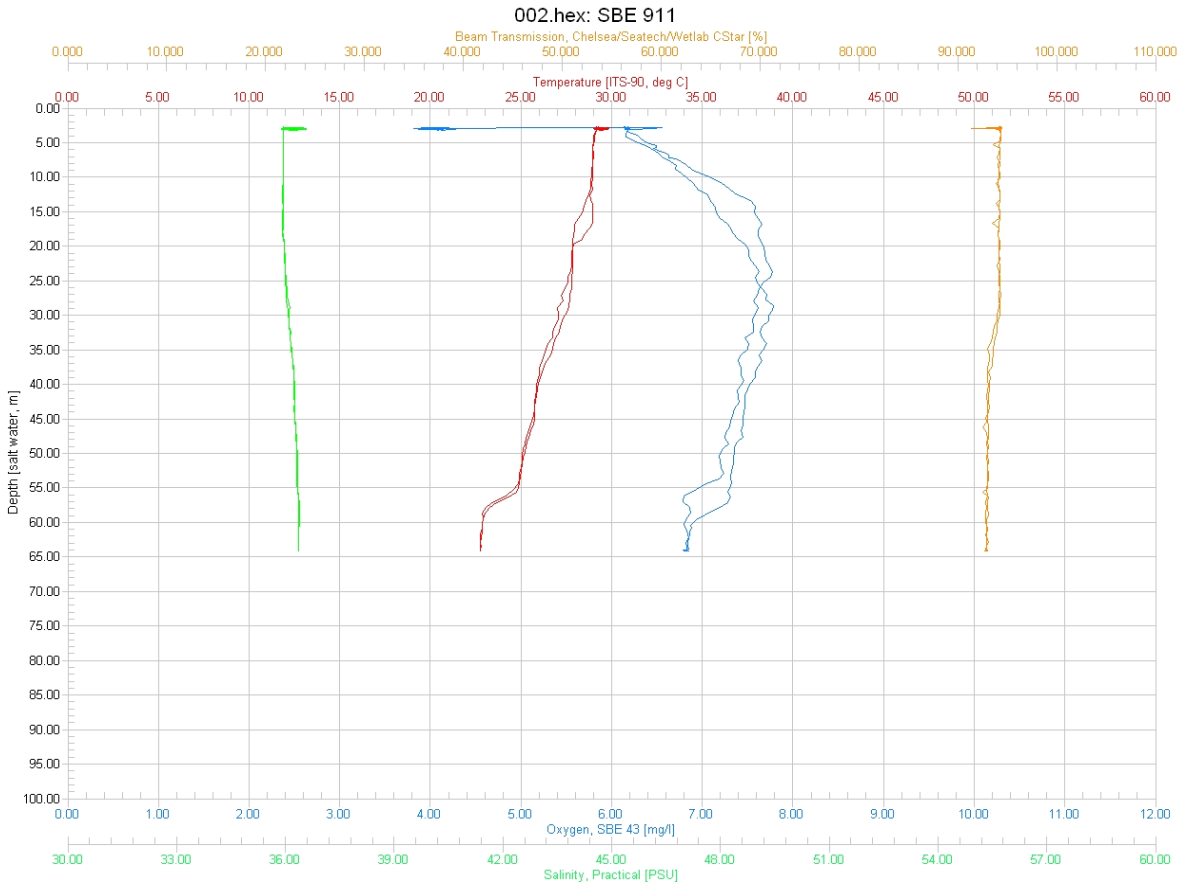
Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-03

Dive Data:

Minimum Bottom Depth (m):	55	**Total Transect Length (km):**	5.741
Maximum Bottom Depth (m):	60	**Surface Current (kn):**	2
On Bottom (Time- GMT):	14:59	**On Bottom (Lat/Long):**	30.39°N; -80.22°W
Off Bottom (Time- GMT):	16:51	**Off Bottom (Lat/Long):**	30.43°N; -80.21°W
Physical (bottom); Temp (°C):	26.81	**Salinity:** 36.20 **Visibility (ft):** 50	**Current (kn):** 1

Physical Environment:

Distance from Dive Site(km): 3.81



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (64 m): temperature- 22, salinity- 36.2, and dissolved oxygen- 6.8. Surface temperature was 30.26 and there was a thermocline near 55 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 25 m. Visibility was estimated at 50 ft from the ROV video.

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-03

Dive Imagery:

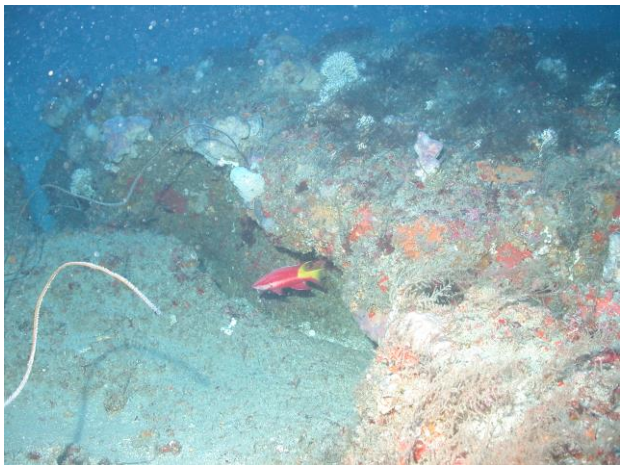


Figure 1: -55.1 m
Spotfin hogfish on moderate relief rock ledge with *Stichopathes* black coral, sponges, and hydroids.

Figure 2: -57.8 m
Male hogfish on moderate relief rock ledges.

Figure 3: -57.2 m
Lobster, blackbar soldierfish and twospot cardinalfish on rocky habtitat with dense sponges and *Filograna* worm colonies.

Figure 4: -55.8 m
Loggerhead turtle on soft bottom habitat.

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-03

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 3, Site #- 7-VII-12-4. Target Site - North Florida MPA; 56-60 m. ROV survey inside MPA; ground truth Navy multibeam sonar of site. Conduct video/photo transect S to N, zigzag along main ridge oriented SW-NE; continuation of ledge in Dive 1.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Digital video copied from DVD. Surface current approx. 2 kn, bottom current ~1 kn. Difficult to stop ROV with current.

Site Description/Habitat/Biota:
West base of main ridge ~54 m; east base ~60 m. Ridge is low to moderate relief with rock slabs and boulders 1/2 m to 1 m relief, rock pavement, and ledges 1/2-1 m relief. Large square rock slabs. Off ridge is rock pavement with sediment veneer and sand sediment.

Dominant Benthic Biota: Dense sessile biota on exposed rock dominated by Demospongiae- *Ircinia campana*, *I. strobilina*, Axinellida; Hydroida; Antipatharia- *Tanacetipathes*, *Stichopathes lutkeni*; Gorgonacea- purple Plexauridae; Polychaeta- *Filograna*; Ascidiacea- Didemnidae mounds; no algae; no hard coral.
Fish: dense schools of tomtate, vermilion snapper; scamp common, several 40-50 cm gag grouper, numerous lionfish; yellowtail reeffish, reef butterfly, blue angelfish, red porgy.

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-03

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-03 was along the main N-S oriented ridge near the western border of the MPA. Dive transects were divided into three habitat zones: Ridge Top, Ridge- East Slope, and West Slope. Table 1 describes the habitat characteristics of each transect based on habitat zone; relief, rugosity, and SEADESC habitat categories (see Methods for definitions). The ridge top was a double ridge system consisting of 100% cover of hard bottom pavement with low relief ledges. The east and west slopes were moderate relief rock slabs and boulders; the east slope had high rugosity of fractured rock slabs of 1 m relief; off ridge was flat sediment and low relief pavement; depth range: 52-60 m.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-03. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 3	Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-03				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	Multibeam center of west ridge: 56 m 0.5 and 1 m boulders, scattered rubble, scattered boulders west of main ridge				
	Ridge- West Slope	On Reef	LRu	MR	RLF
Transect 2	55-58.5 m 100% HB, Rock slabs 0.5 m ledges, double ledge system on top				
	Ridge- Top	On Reef	HRu	LR	RLF
Transect 3	58-60 m slope, very rugged fissures, rock slabs fractured in cuboidal boulders 1 m ledges				
	Ridge- East Slope	On Reef	HRu	MR	RLF
Transect 4	55.5 M top, pvmt small outcrops 0.5 m ledges; west slope: 57-60 m drops to sand				
	Ridge- Top and Slope	On Reef	LRu	LR	RLF

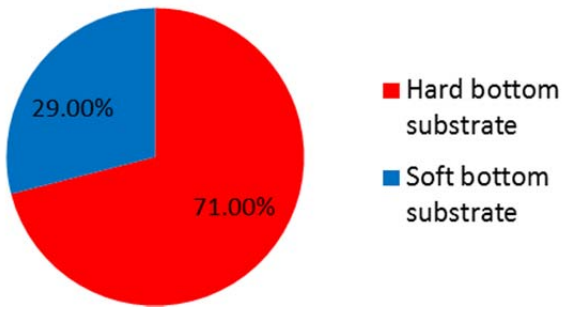


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-03. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-03

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-03 was predominately hard bottom (71%) consisting of rock pavement, boulders and rock slabs.

Bare rock substrate without biota covered 38.51% of the bottom and bare soft bottom was 28.58% (Fig. 2, Table 2). Benthic macro-biota covered 32.9% of the bottom and consisted of 9.93% non-coral Cnidaria (hydroids), 9.74% Porifera, 2.62% Antipatharia, 0.09% Alcyonacea ("gorgonacea"), and 5.1% algae. There was no hard coral.

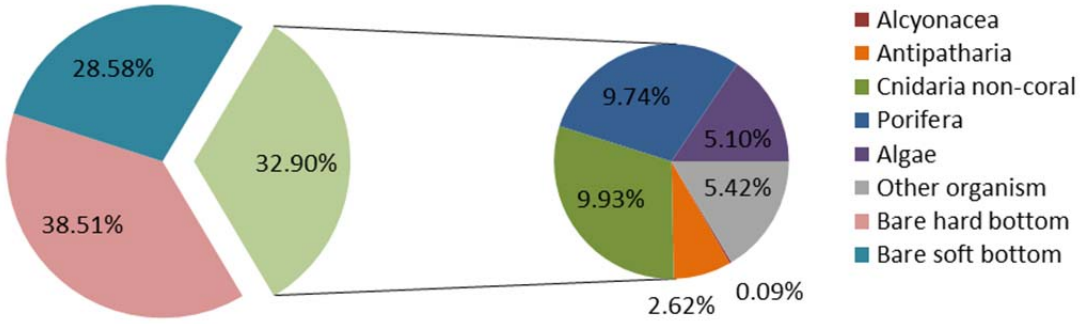


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-03. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-03.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**212**	**9.74%**
Porifera	**212**	**9.74%**
Callyspongia sp.	2	0.09%
Chondrosia sp.	3	0.14%
Chondrosia sp.- lobate gray	7	0.32%
Clathria sp.	2	0.09%
Demospongiae	29	1.33%
Demospongiae- ze tan starlet	7	0.32%
Diplastrella sp.	6	0.28%
Ircinia campana	6	0.28%
Ircinia sp.	26	1.19%
Ircinia strobilina	1	0.05%
Mycale sp.	3	0.14%
Spirastrellidae	120	5.51%
Cnidaria non-coral	**216**	**9.93%**
Cnidaria non-coral	**216**	**9.93%**
Hydroidolina	216	9.93%
Antipatharia	**57**	**2.62%**
Antipatharia	**57**	**2.62%**

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-03

Antipatharia	2	0.09%
Antipathes sp. A	11	0.51%
Stichopathes lutkeni	29	1.33%
Tanacetipathes hirta	15	0.69%
Algae	**111**	**5.10%**
Algae	**111**	**5.10%**
Corallinales/crustose coralline	46	2.11%
Phaeophyta	2	0.09%
Rhodophyta	63	2.90%
Alcyonacea	**2**	**0.09%**
Alcyonacea	**2**	**0.09%**
Diodogorgia sp.	1	0.05%
Gorgonacea	1	0.05%
Other organism	**118**	**5.42%**
Annelida	**26**	**1.19%**
Filograna sp.	24	1.10%
Serpulidae	2	0.09%
Arthropoda	**3**	**0.14%**
Panulirus argus	3	0.14%
Bryozoa	**12**	**0.55%**
Schizoporella sp.	12	0.55%
Chordata	**12**	**0.55%**
Ascidiacea	3	0.14%
Didemnidae	5	0.23%
Fish	4	0.18%
Echinodermata	**4**	**0.18%**
Arbacia punctulata	2	0.09%
Eucidaris tribuloides	2	0.09%
Other organism	**61**	**2.80%**
Other organism	61	2.80%
Hard bottom substrate	**838**	**38.51%**
Hard bottom substrate	**838**	**38.51%**
Bare rock- pavement boulder ledge	775	35.62%
Bare rubble- rock	63	2.90%
Soft bottom substrate	**622**	**28.58%**
Soft bottom substrate	**622**	**28.58%**
Bare soft bottom substrate	622	28.58%
Grand Total	**2176**	**100.00%**

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-03

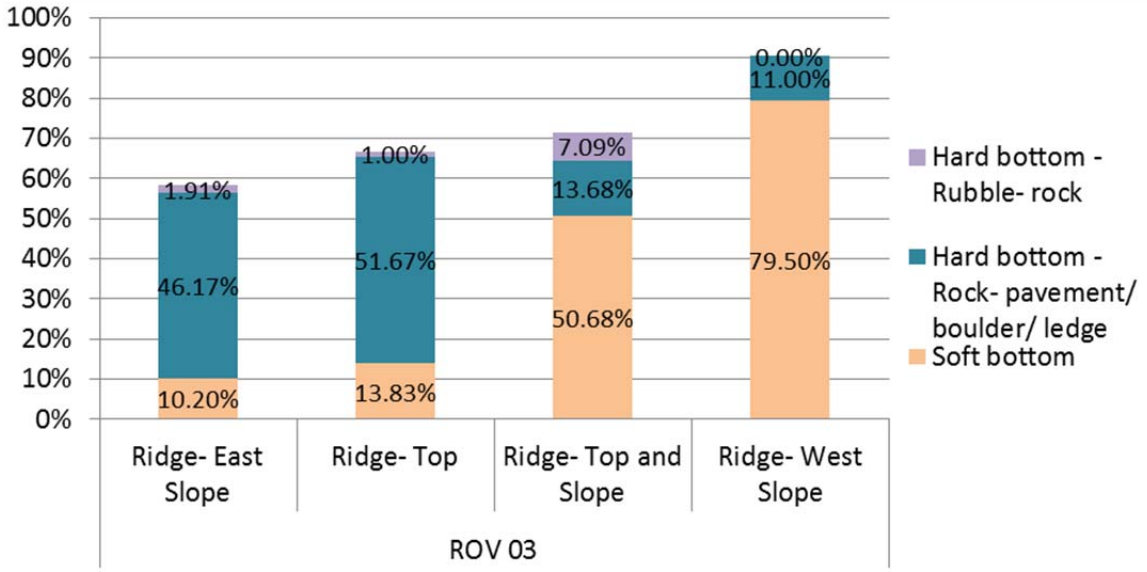


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-03.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The west slope had much greater cover of soft bottom; the ridge top and east slope were predominately bare hard bottom pavement (46-51%).

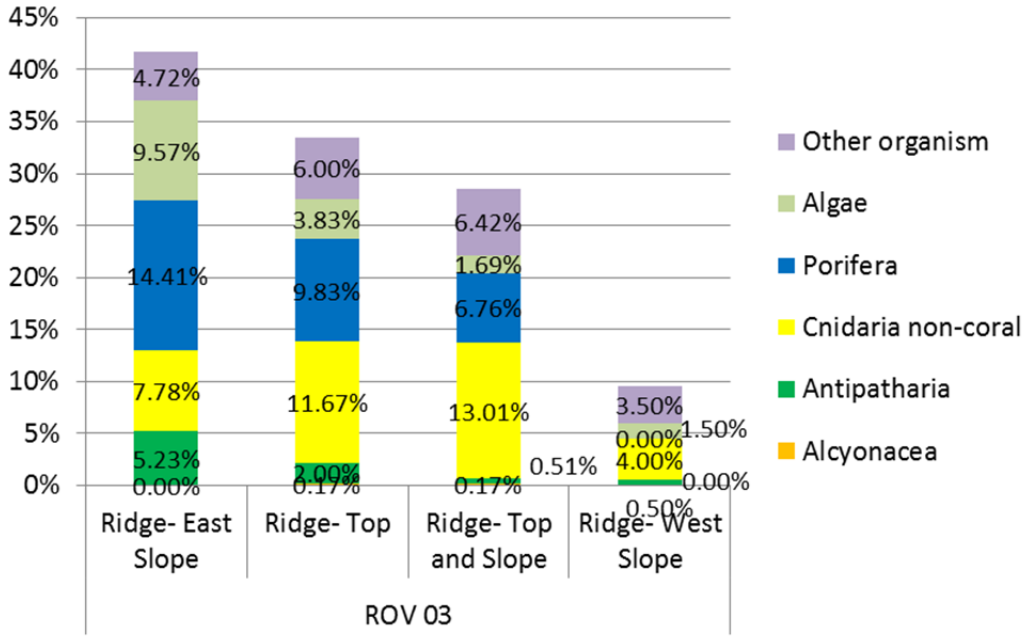


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-03.

Figure 4 shows the ridge top and east slope to be dominated by Porifera (9.8-14.4% cover), Cnidaria non-coral (hydroids; 7.7-11.6%), Antipatharia (2.0-5.2%), and algae (3.8-9.5%). The west slope which was predominately soft bottom had correspondingly lower cover of biota.

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-03

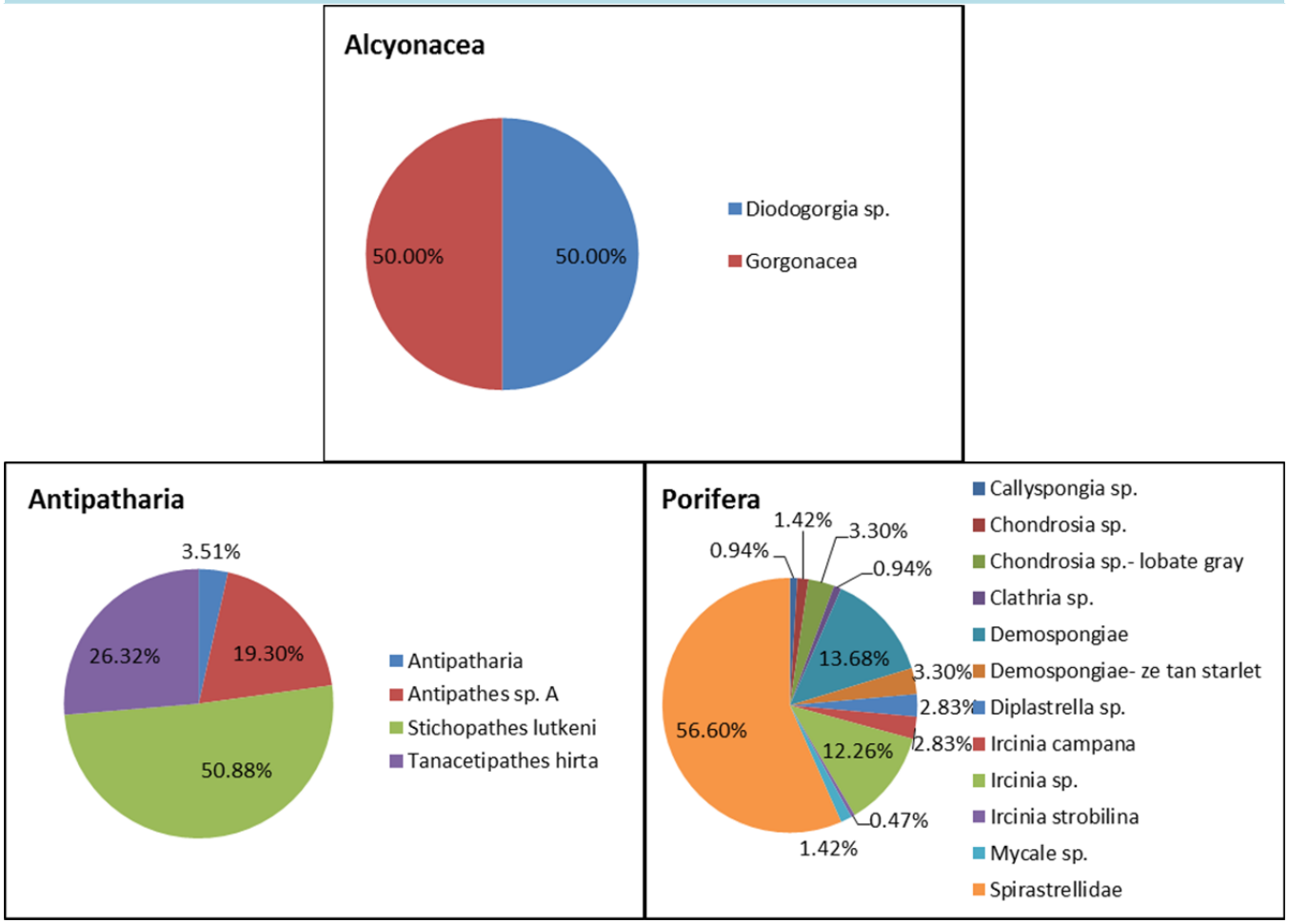


Figure 5. Diversity of corals and sponges at dive site ROV 12-03; CPCe analysis showing percent of total for each taxa category. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Porifera are Demospongiae.

Corals consisted of two taxa of Alcyonacea (gorgonacea) and Antipatharia which were dominated by the wire coral *Stichopathes lutkeni* (50.8% of the total Antipatharia) and the bottle brush *Tanacetipathes hirta* (26.3%). Sponges were quite diverse. There were 12 taxa of Porifera which were dominated by *Ircinia* spp. and encrusting Spirastrellidae (56.6% of the total Porifera).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 48 taxa of fish were identified from dive ROV 3 for a total density of 2072 individuals/km (Table 3). These were dominated by Vermilion snapper (1189/km), tomtate (621), and wrasse (39.5). Managed species included vermilion snapper, red porgy (3.3), scamp (2.4), gag grouper (0.9), red snapper (0.2), snowy grouper (0.2), and amberjack (0.7).

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-03

Table 3. Density of fish for all transects at dive site ROV 12-03 (number individuals/km).

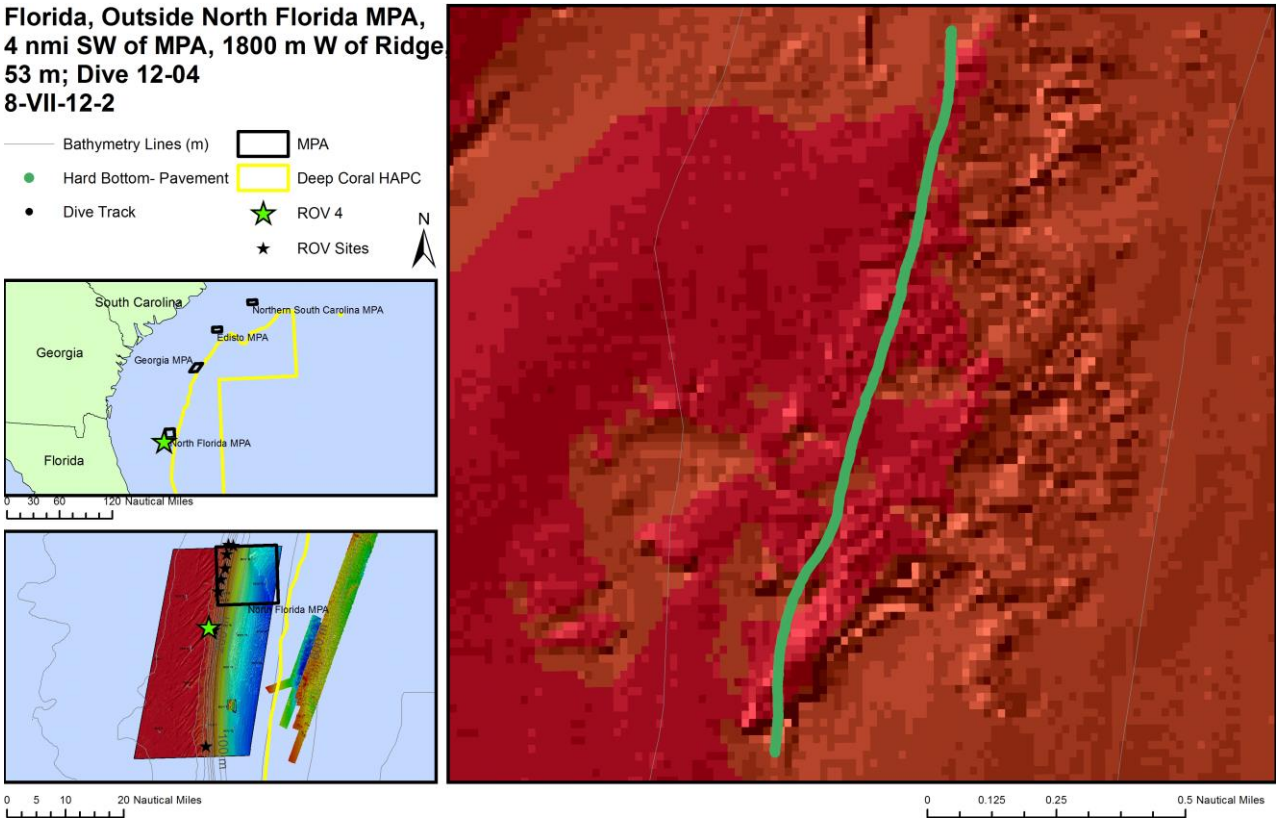
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus sp.	doctorfish	1	5.74	0.2
Balistes capriscus	grey triggerfish	7	5.74	1.2
Balistes sp.	triggerfish	1	5.74	0.2
Balistes vetula	queen triggerfish	1	5.74	0.2
Bodianus pulchellus	spotfin hogfish	123	5.74	21.4
Calamus sp.	porgy	1	5.74	0.2
Canthigaster rostrata	sharpnose puffer	52	5.74	9.1
Centropristis ocyurus	bank sea bass	10	5.74	1.7
Chaeotodon sp.	butteflyfish	2	5.74	0.3
Chaetodon ocellatus	spotfin butterflyfish	15	5.74	2.6
Chaetodon sedentarius	reef butterflyfish	163	5.74	28.4
Chromis enchrysurus	yellowtail reeffish	207	5.74	36.1
Chromis insolatus	sunshinefish	9	5.74	1.6
Chromis scotti	purple reeffish	116	5.74	20.2
Chromis sp.	damselfish	77	5.74	13.4
Epinephelus niveatus	snowy grouper	1	5.74	0.2
Equetus umbrosus	cubbyu	13	5.74	2.3
Haemulon aurolineatum	tomtate	3569	5.74	621.8
Haemulon striatum	striped grunt	81	5.74	14.1
Halichoeres garnoti	yellowhead wrasse	2	5.74	0.3
Halichoeres sp.	wrasse	227	5.74	39.5
Holacanthus bermudensis	blue angelfish	101	5.74	17.6
Holacanthus sp.	angelfish	1	5.74	0.2
Holocentridae	squirrelfish/soldierfish	1	5.74	0.2
Holocentrus sp.	squirrelfish	51	5.74	8.9
Lachnolaimus maximus	hogfish	1	5.74	0.2
Lactophrys sp.	cowfish	8	5.74	1.4
Lactophrys trigonus	trunkfish	1	5.74	0.2
Liopropoma eukrines	wrasse bass	1	5.74	0.2
Lutjanus campechanus	red snapper	1	5.74	0.2
Lutjanus griseus	grey snapper	3	5.74	0.5
Lutjanus sp.	snapper	1	5.74	0.2
Mycteroperca microlepis	gag grouper	5	5.74	0.9
Mycteroperca phenax	scamp	14	5.74	2.4
Myripristis jacobus	blackbar soldierfish	61	5.74	10.6
Pagrus pagrus	red porgy	19	5.74	3.3
Paranthias furcifer	creole-fish	4	5.74	0.7
Pomacanthus paru	french angelfish	1	5.74	0.2
Priacanthus arenatus	bigeye	3	5.74	0.5

Dive Site: Florida, Inside North Florida MPA, West Ridge, 60 m; Dive 12-03

Prognathodes aya	bank butterflyfish	14	5.74	2.4
Pterois volitans	lionfish	26	5.74	4.5
Rhomboplites aurorubens	vermilion snapper	6828	5.74	1189.5
Rypticus sp.	soapfish	1	5.74	0.2
Seriola sp.	amberjack	4	5.74	0.7
Serranus annularis	orangeback bass	1	5.74	0.2
Serranus phoebe	tattler	39	5.74	6.8
Sparidae	porgy	2	5.74	0.3
Stegastes partitus	bicolor damselfish	27	5.74	4.7
Total		11897		2072.6

Dive Site: Florida, Outside North Florida MPA, 4 nmi SW of MPA, 1800 m W of Ridge, 53 m; Dive 12-04

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	USWTR Bathy with ROV (Navy)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	No Sensors Used
Date of Dive:	7/8/2012
Specimens:	
Digital Photos:	15
DVD:	1
Hard Drive:	2

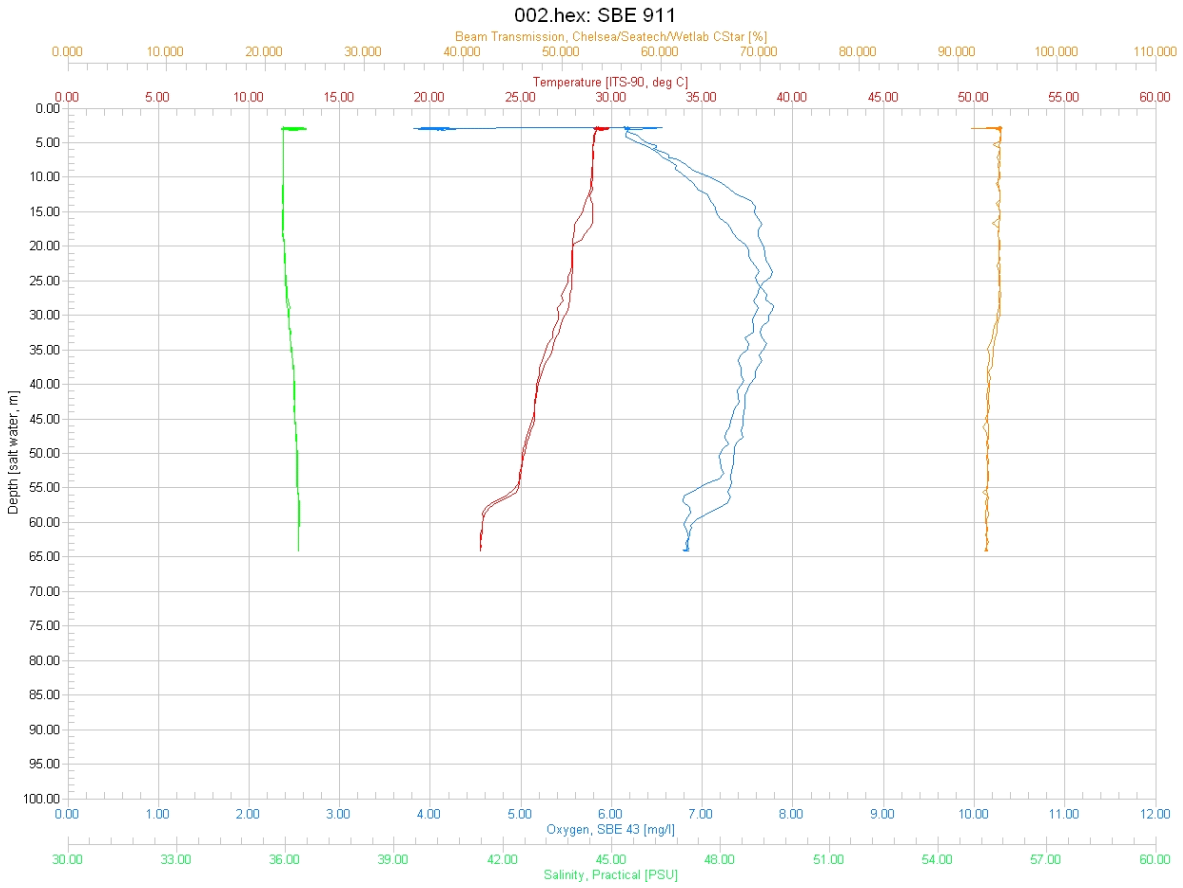
Dive Site: Florida, Outside North Florida MPA, 4 nmi SW of MPA, 1800 m W of Ridge, 53 m; Dive 12-04

Dive Data:

Minimum Bottom Depth (m):	52	**Total Transect Length (km):**	2.838
Maximum Bottom Depth (m):	54	**Surface Current (kn):**	2.8
On Bottom (Time- GMT):	10:05	**On Bottom (Lat/Long):**	30.25°N; -80.27°W
Off Bottom (Time- GMT):	10:45	**Off Bottom (Lat/Long):**	30.27°N; -80.26°W
Physical (bottom); Temp (°C):	24.00	**Salinity:** 36.20 **Visibility (ft):** 30	**Current (kn):** 1

Physical Environment:

Distance from Dive Site(km): 19.57



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (64 m): temperature- 22, salinity- 36.2, and dissolved oxygen- 6.8. Surface temperature was 28.5 and there was a thermocline near 55 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 25 m. Visibility was estimated at 30 ft from the ROV video.

Dive Site: Florida, Outside North Florida MPA, 4 nmi SW of MPA, 1800 m W of Ridge, 53 m; Dive 12-04

Dive Imagery:

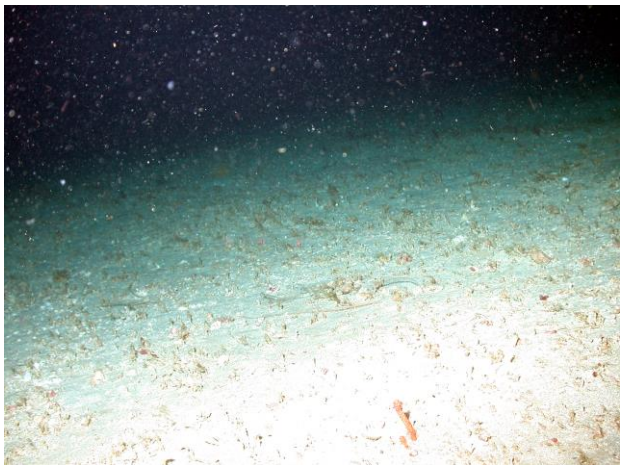


Figure 1: -50.6 m
Soft bottom habitat with human debris (fishing line).

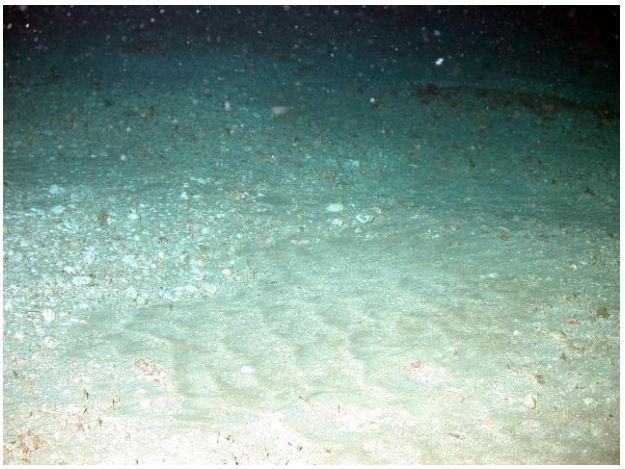


Figure 2: -50.1 m
Soft bottom habitat.

Dive Site: Florida, Outside North Florida MPA, 4 nmi SW of MPA, 1800 m W of Ridge, 53 m; Dive 12-04

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 4, Site #- 8-VII-12-2. Target Site – outside and south of North Florida MPA; 60 m. ROV survey outside MPA site; ground truth Navy multibeam sonar of site. Conduct video/photo transect S to N, west of main ledge.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current approx. 2 kn. Difficulty station keeping; drifting N at 1 kn; pulled off bottom during transect.

Site Description/Habitat/Biota:
West of main ridge and on west side of multibeam feature. Dive track 90-120 m west of plotted transect line; depth range 52-54 m. Flat, soft bottom with cobble and sand; patchy rock pavement with sediment veneer, sparse exposed bedrock, 20-50 cm relief, some to 1.5 m, patchy small boulders and cobble.

Dominant Benthic Biota: Antipathidae- Stichopathes, Gorgonacea- purple Plexauridae, Hydroida; Demospongiae- *Ircinia campana*.
Fish: tattler, grey triggerfish, reef butterfly, squirrelfish.

Dive Site: Florida, Outside North Florida MPA, 4 nmi SW of MPA, 1800 m W of Ridge, 53 m; Dive 12-04

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-04 was conducted outside and south of the MPA. The transect was along the western edge of the main ridge apparent in the multibeam sonar. The ROV had difficulty station keeping due to the current and resulted in poor photos and video. Only one habitat zone was noted which was Hard Bottom Pavement. Table 1 describes the habitat characteristics of each transect based on habitat zone; relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This dive site was primarily low relief and low rugosity, rock pavement with cobble and soft bottom; 52-53 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-04. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 4	Florida, Outside North Florida MPA, 4 nmi SW of MPA, 1800 m W of Ridge, 53 m; Dive 12-04				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	1800 m west of main west ridge, only 6 usable images difficulty station keeping, fathometer intermittent, unsure of depth : 52-53m pavement w sediment, cobble, soft bottom sand with ripples, <30 cm relief,				
	Hard Bottom- Pavement	On Reef	LRu	LR	PF

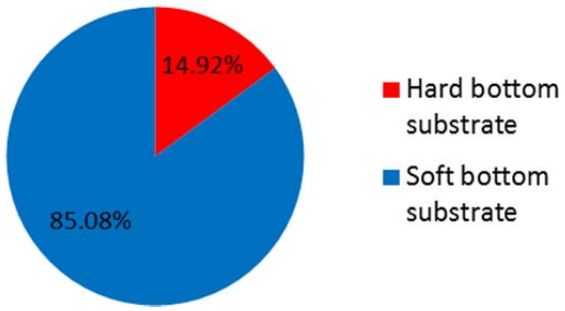


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-04. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-04 was predominately soft bottom (85.08%).

Bare rock substrate without biota covered 14.92% of the bottom and bare soft bottom was 80.65% (Fig. 2, Table 2). Benthic macro-biota covered 4.44% of the bottom and consisted of primarily of motile invertebrates. No hard coral, Hydrozoa, Porifera, Antipatharia, or Alcyonacea (Gorgonacea) were in the photo transects but a few *Stichopathes lutkeni* (Antipatharia), purple Plexauridae (gorgonacea), and *Ircinia campana* (Demospongiae) were noted in the video.

Dive Site: Florida, Outside North Florida MPA, 4 nmi SW of MPA, 1800 m W of Ridge, 53 m; Dive 12-04

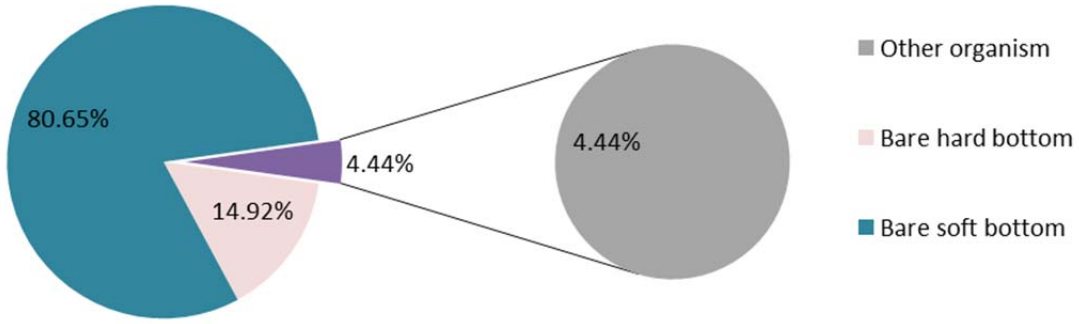


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-04.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-04.

Benthic macro-biota and substrate types	Point Count	% Cover
Other organism	**11**	**4.44%**
Annelida	**5**	**2.02%**
Annelida	5	2.02%
Chordata	**1**	**0.40%**
Fish	1	0.40%
Echinodermata	**5**	**2.02%**
Echinoidea	5	2.02%
Hard bottom substrate	**37**	**14.92%**
Hard bottom substrate	**37**	**14.92%**
Bare rock- pavement boulder ledge	22	8.87%
Bare rubble- rock	15	6.05%
Soft bottom substrate	**200**	**80.65%**
Soft bottom substrate	**200**	**80.65%**
Bare soft bottom substrate	200	80.65%
Grand Total	**248**	**100.00%**

Dive Site: Florida, Outside North Florida MPA, 4 nmi SW of MPA, 1800 m W of Ridge, 53 m; Dive 12-04

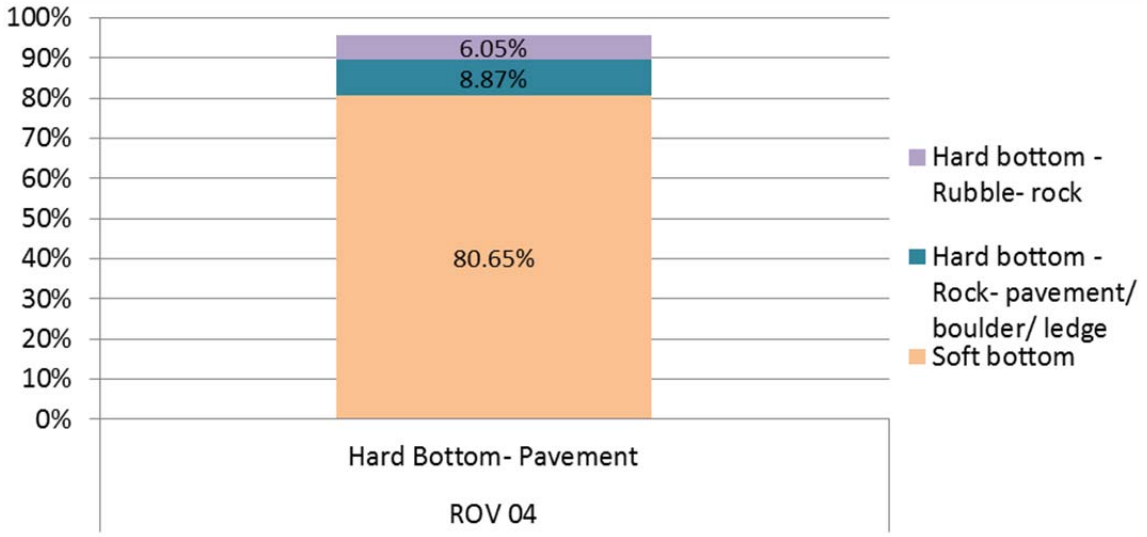


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-04.

Figure 3 shows the percent cover of each bare substrate type for the one habitat zone at the dive site. It was predominately bare soft bottom (80.65% cover), with 8.8% rock pavement and 6.0% rubble bottom. Figure 4 shows the cover of biota for the single habitat zone found at the site.

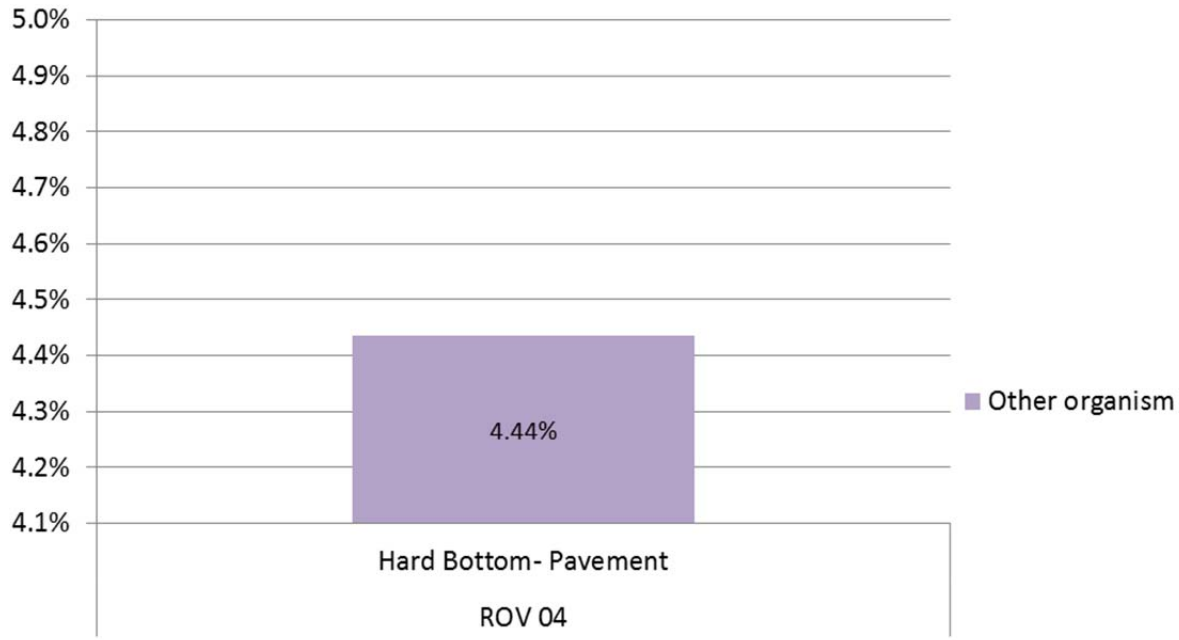


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-04.

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 10-15 m. A total of 9 taxa of fish were identified from dive ROV 4 for a total density of 10.2 individuals/km (Table 3). These were dominated by

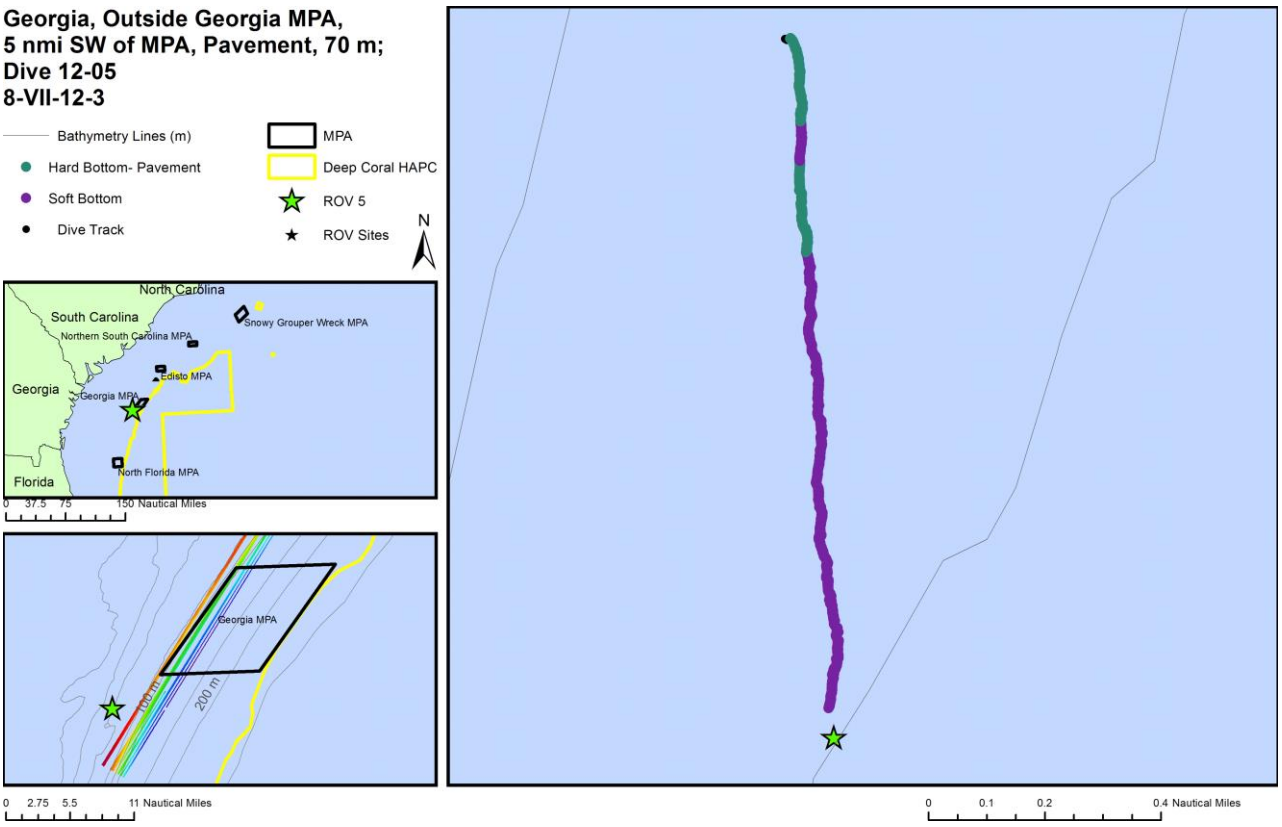
yellowtail reeffish (4.6/km), vermilion snapper (1.4), and tattler (1.1). Managed species included scamp (0.4) and vermilions.

Table 3. Density of fish for all transects at dive site ROV 12-04 (number individuals/km).

Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Balistes capriscus	grey triggerfish	2	2.84	0.7
Balistes vetula	queen triggerfish	1	2.84	0.4
Chaetodon sedentarius	reef butterflyfish	2	2.84	0.7
Chromis enchrysurus	yellowtail reeffish	13	2.84	4.6
Holocentrus sp.	squirrelfish	2	2.84	0.7
Mycteroperca phenax	scamp	1	2.84	0.4
Rhomboplites aurorubens	vermilion snapper	4	2.84	1.4
Serranus phoebe	tattler	3	2.84	1.1
Stegastes partitus	bicolor damselfish	1	2.84	0.4
Total		29		10.2

Dive Site: Georgia, Outside Georgia MPA, 5 nmi SW of MPA, Pavement, 70 m; Dive 12-05

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	None Available
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	No Sensors Used
Date of Dive:	7/8/2012
Specimens:	
Digital Photos:	73
DVD:	2
Hard Drive:	1

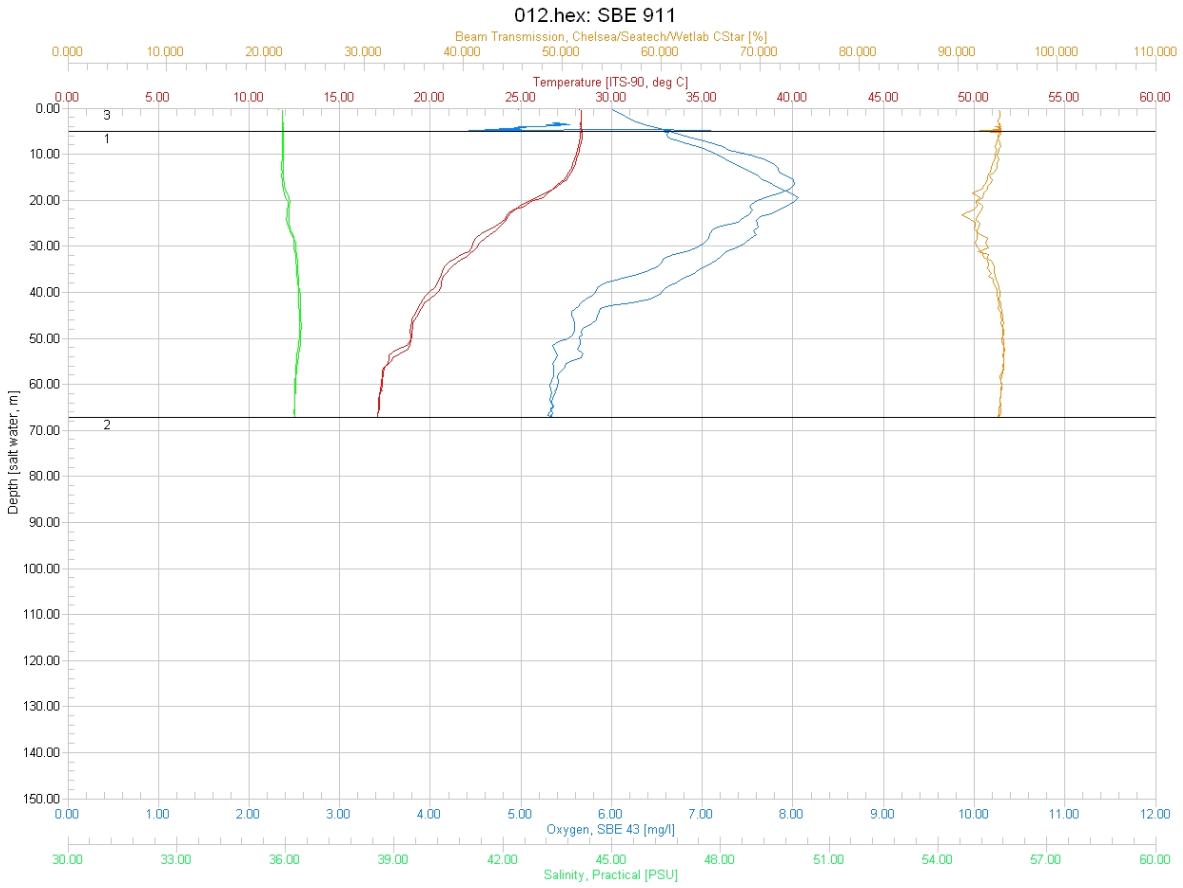
Dive Site: Georgia, Outside Georgia MPA, 5 nmi SW of MPA, Pavement, 70 m; Dive 12-05

Dive Data:

Minimum Bottom Depth (m):	62	**Total Transect Length (km):**	2.989
Maximum Bottom Depth (m):	72	**Surface Current (kn):**	1.2
On Bottom (Time- GMT):	17:10	**On Bottom (Lat/Long):**	31.52°N; -79.73°W
Off Bottom (Time- GMT):	18:20	**Off Bottom (Lat/Long):**	31.54°N; -79.73°W
Physical (bottom); Temp (°C):	17.00	**Salinity:** 36.10 **Visibility (ft):** 10	**Current (kn):** 1.2

Physical Environment:

Distance from Dive Site(km): 41.27



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (68 m): temperature- 17, salinity- 36, and dissolved oxygen- 5.2. Surface temperature was 27.88 and there was a thermocline near 20-50 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 20 m. Visibility was estimated at 10 ft from the ROV video.

Dive Site: Georgia, Outside Georgia MPA, 5 nmi SW of MPA, Pavement, 70 m; Dive 12-05

Dive Imagery:

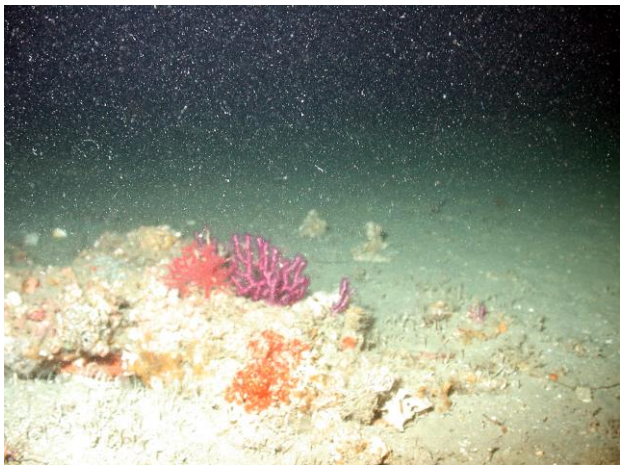


Figure 1: -64.1 m
Gorgonians on small rock outcrop.

Figure 2: -69.3 m
Luidia starfish on soft bottom.

Figure 3: -67.2 m
Bigeye in burrow on hard bottom.

Figure 4: -70.1 m
Flounder on soft bottom and pavement habitat.

Dive Site: Georgia, Outside Georgia MPA, 5 nmi SW of MPA, Pavement, 70 m; Dive 12-05

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 5, Site #- 8-VII-12-3. Target Site – outside and SW of Georgia MPA; 70 m. ROV survey outside MPA; no multibeam data. Conduct video/photo transect S-N along low relief features.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 1.2 kn to NE. Good station keeping, stayed on transect line. No multibeam or bathymetric data.

Site Description/Habitat/Biota:
Mostly soft sediment, sand with sparse shell hash, asymmetrical ripples, sparse bioturbation. Patches of hard bottom, rock pavement, low relief rock outcrops, 10-20 cm boulders; 62-72 m; hard bottom at 62-64 m.

Dominant Benthic Biota: Asteroidea- *Luidia*; Holothuroidea; Cidaroidea; Pennatulacea-*Virgularia*; Cerianthidae; Antipathidae- *Stichopathes*, *Tanacetipathes*; Demospongiae (several spp.)- *Ircinia campana*; Polychaeta- *Filograna*; Ascidiacea- Didemnidae.
Fish: flounder, tonguefish, lizardfish, batfish, bank seabass, sea robin, bigeye, tattler, red porgy, spotfin butterfly, bank butterfly, porcupine fish, numerous lionfish (7).

Dive Site: Georgia, Outside Georgia MPA, 5 nmi SW of MPA, Pavement, 70 m; Dive 12-05

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-05 conducted a survey 5 nmi SW of the Georgia MPA. The south to north transect was conducted without a multibeam sonar map. Dive transects were divided into two habitat zones: Hard Bottom- Pavement and Soft Bottom. Table 1 describes the habitat characteristics of each transect based on habitat zone; relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This dive site was primarily low relief rock pavement, pavement with sediment veneer, and sediment with sparse rubble and shell hash; 59-72 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-05. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 5	Georgia, Outside Georgia MPA, 5 nmi SW of MPA, Pavement, 70 m; Dive 12-05				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	No MB or bathy: soft bottom 70-71 m, sparse rubble and shell hash				
	Soft Bottom	Off Reef	LRu	LR	SRB
Transect 2	62-68 m HB pvmt, sed veneer, 20-30 cm relief				
	Hard Bottom- Pavement	On Reef	LRu	LR	PF
Transect 3	SB- 64 m				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 4	62 pvmt with sed veneer and SB.				
	Hard Bottom- Pavement	On Reef	LRu	LR	PF

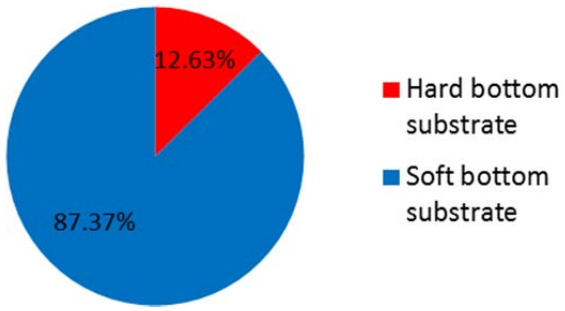


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-05. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Dive Site: Georgia, Outside Georgia MPA, 5 nmi SW of MPA, Pavement, 70 m; Dive 12-05

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-05 was predominately soft bottom (87.37%).

Bare rock substrate without biota covered 10.94% of the bottom and bare soft bottom was 83.34% (Fig. 2, Table 2). Benthic macro-biota covered 5.71% of the bottom and consisted of 0.42% Porifera, 0.48% Antipatharia, 0.18% Alcyonacea ("gorgonacea"), and 4.63% other organisms. There was no hard coral.

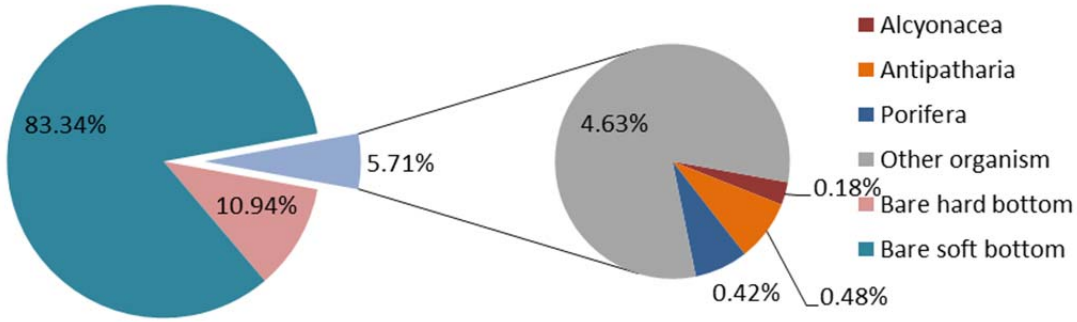


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-05. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-05.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**7**	**0.42%**
Porifera	**7**	**0.42%**
Demospongiae	6	0.36%
Ircinia campana	1	0.06%
Antipatharia	**8**	**0.48%**
Antipatharia	**8**	**0.48%**
Stichopathes lutkeni	8	0.48%
Alcyonacea	**3**	**0.18%**
Alcyonacea	**3**	**0.18%**
Diodogorgia sp.	2	0.12%
Swiftia exerta	1	0.06%
Other organism	**77**	**4.63%**
Annelida	**74**	**4.45%**
Annelida	31	1.86%
Sabellidae	43	2.59%
Chordata	**1**	**0.06%**
Didemnidae	1	0.06%
Other organism	**2**	**0.12%**

Dive Site: Georgia, Outside Georgia MPA, 5 nmi SW of MPA, Pavement, 70 m; Dive 12-05

Other organism	2	0.12%
Hard bottom substrate	**182**	**10.94%**
Hard bottom substrate	**182**	**10.94%**
Bare rock- pavement boulder ledge	151	9.08%
Bare rubble- rock	31	1.86%
Soft bottom substrate	**1386**	**83.34%**
Soft bottom substrate	**1386**	**83.34%**
Bare soft bottom substrate	1386	83.34%
Grand Total	**1663**	**100.00%**

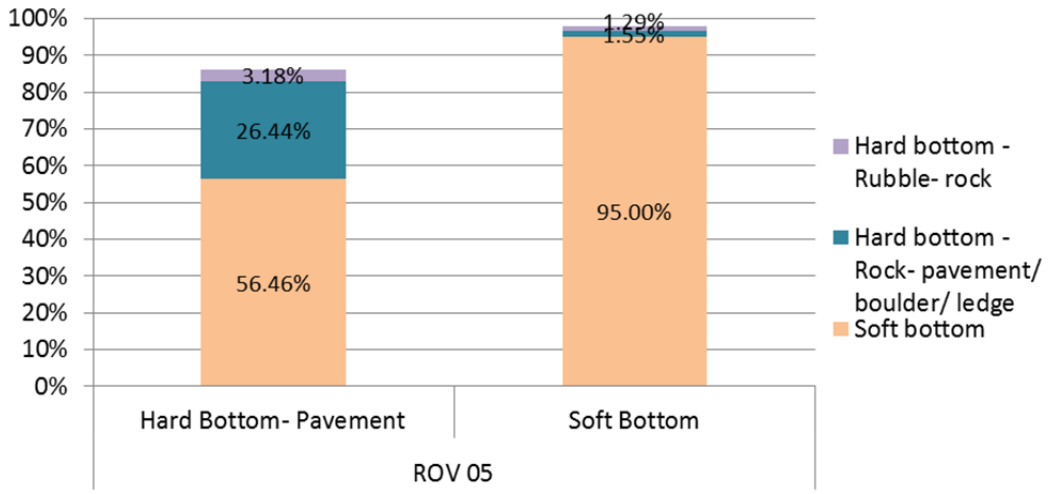


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-05.

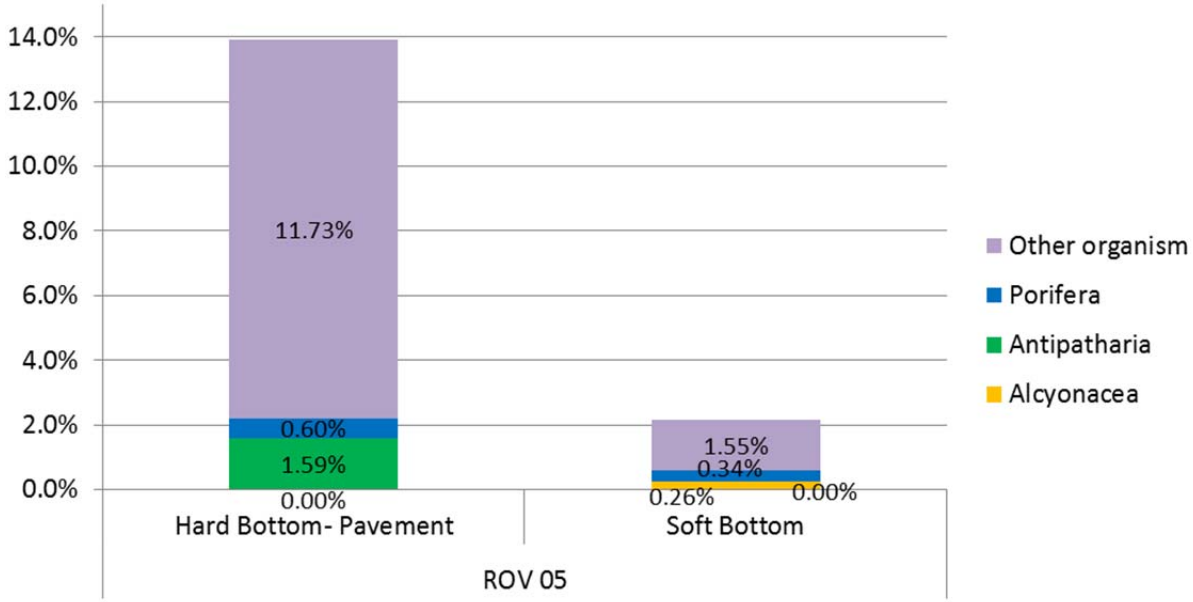


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-05.

Dive Site: Georgia, Outside Georgia MPA, 5 nmi SW of MPA, Pavement, 70 m; Dive 12-05

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The pavement zone appeared to be mostly soft sediment (56.4% cover) but evidence of emergent sessile organisms indicate that this was primarily a thin veneer of sediment over rock pavement. Figure 4 shows that the pavement zone had about 14% cover of biota consisting of 1.5% cover of Antipatharia, 0.6% Porifera and 11.7% other organisms (annelids and tunicates).

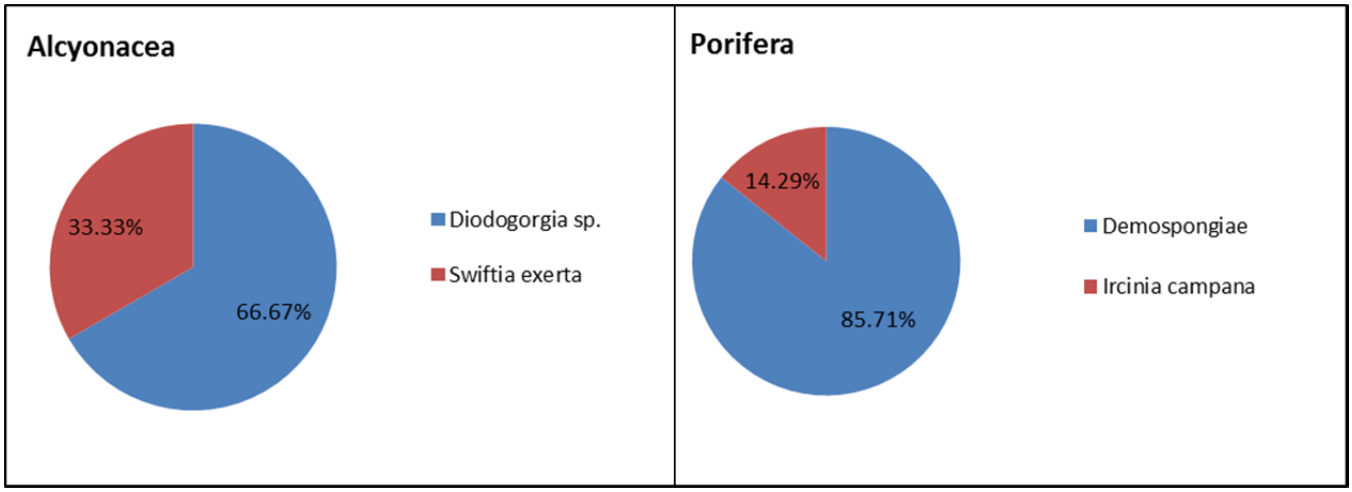


Figure 5. Diversity of corals and sponges at dive site ROV 12-05; CPCe analysis showing percent of total for each taxa category. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Porifera are Demospongiae.

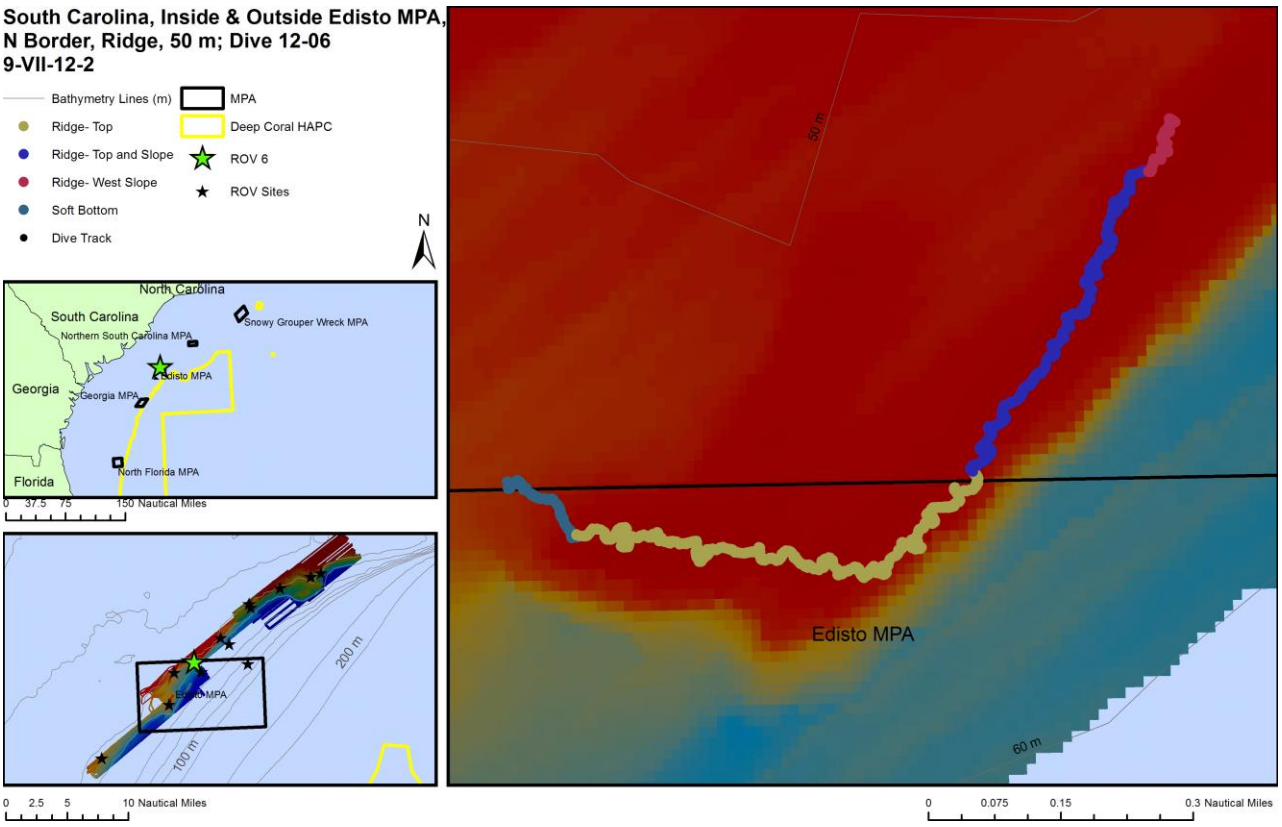
No hard coral was present at the dive site. Other corals included one species of Antipatharia (*Stichopathes lutkeni*), and two species of gorgonacea (*Diodogorgia* sp., 66.6% of the total Alcyonacea; *Swiftia exerta*, 33.3%). Numerous small unidentified taxa of Demospongiae were present (85.7% of the total Porifera) along with *Ircinia campana.*

Fish Data Analysis:

Dive 5 was the only dive we did off Georgia; the dive was short and mostly sand so we did not analyze the fish as we were focusing on hardbottom habitat.

Dive Site: South Carolina, Inside & Outside Edisto MPA, N Border, Ridge, 50 m; Dive 12-06

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	ed1_wgs84 (Edisto1)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	No Sensors Used
Date of Dive:	7/9/2012
Specimens:	
Digital Photos:	253
DVD:	3
Hard Drive:	1

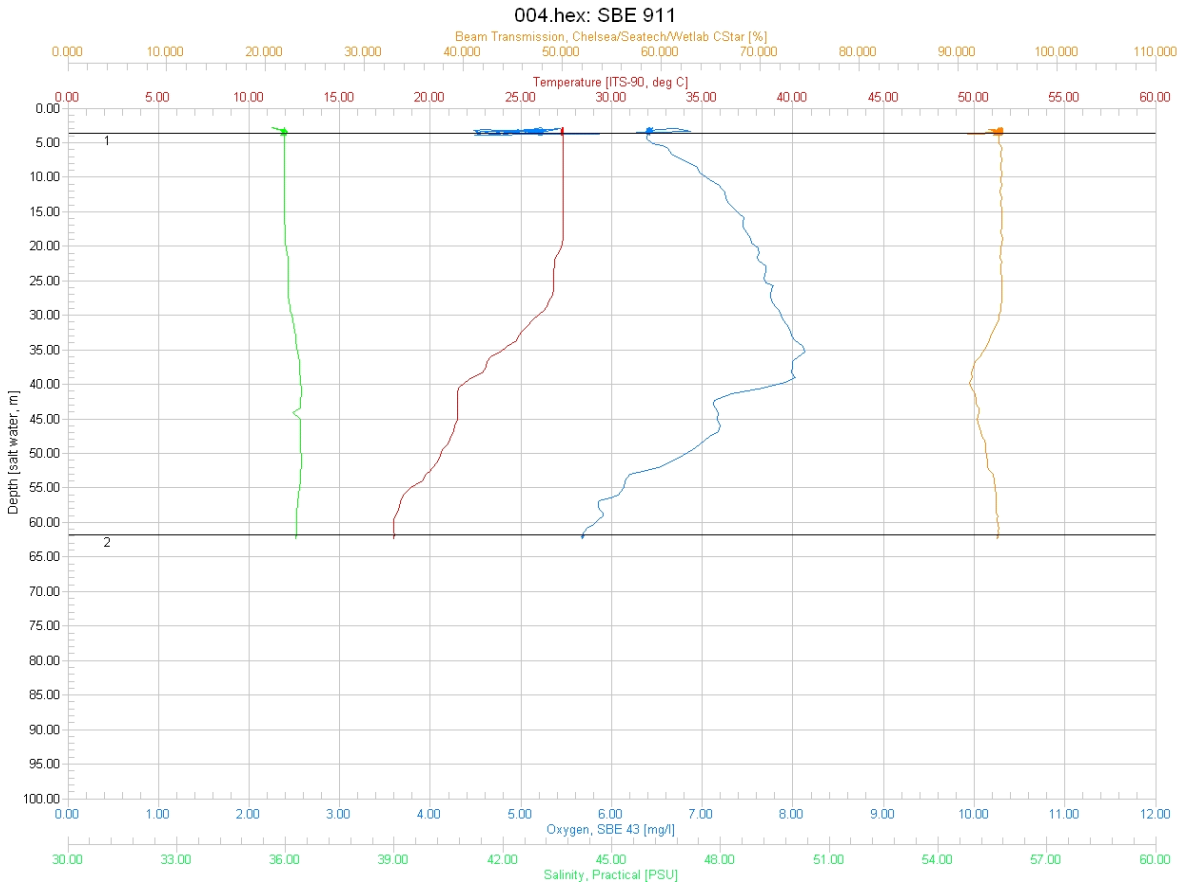
Dive Site: South Carolina, Inside & Outside Edisto MPA, N Border, Ridge, 50 m; Dive 12-06

Dive Data:

Minimum Bottom Depth (m):	47	**Total Transect Length (km):**	5.765
Maximum Bottom Depth (m):	51	**Surface Current (kn):**	1
On Bottom (Time- GMT):	7:49	**On Bottom (Lat/Long):**	32.4°N; -79.01°W
Off Bottom (Time- GMT):	10:28	**Off Bottom (Lat/Long):**	32.41°N; -79°W
Physical (bottom); Temp (°C):	20.00	**Salinity:** 36.10 **Visibility (ft):** 40	**Current (kn):** 0.25

Physical Environment:

Distance from Dive Site(km): 5.95



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (62 m): temperature- 18, salinity- 36.1, and dissolved oxygen- 5.8. Surface temperature was 27.33 and there was a thermocline near 30-40 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 35 m. Visibility was estimated at 40 ft from the ROV video.

Dive Site: South Carolina, Inside & Outside Edisto MPA, N Border, Ridge, 50 m; Dive 12-06

Dive Imagery:

Figure 1: -48.9 m
Bigeye and lionfish on hardbottom low relief outcrops.

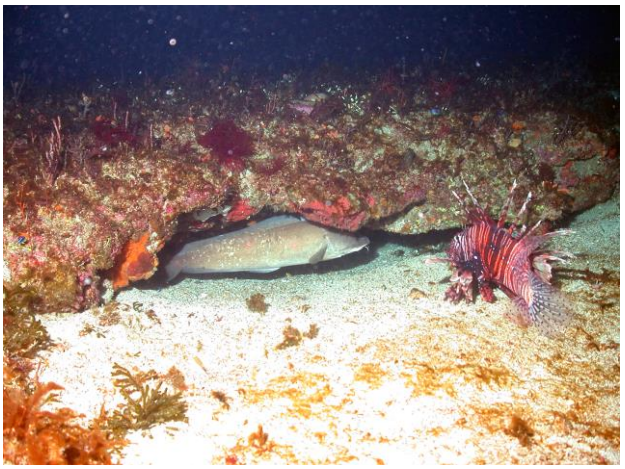


Figure 2: -48.5 m
Brotulid and lionfish on hardbottom low relief outcrops.

Figure 3: -48.5 m
Jackknife fish and lionfish on hardbottom low relief outcrops.

Figure 4: -50.8 m
Gorgonian on hard bottom low relief pavement.

Dive Site: South Carolina, Inside & Outside Edisto MPA, N Border, Ridge, 50 m; Dive 12-06

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 6, Site #- 9-VII-12-2. Target Site – outside South Carolina Edisto MPA, near north border; 55 m. ROV survey outside MPA; ground truth multibeam sonar of site. Conduct two video/photo transects on low relief pavement and along NE oriented ridge.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.5 kn to NE. Good station keeping, stayed on transect line. Trouble with digital still- unable to use manual w/ shutter priority. Used auto mode.

Site Description/Habitat/Biota:
Transect 1: Head east along border of MPA. Flat sediment, sand w/ dense Cyanophyta cover; areas of hard bottom, low relief rock pavement, exposed rock outcrops with 10-50 cm relief. Rock ledge 47 m top, 49.5 m base. Transect 2: Head NE parallel to ridge on multibeam map. All hard bottom. Rock pavement, rock outcrops 10-50 cm relief, some ledges 1 m. 80-100% rock cover on top of ridge; rock rubble and sediment along E base of ridge; 50% cover of rock boulders, 1 m relief, some 2 m relief, very rugose along west edge of ridge. Depth range 47-51 m.

Dominant Benthic Biota: Gorgonacea- purple plexaurid, *Diodogorgia*, *Titanideum frauenfeldii*, *Ellisella*, Leptogorgia; Antipatharia- *Stichopathes*; Demospongiae- *Ircinia campana*, tan cake sponge, Axinellida, many spp.; Hydroida; Annelida- *Filograna*; Echinoidea- *Clypeaster*; Decapoda- *Panulirus argus*; Ascidiacea- Didemnidae; Chlorophyta- *Ulva*?, leafy green, *Codium*; Rhodophyta- several spp., red blade; Phaeophyta- *Sargassum* (attached); Cyanophyta- mats on sediment and invertebrates.
Fish: yellow tail reeffish, reef butterfly, bank butterfly, tomtate, vermilion snapper, porgy (common), scamp (several), gag (few), graysby (common), spotfin hogfish, hogfish, scrawled cowfish, Brotulidae, wrasse bass, jackknife fish, blue angelfish, queen angelfish, rock beauty, blue spotted cornet fish, lionfish (common- 40).

Dive Site: South Carolina, Inside & Outside Edisto MPA, N Border, Ridge, 50 m; Dive 12-06

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-06 conducted a survey groundtruthing a multibeam sonar map both inside and outside the north border of Edisto MPA. A dogleg transect from SW to NE was made along the ridge which is evident in the multibeam sonar map. Dive transects were divided into four habitat zones: Ridge- Top, Ridge- Top and Slope, Ridge- West Slope and Soft Bottom. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This dive site was primarily low relief pavement and ledges on top of ridge, and low to moderate relief west slope with 1-2 m ledges; 44-51 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-06. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 6	South Carolina, Inside & Outside Edisto MPA, N Border, Ridge, 50 m; Dive 12-06				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	Very poor resolution MB, XS on NE -SW ridge: 50.5 m 100% sand- outside MPA				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 2	50.5 m 100% sand- inside MPA				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 3	47-51 m pvmt, <50 cm ledges outcrops, patchy rock and soft bottom, xs NE along ridge, 100% rock				
	Ridge- Top	On Reef	LRu	LR	RLF
Transect 4	Exiting MPA 50.0 m -47 m, on top of ledge, 100% hb pvmt, rubble, flat, larger ledges; 1-2 m				
	Ridge- Top and Slope	On Reef	LRu	MR	RLF
Transect 5	49-49.5 m 505 HB/SB, 50 cm relief pvmt				
	Ridge- West Slope	On Reef	LRu	LR	RLF

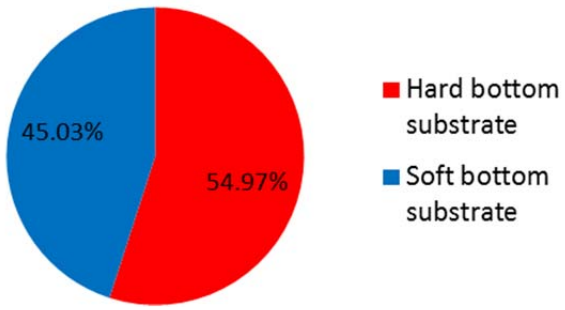


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-06. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Dive Site: South Carolina, Inside & Outside Edisto MPA, N Border, Ridge, 50 m; Dive 12-06

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-06 was a mix of hard bottom (54.97% cover) and soft bottom (45.03%).

Bare rock substrate without biota covered 10.16% of the bottom and bare soft bottom was 26.89% (Fig. 2, Table 2). Benthic macro-biota covered 62.95% of the bottom and consisted of 1.72% non-coral Cnidaria (Hydrozoa), 1.5% Porifera, 0.65% Antipatharia, 2.25% Alcyonacea ("gorgonacea"), but was dominated by algae (cyanobacteria- 37.4%, Phaeophyta- 6.0%, and Rhodophyta- 6.7%). There was no hard coral.

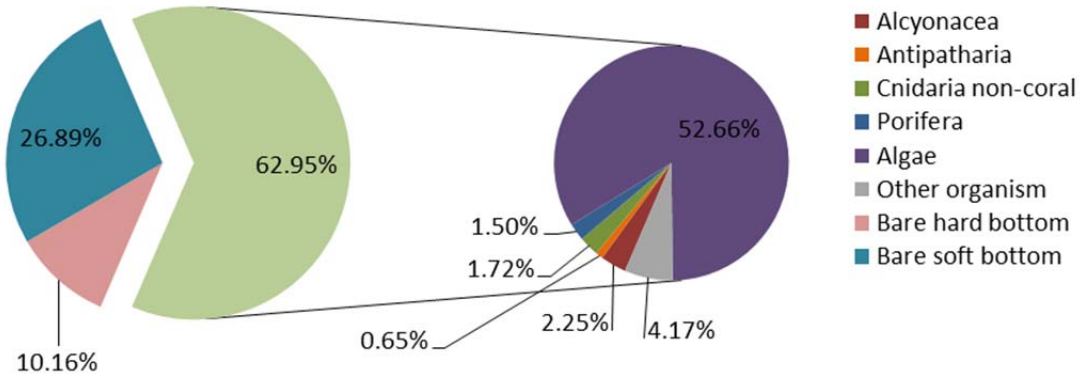


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-06. Non-scleractinian corals include Alcyonacea (primarily "gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida and Zoanthidea.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-06.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**60**	**1.50%**
Porifera	**60**	**1.50%**
Agelas sp.	4	0.10%
Astrophorida	2	0.05%
Cinachyra sp./Cinachyrella sp.	1	0.02%
Clathria sp.	1	0.02%
Demospongiae	33	0.82%
Demospongiae- ze tan starlet	9	0.22%
Ircinia campana	7	0.17%
Spirastrellidae	3	0.07%
Cnidaria non-coral	**69**	**1.72%**
Cnidaria non-coral	**69**	**1.72%**
Hydroidolina	68	1.70%
Zoanthidea	1	0.02%
Antipatharia	**26**	**0.65%**
Antipatharia	**26**	**0.65%**
Antipatharia	7	0.17%

Dive Site: South Carolina, Inside & Outside Edisto MPA, N Border, Ridge, 50 m; Dive 12-06

Antipathes sp. A	2	0.05%
Stichopathes lutkeni	16	0.40%
Tanacetipathes hirta	1	0.02%
Algae	**2109**	**52.66%**
Algae	**2109**	**52.66%**
Chlorophyta	29	0.72%
Corallinales/crustose coralline	70	1.75%
Cyanophyta	1498	37.40%
Phaeophyta	241	6.02%
Rhodophyta	271	6.77%
Alcyonacea	**90**	**2.25%**
Alcyonacea	**90**	**2.25%**
Alcyonacea	1	0.02%
Diodogorgia sp.	40	1.00%
Ellisella sp.	9	0.22%
Ellisellidae	9	0.22%
Gorgonacea	12	0.30%
Muricea sp.	8	0.20%
Pseudopterogorgia	1	0.02%
Swiftia exerta	3	0.07%
Titanideum frauenfeldii	7	0.17%
Other organism	**167**	**4.17%**
Annelida	**16**	**0.40%**
Filograna sp.	16	0.40%
Arthropoda	**1**	**0.02%**
Stenorhynchus seticornis	1	0.02%
Bryozoa	**2**	**0.05%**
Schizoporella sp.	2	0.05%
Chordata	**50**	**1.25%**
Ascidiacea	5	0.12%
Didemnidae	8	0.20%
Fish	37	0.92%
Natural detritus	**2**	**0.05%**
Natural detritus	2	0.05%
Other organism	**96**	**2.40%**
Other organism	96	2.40%
Hard bottom substrate	**407**	**10.16%**
Hard bottom substrate	**407**	**10.16%**
Bare rock- pavement boulder ledge	368	9.19%
Bare rubble- coral	1	0.02%
Bare rubble- rock	38	0.95%
Soft bottom substrate	**1077**	**26.89%**

Dive Site: South Carolina, Inside & Outside Edisto MPA, N Border, Ridge, 50 m; Dive 12-06

Soft bottom substrate	**1077**	**26.89%**
Bare soft bottom substrate	1077	26.89%
Grand Total	**4005**	**100.00%**

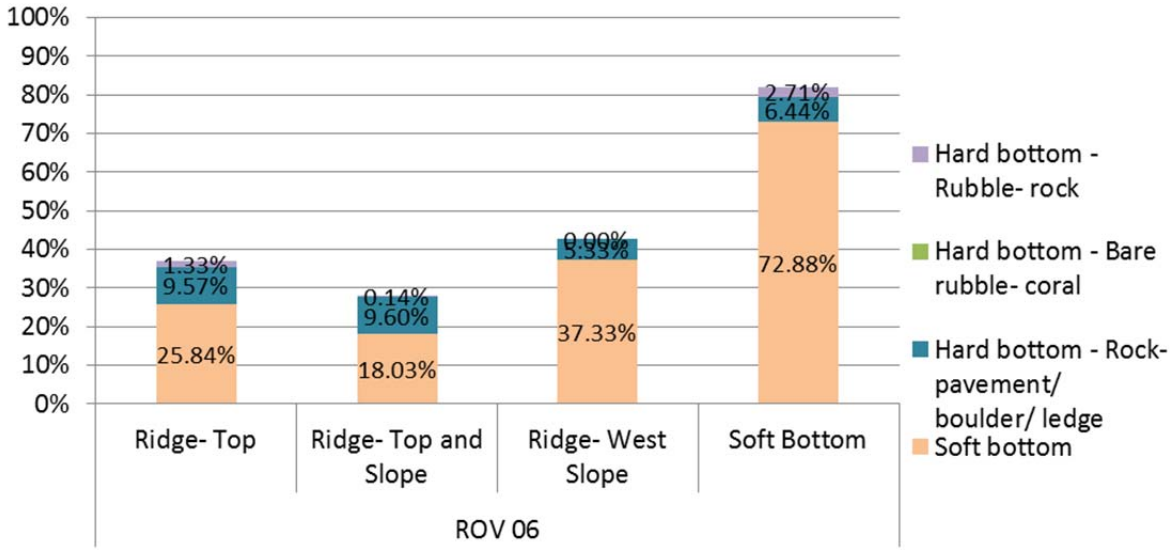


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-06.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The ridge top and slopes had about 30-40% cover of bare substrate. The ridge top had 25.8% bare soft bottom and the west slope had 37.3% cover of soft bottom. Figure 4 shows that the ridge top and slopes had between 57 and 72% cover of biota which was mainly dominated by algae (45.3-62.3%). There was little difference in the distribution of benthic biota either on top of the ridge or the slopes. The soft bottom habitat off the ridge had less than 20% cover of biota, also dominated by algae. Cyanobacteria (Cyanophyta) was present over much of the site.

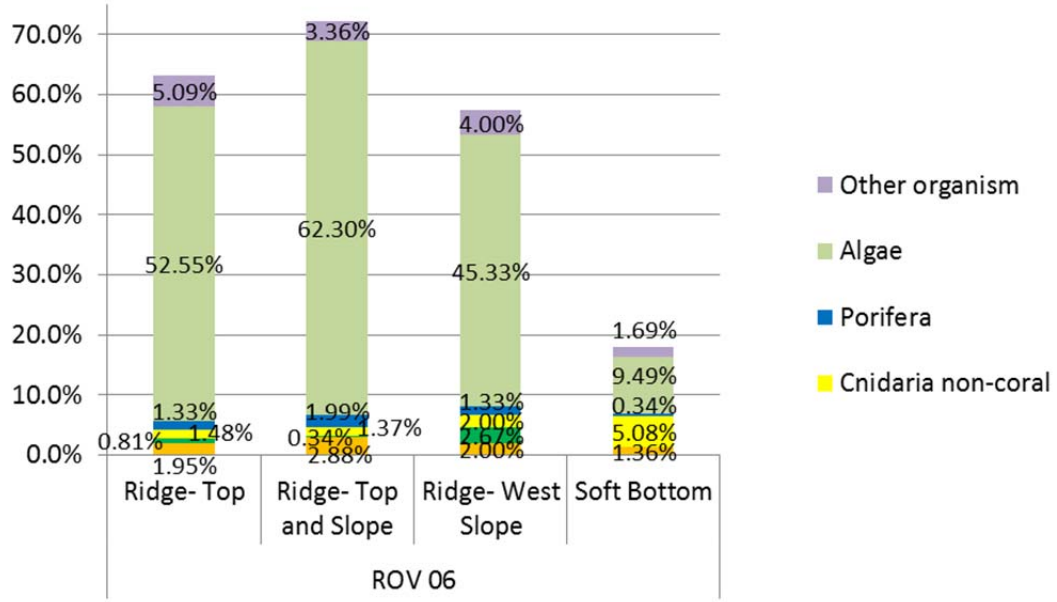


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-06.

Dive Site: South Carolina, Inside & Outside Edisto MPA, N Border, Ridge, 50 m; Dive 12-06

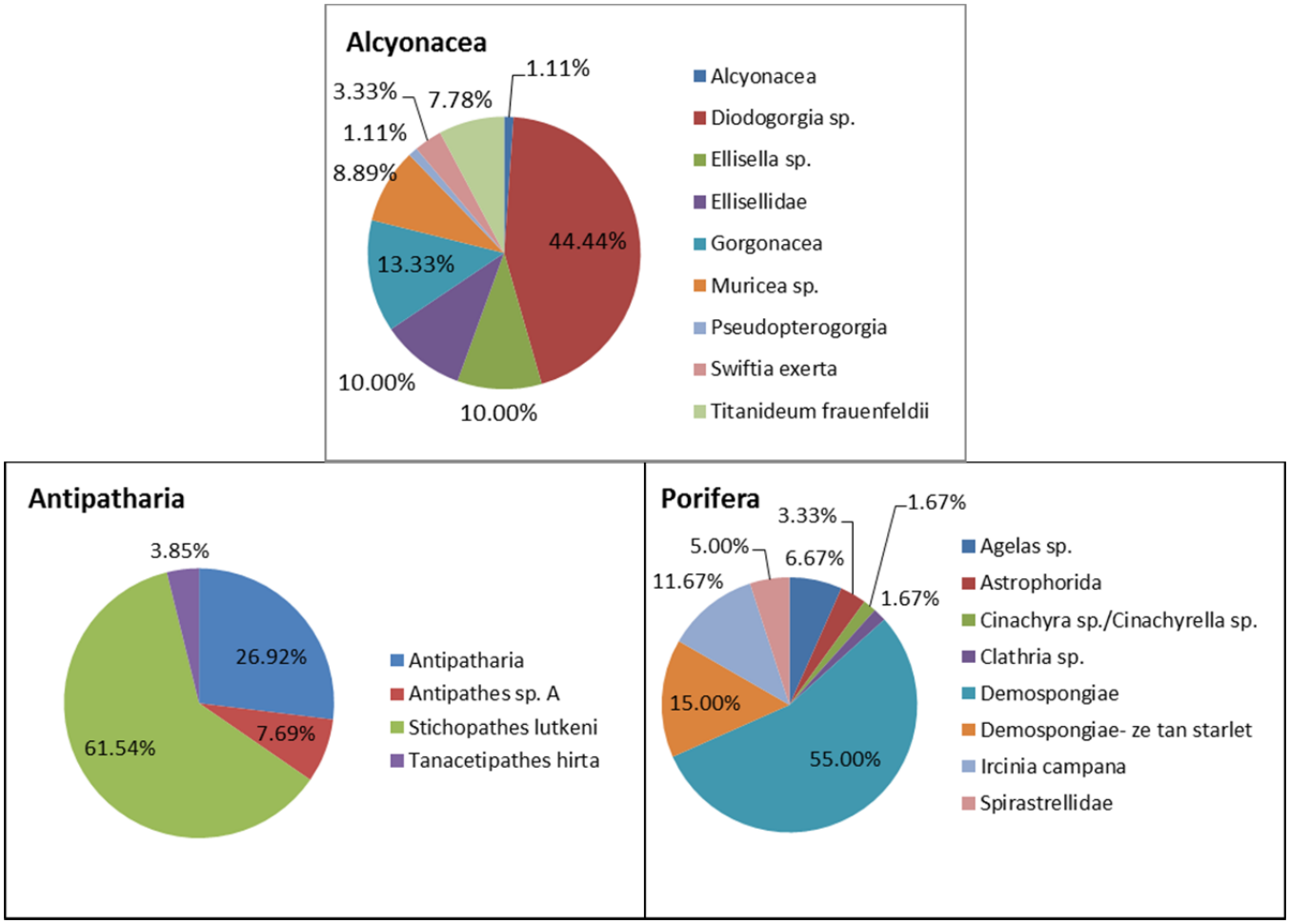


Figure 5. Diversity of corals and sponges at dive site ROV 12-06; CPCe analysis showing percent of total for each taxa category. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Porifera are Demospongiae.

No hard coral was present at the dive site. This site however was fairly diverse in other corals including 9 taxa of Alcyonacea ("gorgonacea"); 44.4% of the total gorgonacea were *Diodogorgia* sp., 10.0% *Ellisella* sp., and 8.8% *Muricea* sp. Black corals were dominated by the wire coral *Stichopathes lutkeni* (61.5% of the total Antipatharia), *Tanacetipathes* bush coral (3.8%), and *Antipathes* sp. A (7.6%). Porifera were fairly diverse with 8 taxa and dominated by the tan starlet Demospongiae (15% of the total Porifera), *Ircinia campana* (11.6%), *Agelas* sp. (6.6%), Spirastrellidae (5%), *Cinachyra* sp. (1.6%), and *Clathria* sp. (1.6%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 50 taxa of fish were identified from dive ROV 6 for a total density of 529 individuals/km (Table 3). These were dominated by tomtate (193.6/km), wrasse (64.4), and vermilion snapper (51.7). Managed species included scamp (1.4), red porgy (0.7), amberjack (0.2), gag grouper (0.2), and vermilions.

Dive Site: South Carolina, Inside & Outside Edisto MPA, N Border, Ridge, 50 m; Dive 12-06

Table 3. Density of fish for all transects at dive site ROV 12-06 (number individuals/km).

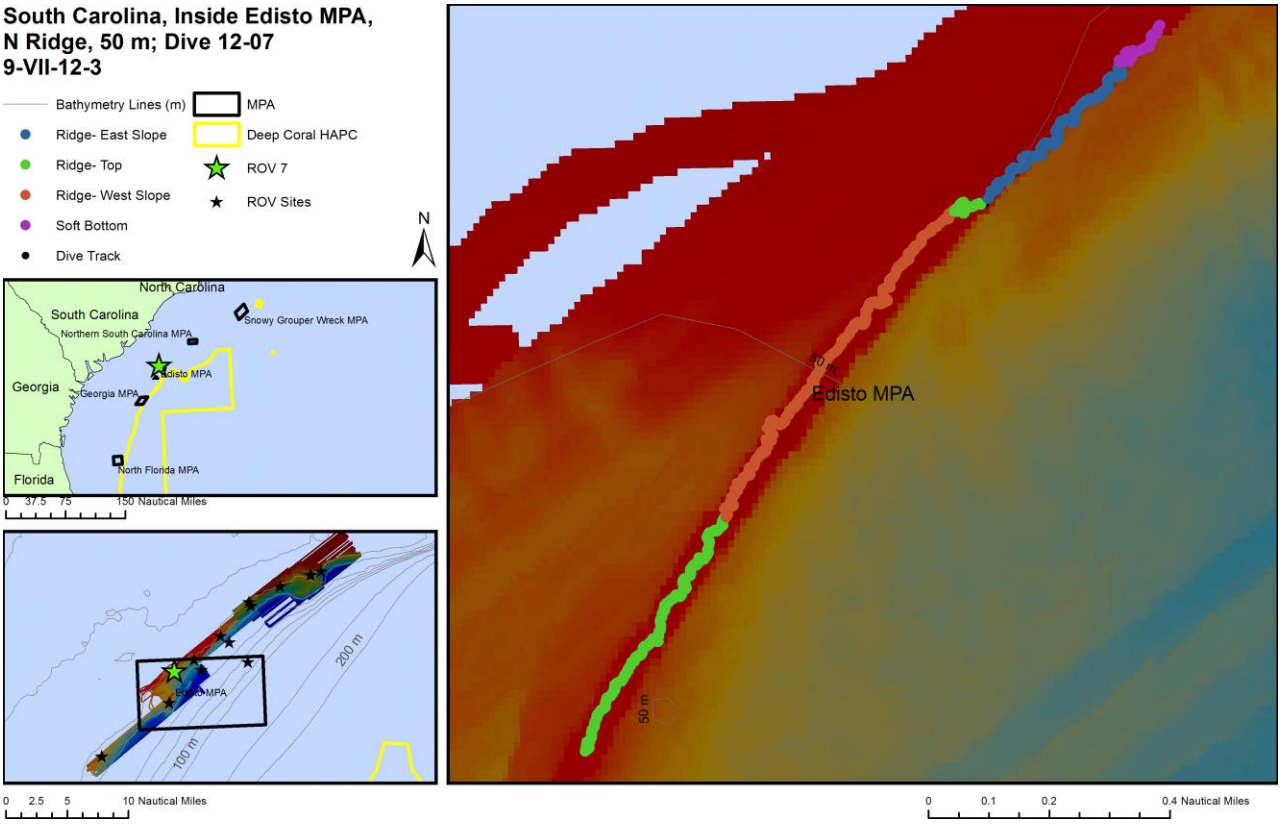
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthostracion polygonius	honeycomb cowfish	1	5.76	0.2
Acanthurus sp.	doctorfish	38	5.76	6.6
Balistes capriscus	grey triggerfish	4	5.76	0.7
Balistes sp.	triggerfish	1	5.76	0.2
Balistes vetula	queen triggerfish	2	5.76	0.3
Bodianus pulchellus	spotfin hogfish	67	5.76	11.6
Calamus sp.	porgy	37	5.76	6.4
Canthigaster rostrata	sharpnose puffer	253	5.76	43.9
Chaetodon oceallatus	spotfin butterflyfish	22	5.76	3.8
Chaetodon sedentarius	reef butterflyfish	193	5.76	33.5
Chromis enchrysurus	yellowtail reeffish	191	5.76	33.2
Chromis insolatus	sunshinefish	6	5.76	1.0
Chromis scotti	purple reeffish	41	5.76	7.1
Chromis sp.	damselfish	7	5.76	1.2
Dactylopterus volitans	flying gurnard	1	5.76	0.2
Epinephelus cruentatus	graysby	11	5.76	1.9
Equetus lanceolatus	jack-knife fish	4	5.76	0.7
Equetus umbrosus	cubbyu	42	5.76	7.3
Fistularia sp.	cornetfish	1	5.76	0.2
Haemulon aurolineatum	tomtate	1115	5.76	193.6
Halichoeres garnoti	yellowhead wrasse	2	5.76	0.3
Halichoeres sp.	wrasse	371	5.76	64.4
Holacanthus bermudensis	blue angelfish	48	5.76	8.3
Holacanthus tricolor	rock beauty	2	5.76	0.3
Holocentrus sp.	squirrelfish	26	5.76	4.5
Lachnolaimus maximus	hogfish	2	5.76	0.3
Lactophrys quadricornis	scrawled cowfish	1	5.76	0.2
Lactophrys sp.	cowfish	7	5.76	1.2
Liopropoma eukrines	wrasse bass	1	5.76	0.2
Mycteroperca microlepis	gag grouper	1	5.76	0.2
Mycteroperca phenax	scamp	8	5.76	1.4
Myripristis jacobus	blackbar soldierfish	1	5.76	0.2
Pagrus pagrus	red porgy	4	5.76	0.7
Paranthias furcifer	creole-fish	3	5.76	0.5
Pomacanthus paru	french angelfish	4	5.76	0.7
Pristigenys alta	short bigeye	54	5.76	9.4
Prognathodes aya	bank butterflyfish	10	5.76	1.7
Pseudupeneus maculatus	spotted goatfish	4	5.76	0.7
Pterois volitans	lionfish	68	5.76	11.8

Dive Site: South Carolina, Inside & Outside Edisto MPA, N Border, Ridge, 50 m; Dive 12-06

Rhomboplites aurorubens	vermilion snapper	298	5.76	51.7
Scarus sp.	parrotfish	13	5.76	2.3
Scorpaenidae	scorpionfish	1	5.76	0.2
Seriola dumerili	greater amberjack	1	5.76	0.2
Seriola sp.	amberjack	12	5.76	2.1
Serranus annularis	orangeback bass	9	5.76	1.6
Serranus phoebe	tattler	37	5.76	6.4
Sphoeroides spengleri	bandtail puffer	14	5.76	2.4
Stegastes partitus	bicolor damselfish	4	5.76	0.7
Stephanolepis hispidus	planehead filefish	1	5.76	0.2
Tetraodontidae	puffer	5	5.76	0.9
Total		3049		529.3

Dive Site: South Carolina, Inside Edisto MPA, N Ridge, 50 m; Dive 12-07

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	ed1_wgs84 (Edisto1)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	No Sensors Used
Date of Dive:	7/9/2012
Specimens:	
Digital Photos:	214
DVD:	4
Hard Drive:	1

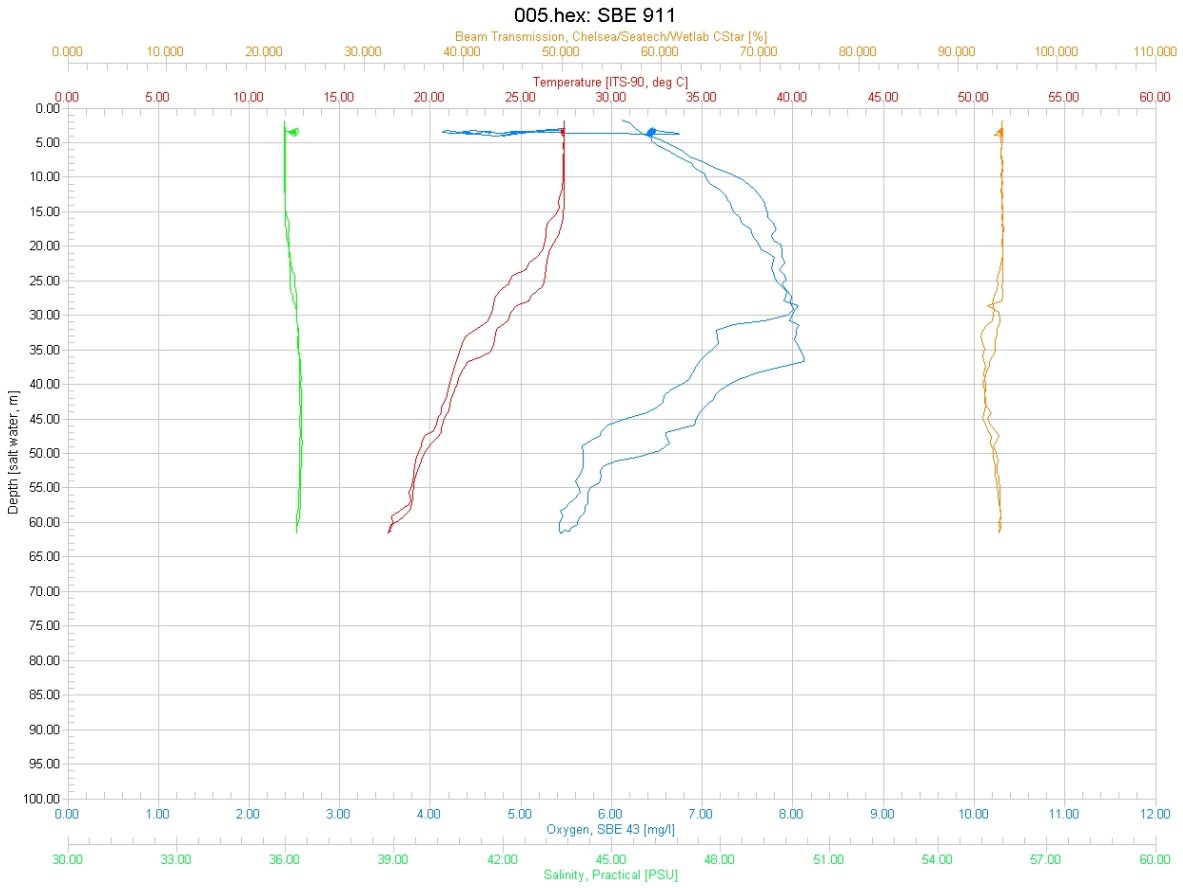
Dive Site: South Carolina, Inside Edisto MPA, N Ridge, 50 m; Dive 12-07

Dive Data:

Minimum Bottom Depth (m):	46	**Total Transect Length (km):**	7.078
Maximum Bottom Depth (m):	52	**Surface Current (kn):**	.5
On Bottom (Time- GMT):	12:05	**On Bottom (Lat/Long):**	32.38°N; -79.05°W
Off Bottom (Time- GMT):	15:29	**Off Bottom (Lat/Long):**	32.4°N; -79.03°W
Physical (bottom); Temp (°C):	19.00	**Salinity:** 36.00 **Visibility (ft):** 30	**Current (kn):** 0.5

Physical Environment:

Distance from Dive Site(km): 4.10



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (62 m): temperature- 17, salinity- 36, and dissolved oxygen- 5.4. Surface temperature was 27 and there was a thermocline near 26-35 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 38 m. Visibility was estimated at 30 ft from the ROV video.

Dive Site: South Carolina, Inside Edisto MPA, N Ridge, 50 m; Dive 12-07

Dive Imagery:

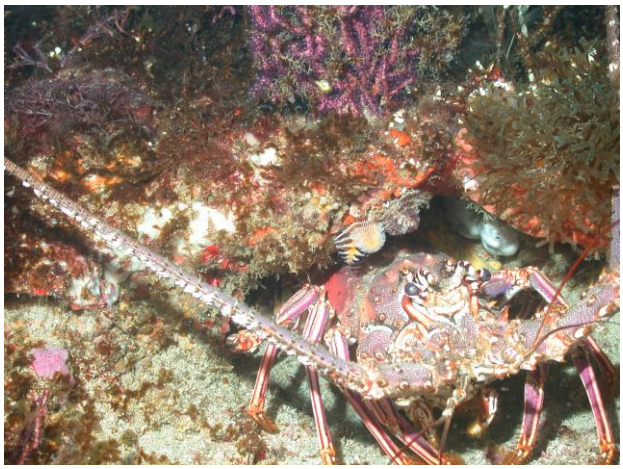


Figure 1: -46.8 m
Panulirus argus (lobster) under low relief rock outcrops.

Figure 2: -47.4 m
Graysby and reef butterfly fish on moderate relief boulder with dense biota.

Figure 3: -47.2 m
Large *Tanacetipathes* black coral.

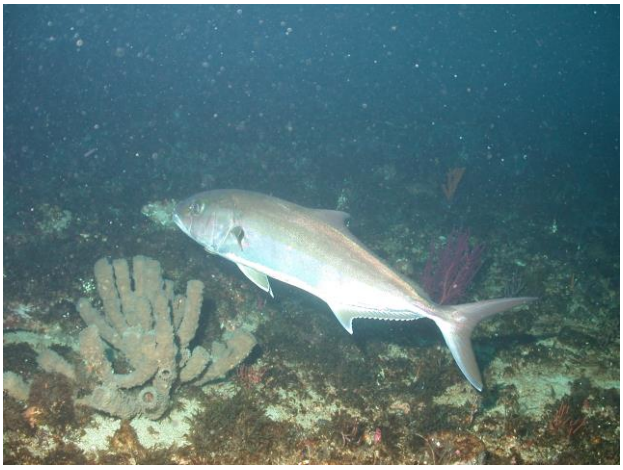


Figure 4: -47.2 m
Greater amberjack and *Callyspongia vaginalis* sponge on low relief pavement.

Dive Site: South Carolina, Inside Edisto MPA, N Ridge, 50 m; Dive 12-07

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 7, Site #- 9-VII-12-3. Target Site – South Carolina Edisto MPA; 50 m. ROV survey inside MPA; ground truth multibeam sonar of site. Conduct video/photo transects on north ridge, oriented NE-SW; Transect 4 and 5 along west edge of ridge, Transect 6 along east edge.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.5 kn to NE. Good station keeping, stayed on transect line. Camera in manual mode, shutter priority 1/125 s.

Site Description/Habitat/Biota:
Transect 4 and 5, heading NE along west slope of main ridge which is ~150 m wide, oriented NE-SW. Middle of ridge- rock pavement, rock outcrops 80-100% cover, dense biota; west slope- steep drop-off with rugged topography, rock slabs undercut and broken off forming 1-2 m ledges, total relief of 4 m. Top of slope 46.5 m, base of west slope are rock slabs and boulders on sediment, grading into sediment at 52 m. Slope over ~ 10-20 m in width. Transect 6 heading NE along east edge of ridge. Less rugose than west slope. Drop-off from 47 m at top of east slope to 50 m at base. Rock slabs 50-100 cm relief.

Dominant Benthic Biota: Gorgonacea- *Telesto*, *Swiftia*, *Diodogorgia*, purple plexaurid, Diodogorgia, *Ellisella*; Antipatharia- *Stichopathes*, bushy white; Demospongiae- *Ircinia campana*, *Callyspongia*, tan cake sponge, *Axinellida*, many spp.; Hydroida; Decapoda- *Panulirus argus*; Ascidiacea- Didemnidae, *Eudistoma*; Chlorophyta- *Codium*, *Caulerpa*?; Rhodophyta- several spp., red blade; Phaeophyta- *Sargassum* (attached), *Dictyota*.
Fish: spawning(?) aggregation of scamp on west ridge (>50 in one aggregation), gag, snowy grouper, Yellowtail reeffish, reef butterfly, bank butterfly, banded butterfly, French angelfish, scorpionfish, tomtate, vermilion snapper (large schools), porgy (common), graysby (common), spotfin hogfish, hogfish, scrawled cowfish, blue angelfish, blue spotted cornet fish, lionfish (abundant- 150).

Dive Site: South Carolina, Inside Edisto MPA, N Ridge, 50 m; Dive 12-07

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-07 conducted a survey along a NE-SW oriented ridge within the MPA. A transect from SW to NE was made along the ridge which is evident in the multibeam sonar map. Dive transects were divided into four habitat zones: Ridge- East Slope, Ridge- Top, Ridge- West Slope and Soft Bottom. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This dive site consisted of a ridge top that was ~50-150 m wide, with ledges and boulders of moderate relief on pavement; the east and west slopes of the ridge were drop-offs of moderate to high relief and high rugosity with rock slabs and ledges; 41-52 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-07. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 7	South Carolina, Inside Edisto MPA, N Ridge, 50 m; Dive 12-07				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	NE-SW Ridge: middle of ridge top, 47 - 50 m on top, 150 m wide, boulders 2-3 m diam, w/ sed between, pvmt, 2-3 m slabs, 2-3 m relief.				
	Ridge- Top	On Reef	HRu	MR	RLF
Transect 2	Large ledges on west edge, 48 m, 2-3 m drop off undercut, 46.5 m on top, 5 m total relief, 1-2 m ledges, base 52 m; slope 20 m wide, rock slabs broken off.				
	Ridge- West Slope	On Reef	HRu	HR	RLF
Transect 3	47 m xs across ridge, flat pvmt 1 m ledges, sed veneer.				
	Ridge- Top	On Reef	LRu	MR	RLF
Transect 4	Top 47 m, base of wall 49 m, 3 m diam boulders, <1 m relief rock slabs.				
	Ridge- East Slope	On Reef	HRu	MR	RLF
Transect 5	48.5 m end of ridge, 50/50 SB/HB, Pvmt some slabs 0.3 m relief.				
	Soft Bottom	Off Reef	LRu	LR	SRF

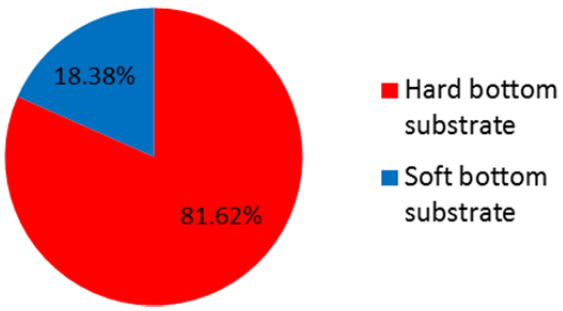


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-07. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Dive Site: South Carolina, Inside Edisto MPA, N Ridge, 50 m; Dive 12-07

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-07 was predominately hard bottom (81.62%) consisting of rock pavement, rock ledges, 2-3 m diameter rock slabs and boulders.

Bare rock substrate without biota covered 8.15% of the bottom and bare soft bottom was 14.49% (Fig. 2, Table 2). Benthic macro-biota covered 77.36% of the bottom and consisted of 5.29% non-coral Cnidaria (Hydrozoa), 3.99% Porifera, 1.53% Antipatharia, 3.58% Alcyonacea ("gorgonacea"), but was dominated by 54.55% algae including a dense cover of cyanobacteria (38.5%). There was no hard coral.

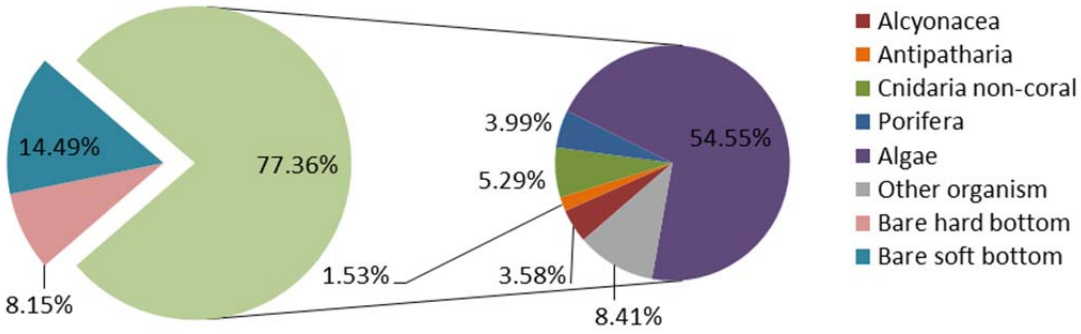


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-07. Non-scleractinian corals include Alcyonacea (primarily "gorgonacea" and soft coral) and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida and Corallimorpharia.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-07.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**172**	**3.99%**
Porifera	**172**	**3.99%**
Agelas sp.	2	0.05%
Aplysina sp.	11	0.26%
Chondrosia sp.	3	0.07%
Cliona sp.	4	0.09%
Demospongiae	61	1.42%
Demospongiae- ze tan starlet	15	0.35%
Diplastrella sp.	1	0.02%
Geodia sp.	7	0.16%
Haliclona sp.	2	0.05%
Holopsamma sp.	8	0.19%
Ircinia campana	6	0.14%
Ircinia sp.	20	0.46%
Ircinia strobilina	1	0.02%
Mycale sp.	1	0.02%

Dive Site: South Carolina, Inside Edisto MPA, N Ridge, 50 m; Dive 12-07

Niphates sp.	1	0.02%
Spirastrellidae	29	0.67%
Cnidaria non-coral	**228**	**5.29%**
Cnidaria non-coral	**228**	**5.29%**
Corallimorpharia	2	0.05%
Hydroidolina	226	5.25%
Antipatharia	**66**	**1.53%**
Antipatharia	**66**	**1.53%**
Antipatharia	39	0.91%
Antipathes sp. A	20	0.46%
Stichopathes lutkeni	6	0.14%
Tanacetipathes hirta	1	0.02%
Algae	**2349**	**54.55%**
Algae	**2349**	**54.55%**
Chlorophyta	15	0.35%
Corallinales/crustose coralline	106	2.46%
Cyanophyta	1661	38.57%
Phaeophyta	421	9.78%
Rhodophyta	146	3.39%
Alcyonacea	**154**	**3.58%**
Alcyonacea	**154**	**3.58%**
Alcyonacea	1	0.02%
Diodogorgia sp.	51	1.18%
Ellisellidae	8	0.19%
Gorgonacea	10	0.23%
Muricea sp.	12	0.28%
Telesto sp.	71	1.65%
Titanideum frauenfeldii	1	0.02%
Other organism	**362**	**8.41%**
Annelida	**16**	**0.37%**
Annelida	1	0.02%
Filograna sp.	14	0.33%
Serpulidae	1	0.02%
Bryozoa	**137**	**3.18%**
Bryozoa	131	3.04%
Schizoporella sp.	6	0.14%
Chordata	**35**	**0.81%**
Ascidiacea	10	0.23%
Didemnidae	20	0.46%
Fish	5	0.12%
Echinodermata	**7**	**0.16%**
Crinoidea	7	0.16%

Dive Site: South Carolina, Inside Edisto MPA, N Ridge, 50 m; Dive 12-07

Human debris	**1**	**0.02%**
Fishing gear/line/long line	1	0.02%
Mollusca	**1**	**0.02%**
Bivalvia	1	0.02%
Natural detritus	**2**	**0.05%**
Natural detritus	2	0.05%
Other organism	**163**	**3.79%**
Other organism	163	3.79%
Hard bottom substrate	**351**	**8.15%**
Hard bottom substrate	**351**	**8.15%**
Bare rock- pavement boulder ledge	327	7.59%
Bare rubble- rock	24	0.56%
Soft bottom substrate	**624**	**14.49%**
Soft bottom substrate	**624**	**14.49%**
Bare soft bottom substrate	624	14.49%
Grand Total	**4306**	**100.00%**

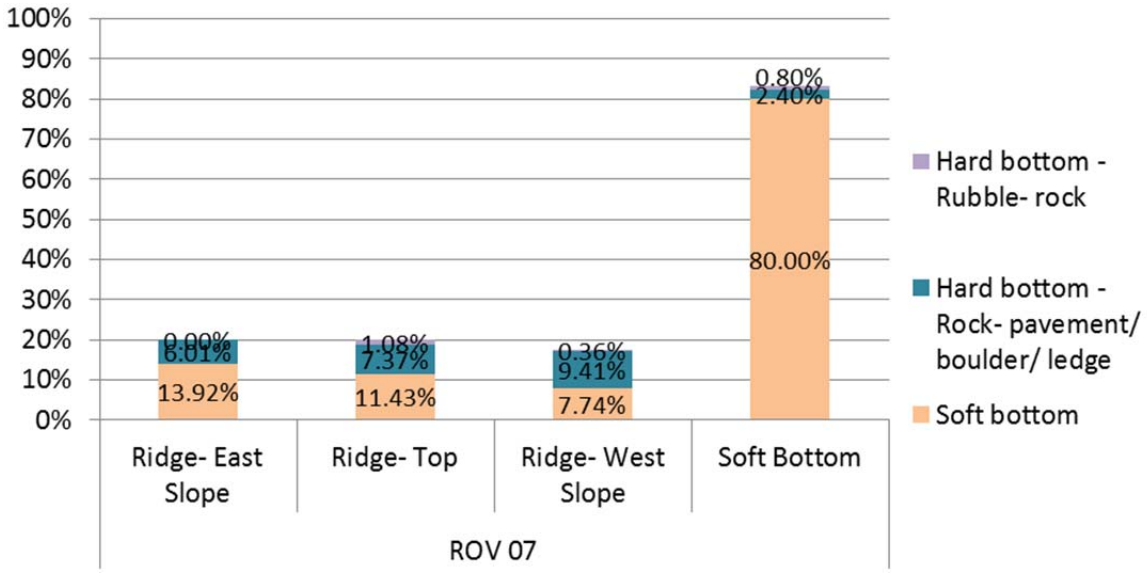


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-07.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The ridge top and east and west slopes had similar cover of bare substrate (~20% cover) and relatively low cover of bare hard bottom (6.0-9.4% cover). Off the ridge was primarily soft bottom with some pavement and rubble. Figure 4 shows similar dense cover in biota for the ridge top and slopes (~80% cover) which was clearly dominated by algae (54.1-63.2%). Porifera ranged from 3.3-5.0%.

Dive Site: South Carolina, Inside Edisto MPA, N Ridge, 50 m; Dive 12-07

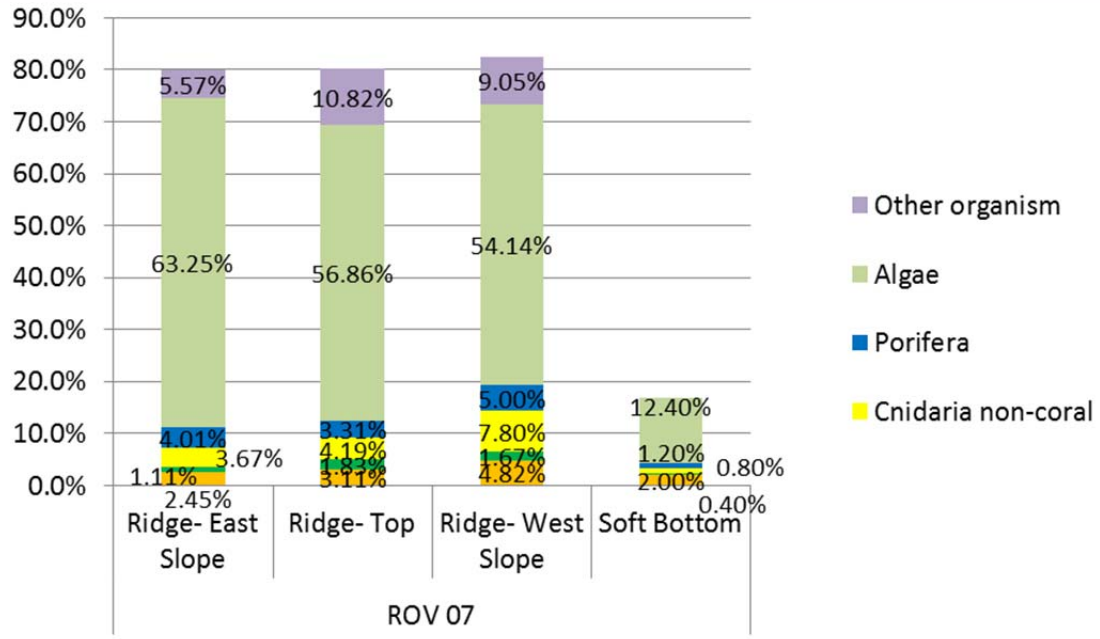


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-07.

Dive Site: South Carolina, Inside Edisto MPA, N Ridge, 50 m; Dive 12-07

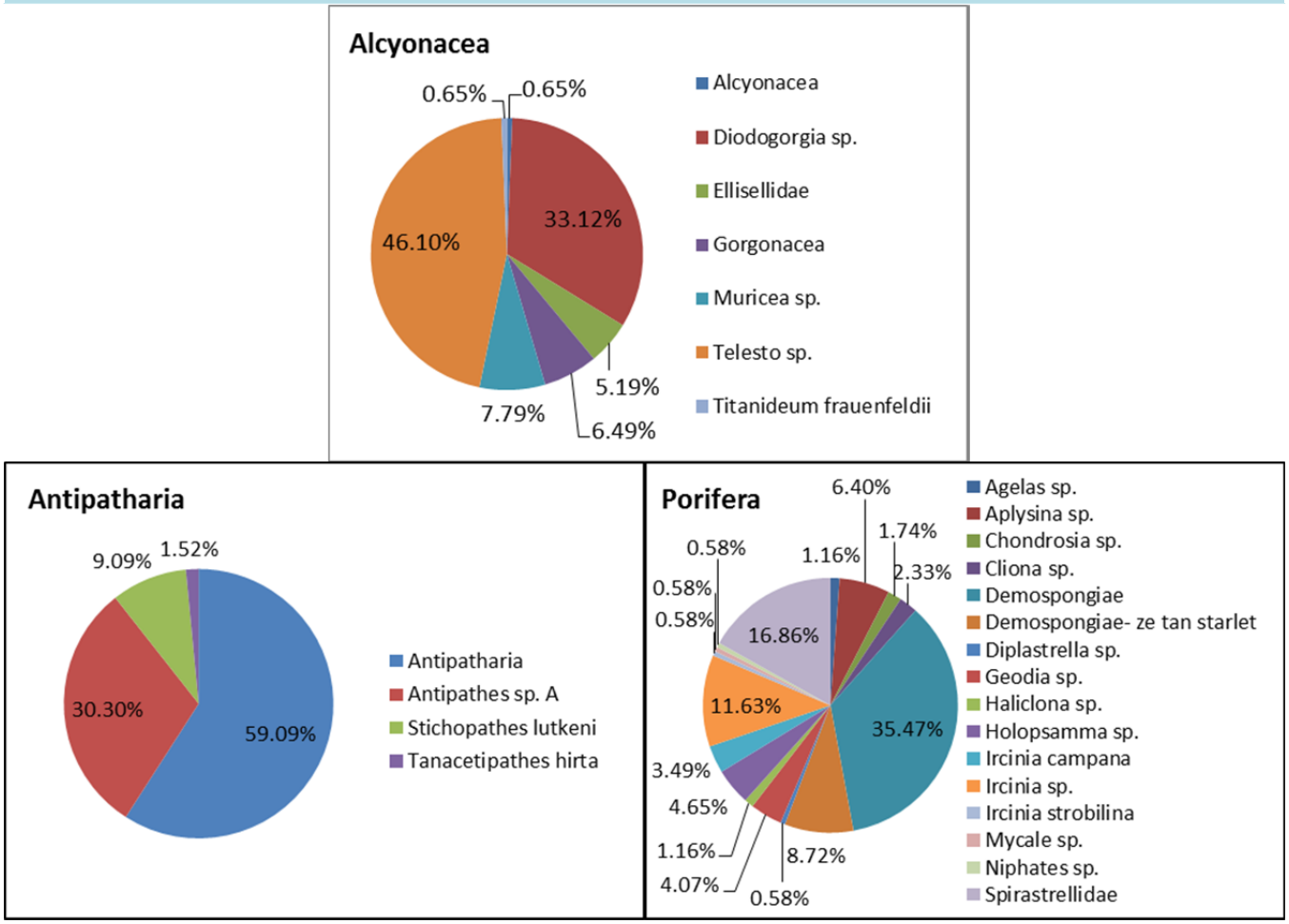


Figure 5. Diversity of corals and sponges at dive site ROV 12-07; CPCe analysis showing percent of total for each taxa category. Corals include Alcyonacea ("gorgonacea" and soft corals) and Antipatharia (black coral); Porifera are Demospongiae.

No hard coral was present at the dive site. Seven taxa of gorgonacea were identified and were dominated by *Telesto* sp. (46.1% of all Alcyonacea), *Diodogorgia* sp. (33.1%), *Muricea* sp. (7.7%), and Ellisellidae (5.1%). Four taxa of Antipatharia included 30.3% *Antipathes* sp. A and 9.0% *Stichopathes lutkeni*. Sponges were quite diverse with 16 taxa, dominated by *Ircinia* sp. (11.6% of all Porifera), Spirastrellidae (16.8%), tan starlet Demospongiae (8.7%), and *Aplysina* sp. (6.3%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 63 taxa of fish were identified from dive ROV 7 for a total density of 858 individuals/km (Table 3). These were dominated by tomtate (319.8/km), vermilion snapper (192.7), and sharpnose puffer (38.7). Managed species included scamp (26.3/km), red porgy (8.9), amberjack (5.9), hogfish (0.3), gag grouper (1.6), snowy grouper (0.1), and yellowmouth grouper (0.1).

Dive Site: South Carolina, Inside Edisto MPA, N Ridge, 50 m; Dive 12-07

Table 3. Density of fish for all transects at dive site ROV 12-07 (number individuals/km).

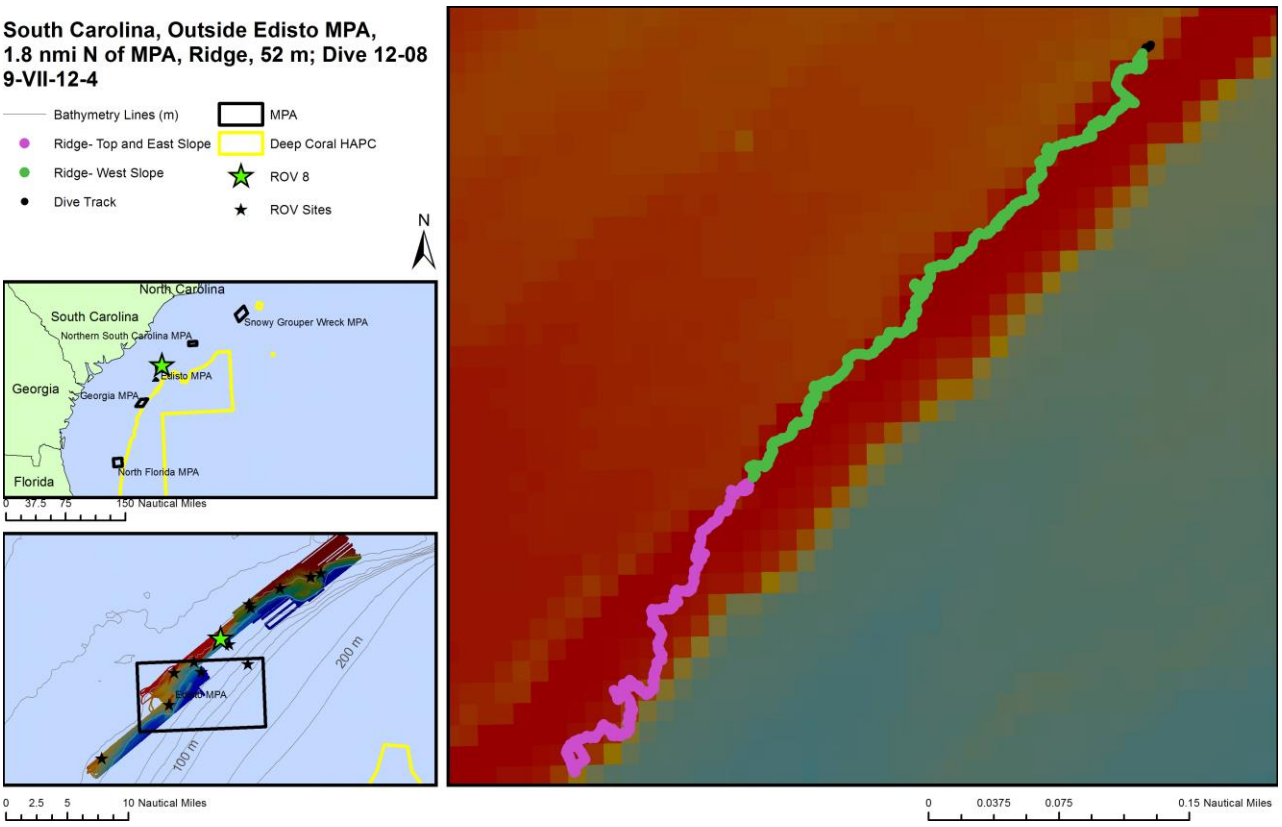
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus bahianus	ocean surgeonfish	1	7.08	0.1
Acanthurus sp.	doctorfish	18	7.08	2.5
Balistes capriscus	grey triggerfish	32	7.08	4.5
Bodianus pulchellus	spotfin hogfish	214	7.08	30.2
Bodianus rufus	spanish hogfish	1	7.08	0.1
Calamus sp.	porgy	72	7.08	10.2
Canthigaster rostrata	sharpnose puffer	274	7.08	38.7
Centropristis ocyurus	bank sea bass	1	7.08	0.1
Chaetodon aculeatus	longsnout butterflyfish	1	7.08	0.1
Chaetodon ocellatus	spotfin butterflyfish	30	7.08	4.2
Chaetodon sedentarius	reef butterflyfish	192	7.08	27.1
Chaetodon striatus	banded butterflyfish	6	7.08	0.8
Chromis enchrysurus	yellowtail reeffish	71	7.08	10.0
Chromis insolatus	sunshinefish	16	7.08	2.3
Chromis scotti	purple reeffish	270	7.08	38.1
Chromis sp.	damselfish	95	7.08	13.4
Diodon sp.	puffer	6	7.08	0.8
Epinephelus cruentatus	graysby	11	7.08	1.6
Epinephelus niveatus	snowy grouper	1	7.08	0.1
Equetus umbrosus	cubbyu	23	7.08	3.2
Fistularia sp.	cornetfish	4	7.08	0.6
Fistularia tabacaria	bluespotted cornetfish	1	7.08	0.1
Haemulon aurolineatum	tomtate	2264	7.08	319.8
Haemulon plumieri	white grunt	4	7.08	0.6
Halichoeres garnoti	yellowhead wrasse	4	7.08	0.6
Halichoeres sp.	wrasse	118	7.08	16.7
Holacanthus bermudensis	blue angelfish	200	7.08	28.2
Holacanthus tricolor	rock beauty	2	7.08	0.3
Holocentridae	soldierfish/squirrelfish	5	7.08	0.7
Holocentrus sp.	squirrelfish	58	7.08	8.2
Lachnolaimus maximus	hogfish	2	7.08	0.3
Lactophrys sp.	cowfish	14	7.08	2.0
Lutjanidae	snapper	3	7.08	0.4
Lutjanus griseus	grey snapper	5	7.08	0.7
Monacanthus sp.	filefish	7	7.08	1.0
Mycteroperca interstitialis	yellowmouth grouper	1	7.08	0.1
Mycteroperca microlepis	gag grouper	11	7.08	1.6

Dive Site: South Carolina, Inside Edisto MPA, N Ridge, 50 m; Dive 12-07

Mycteroperca phenax	scamp	186	7.08	26.3
Mycteroperca sp.	grouper	1	7.08	0.1
Myripristis jacobus	blackbar soldierfish	22	7.08	3.1
Ophichthidae	snake eel	1	7.08	0.1
Pagrus pagrus	red porgy	63	7.08	8.9
Pomacanthus arcuatus	grey angelfish	5	7.08	0.7
Pomacanthus paru	french angelfish	5	7.08	0.7
Pomacanthus sp.	angelfish	1	7.08	0.1
Priacanthus arenatus	bigeye	2	7.08	0.3
Pristigenys alta	short bigeye	22	7.08	3.1
Prognathodes aya	bank butterflyfish	13	7.08	1.8
Pseudupeneus maculatus	spotted goatfish	3	7.08	0.4
Pterois volitans	lionfish	255	7.08	36.0
Rhomboplites aurorubens	vermilion snapper	1364	7.08	192.7
Rypticus maculatus	whitespotted soapfish	1	7.08	0.1
Rypticus sp.	soapfish	2	7.08	0.3
Scorpaenidae	scorpionfish	4	7.08	0.6
Seriola dumerili	greater amberjack	1	7.08	0.1
Seriola rivoliana	almaco jack	4	7.08	0.6
Seriola sp.	amberjack	37	7.08	5.2
Serranus annularis	orangeback bass	1	7.08	0.1
Serranus phoebe	tattler	18	7.08	2.5
Sparidae	porgy	14	7.08	2.0
Sphoeroides spengleri	bandtail puffer	7	7.08	1.0
Stegastes partitus	bicolor damselfish	9	7.08	1.3
Thalassoma bifasciatum	bluehead wrasse	1	7.08	0.1
Total		6080		858.8

Dive Site: South Carolina, Outside Edisto MPA, 1.8 nmi N of MPA, Ridge, 52 m; Dive 12-08

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	ed1_wgs84 (Edisto1)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	No Sensors Used
Date of Dive:	7/9/2012
Specimens:	
Digital Photos:	52
DVD:	1
Hard Drive:	1

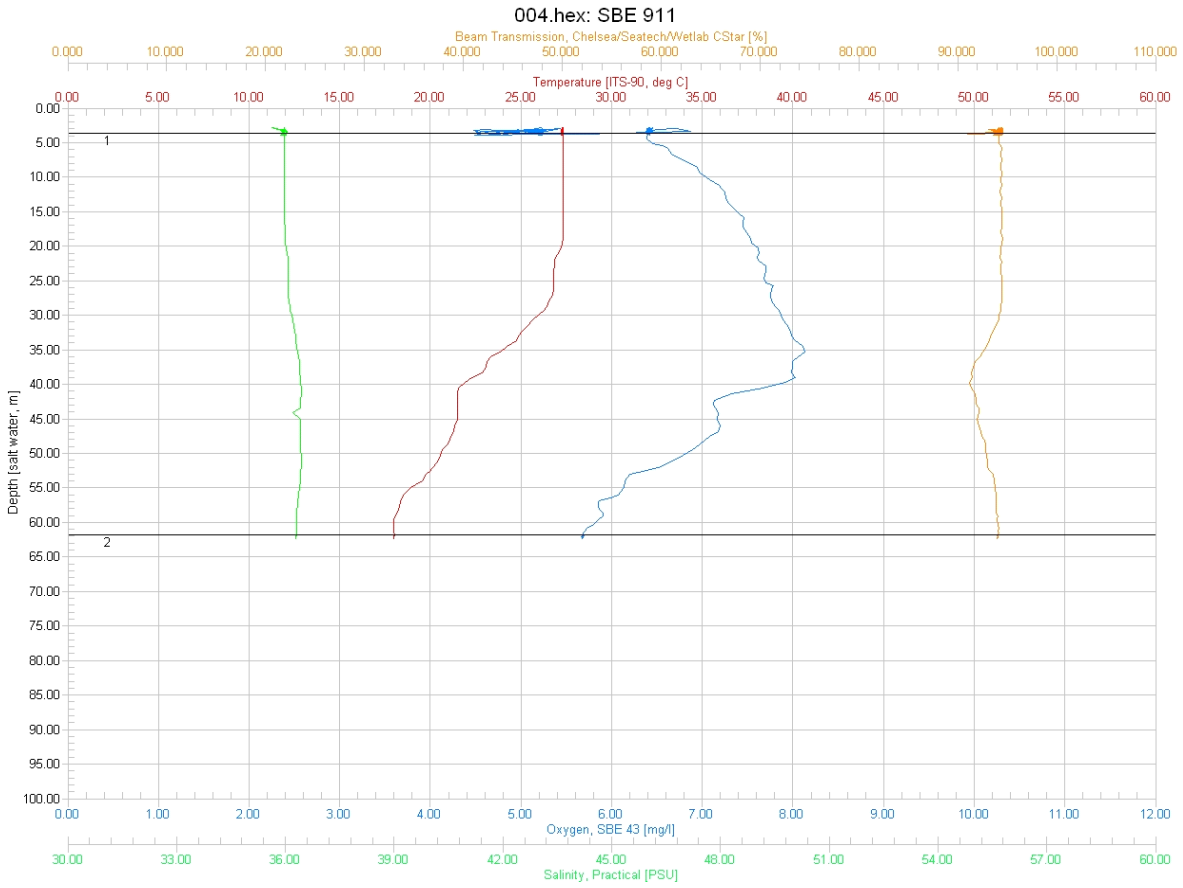
Dive Site: South Carolina, Outside Edisto MPA, 1.8 nmi N of MPA, Ridge, 52 m; Dive 12-08

Dive Data:

Minimum Bottom Depth (m):	48	**Total Transect Length (km):**	2.338
Maximum Bottom Depth (m):	54	**Surface Current (kn):**	1.5
On Bottom (Time- GMT):	16:28	**On Bottom (Lat/Long):**	32.43°N; -78.98°W
Off Bottom (Time- GMT):	17:27	**Off Bottom (Lat/Long):**	32.44°N; -78.96°W
Physical (bottom); Temp (°C):	20.00	**Salinity:** 36.10 **Visibility (ft):** 45	**Current (kn):** 0.5

Physical Environment:

Distance from Dive Site(km): 1.63



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (62 m): temperature- 18, salinity- 36.1, and dissolved oxygen- 5.8. Surface temperature was 27 and there was a thermocline near 30-40 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 35 m. Visibility was estimated at 45 ft from the ROV video.

Dive Site: South Carolina, Outside Edisto MPA, 1.8 nmi N of MPA, Ridge, 52 m; Dive 12-08

Dive Imagery:

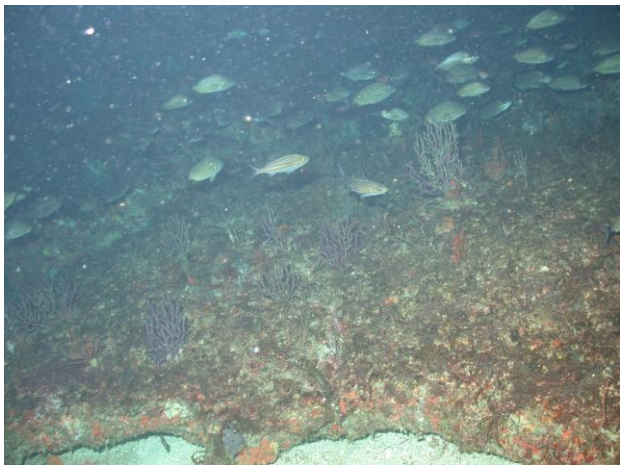


Figure 1: -50.8 m
Rock pavement habitat with school of tomtate and dense cover of gorgonians, sponges, and algae.

Figure 2: -50.8 m
Scamp grouper under rock ledge.

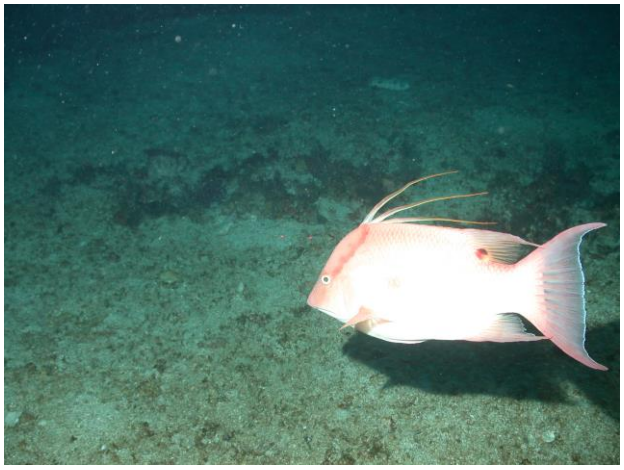


Figure 3: -52.2 m
Male hogfish on sediment habitat.

Figure 4: -50.3 m
Male hogfish on pavement habitat.

Dive Site: South Carolina, Outside Edisto MPA, 1.8 nmi N of MPA, Ridge, 52 m; Dive 12-08

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 8, Site #- 9-VII-12-4. Target Site – outside and north of South Carolina Edisto MPA; 50 m. ROV survey outside MPA site; ground truth multibeam sonar of site. Conduct one video/photo transect along west edge of NE-SW oriented ridge of multibeam map.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 1.5 kn to NW. Good station keeping, stayed on transect line. Camera in manual mode, shutter priority 1/125 s.

Site Description/Habitat/Biota:
Transect along NE-SW oriented ridge, ~100 m wide, along west edge of ridge. Similar to ROV site 7. High relief slope from 46-48 m at top of ridge to 52-53 m at west base. Large rock slabs, undercut ridge with 1-2 m relief; rugged topography. Base of ridge with rock slabs and boulders grading to sand sediment.

Dominant Benthic Biota: Gorgonacea- purple plexaurid, *Nicella*; Antipatharia- *Stichopathes*, bushy white; Hydroida; Demospongiae- *Ircinia campana*, tan cake, *Aplysina*, *Callyspongia vaginalis*; Annelida- *Filograna*; Ascidiacea- *Eudistoma*; Phaeophyta- *Sargassum* (attached).
Fish: scamp (common), gag, tomtate, vermilion snapper, blue angelfish, yellowtail reeffish, hogfish, spotfin hogfish, short bigeye, bigeye, porgy, reef butterfly, purple reeffish, queen angelfish, graysby, lionfish (common- 29).

Dive Site: South Carolina, Outside Edisto MPA, 1.8 nmi N of MPA, Ridge, 52 m; Dive 12-08

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-08 conducted a survey 1.8 nmi north of Edisto MPA. A zig-zag transect from SW to NE was made along the ridge which is evident in the multibeam sonar map. Dive transects were divided into two habitat zones: Ridge- Top and East Slope and Ridge- West Slope. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This dive site's ridge top was rock pavement and east and west slopes were moderate relief but of high rugosity, with rock slabs and boulders on the slopes; 46-53 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-08. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 8	South Carolina, Outside Edisto MPA, 1.8 nmi N of MPA, Ridge, 52 m; Dive 12-08				
Transect #	Habitat Zone	On/Off Reef	Rugosity	Relief	SEADESC Code
Transect 1	East Edge of NE-SW ridge: east slope: 49.5 - 52 m pvmt, < 50 cm slabs, 1-2 m diam boulders, rubble, 100% HB.				
	Ridge- Top and East Slope	On Reef	HRu	MR	RLF
Transect 2	48.5 m top, 52 m base of slope, rock slabs boulders 1 m relief, SB at base of wall.				
	Ridge- West Slope	On Reef	HRu	MR	RLF

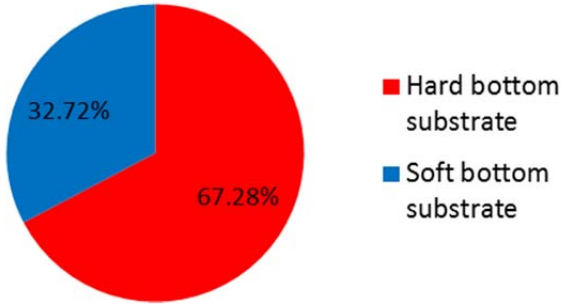


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-08. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-08 was predominately hard bottom (67.28%) consisting of rock pavement, low relief rock slabs, 1-2 m boulders, and rock rubble.

Bare rock substrate without biota covered 10.59% of the bottom and bare soft bottom was 22.05% (Fig. 2, Table 2). Benthic macro-biota covered 67.36% of the bottom and consisted of 2.33% non-coral Cnidaria (Hydrozoa),

Dive Site: South Carolina, Outside Edisto MPA, 1.8 nmi N of MPA, Ridge, 52 m; Dive 12-08

3.29% Porifera, 0.72% Antipatharia, 0.48% Alcyonacea ("gorgonacea"), but was dominated by 55.49% algae including fairly dense cyanobacteria (40.26%). No hard coral was observed.

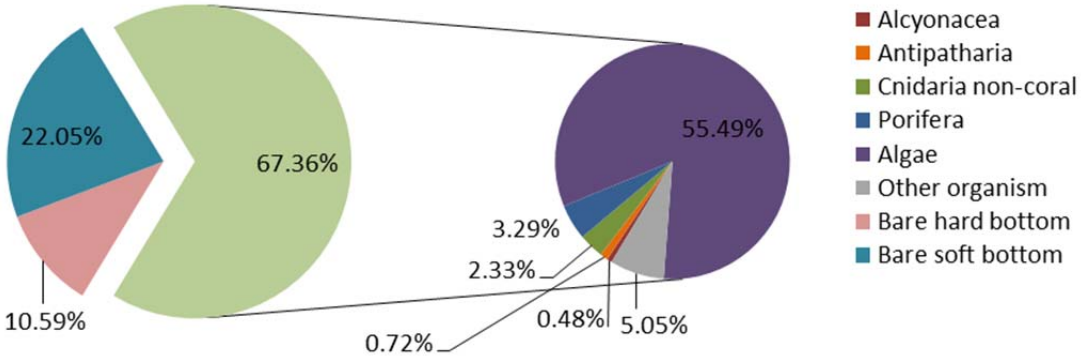


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-08. Non-scleractinian corals include Alcyonacea (primarily "gorgonacea" and soft coral) and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida..

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-08.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**41**	**3.29%**
Porifera	**41**	**3.29%**
Aplysina sp.	4	0.32%
Demospongiae	20	1.60%
Ircinia sp.	3	0.24%
Spirastrellidae	14	1.12%
Cnidaria non-coral	**29**	**2.33%**
Cnidaria non-coral	**29**	**2.33%**
Hydroidolina	29	2.33%
Antipatharia	**9**	**0.72%**
Antipatharia	**9**	**0.72%**
Antipatharia	1	0.08%
Stichopathes lutkeni	7	0.56%
Tanacetipathes hirta	1	0.08%
Algae	**692**	**55.49%**
Algae	**692**	**55.49%**
Chlorophyta	6	0.48%
Corallinales/crustose coralline	22	1.76%
Cyanophyta	502	40.26%
Phaeophyta	84	6.74%
Rhodophyta	78	6.26%
Alcyonacea	**6**	**0.48%**
Alcyonacea	**6**	**0.48%**

Dive Site: South Carolina, Outside Edisto MPA, 1.8 nmi N of MPA, Ridge, 52 m; Dive 12-08

Diodogorgia sp.	2	0.16%
Ellisellidae	3	0.24%
Nidallia occidentalis	1	0.08%
Other organism	**63**	**5.05%**
Annelida	**1**	**0.08%**
Filograna sp.	1	0.08%
Bryozoa	**27**	**2.17%**
Bryozoa	22	1.76%
Schizoporella sp.	5	0.40%
Chordata	**16**	**1.28%**
Ascidiacea	4	0.32%
Didemnidae	10	0.80%
Fish	2	0.16%
Other organism	**19**	**1.52%**
Other organism	19	1.52%
Hard bottom substrate	**132**	**10.59%**
Hard bottom substrate	**132**	**10.59%**
Bare rock- pavement boulder ledge	129	10.34%
Bare rubble- rock	3	0.24%
Soft bottom substrate	**275**	**22.05%**
Soft bottom substrate	**275**	**22.05%**
Bare soft bottom substrate	275	22.05%
Grand Total	**1247**	**100.00%**

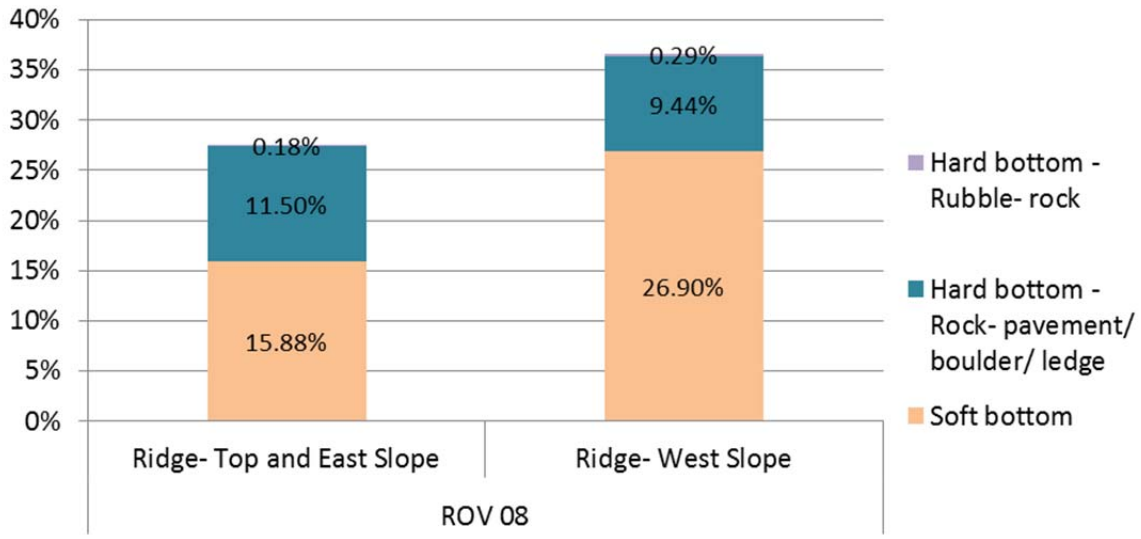


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-08.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The ridge top and slopes had 9.4-11.5% cover of bare rock substrate; the west slope had greater cover of bare sediment (26.9%).

Dive Site: South Carolina, Outside Edisto MPA, 1.8 nmi N of MPA, Ridge, 52 m; Dive 12-08

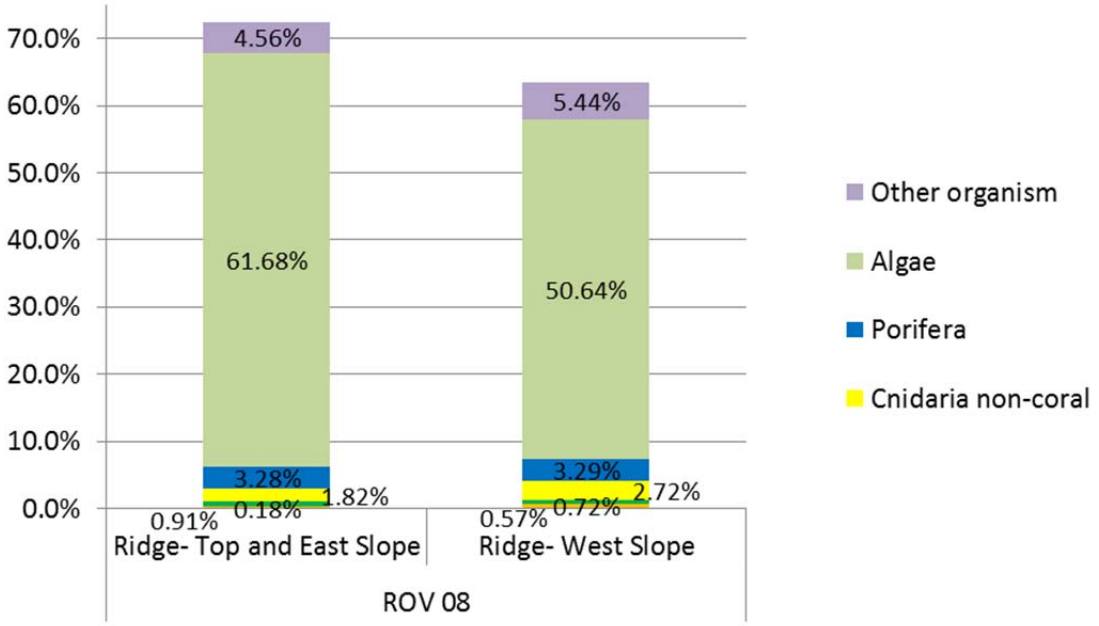


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-08.

Figure 4 shows that the reef top and slopes had high cover of biota ranging from 53-72%. All hard bottom areas had high densities of algae (50.6-61.6%) and Porifera (3.2%).

Dive Site: South Carolina, Outside Edisto MPA, 1.8 nmi N of MPA, Ridge, 52 m; Dive 12-08

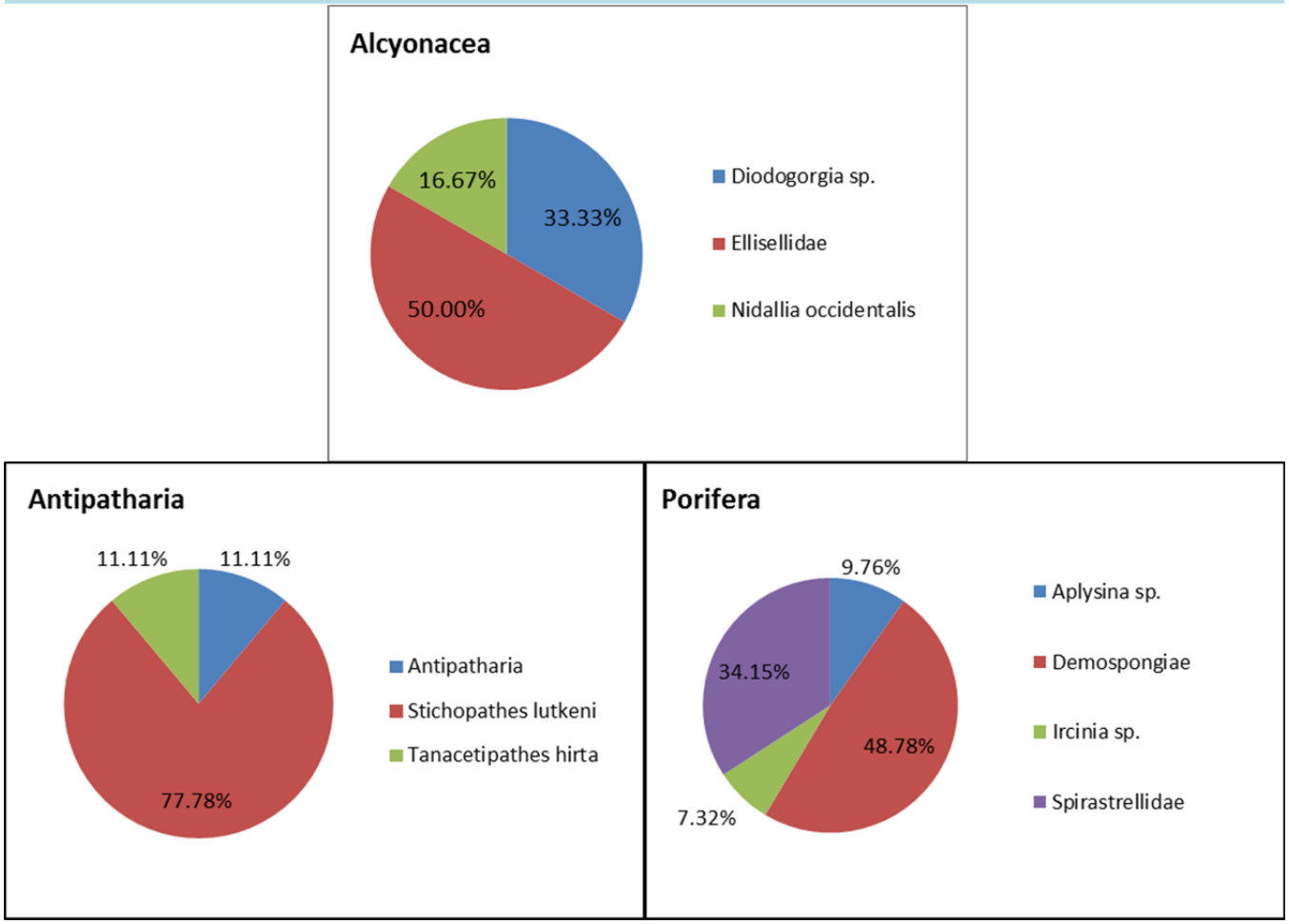


Figure 5. Diversity of corals and sponges at dive site ROV 12-08; CPCe analysis showing percent of total for each taxa category. Corals include Alcyonacea ("gorgonacea" and soft corals) and Antipatharia (black coral); Porifera are Demospongiae.

No hard coral was present at the dive site. Other corals included 3 taxa of Alcyonacea and 3 Antipatharia. The Alcyonacea consisted of Ellisellidae (50.0% of the total Alcyonacea), *Diodogorgia* sp. (33.3%), and the soft coral *Nidalia occidentalis* (16.6%). The black corals were dominated by *Stichpathes lutkeni* (77.7% of the total Antipatharia). Sponges were of low diversity and included Spirastrellidae (34.1% of the total Porifera), *Aplysina* sp. (9.7%), and *Ircinia* sp. (7.3%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 10-15 m. A total of 40 taxa of fish were identified from dive ROV 8 for a total density of 2132 individuals/km (Table 3). These were dominated by tomtate (1232/km), vermilion snapper (519), and grunts (74.8). Managed species included scamp (13.2/km), amberjack (5.2), hogfish (3.4), red porgy (2.6), and gag grouper (2.1).

Dive Site: South Carolina, Outside Edisto MPA, 1.8 nmi N of MPA, Ridge, 52 m; Dive 12-08

Table 3. Density of fish for all transects at dive site ROV 12-08 (number individuals/km).

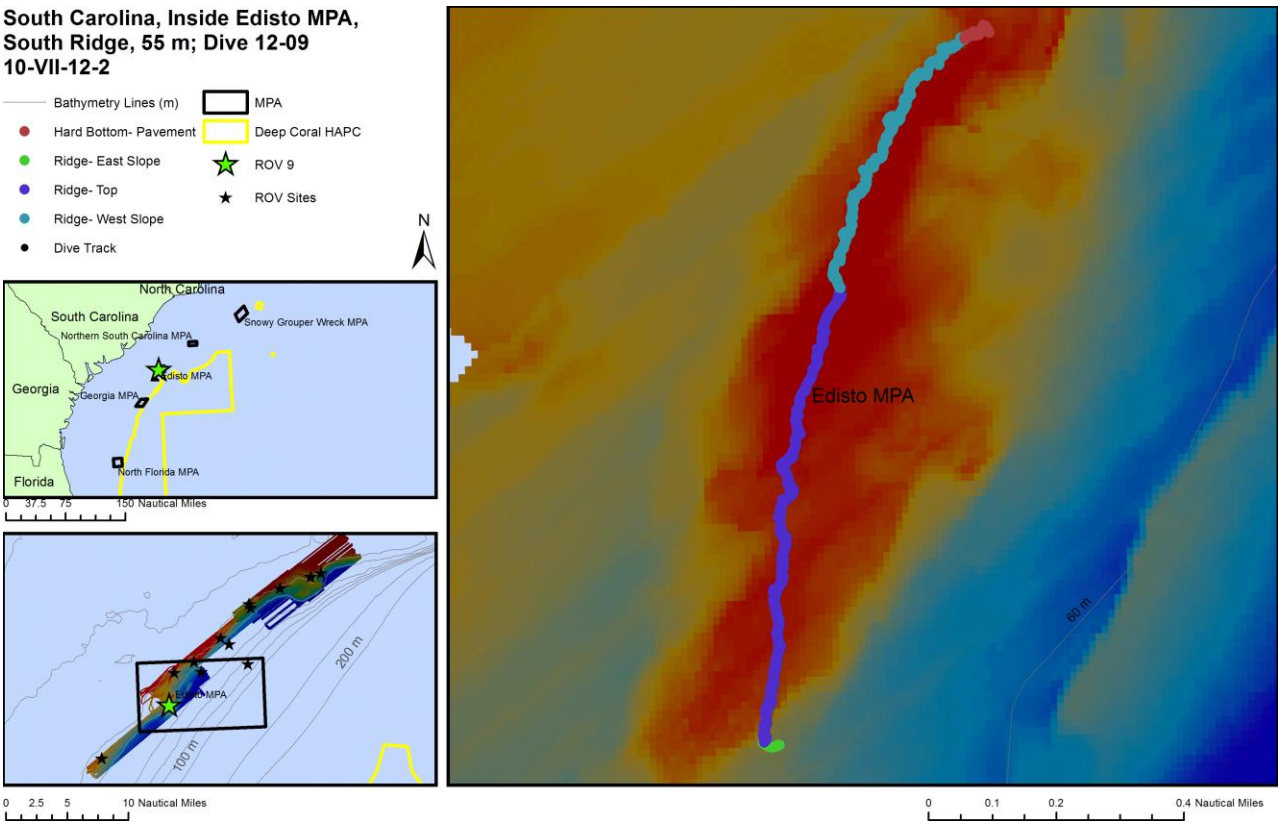
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Balistes sp.	triggerfish	1	2.34	0.4
Bodianus pulchellus	spotfin hogfish	61	2.34	26.1
Calamus sp.	porgy	55	2.34	23.5
Canthigaster rostrata	sharpnose puffer	115	2.34	49.1
Chaetodon oceallatus	spotfin butterflyfish	7	2.34	3.0
Chaetodon sedentarius	reef butterflyfish	61	2.34	26.1
Chilomycterus sp.	burrfish	1	2.34	0.4
Chromis enchrysurus	yellowtail reeffish	20	2.34	8.5
Chromis insolatus	sunshinefish	17	2.34	7.3
Chromis scotti	purple reeffish	43	2.34	18.4
Chromis sp.	damselfish	25	2.34	10.7
Epinephelus cruentatus	graysby	7	2.34	3.0
Equetus umbrosus	cubbyu	2	2.34	0.9
Haemulon aurolineatum	tomtate	2884	2.34	1232.5
Haemulon sp.	grunts	175	2.34	74.8
Halichoeres garnoti	yellowhead wrasse	1	2.34	0.4
Halichoeres sp.	wrasse	82	2.34	35.0
Holacanthus bermudensis	blue angelfish	48	2.34	20.5
Holocentrus sp.	squirrelfish	14	2.34	6.0
Lachnolaimus maximus	hogfish	8	2.34	3.4
Lactophrys sp.	cowfish	3	2.34	1.3
Liopropoma eukrines	wrasse bass	1	2.34	0.4
Malacanthus plumieri	sand tilefish	2	2.34	0.9
Mycteroperca microlepis	gag grouper	5	2.34	2.1
Mycteroperca phenax	scamp	31	2.34	13.2
Ocyrus chrysurus	yellowtail snapper	1	2.34	0.4
Pagrus pagrus	red porgy	6	2.34	2.6
Pomacanthus paru	french angelfish	2	2.34	0.9
Priacanthus arenatus	bigeye	3	2.34	1.3
Pristigenys alta	short bigeye	10	2.34	4.3
Prognathodes aya	bank butterflyfish	1	2.34	0.4
Pseudupeneus maculatus	spotted goatfish	3	2.34	1.3
Pterois volitans	lionfish	45	2.34	19.2
Rhomboplites aurorubens	vermilion snapper	1216	2.34	519.7
Seriola dumerili	greater amberjack	1	2.34	0.4
Seriola sp.	amberjack	20	2.34	8.5
Serranus annularis	orangeback bass	1	2.34	0.4
Serranus phoebe	tattler	8	2.34	3.4
Sphoeroides spengleri	bandtail puffer	2	2.34	0.9

Dive Site: South Carolina, Outside Edisto MPA, 1.8 nmi N of MPA, Ridge, 52 m; Dive 12-08

Stegastes partitus	bicolor damselfish	2	2.34	0.9
Total		4990		2132.5

Dive Site: South Carolina, Inside Edisto MPA, South Ridge, 55 m; Dive 12-09

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	ed1_wgs84 (Edisto1)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/10/2012
Specimens:	
Digital Photos:	215
DVD:	3
Hard Drive:	1

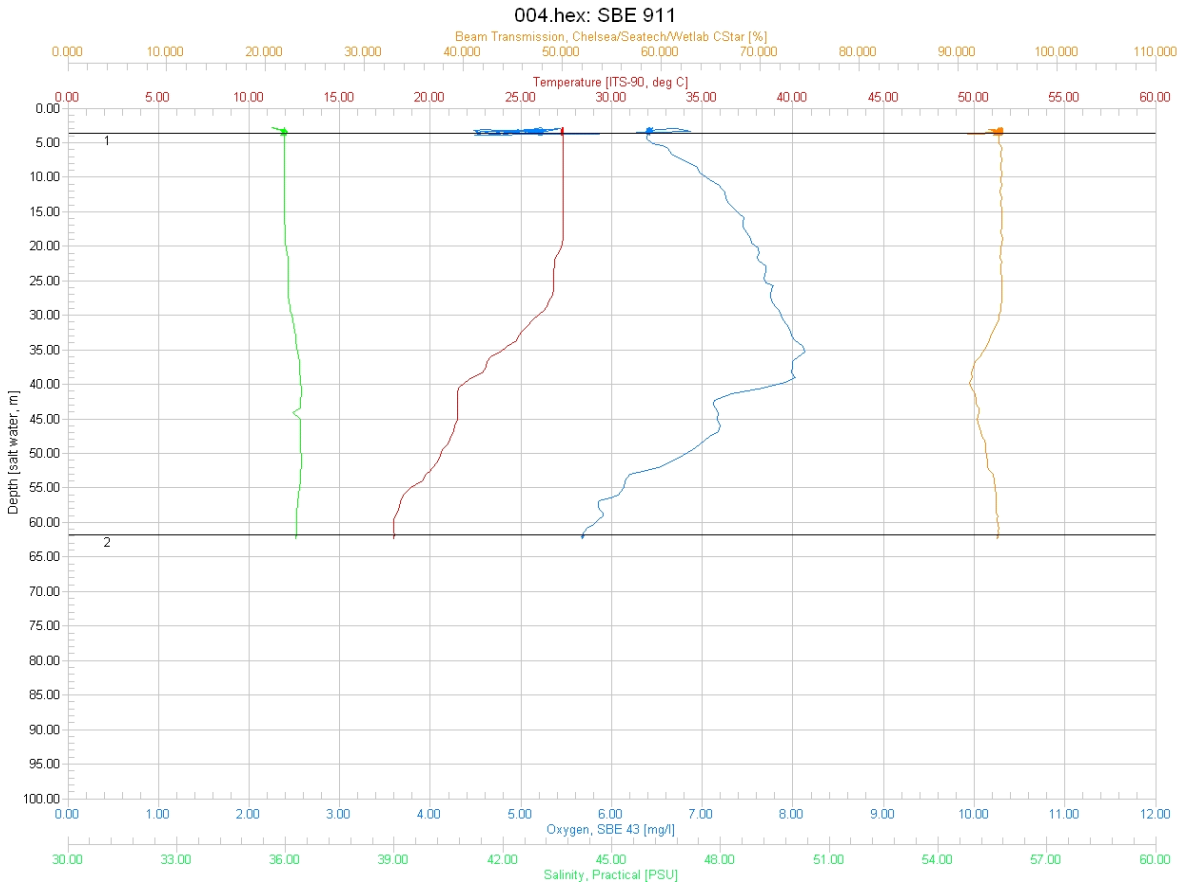
Dive Site: South Carolina, Inside Edisto MPA, South Ridge, 55 m; Dive 12-09

Dive Data:

Minimum Bottom Depth (m):	46	**Total Transect Length (km):**	6.461
Maximum Bottom Depth (m):	53	**Surface Current (kn):**	1.25
On Bottom (Time- GMT):	7:55	**On Bottom (Lat/Long):**	32.34°N; -79.05°W
Off Bottom (Time- GMT):	10:46	**Off Bottom (Lat/Long):**	32.35°N; -79.05°W
Physical (bottom); Temp (°C):	17.00	**Salinity:** 36.10 **Visibility (ft):** 50	**Current (kn):** 0.25

Physical Environment:

Distance from Dive Site(km): 6.99



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (62 m): temperature- 18, salinity- 36.1, and dissolved oxygen- 5.8. Surface temperature was 27.71 and there was a thermocline near 30-40 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 35 m. Visibility was estimated at 50 ft from the ROV video.

Dive Site: South Carolina, Inside Edisto MPA, South Ridge, 55 m; Dive 12-09

Dive Imagery:

Figure 1: -49.9 m
Hogfish (red color morph) on sediment with cyanophyta cover.

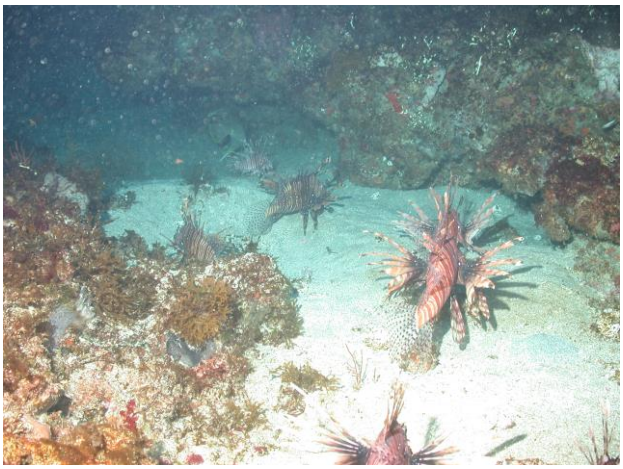


Figure 2: -48.1 m
Lionfish (6) in rocky outcrop habitat.

Figure 3: -48.3 m
Dense *Dictyota* algae on hardbottom habitat.

Figure 4: -47.6 m
Scamp grouper on rock pavement with dense biota.

Dive Site: South Carolina, Inside Edisto MPA, South Ridge, 55 m; Dive 12-09

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 9, Site #- 10-VII-12-2. Target Site – South Carolina Edisto MPA; 60 m. ROV survey inside MPA; ground truth multibeam sonar of site. Conduct two S to N video/photo transects along middle and edge of south ridge.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 1.25 kn from SW.

Site Description/Habitat/Biota:
Transect 1: low relief hard bottom, light orange zone of multibeam; 51.0- 51.5 m. Mostly low relief pavement, smooth exposed rock with no ledges, pavement with sediment veneer; sediment with Cyanophyta cover. 30-80% hard bottom cover. Sparse epifauna dominated by gorgonians, very few demosponges, and very few fish. Transect 2: in red zone of multibeam; transect in middle region of red zone mostly low relief rock pavement, and pavement with sediment veneer, with few or no small ledges; sparse sessile fauna and fish. Continue transect along west edge of high relief ridge. Top of ledge 47.5 m, base of slope 52-53 m. Slope very rugged, upper slope with 1 m ledges, undercut slabs, <30o slope to base. Lower slope and base with rock slabs, boulders, ledges 50-100 cm, then grading to sediment with Cyanophyta veneer at 52 m.

Dominant Benthic Biota: Very dense sessile biota dominated by purple gorgonians, Ellisellidae (several spp.), hydroids, Antipatharia (several spp.), and demosponges. Gorgonacea- *Ellisella* (whip, tan, li-pink), *Ellisella barbadensis*, *Ellisella* (erect branching), purple Plexaurid, *Swiftia exserta*, *Nicella*? (40 cm purple); Demospongiae- *Ircinia campana*, *Ircinia strobilina*, *Callyspongia vaginalis*, tan cake sponge, orange Axinellida, *Aplysina* (finger sponge), Spirastrellidae (encrusting); Antipathidae- *Stichopathes*, white bush, bottle brush, white mesh fan, *Tanacetipathes*; Hydroida; Annelida- *Filograna* (with ye Cyanophyta); Ascidiacea- Didemnidae (encrusting buttons), *Eudistoma*; Decapoda- *Panulirus argus*; Phaeophyta- *Dictyota*, *Sargassum* (attached); Chlorophyta- *Ulva*?, green blade, *Codium*; Rhodophyta- red blades.
Fish: scamp (common), Amberjack, tomtate (large schools), vermilion snapper (large school), reef butterfly, bank butterfly, cornet fish, cowfish, sharpnose puffer, gag (few), blue angelfish, lionfish, soldierfish, Calamus porgy, short bigeye, tattler, jackknife fish, flying gurnard, lionfish (common, 35).

Dive Site: South Carolina, Inside Edisto MPA, South Ridge, 55 m; Dive 12-09

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-09 conducted a survey near the southern end of the main ridge within the MPA. A S-N transect was made along the ridge which is evident in the multibeam sonar map. Dive transects were divided into four habitat zones: Hard Bottom- Pavement, Ridge- East Slope, Ridge- Top and Ridge- West Slope. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). The ridge top was low relief pavement with rubble and low rock knolls; the west slope was a high relief drop-off of high rugosity with scattered rock slabs and ledges on 35^{o} slope; 46-56 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-09. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 9	South Carolina, Inside Edisto MPA, South Ridge, 55 m; Dive 12-09				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	S ridge XS along middle and edge: 55-56.6 m 50% Hb, pvmt rubble, 1-2 m ledges.				
	Ridge- East Slope	On Reef	LRu	MR	RLF
Transect 2	50.5 - 54 m top of E ridge 70% HB 50 cm relief, pvmt, low relief knolls, rubble.				
	Ridge- Top	On Reef	LRu	LR	PF
Transect 3	48 m 70% cover, pvmt sed veneer, no ledges.				
	Ridge- Top	On Reef	LRu	LR	PF
Transect 4	47.5 m on top, 51.5 at base, max depth 53 m, SB the slope is gentle 1-2 m ledges, scattered rock slabs 35o slope, 50-100 cm relief boulders.				
	Ridge- West Slope	On Reef	HRu	HR	RLF
Transect 5	52 m off ridge in MB; pvmt SB some outcrops				
	Hard Bottom- Pavement	On Reef	LRu	LR	PF

Dive Site: South Carolina, Inside Edisto MPA, South Ridge, 55 m; Dive 12-09

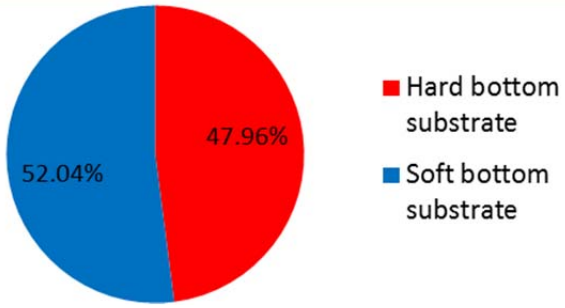


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-09. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-09 was a mix of hard and soft bottom (47.9 and 52.0% cover, respectively) consisting of rock pavement, rock slabs and boulders, ledges, and small knolls.

Bare rock substrate without biota covered 5.85% of the bottom and bare soft bottom was 38.32% (Fig. 2, Table 2). Benthic macro-biota covered 55.83% of the bottom and consisted of 0.91% non-coral Cnidaria (Hydrozoa), 1.83% Porifera, 0.8% Antipatharia, 1.97% Alcyonacea ("gorgonacea"), and 47.52% algae (primarily cyanobacteria- 36.38%).

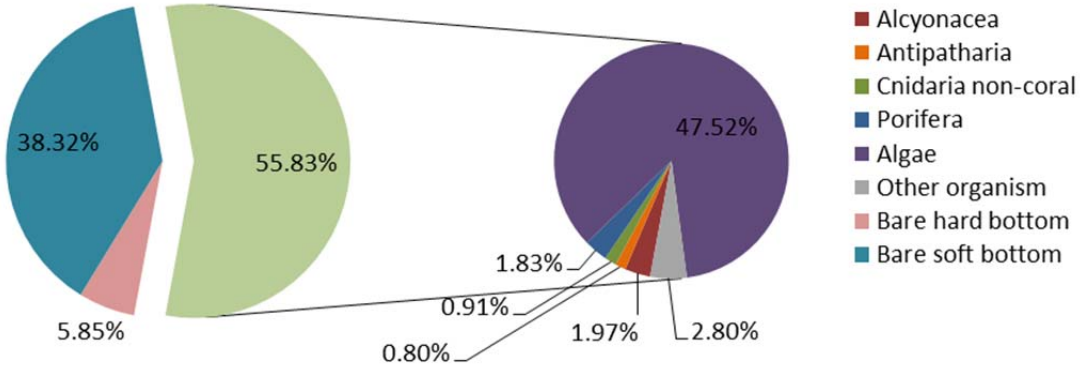


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-09. Corals include Alcyonacea (primarily "gorgonacea" and soft coral) and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida and Zoanthidea.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-09.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**66**	**1.83%**
Porifera	**66**	**1.83%**
Axinellida	1	0.03%
Callyspongia vaginalis	1	0.03%
Cliona sp.	2	0.06%
Demospongiae	28	0.78%
Demospongiae- ze tan starlet	4	0.11%

Dive Site: South Carolina, Inside Edisto MPA, South Ridge, 55 m; Dive 12-09

Ircinia campana	1	0.03%
Ircinia sp.	12	0.33%
Niphates sp.	2	0.06%
Ptilocaulis sp.	1	0.03%
Spirastrellidae	14	0.39%
Cnidaria non-coral	**33**	**0.91%**
Cnidaria non-coral	**33**	**0.91%**
Hydroidolina	32	0.89%
Zoanthidea	1	0.03%
Antipatharia	**29**	**0.80%**
Antipatharia	**29**	**0.80%**
Antipatharia	10	0.28%
Antipathes sp. A	3	0.08%
Stichopathes lutkeni	8	0.22%
Tanacetipathes hirta	8	0.22%
Algae	**1715**	**47.52%**
Algae	**1715**	**47.52%**
Chlorophyta	17	0.47%
Corallinales/crustose coralline	67	1.86%
Cyanophyta	1313	36.38%
Phaeophyta	200	5.54%
Rhodophyta	118	3.27%
Alcyonacea	**71**	**1.97%**
Alcyonacea	**71**	**1.97%**
Alcyonacea	1	0.03%
Diodogorgia sp.	20	0.55%
Ellisellidae	35	0.97%
Gorgonacea	8	0.22%
Pseudopterogorgia	2	0.06%
Titanideum frauenfeldii	5	0.14%
Other organism	**101**	**2.80%**
Annelida	**19**	**0.53%**
Filograna sp.	19	0.53%
Arthropoda	**1**	**0.03%**
Decapoda	1	0.03%
Bryozoa	**7**	**0.19%**
Bryozoa	3	0.08%
Schizoporella sp.	4	0.11%
Chordata	**30**	**0.83%**
Ascidiacea	1	0.03%
Didemnidae	13	0.36%
Fish	16	0.44%

Dive Site: South Carolina, Inside Edisto MPA, South Ridge, 55 m; Dive 12-09

Other organism	**44**	**1.22%**
Other organism	44	1.22%
Hard bottom substrate	**211**	**5.85%**
Hard bottom substrate	**211**	**5.85%**
Bare rock- pavement boulder ledge	186	5.15%
Bare rubble- rock	25	0.69%
Soft bottom substrate	**1383**	**38.32%**
Soft bottom substrate	**1383**	**38.32%**
Bare soft bottom substrate	1383	38.32%
Grand Total	**3609**	**100.00%**

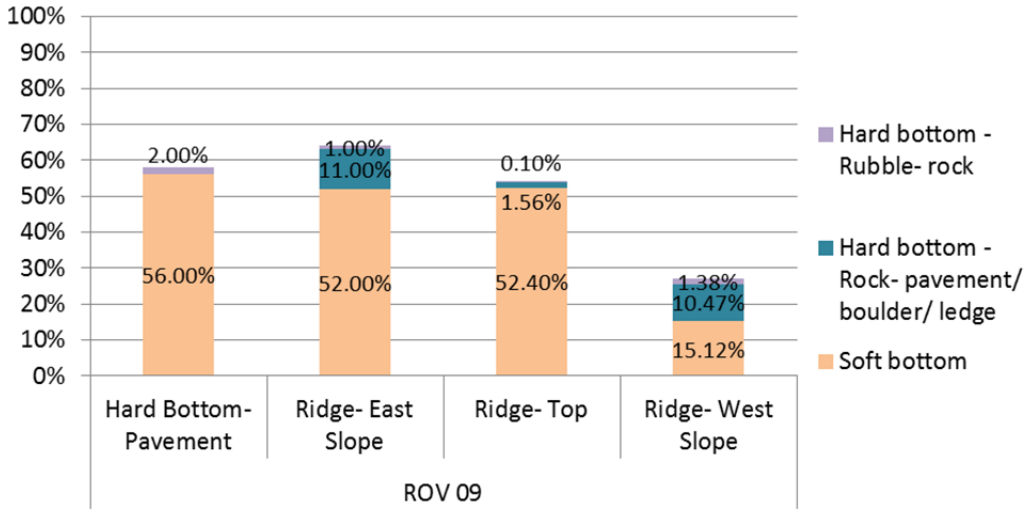


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-09.

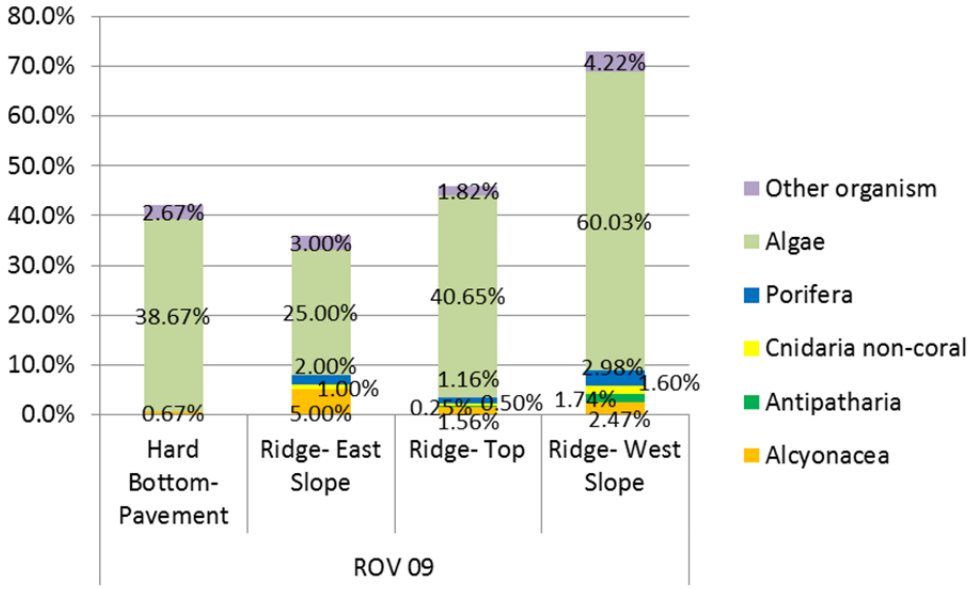


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-09.

Dive Site: South Carolina, Inside Edisto MPA, South Ridge, 55 m; Dive 12-09

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. It appears that the hard bottom pavement habitat zone was mostly soft bottom when in fact it was a thin layer of sediment over rock pavement. The ridge west slope had the least amount of bare substrate and the highest cover of biota. Figure 4 shows the west slope to have 60.0% cover of algae along with 2.9% Porifera, 1.7% Antipatharia and 2.4% Alcyonacea.

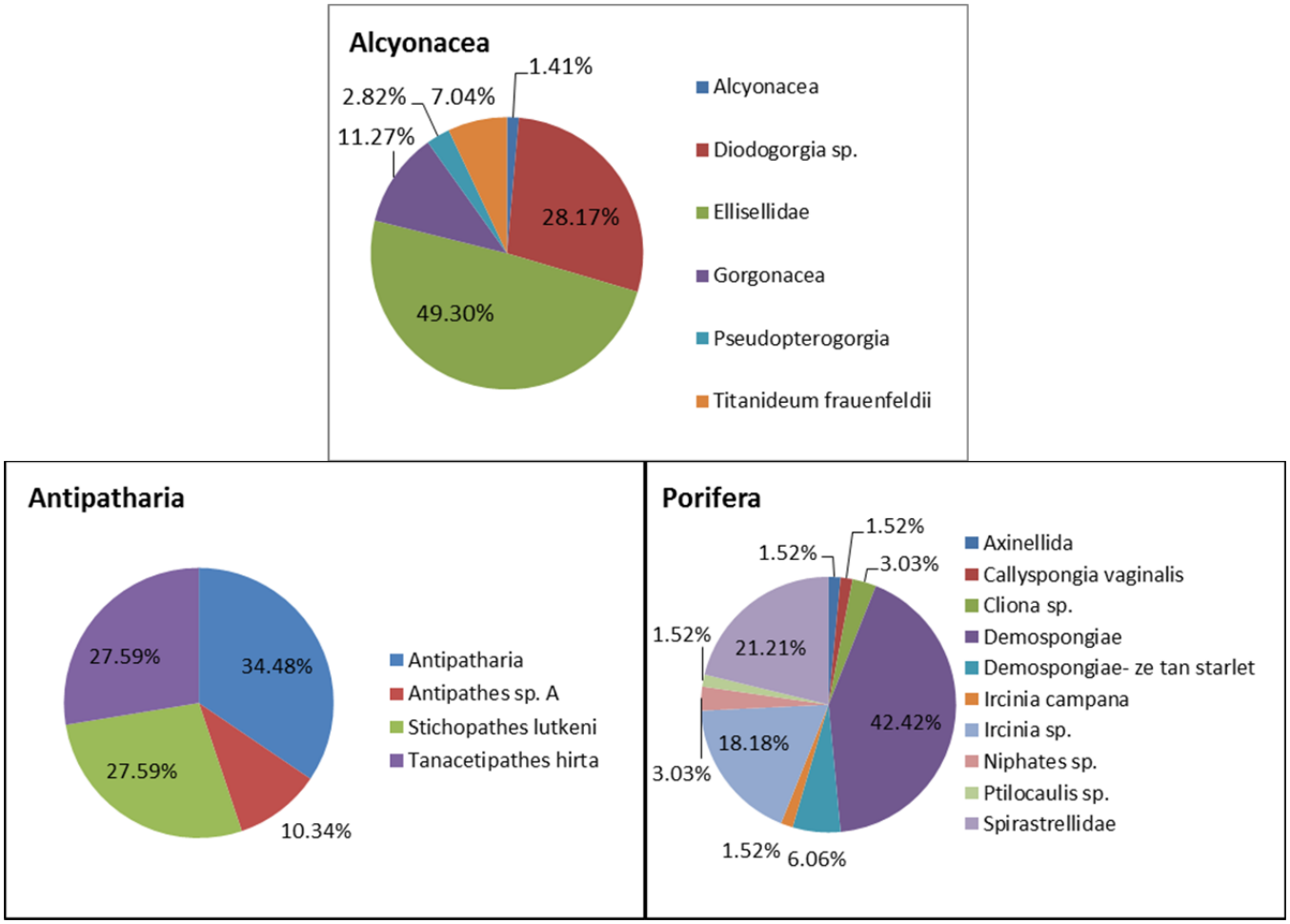


Figure 5. Diversity of corals and sponges at dive site ROV 12-09; CPCe analysis showing percent of total for each taxa category. Corals include Alcyonacea ("gorgonacea" and soft corals) and Antipatharia (black coral); Porifera are Demospongiae.

No hard coral was present at the dive site. Alcyonacea included at least 6 taxa of Ellisellidae (49.3% of the total Alcyonacea), *Diodogorgia* sp. (28.1%), *Titanideum frauenfeldii* (7.0%), and *Pseudopterogorgia* sp. (2.8%). Four taxa of Antipatharia included *Stichopathes lutkeni* (27.5%), *Tanacetipathes hirta* (27.5%) and *Antipathes* sp. A (10.3%). Porifera were fairly diverse with at least 10 taxa; Spirastrellidea (21.2% of the total Porifera), *Ircinia* sp. (18.1%), *Callyspongia vaginalis*, *Cliona* sp., *Niphates* sp., and *Ptilocaulis* sp.

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 49 taxa of fish were

identified from dive ROV 9 for a total density of 701.9 individuals/km (Table 3). These were dominated by tomtate (394.9/km), grunt (128.6), and vermilion snapper (45). Managed species included scamp (6.8/km), amberjack (4.8), hogfish (0.5), gag grouper (0.5), and red porgy (0.2).

Table 3. Density of fish for all transects at dive site ROV 12-09 (number individuals/km).

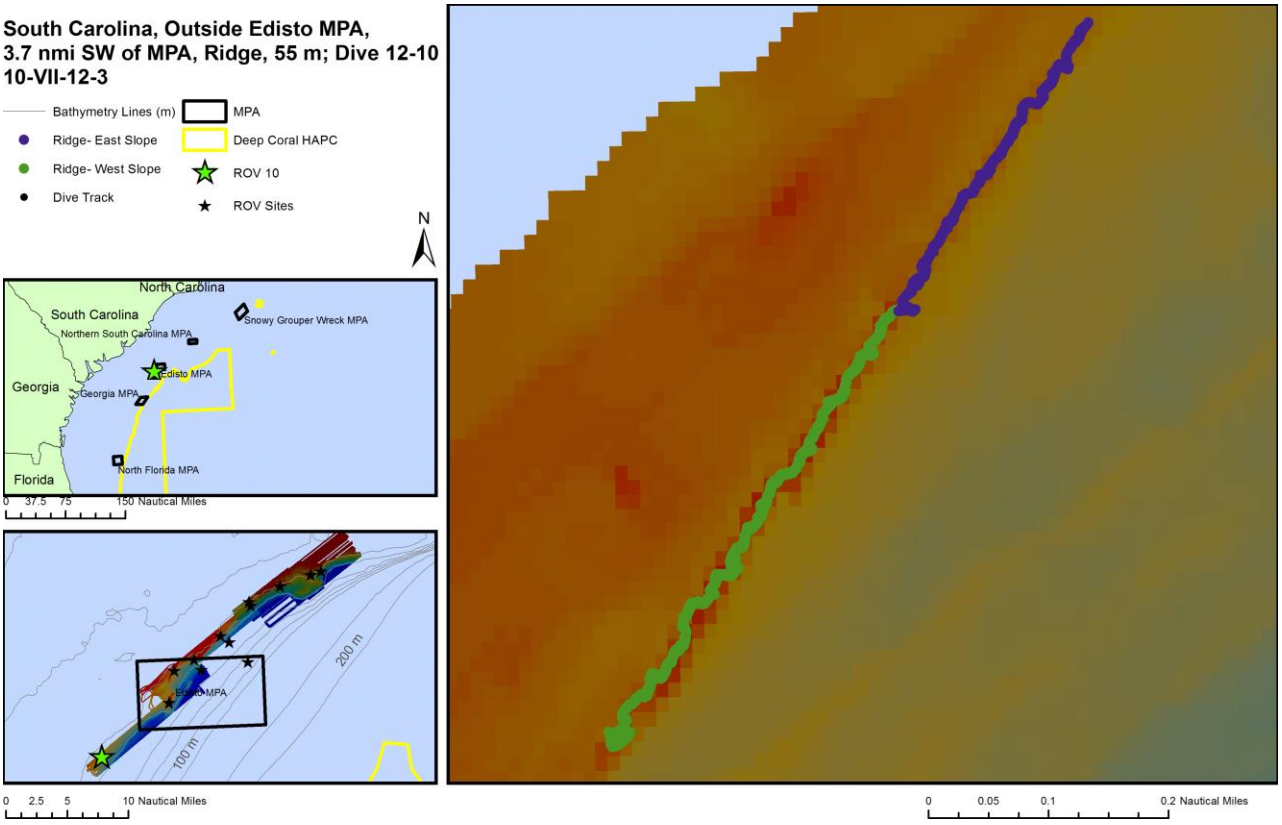
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus sp.	doctorfish	2	6.46	0.3
Bodianus pulchellus	spotfin hogfish	32	6.46	5.0
Bodianus rufus	spanish hogfish	1	6.46	0.2
Calamus sp.	porgy	22	6.46	3.4
Canthigaster rostrata	sharpnose puffer	75	6.46	11.6
Chaetodon ocellatus	spotfin butterflyfish	19	6.46	2.9
Chaetodon sedentarius	reef butterflyfish	96	6.46	14.9
Chilomycterus sp.	burrfish	1	6.46	0.2
Chromis enchrysurus	yellowtail reeffish	22	6.46	3.4
Chromis insolatus	sunshinefish	1	6.46	0.2
Chromis scotti	purple reeffish	43	6.46	6.7
Chromis sp.	damselfish	14	6.46	2.2
Dactylopterus volitans	flying gurnard	1	6.46	0.2
Epinephelus cruentatus	graysby	8	6.46	1.2
Equetus lanceolatus	jack-knife fish	2	6.46	0.3
Equetus umbrosus	cubbyu	17	6.46	2.6
Fistularia sp.	cornetfish	3	6.46	0.5
Fistularia tabacaria	bluespotted cornetfish	1	6.46	0.2
Haemulon aurolineatum	tomtate	2551	6.46	394.9
Haemulon sp.	grunt	831	6.46	128.6
Haemulon striatum	striped grunt	35	6.46	5.4
Halichoeres garnoti	yellowhead wrasse	3	6.46	0.5
Halichoeres sp.	wrasse	179	6.46	27.7
Hemicaranx amblyrhynchus	bluntnose jack	5	6.46	0.8
Holacanthus bermudensis	blue angelfish	43	6.46	6.7
Holacanthus tricolor	rock beauty	1	6.46	0.2
Holocentridae	soldierfish/squirrelfish	2	6.46	0.3
Holocentrus sp.	squirrelfish	60	6.46	9.3
Lachnolaimus maximus	hogfish	3	6.46	0.5
Lactophrys polygonia	honeycomb cowfish	1	6.46	0.2
Lactophrys sp.	cowfish	9	6.46	1.4
Mycteroperca microlepis	gag grouper	3	6.46	0.5
Mycteroperca phenax	scamp	44	6.46	6.8
Pagrus pagrus	red porgy	1	6.46	0.2
Pomacanthus arcuatus	grey angelfish	2	6.46	0.3
Pristigenys alta	short bigeye	4	6.46	0.6

Dive Site: South Carolina, Inside Edisto MPA, South Ridge, 55 m; Dive 12-09

Prognathodes aya	bank butterflyfish	4	6.46	0.6
Pseudupeneus maculatus	spotted goatfish	1	6.46	0.2
Pterois volitans	lionfish	44	6.46	6.8
Rhomboplites aurorubens	vermilion snapper	291	6.46	45.0
Scorpaenidae	scorpionfish	1	6.46	0.2
Seriola dumerili	greater amberjack	5	6.46	0.8
Seriola rivoliana	almaco jack	6	6.46	0.9
Seriola sp.	amberjack	18	6.46	2.8
Serranus phoebe	tattler	18	6.46	2.8
Sparidae	porgy	6	6.46	0.9
Sparisoma atomarium	greenblotch parrotfish	1	6.46	0.2
Sphyraena barracuda	barracuda	1	6.46	0.2
Stegastes partitus	bicolor damselfish	1	6.46	0.2
Total		4534		701.9

Dive Site: South Carolina, Outside Edisto MPA, 3.7 nmi SW of MPA, Ridge, 55 m; Dive 12-10

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	ed1_wgs84 (Edisto1)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/10/2012
Specimens:	
Digital Photos:	170
DVD:	2
Hard Drive:	1

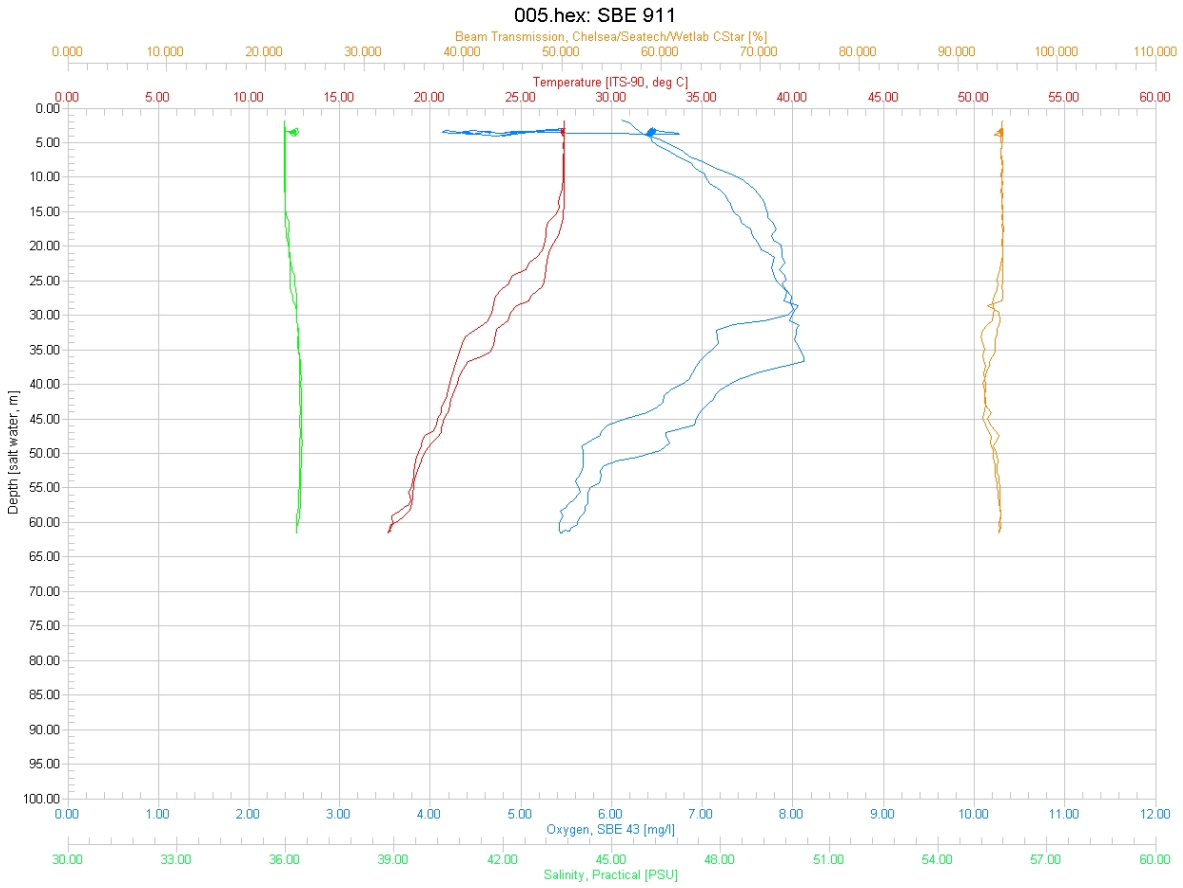
Dive Site: South Carolina, Outside Edisto MPA, 3.7 nmi SW of MPA, Ridge, 55 m; Dive 12-10

Dive Data:

Minimum Bottom Depth (m):	54	**Total Transect Length (km):**	3.672
Maximum Bottom Depth (m):	51	**Surface Current (kn):**	.25
On Bottom (Time- GMT):	12:08	**On Bottom (Lat/Long):**	32.27°N; -79.17°W
Off Bottom (Time- GMT):	14:07	**Off Bottom (Lat/Long):**	32.28°N; -79.16°W
Physical (bottom); Temp (°C):	27.16	**Salinity:** 36.00 **Visibility (ft):** 50	**Current (kn):** 0.25

Physical Environment:

Distance from Dive Site(km): 20.05



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (62 m): temperature- 17, salinity- 36, and dissolved oxygen- 5.4. Surface temperature was 27.7 and there was a thermocline near 26-35 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 38 m. Visibility was estimated at 50 ft from the ROV video.

Dive Site: South Carolina, Outside Edisto MPA, 3.7 nmi SW of MPA, Ridge, 55 m; Dive 12-10

Dive Imagery:

Figure 1: -53.5 m
Scamp grouper on high relief rock habitat.

Figure 2: -52.2 m
Slipper lobster on high relief rock habitat.

Figure 3: -53.3 m
Lionfish on high relief rock habitat with gorgonians and sponges.

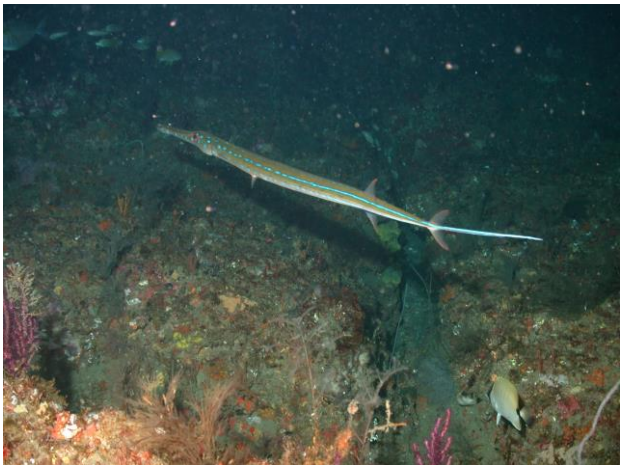


Figure 4: -53.3 m
Cornetfish on high relief rock habitat.

Dive Site: South Carolina, Outside Edisto MPA, 3.7 nmi SW of MPA, Ridge, 55 m; Dive 12-10

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 10, Site #- 10-VII-12-3. Target Site – outside and southwest of South Carolina Edisto MPA; 55 m. ROV survey outside MPA site; ground truth multibeam sonar of site. Conduct video/photo transect along ridge; narrow ridge, 50 m wide, oriented SE-NW. Multibeam pixel resolution of sonar map is ~20 m.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 1.25 kn from SW.

Site Description/Habitat/Biota:
West slope of ridge: high relief, fractured rock slabs, undercut ledges, 1/2 to 2 m relief; top of slope 51 m, base 54 m. Slope <30o, 10-20 m wide. Lower slope fractured rock slabs 3-4 m wide, 1/2-1 m relief; boulders grading to sand with Cyanophyta veneer. Top middle of ridge, fractured rock, 1/2 m relief, less rugose. East slope of ridge, narrow slope 10 m, < 30o slope, top- 51 m, base 54.5 m. Fractured rock slabs, 1/2-1 m relief, but less rugose than west slope.

Dominant Benthic Biota: Very diverse and dense demosponges, gorgonians, and black coral common. Gorgonacea- *Nicella* (30-40 cm purple fan), *Diodogorgia nodulifera*? (10 cm purple, knobby); Hydroida; Antipatharia- *Stichopathes*, Antipathidae (several spp); Demospongiae- *Ircinia campana*, *Ircinia strobilina*, *Callyspongia vaginalis*, *Aplysina*, numerous thin encrusting spp, *Erylus*, *Cinachyra*, Spirastrellidae, *Holopsamma*?, tan cake; Annelida- *Filograna*; Decapoda- *Panulirus argus*, slipper lobster; Mollusca- spiny oyster; Ascidiacea- Didemnidae, *Eudistoma*.
Fish: scamp (common), gag, tomtate (large schools), vermilion snapper (large schools), amberjack, reef butterfly, bank butterfly, cornet fish, blue angel, French angel, bigeye, short bigeye, spadefish, spotfin hog, hogfish, spotted goatfish, purple reeffish, cowfish, graysby, ocean surgeonfish, southern? stingray, lionfish (abundant, 119).

Dive Site: South Carolina, Outside Edisto MPA, 3.7 nmi SW of MPA, Ridge, 55 m; Dive 12-10

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-10 surveyed a ridge site 3.7 nmi SW of the MPA. A transect from SW to NE was made along the ridge which is evident in the multibeam sonar map. Dive transects were divided into two habitat zones: Ridge-East Slope and Ridge- West Slope. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). The ridge was ~50 m wide; east and west slopes of ridge were moderate to high relief drop-offs and high rugosity with large 3-4 m diameter rock slabs; 43-54 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-10. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 10	South Carolina, Outside Edisto MPA, 3.7 nmi SW of MPA, Ridge, 55 m; Dive 12-10				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	NE-SW narrow ridge: west slope 51 m top, 54 m at base, 1-2 m and 2-3 m relief outcrops, 3-4 m dial rock slabs, ridge 50 m wide, west of ridge is flat sand/sed				
	Ridge- West Slope	On Reef	HRu	HR	RLF
Transect 2	52 m top ledge, 54 m very narrow ridge, 10 m wide, 3-4 m diam rock slabs 0.5 m to 1 m relief.				
	Ridge- East Slope	On Reef	HRu	MR	RLF

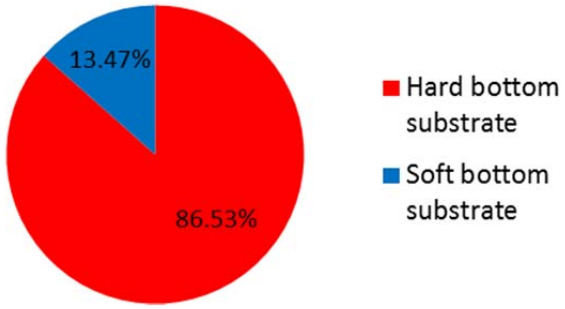


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-10. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-10 was predominately hard bottom (86.53%) consisting of 3-4 m rock slabs, ledges, and pavement. Off the ridge was flat sand bottom.

Bare rock substrate without biota covered 43.11% of the bottom and bare soft bottom was 13.6% (Fig. 2, Table 2). Benthic macro-biota covered 43.28% of the bottom and consisted of 0.04% hard coral, 2.87% non-coral Cnidaria (Hydrozoa), 8.11% Porifera, 3.73% Antipatharia, 1.54% Alcyonacea (“gorgonacea”), and 18.58% algae.

Dive Site: South Carolina, Outside Edisto MPA, 3.7 nmi SW of MPA, Ridge, 55 m; Dive 12-10

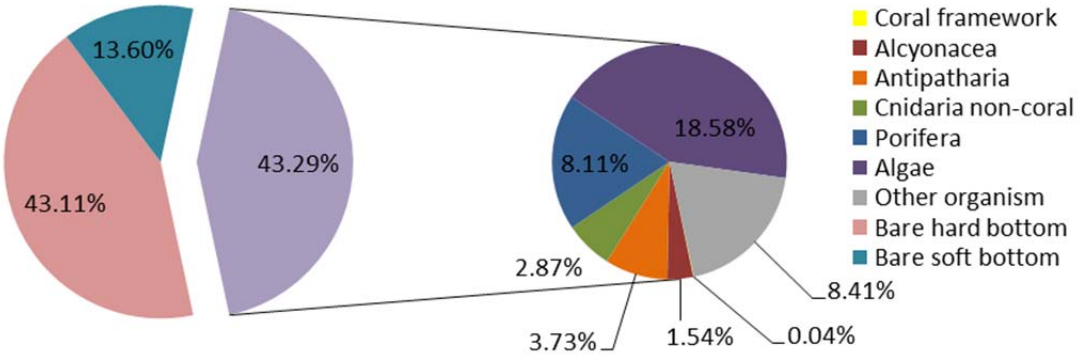


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-10. Corals include framework scleractinian coral, Alcyonacea ("gorgonacea" and soft coral), and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-10.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**189**	**8.11%**
Porifera	**189**	**8.11%**
Aplysina sp.	10	0.43%
Callyspongia sp.	1	0.04%
Chondrosia sp.	12	0.51%
Cinachyra sp./Cinachyrella sp.	1	0.04%
Cliona sp.	2	0.09%
Demospongiae	62	2.66%
Demospongiae- ze tan starlet	7	0.30%
Geodia sp.	5	0.21%
Holopsamma sp.	1	0.04%
Ircinia sp.	15	0.64%
Mycale sp.	1	0.04%
Niphates sp.	1	0.04%
Spirastrellidae	71	3.05%
Cnidaria non-coral	**67**	**2.87%**
Cnidaria non-coral	**67**	**2.87%**
Hydroidolina	67	2.87%
Antipatharia	**87**	**3.73%**
Antipatharia	**87**	**3.73%**
Antipatharia	73	3.13%
Antipathes sp. A	7	0.30%
Stichopathes lutkeni	7	0.30%
Algae	**433**	**18.58%**
Algae	**433**	**18.58%**
Chlorophyta	15	0.64%

Dive Site: South Carolina, Outside Edisto MPA, 3.7 nmi SW of MPA, Ridge, 55 m; Dive 12-10

Corallinales/crustose coralline	140	6.01%
Cyanophyta	269	11.54%
Phaeophyta	1	0.04%
Rhodophyta	8	0.34%
Alcyonacea	**36**	**1.54%**
Alcyonacea	**36**	**1.54%**
Alcyonacea	2	0.09%
Diodogorgia sp.	22	0.94%
Ellisellidae	3	0.13%
Gorgonacea	6	0.26%
Telesto sp.	3	0.13%
Coral	**1**	**0.04%**
Coral	**1**	**0.04%**
Madracis myriaster	1	0.04%
Other organism	**196**	**8.41%**
Annelida	**23**	**0.99%**
Filograna sp.	23	0.99%
Bryozoa	**18**	**0.77%**
Bryozoa	12	0.51%
Schizoporella sp.	6	0.26%
Chordata	**89**	**3.82%**
Ascidiacea	34	1.46%
Didemnidae	51	2.19%
Fish	4	0.17%
Echinodermata	**15**	**0.64%**
Crinoidea	15	0.64%
Mollusca	**1**	**0.04%**
Bivalvia	1	0.04%
Natural detritus	**1**	**0.04%**
Natural detritus	1	0.04%
Other organism	**49**	**2.10%**
Other organism	49	2.10%
Hard bottom substrate	**1005**	**43.11%**
Hard bottom substrate	**1005**	**43.11%**
Bare rock- pavement boulder ledge	902	38.70%
Bare rubble- coral	1	0.04%
Bare rubble- rock	102	4.38%
Soft bottom substrate	**317**	**13.60%**
Soft bottom substrate	**317**	**13.60%**
Bare soft bottom substrate	317	13.60%
Grand Total	**2331**	**100.00%**

Dive Site: South Carolina, Outside Edisto MPA, 3.7 nmi SW of MPA, Ridge, 55 m; Dive 12-10

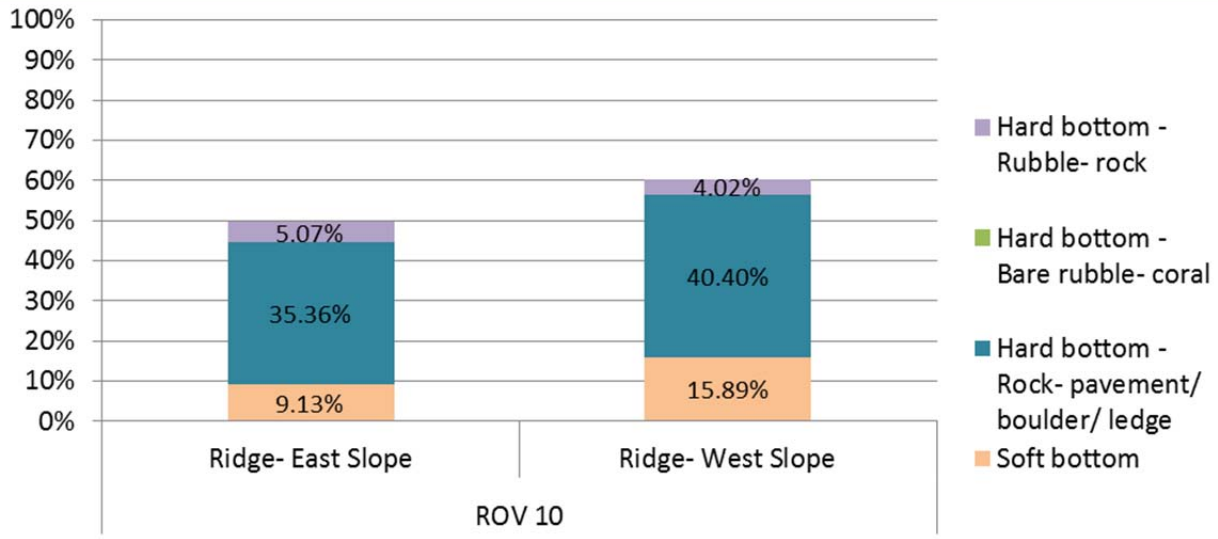


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-10.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The east and west slopes of the ridge have similar cover of bare hard bottom (35.3-40.4% cover). Figure 4 shows the ridge east slope to have greater cover of biota consisting of 10.3% Porifera, 4.69% Antipatharia, and 2.41% Alcyonacea. Algal cover was fairly dense in both habitat zones (18.0-19.5%), and consisted of cyanobacteria (11.5%), crustose corallines (6.0%), and fleshy macro-red algae (0.3%).

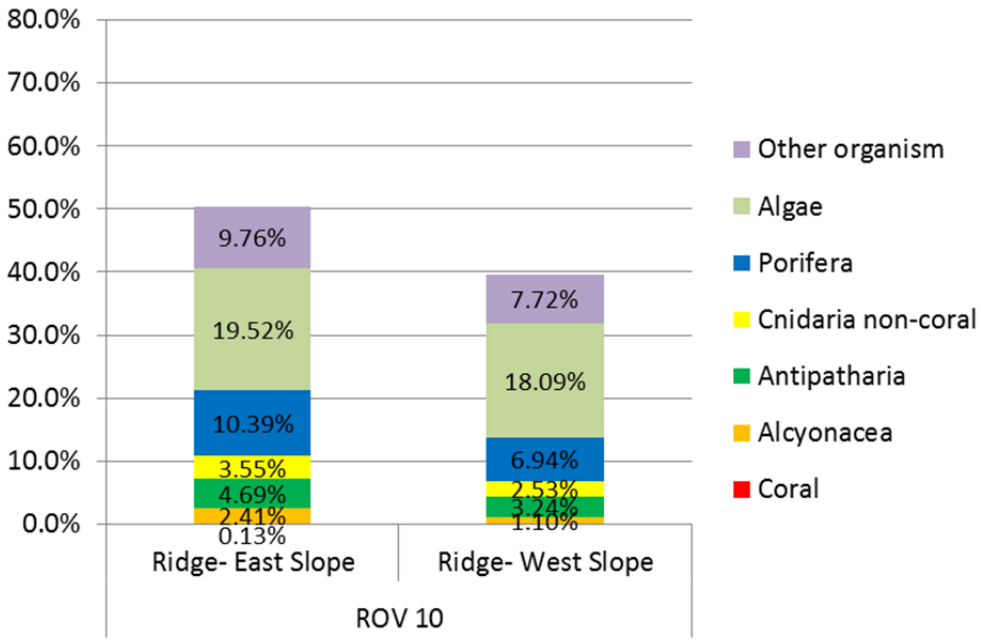


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-10.

Dive Site: South Carolina, Outside Edisto MPA, 3.7 nmi SW of MPA, Ridge, 55 m; Dive 12-10

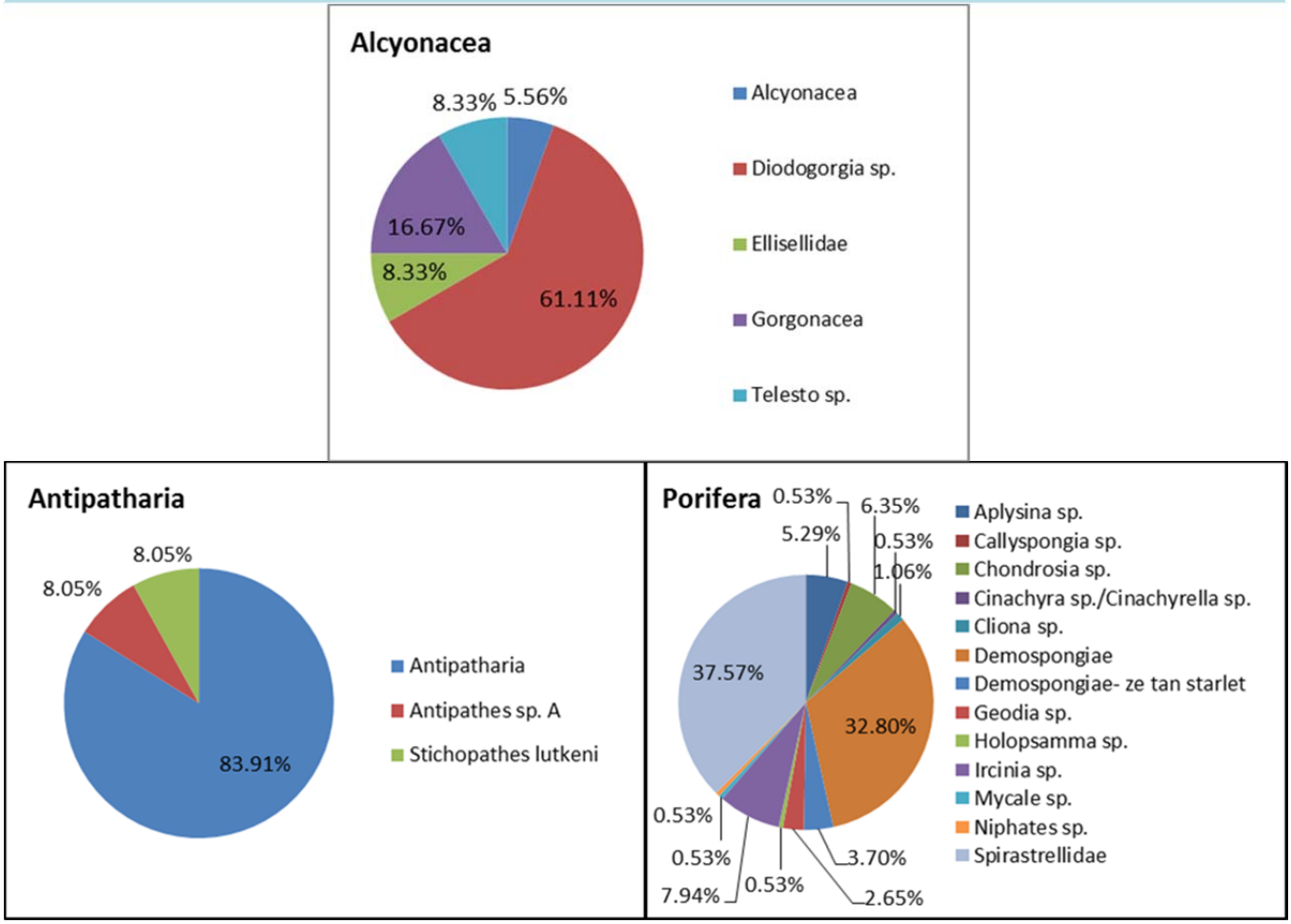


Figure 5. Diversity of corals and sponges at dive site ROV 12-10; CPCe analysis showing percent of total for each taxa category. Corals include framework scleractinian coral, Alcyonacea ("gorgonacea" and soft corals), and Antipatharia (black coral); Porifera are Demospongiae.

This was the first dive of the cruise that had framework hard coral (*Madracis myriaster*). Alcyonacea were dominated by *Diodogorgia* sp. (61.1% of the total Alcyonacea), Ellisellidae (8.3%), and *Telesto* sp. (8.3%). Black coral included *Antipathes* sp. A (8.0%) and *Stichopathes lutkeni* (8.0%) along with numerous unidentified Antipatharia (83.9%). Porifera were quite diverse at this site with Spirastrellidae (37.8% of the total Porifera), *Ircinia* sp. (7.9%), and *Chondrosia* (6.3%), along with *Aplysina* sp., *Cinachyra* sp., *Geodia* sp., *Cliona* sp., and *Holopsamma* sp.

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 45 taxa of fish were identified from dive ROV 10 for a total density of 3761 individuals/km (Table 3). These were dominated by tomtate (2708/km), vermilions snapper (683.7), and purple reeffish (58). Managed species included scamp (33.2/km), amberjack (30.2), red porgy (11.2), snowy grouper (0.3), red grouper (0.3), and gag grouper (0.8).

Dive Site: South Carolina, Outside Edisto MPA, 3.7 nmi SW of MPA, Ridge, 55 m; Dive 12-10

Table 3. Density of fish for all transects at dive site ROV 12-10 (number individuals/km).

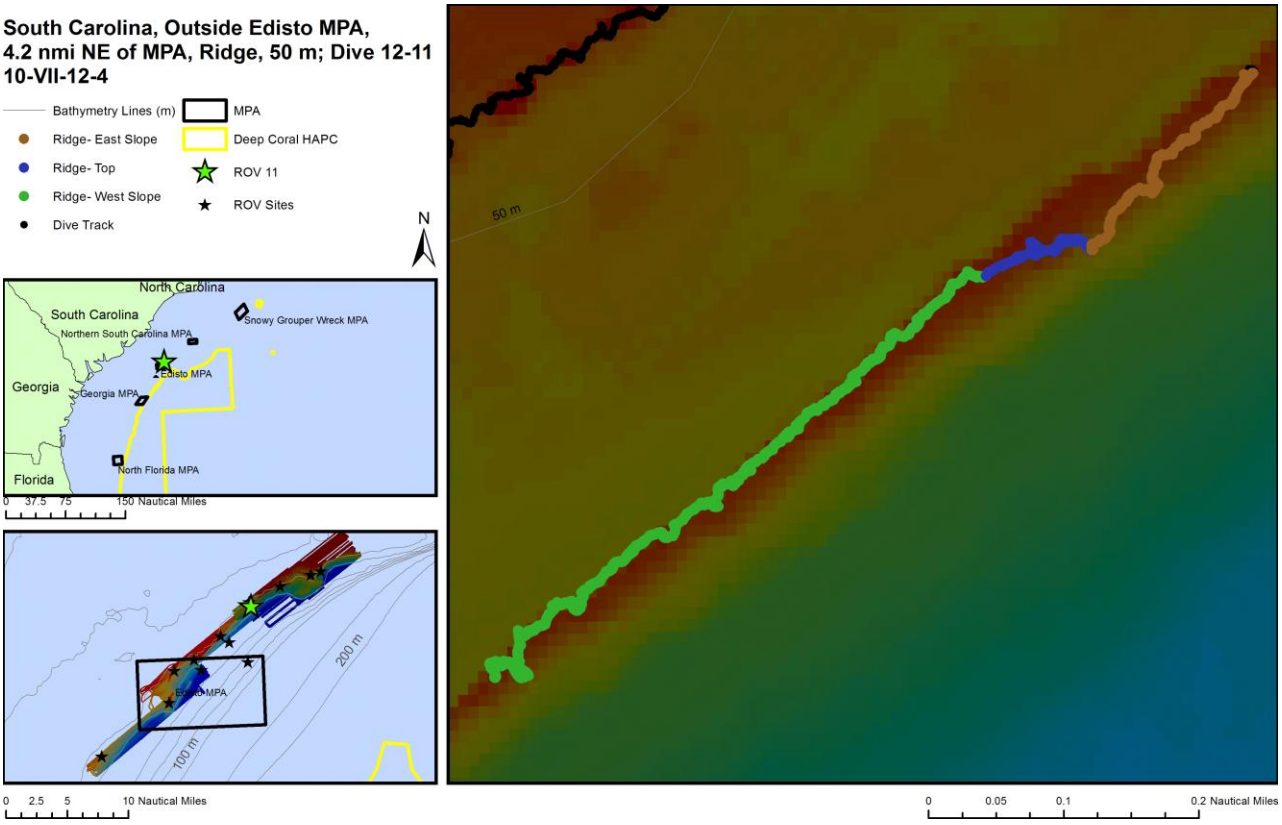
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthostracion polygonius	honeycomb cowfish	1	3.67	0.3
Acanthurus bahianus	ocean surgeonfish	3	3.67	0.8
Acanthurus sp.	doctorfish	3	3.67	0.8
Balistes sp.	triggerfish	2	3.67	0.5
Bodianus pulchellus	spotfin hogfish	80	3.67	21.8
Calamus sp.	porgy	23	3.67	6.3
Canthigaster rostrata	sharpnose puffer	92	3.67	25.1
Chaetodipterus faber	spadefish	20	3.67	5.4
Chaetodon ocellatus	spotfin butterflyfish	22	3.67	6.0
Chaetodon sedentarius	reef butterflyfish	82	3.67	22.3
Chromis enchrysurus	yellowtail reeffish	22	3.67	6.0
Chromis insolatus	sunshinefish	14	3.67	3.8
Chromis scotti	purple reeffish	213	3.67	58.0
Chromis sp.	damselfish	4	3.67	1.1
Diodon sp.	pufferfish	2	3.67	0.5
Epinephelus cruentatus	graysby	10	3.67	2.7
Epinephelus morio	red grouper	1	3.67	0.3
Epinephelus niveatus	snowy	1	3.67	0.3
Equetus umbrosus	cubbyu	15	3.67	4.1
Fistularia commersonii	bluespotted cornetfish	6	3.67	1.6
Haemulon aurolineatum	tomtate	9940	3.67	2708.4
Halichoeres sp.	wrasse	59	3.67	16.1
Holacanthus bermudensis	blue angelfish	129	3.67	35.1
Holocentrus sp.	squirrelfish	17	3.67	4.6
Hypoplectrus aberrans	yellowbelly hamlet	1	3.67	0.3
Lactophrys quadricornis	scrawled cowfish	1	3.67	0.3
Lactophrys sp.	cowfish	11	3.67	3.0
Liopropoma eukrines	wrasse bass	1	3.67	0.3
Monacanthus sp.	filefish	5	3.67	1.4
Mulloidichthys martinicus	yellow goatfish	2	3.67	0.5
Mycteroperca microlepis	gag grouper	3	3.67	0.8
Mycteroperca phenax	scamp	122	3.67	33.2
Myripristis jacobus	blackbar soldierfish	10	3.67	2.7
Pagrus pagrus	red porgy	41	3.67	11.2
Pomacanthus paru	french angelfish	12	3.67	3.3
Priacanthus arenatus	bigeye	3	3.67	0.8
Pristigenys alta	short bigeye	20	3.67	5.4
Prognathodes aya	bank butterflyfish	26	3.67	7.1
Pseudupeneus maculatus	spotted goatfish	2	3.67	0.5

Dive Site: South Carolina, Outside Edisto MPA, 3.7 nmi SW of MPA, Ridge, 55 m; Dive 12-10

Pterois volitans	lionfish	155	3.67	42.2
Rhomboplites aurorubens	vermilion snapper	2509	3.67	683.7
Rypticus sp.	soapfish	2	3.67	0.5
Scorpaenidae	scorpionfish	4	3.67	1.1
Seriola sp.	amberjack	111	3.67	30.2
Sphoeroides spengleri	bandtail puffer	1	3.67	0.3
Total		13803		3761.0

Dive Site: South Carolina, Outside Edisto MPA, 4.2 nmi NE of MPA, Ridge, 50 m; Dive 12-11

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	ed2_wgs84 (Edisto2)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/10/2012
Specimens:	
Digital Photos:	98
DVD:	2
Hard Drive:	1

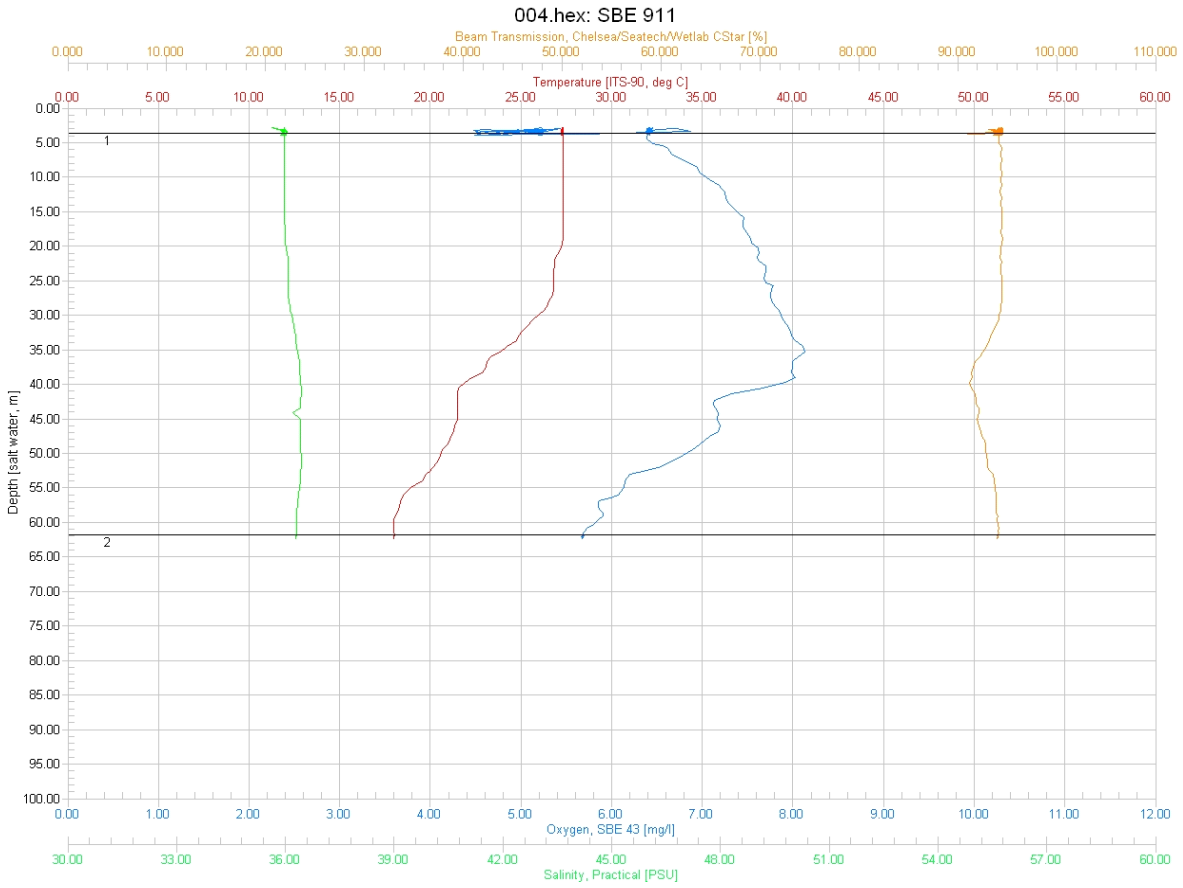
Dive Site: South Carolina, Outside Edisto MPA, 4.2 nmi NE of MPA, Ridge, 50 m; Dive 12-11

Dive Data:

Minimum Bottom Depth (m):	47	**Total Transect Length (km):**	3.251
Maximum Bottom Depth (m):	52	**Surface Current (kn):**	0.6
On Bottom (Time- GMT):	15:57	**On Bottom (Lat/Long):**	32.47°N; -78.91°W
Off Bottom (Time- GMT):	17:52	**Off Bottom (Lat/Long):**	32.48°N; -78.9°W
Physical (bottom); Temp (°C):	19.30	**Salinity:** 36.00 **Visibility (ft):** 50	**Current (kn):** 0.25

Physical Environment:

Distance from Dive Site(km): 6.48



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (62 m): temperature- 18, salinity- 36.1, and dissolved oxygen- 5.8. Surface temperature was 27.8 and there was a thermocline near 30-40 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 35 m. Visibility was estimated at 50 ft from the ROV video.

Dive Site: South Carolina, Outside Edisto MPA, 4.2 nmi NE of MPA, Ridge, 50 m; Dive 12-11

Dive Imagery:

Figure 1: -50.3 m
Swiftia exerta gorgonian on low relief pavement.

Figure 2: -49.1 m
Fish school under high relief ledge with gorgonians.

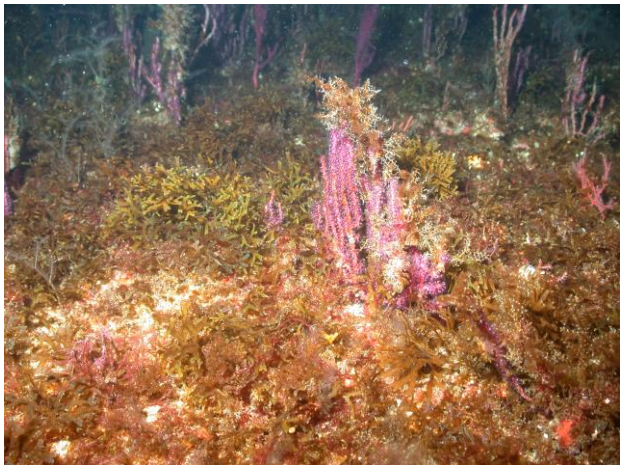


Figure 3: -47 m
Dictyota algae and *Diodogorgia* octocoral on low relief pavement.

Figure 4: -48.1 m
Dictyota and *Peysonnellia* algae on hardbottom habitat.

Dive Site: South Carolina, Outside Edisto MPA, 4.2 nmi NE of MPA, Ridge, 50 m; Dive 12-11

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 11, Site #- 10-VII-12-4. Target Site – ridge outside and north of South Carolina Edisto MPA; 52 m. ROV survey outside MPA; ground truth multibeam sonar of site. Conduct video/photo transect S to N along ridge oriented NE-SW, ~75 m wide. Multibeam pixel resolution ~20 m.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.25 kn from SW.

Site Description/Habitat/Biota:
West slope of ridge is rugged, fractured rock slabs; top of ridge 48 m, base 51.5 m, <30o slope, 15-20 m wide; upper slope- very rugged, rock slabs, undercut 1-2 m relief; lower slope- 10o slope, rock slabs, 1/2-1 m relief; base of slope- rock slabs and boulders, 1/2 m relief grading to 100% sediment with Cyanophyta veneer at 52 m. Top middle of ridge- flat rock pavement, low relief, 48 m. East slope <10o, rock pavement, few ledges.

Dominant Benthic Biota: Very dense cover dominated by gorgonians, algae, sponges and some black coral. Top of ridge with abundant *Dictyota*, *Diodogorgia*, *Swiftia*, *Nicella*, hydroids and Antipatharia. Gorgonacea- *Diodogorgia* (10 cm knobby purple), *Ellisella* (branching), *Swiftia* (30-60 cm orange), *Nicella* (30-50 cm purple fan), *Titanideum frauenfeldii*; Corallimorpharia; Antipatharia- *Stichopathes*, Antipathidae (several spp, large bushy white, white mesh fan); Hydroida; Demospongiae- *Ircinia campana*, *Geodia*, *Callyspongia vaginalis*, Axinellida (several spp), *Aplysina* (tubes), Annelida- *Filograna*; Ascidiacea- Didemnidae, *Eudistoma*; Phaeophyta- *Dictyota*, *Sargassum*; Rhodophyta- flat, bifurcate blades.
Fish: scamp (common), gag, tomtate (abundant), snowy grouper, vermilion snapper, reef butterfly, bank butterfly, banded butterfly, spotfin butterfly, blue angel, queen angelfish, porcupine fish, sharpnose puffer, spotfin hogfish, hogfish, scorpionfish, graysby, cornet fish, blackbar soldier, squirrelfish, Calamus porgy, gray snapper, short bigeye, cowfish, lionfish (common, 30).

Dive Site: South Carolina, Outside Edisto MPA, 4.2 nmi NE of MPA, Ridge, 50 m; Dive 12-11

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-11 conducted a survey 4.2 nmi NE of MPA. A SW to NE transect was made along the ridge which is evident in the multibeam sonar map. Dive transects were divided into three habitat zones: Ridge- East Slope, Ridge- Top and Ridge- West Slope. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This ridge top was low relief pavement, ~50 m wide; the west slope was high relief and highly rugose rock slabs and boulders; the east slope was low relief slabs; 45-51 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-11. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 11	South Carolina, Outside Edisto MPA, 4.2 nmi NE of MPA, Ridge, 50 m; Dive 12-11				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	NE-SW Ridge 50 m wide: 48 m top 51.5 m base in sed. Slope Is 15 m wide 35 degree. Rock slabs, boulders, 1-2 m ledges, top of reef - flat pvmt				
	Ridge- West Slope	On Reef	HRu	HR	RLF
Transect 2	Ridge top, xs across ridge, 48 m pvmt. LR outcrops				
	Ridge- Top	On Reef	LRu	LR	PF
Transect 3	47-48 m rock pvmt on top, few rock slabs and boulders				
	Ridge- East Slope	On Reef	LRu	LR	RLF

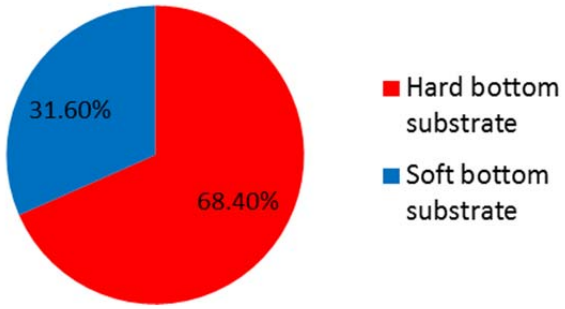


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-11. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-11 was predominately hard bottom (68.4%) consisting of rock pavement, rock slabs, boulders and 1-2 m ledges.

Dive Site: South Carolina, Outside Edisto MPA, 4.2 nmi NE of MPA, Ridge, 50 m; Dive 12-11

Bare rock substrate without biota covered 9.59% of the bottom and bare soft bottom was 13.01% (Fig. 2, Table 2). Benthic macro-biota covered 77.39% of the bottom and consisted of 0.05% hard coral, 0.65% non-coral Cnidaria (Hydrozoa), 5.58% Porifera, 0.92% Antipatharia, 2.22% Alcyonacea ("gorgonacea"), and 64.99% algae of which were 41.25% cyanobacteria, 10.8% Rhodophyta, and 9.7% Phaeophyta.

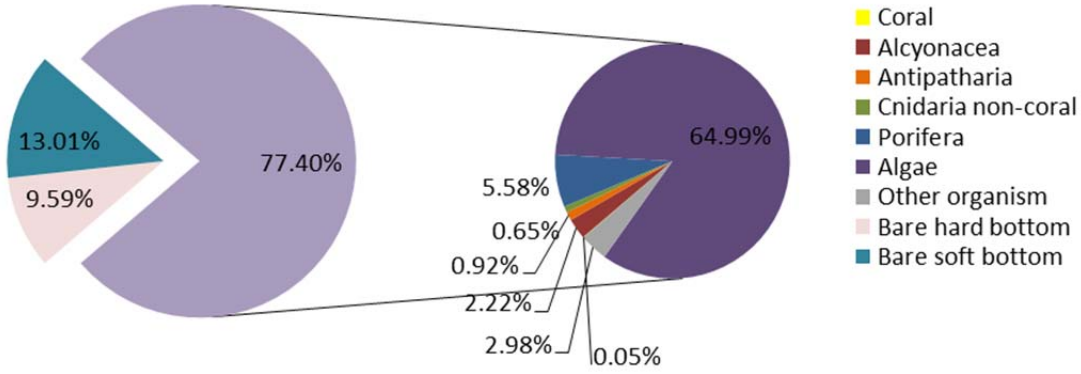


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-11. Corals include solitary coral. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-11.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**103**	**5.58%**
Porifera	**103**	**5.58%**
Agelas sp.	2	0.11%
Axinellida	1	0.05%
Cliona sp.	18	0.98%
Demospongiae	37	2.01%
Demospongiae- ze tan starlet	2	0.11%
Geodia sp.	4	0.22%
Ircinia sp.	9	0.49%
Spirastrellidae	30	1.63%
Cnidaria non-coral	**12**	**0.65%**
Cnidaria non-coral	**12**	**0.65%**
Hydroidolina	12	0.65%
Antipatharia	**17**	**0.92%**
Antipatharia	**17**	**0.92%**
Antipatharia	9	0.49%
Antipathes sp. A	1	0.05%
Stichopathes lutkeni	7	0.38%
Algae	**1199**	**64.99%**
Algae	**1199**	**64.99%**
Chlorophyta	4	0.22%

Dive Site: South Carolina, Outside Edisto MPA, 4.2 nmi NE of MPA, Ridge, 50 m; Dive 12-11

Corallinales/crustose coralline	53	2.87%
Cyanophyta	761	41.25%
Phaeophyta	180	9.76%
Rhodophyta	201	10.89%
Alcyonacea	**41**	**2.22%**
Alcyonacea	**41**	**2.22%**
Diodogorgia sp.	32	1.73%
Ellisellidae	5	0.27%
Gorgonacea	2	0.11%
Muricea sp.	2	0.11%
Coral	**1**	**0.05%**
Coral	**1**	**0.05%**
Scleractinia solitary	1	0.05%
Other organism	**55**	**2.98%**
Arthropoda	**2**	**0.11%**
Decapoda	1	0.05%
Stenorhynchus seticornis	1	0.05%
Bryozoa	**18**	**0.98%**
Bryozoa	10	0.54%
Schizoporella sp.	8	0.43%
Chordata	**24**	**1.30%**
Ascidiacea	3	0.16%
Didemnidae	1	0.05%
Fish	20	1.08%
Echinodermata	**1**	**0.05%**
Crinoidea	1	0.05%
Other organism	**10**	**0.54%**
Other organism	10	0.54%
Hard bottom substrate	**177**	**9.59%**
Hard bottom substrate	**177**	**9.59%**
Bare rock- pavement boulder ledge	174	9.43%
Bare rubble- rock	3	0.16%
Soft bottom substrate	**240**	**13.01%**
Soft bottom substrate	**240**	**13.01%**
Bare soft bottom substrate	240	13.01%
Grand Total	**1845**	**100.00%**

Dive Site: South Carolina, Outside Edisto MPA, 4.2 nmi NE of MPA, Ridge, 50 m; Dive 12-11

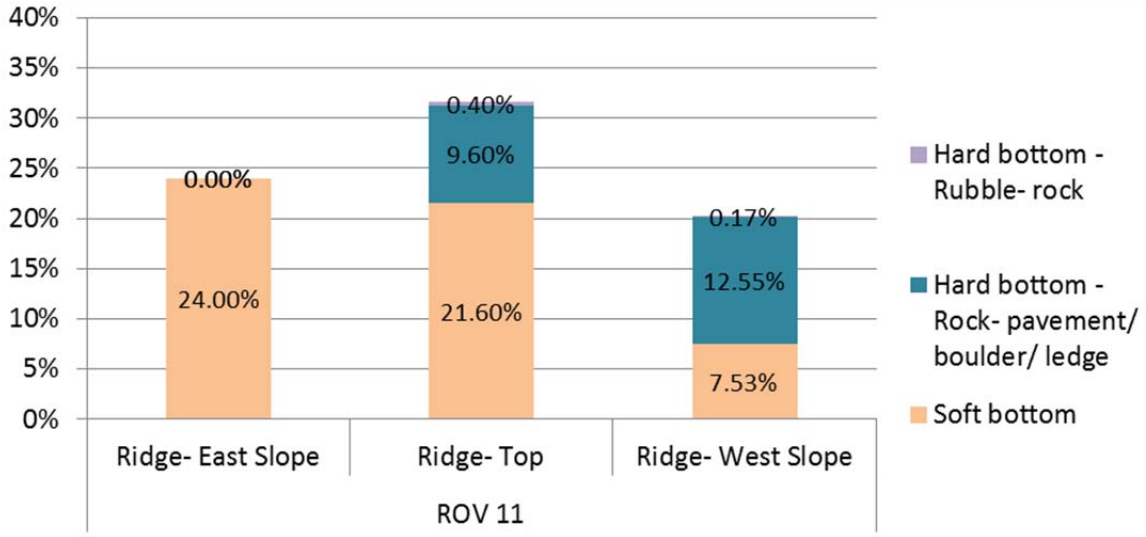


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-11.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The west slope had the most cover of bare hard bottom (12.5%). The ridge top and east slope had more barren soft bottom, which was likely sediment veneer over pavement. Figure 4 shows a high cover of biota for all habitat zones (~70-80% cover) and similar cover of Porifera (5.2-6.0%) at each zone. Alcyonacea were more common on the ridge top and west slope (4.0-5.2%). Overall algae dominated the entire ridge and slopes (56.4-66.8%).

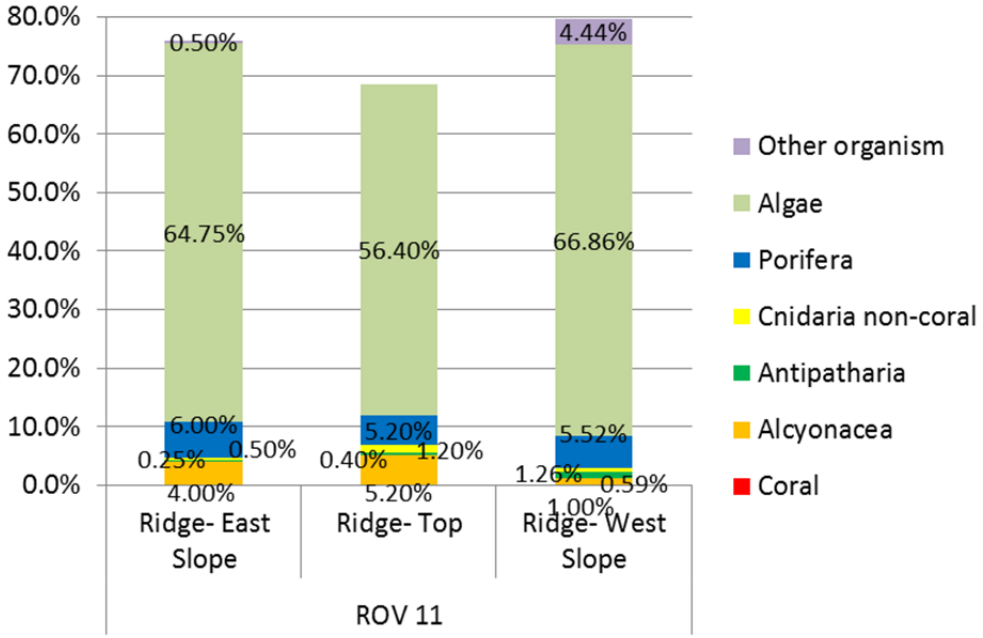


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-11.

Dive Site: South Carolina, Outside Edisto MPA, 4.2 nmi NE of MPA, Ridge, 50 m; Dive 12-11

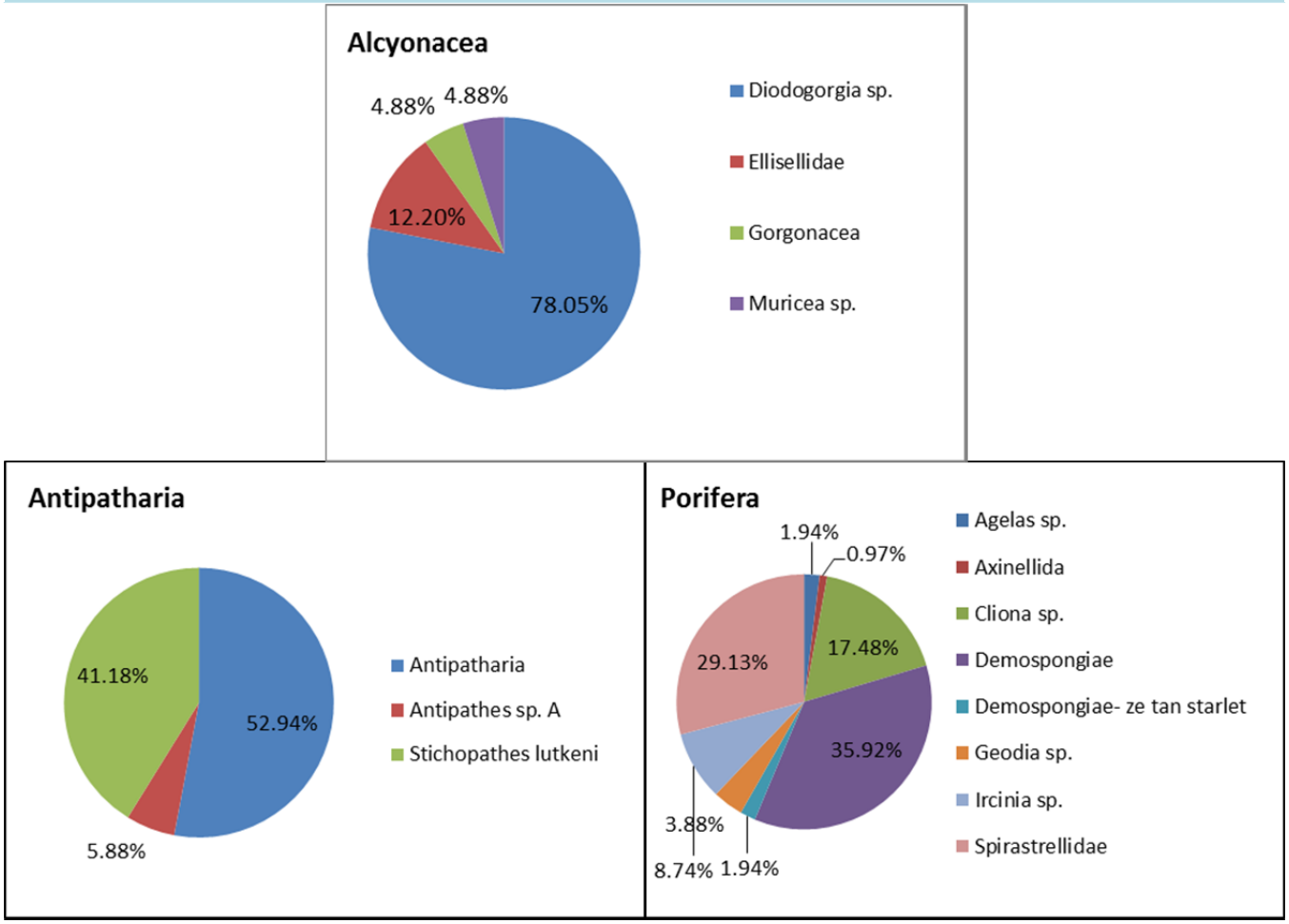


Figure 5. Diversity of corals and sponges at dive site ROV 12-11; CPCe analysis showing percent of total for each taxa category. Non-scleractinian corals include Alcyonacea ("gorgonacea) and Antipatharia (black coral); Porifera are Demospongiae.

Only one solitary hard coral was found at the site. Other corals 4 taxa of gorgonians and 3 black corals. The gorgonacea were dominated by *Diodogorgia* sp. (78.0% of the total Alcyonacea), Ellisellidae (12.2%), and *Muricea* sp. (4.8%). *Stichopathes lutkeni* accounted for 41.4% of the total Antipatharia, and *Antipathes* sp. A 5.8%. Porifera were moderately diverse with Spirastrellidae (29.1% of the total Porifera), *Cliona* sp. (17.4%), along with *Ircinia* sp., *Geodia* sp., *Agelas* sp., Axinellida and tan starlet Demospongiae.

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 53 taxa of fish were identified from dive ROV 11 for a total density of 2710 individuals/km (Table 3). These were dominated by tomtate (1928/km), vermilion snapper (536.9), and stripped grunt (37.5). Managed species included scamp (7.1/km), amberjack (3.1), red porgy (2.8), hogfish (0.6), and gag grouper (0.9).

Dive Site: South Carolina, Outside Edisto MPA, 4.2 nmi NE of MPA, Ridge, 50 m; Dive 12-11

Table 3. Density of fish for all transects at dive site ROV 12-11 (number individuals/km).

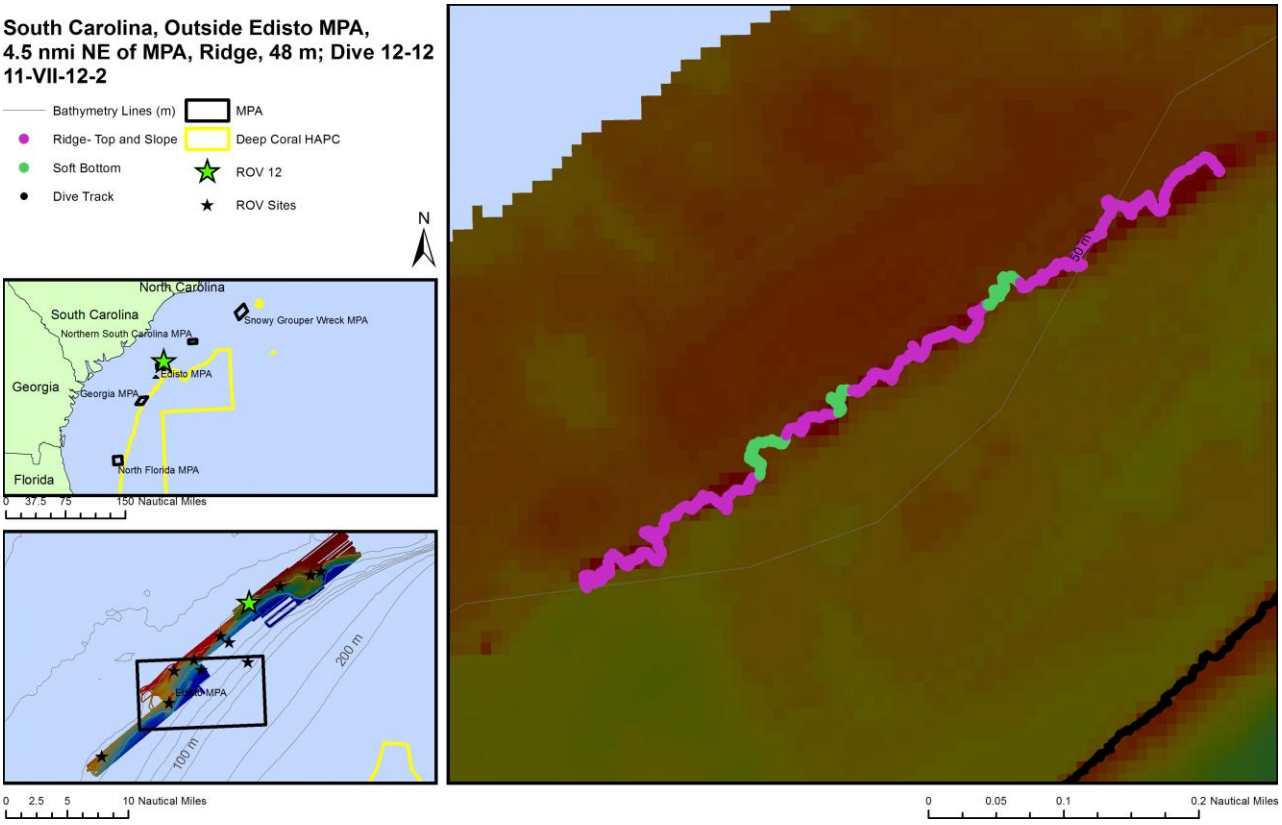
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus sp.	doctorfish	2	3.25	0.6
Aulostomus maculatus	trumpetfish	2	3.25	0.6
Balistes capriscus	grey triggerfish	9	3.25	2.8
Bodianus pulchellus	spotfin hogfish	74	3.25	22.8
Bodianus rufus	spanish hogfish	1	3.25	0.3
Calamus sp.	porgy	16	3.25	4.9
Canthigaster rostrata	sharpnose puffer	109	3.25	33.5
Chaetodon aculeatus	longsnout butterflyfish	1	3.25	0.3
Chaetodon ocellatus	spotfin butterflyfish	11	3.25	3.4
Chaetodon sedentarius	reef butterflyfish	55	3.25	16.9
Chaetodon striatus	banded butterflyfish	2	3.25	0.6
Chilomycterus sp.	burrfish	1	3.25	0.3
Chromis enchrysurus	yellowtail reeffish	15	3.25	4.6
Chromis insolatus	sunshinefish	8	3.25	2.5
Chromis scotti	purple reeffish	61	3.25	18.8
Chromis sp.	damselfish	3	3.25	0.9
Diodon sp.	puffer	1	3.25	0.3
Epinephelus adscensionis	rock hind	1	3.25	0.3
Epinephelus cruentatus	graysby	10	3.25	3.1
Equetus umbrosus	cubbyu	8	3.25	2.5
Fistularia sp.	cornetfish	2	3.25	0.6
Haemulon aurolineatum	tomtate	6266	3.25	1928.0
Haemulon sp.	grunt	3	3.25	0.9
Haemulon striatum	striped grunt	122	3.25	37.5
Halichoeres sp.	wrasse	23	3.25	7.1
Holacanthus bermudensis	blue angelfish	55	3.25	16.9
Holacanthus tricolor	rock beauty	1	3.25	0.3
Holocentridae	soldierfish/squirrelfish	4	3.25	1.2
Holocentrus sp.	squirrelfish	31	3.25	9.5
Lachnolaimus maximus	hogfish	2	3.25	0.6
Lactophrys polygonia	honeycomb cowfish	1	3.25	0.3
Lactophrys sp.	cowfish	5	3.25	1.5
Lutjanus griseus	grey snapper	8	3.25	2.5
Mycteroperca microlepis	gag grouper	3	3.25	0.9
Mycteroperca phenax	scamp	23	3.25	7.1
Myripristis jacobus	blackbar soldierfish	7	3.25	2.2
Pagrus pagrus	red porgy	9	3.25	2.8
Priacanthus arenatus	bigeye	2	3.25	0.6
Pristigenys alta	short bigeye	5	3.25	1.5

Dive Site: South Carolina, Outside Edisto MPA, 4.2 nmi NE of MPA, Ridge, 50 m; Dive 12-11

Prognathodes aya	bank butterflyfish	5	3.25	1.5
Pseudupeneus maculatus	spotted goatfish	1	3.25	0.3
Pterois volitans	lionfish	46	3.25	14.2
Rhomboplites aurorubens	vermilion snapper	1745	3.25	536.9
Rypticus sp.	soapfish	1	3.25	0.3
Scorpaenidae	scorpionfish	1	3.25	0.3
Seriola sp.	amberjack	10	3.25	3.1
Serranus annularis	orangeback bass	1	3.25	0.3
Serranus phoebe	tattler	10	3.25	3.1
Sparidae	porgy	3	3.25	0.9
Sparisoma atomarium	greenblotch parrotfish	18	3.25	5.5
Sphoeroides spengleri	bandtail puffer	1	3.25	0.3
Sphyraena barracuda	barracuda	1	3.25	0.3
Stegastes partitus	bicolor damselfish	3	3.25	0.9
Total		8808		2710.2

Dive Site: South Carolina, Outside Edisto MPA, 4.5 nmi NE of MPA, Ridge, 48 m; Dive 12-12

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	ed2_wgs84 (Edisto2)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/11/2012
Specimens:	
Digital Photos:	132
DVD:	2
Hard Drive:	1

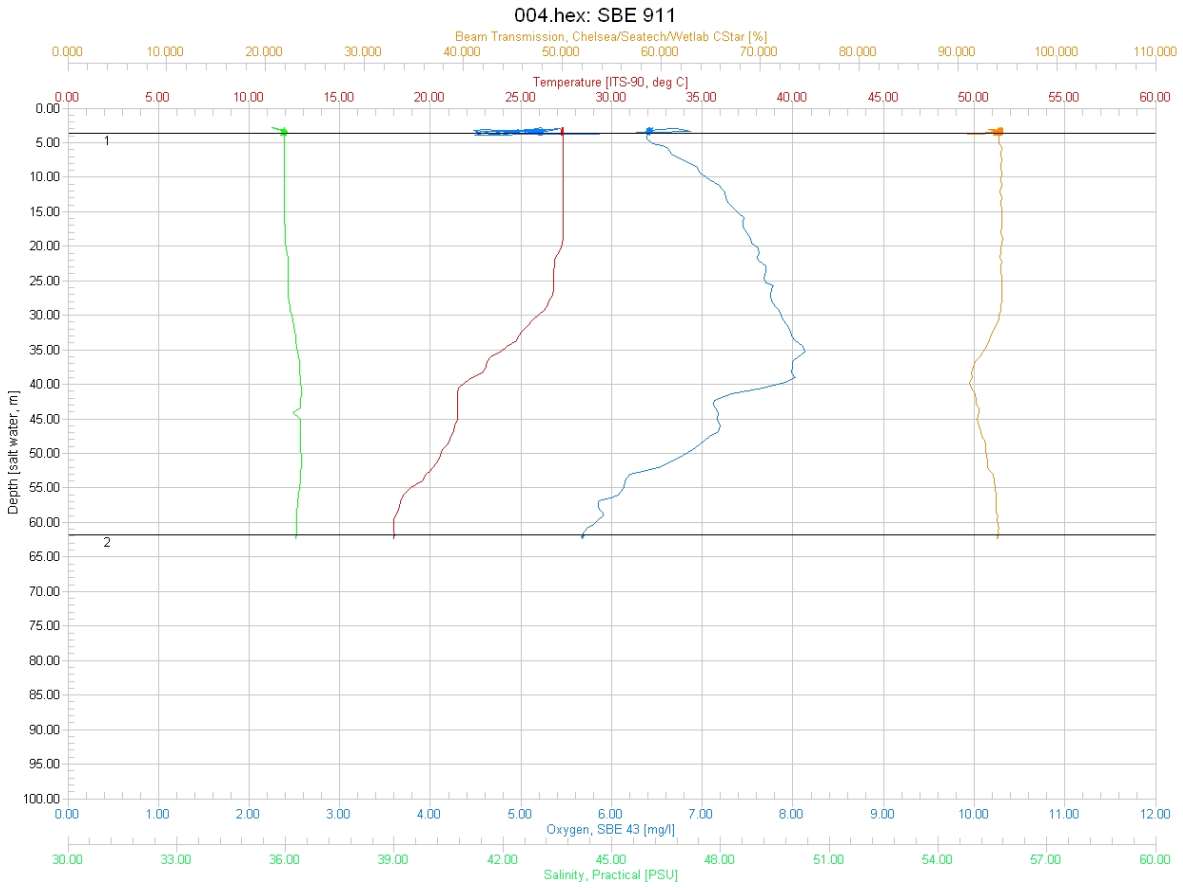
Dive Site: South Carolina, Outside Edisto MPA, 4.5 nmi NE of MPA, Ridge, 48 m; Dive 12-12

Dive Data:

Minimum Bottom Depth (m):	45	**Total Transect Length (km):**	2.927
Maximum Bottom Depth (m):	48	**Surface Current (kn):**	0.6
On Bottom (Time- GMT):	8:00	**On Bottom (Lat/Long):**	32.48°N; -78.92°W
Off Bottom (Time- GMT):	9:30	**Off Bottom (Lat/Long):**	32.48°N; -78.91°W
Physical (bottom); Temp (°C):	19.00	**Salinity:** 36.10 **Visibility (ft):** 50	**Current (kn):** 0.25

Physical Environment:

Distance from Dive Site(km): 6.82



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (62 m): temperature- 18, salinity- 36.1, and dissolved oxygen- 5.8. Surface temperature was 27.6 and there was a thermocline near 30-40 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 35 m. Visibility was estimated at 50 ft from the ROV video.

Dive Site: South Carolina, Outside Edisto MPA, 4.5 nmi NE of MPA, Ridge, 48 m; Dive 12-12

Dive Imagery:

Figure 1: -46.2 m
Scamp grouper on moderate relief hardbottom.

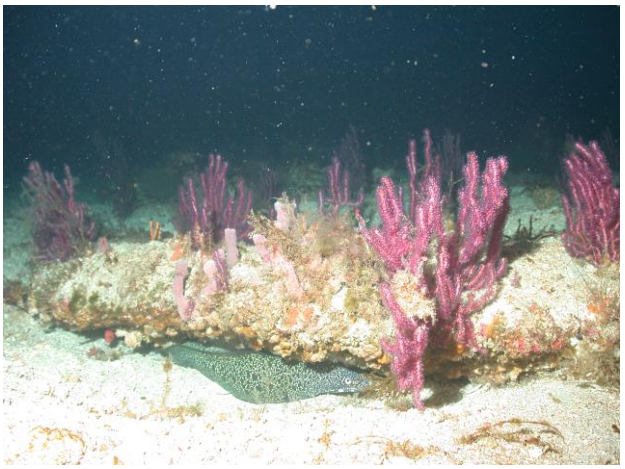


Figure 2: -48.3 m
Eel under low relief ledge with *Diodogorgia* octocoral and *Callyspongia* sponge.

Figure 3: -46.2 m
Schizoporella bryozoa, crinoids, *Pseudoceratina crassa* sponge, and solitary cup corals on moderate relief hardbottom.

Figure 4: -46.4 m
Lionfish (6), bank butterfly and spotfin hog on moderate relief hardbottom.

Dive Site: South Carolina, Outside Edisto MPA, 4.5 nmi NE of MPA, Ridge, 48 m; Dive 12-12

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 12, Site #- 11-VII-12-2. Target Site – ridge outside and north of South Carolina Edisto MPA; 50 m. ROV survey outside MPA; ground truth multibeam sonar of site. Conduct video/photo transect along ridge, oriented SW-NE.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.25 kn from SW.

Site Description/Habitat/Biota:
Transect along moderate relief ridge (depth range-45-48 m) oriented SW-NE. Sediment gaps of 50-100 m width cut the ridge in several spots. The narrow ridge top is ~50 m wide; low relief rock pavement. The western upper slope has 1-3 ledges of 1-2 m relief, the lower slope extends over 15 m in width with low relief rock slabs, 3-4 m diameter, and 1/2 m relief, grading to flat sediment. The east slope is similar. Further north in the transect the reef ridge drops to about 15 m width, and relief of 1/2 to 1 m.

Dominant Benthic Biota: Dense cover dominated by gorgonians, sponges, black coral, and algae. Gorgonacea- *Swiftia exserta* (common), *Diodogorgia*, *Nicella* (20 cm), *Telesto*, *Ellisella*; Antipatharia- *Stichopathes*, *Antipathes* (bushy white); Hydroida; Demospongiae- *Ircinia campana*, Spirastrellidae, encrusting pink (common), Axinellida, *Aplysina*; Annelida- *Filograna*; Mollusca- *Cassius*; Decapoda- *Panulirus argus*; Holothuroidea; Ascidiacea- *Eudistoma*; Phaeophyta- *Dictyota*; Rhodophyta; Cyanophyta.
Fish: scamp (common), gag, tomtate (abundant), vermilion snapper, reef butterfly, soapfish, blue angelfish, cowfish, short bigeye, spotfin hogfish, greater amberjack, white grunt, gray snapper, shortnose puffer, graysby, red porgy, Calamus porgy, blackbar soldierfish, gray triggerfish, goatfish, nurse shark, lionfish (common, 82).

Dive Site: South Carolina, Outside Edisto MPA, 4.5 nmi NE of MPA, Ridge, 48 m; Dive 12-12

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-12 conducted a survey 4.5 nmi NE of MPA. A zig-zag transect from SW to NE was made along the ridge which is evident in the multibeam sonar map. Dive transects were divided into two habitat zones: Ridge-Top and Slope, and Soft Bottom. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). The ridge was broken into four reef segments separated by 50-85 m sediment gaps; the east and west ridge slopes were of moderate relief rock slabs, 2-4 m diameter, and very rugose; 42-48 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-12. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 12	South Carolina, Outside Edisto MPA, 4.5 nmi NE of MPA, Ridge, 48 m; Dive 12-12				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	Zig-zag xs includes west slope/top and east slope of ridge; West Slope: 45 m top, 48 m base; rock slabs 1-2 m relief 20o slope 2-4 m diam slab, 0.5 m relief, slope 15 m wide sed at base. East Slope: 48.5 m base, 45 m top rock slabs 1-2 m diam, 0.5 m relief				
	Ridge- Top and Slope	On Reef	HRu	MR	RLF
Transect 2	85 m wide soft bottom gap between reef segments				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 3	Reef 2				
	Ridge- Top and Slope	On Reef	HRu	MR	RLF
Transect 4	50 m wide sed gap				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 5	Reef 3				
	Ridge- Top and Slope	On Reef	HRu	MR	RLF
Transect 6	70 m wide sediment gap				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 7	Reef 4				
	Ridge- Top and Slope	On Reef	HRu	MR	RLF

Dive Site: South Carolina, Outside Edisto MPA, 4.5 nmi NE of MPA, Ridge, 48 m; Dive 12-12

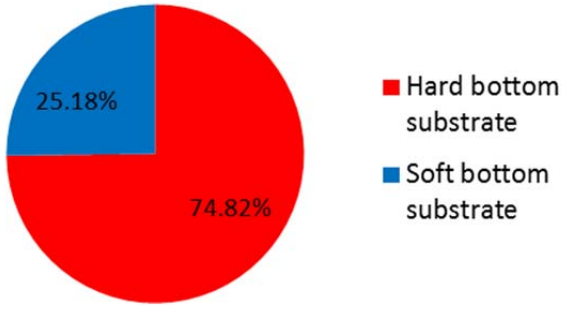


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-12. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-12 w was predominately hard bottom (74.82%) consisting of rock pavement, 2-4 m diameter rock slabs with 0.5 m relief. Off ridge was flat sand bottom.

Bare rock substrate without biota covered 8.97% of the bottom and bare soft bottom was 22.83% (Fig. 2, Table 2). Benthic macro-biota covered 68.2% of the bottom and consisted of 13.47% non-coral Cnidaria (Hydrozoa), 2.16% Porifera, 1.03% Antipatharia, 3.28% Alcyonacea ("gorgonacea"), and 44.98% algae which was dominated by cyanobacteria (36.2%), Rhodophyta (5.4%), and Phaeophyta (2.5%).

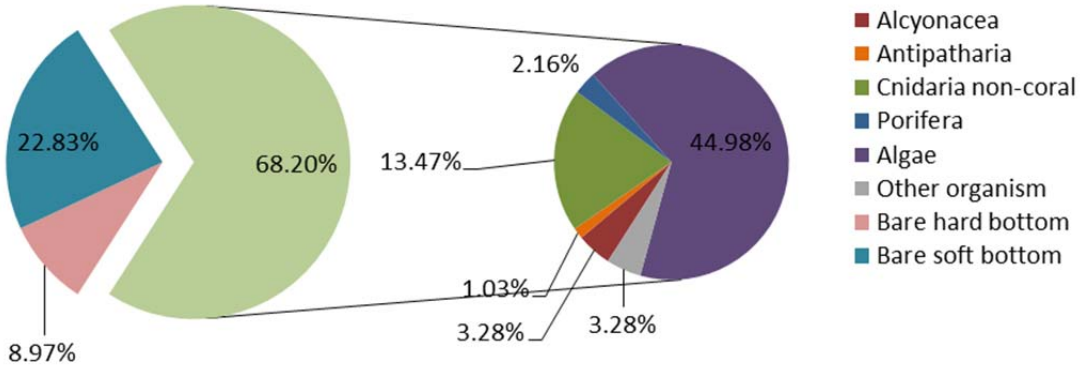


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-12. Non-scleractinian corals include Alcyonacea ("gorgonacea" and soft coral) and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-12.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**44**	**2.16%**
Porifera	**44**	**2.16%**
Axinellida	1	0.05%
Demospongiae	19	0.93%

Dive Site: South Carolina, Outside Edisto MPA, 4.5 nmi NE of MPA, Ridge, 48 m; Dive 12-12

Demospongiae- ze tan starlet	3	0.15%
Ircinia campana	4	0.20%
Ircinia sp.	6	0.29%
Niphates sp.	2	0.10%
Spirastrellidae	9	0.44%
Cnidaria non-coral	**275**	**13.47%**
Cnidaria non-coral	**275**	**13.47%**
Hydroidolina	275	13.47%
Antipatharia	**21**	**1.03%**
Antipatharia	**21**	**1.03%**
Antipatharia	4	0.20%
Antipathes sp. A	12	0.59%
Stichopathes lutkeni	5	0.24%
Algae	**918**	**44.98%**
Algae	**918**	**44.98%**
Chlorophyta	5	0.24%
Corallinales/crustose coralline	11	0.54%
Cyanophyta	739	36.21%
Phaeophyta	52	2.55%
Rhodophyta	111	5.44%
Alcyonacea	**67**	**3.28%**
Alcyonacea	**67**	**3.28%**
Diodogorgia sp.	16	0.78%
Ellisellidae	4	0.20%
Gorgonacea	6	0.29%
Nidallia occidentalis	1	0.05%
Telesto sp.	40	1.96%
Other organism	**67**	**3.28%**
Annelida	**9**	**0.44%**
Filograna sp.	9	0.44%
Bryozoa	**7**	**0.34%**
Bryozoa	4	0.20%
Schizoporella sp.	3	0.15%
Chordata	**29**	**1.42%**
Ascidiacea	11	0.54%
Didemnidae	16	0.78%
Fish	2	0.10%
Echinodermata	**6**	**0.29%**
Crinoidea	6	0.29%
Human debris	**2**	**0.10%**
Human debris- other	2	0.10%
Other organism	**14**	**0.69%**

Dive Site: South Carolina, Outside Edisto MPA, 4.5 nmi NE of MPA, Ridge, 48 m; Dive 12-12

Other organism	14	0.69%
Hard bottom substrate	**183**	**8.97%**
Hard bottom substrate	**183**	**8.97%**
Bare rock- pavement boulder ledge	148	7.25%
Bare rubble- rock	35	1.71%
Soft bottom substrate	**466**	**22.83%**
Soft bottom substrate	**466**	**22.83%**
Bare soft bottom substrate	466	22.83%
Grand Total	**2041**	**100.00%**

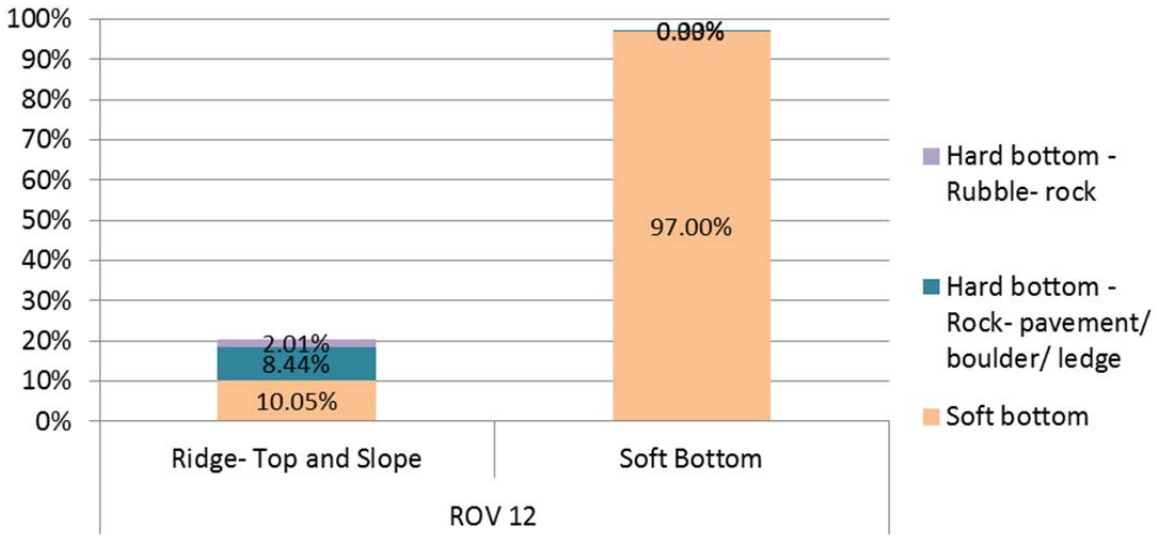


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-12.

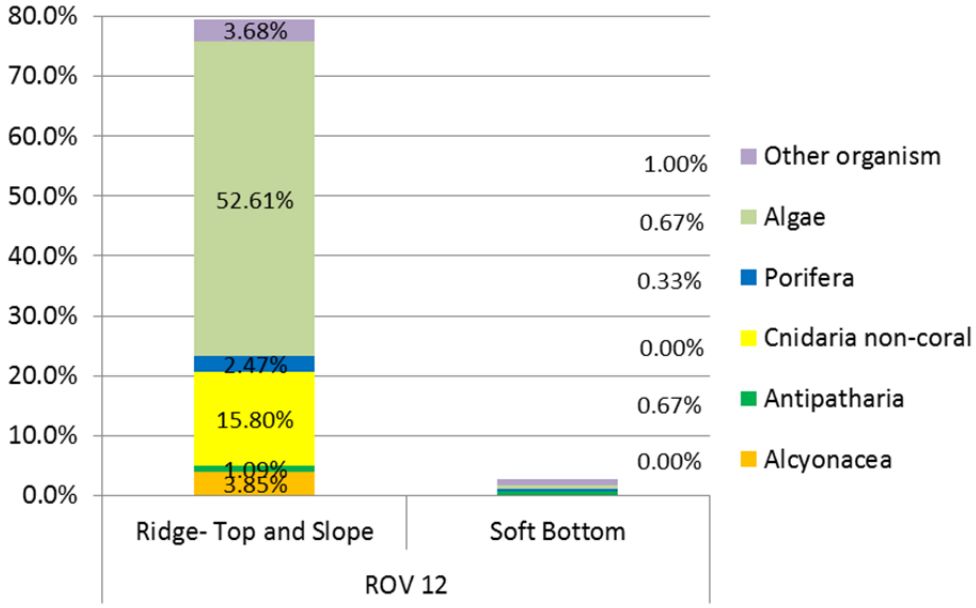


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-12.

Dive Site: South Carolina, Outside Edisto MPA, 4.5 nmi NE of MPA, Ridge, 48 m; Dive 12-12

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The ridge top and slopes only had about 20% exposed bare substrate (10.0% soft, 8.4% rock). Off the ridge was nearly completely barren soft sediment (97%). Figure 4 shows the high cover of biota (~80%) on the ridge top and slopes and included hydroids (15.8% cover), Alcyonacea (3.8%), and Porifera (2.4%). Algae clearly dominated the bottom on the ridge (52.6%). Off reef was nearly barren of biota.

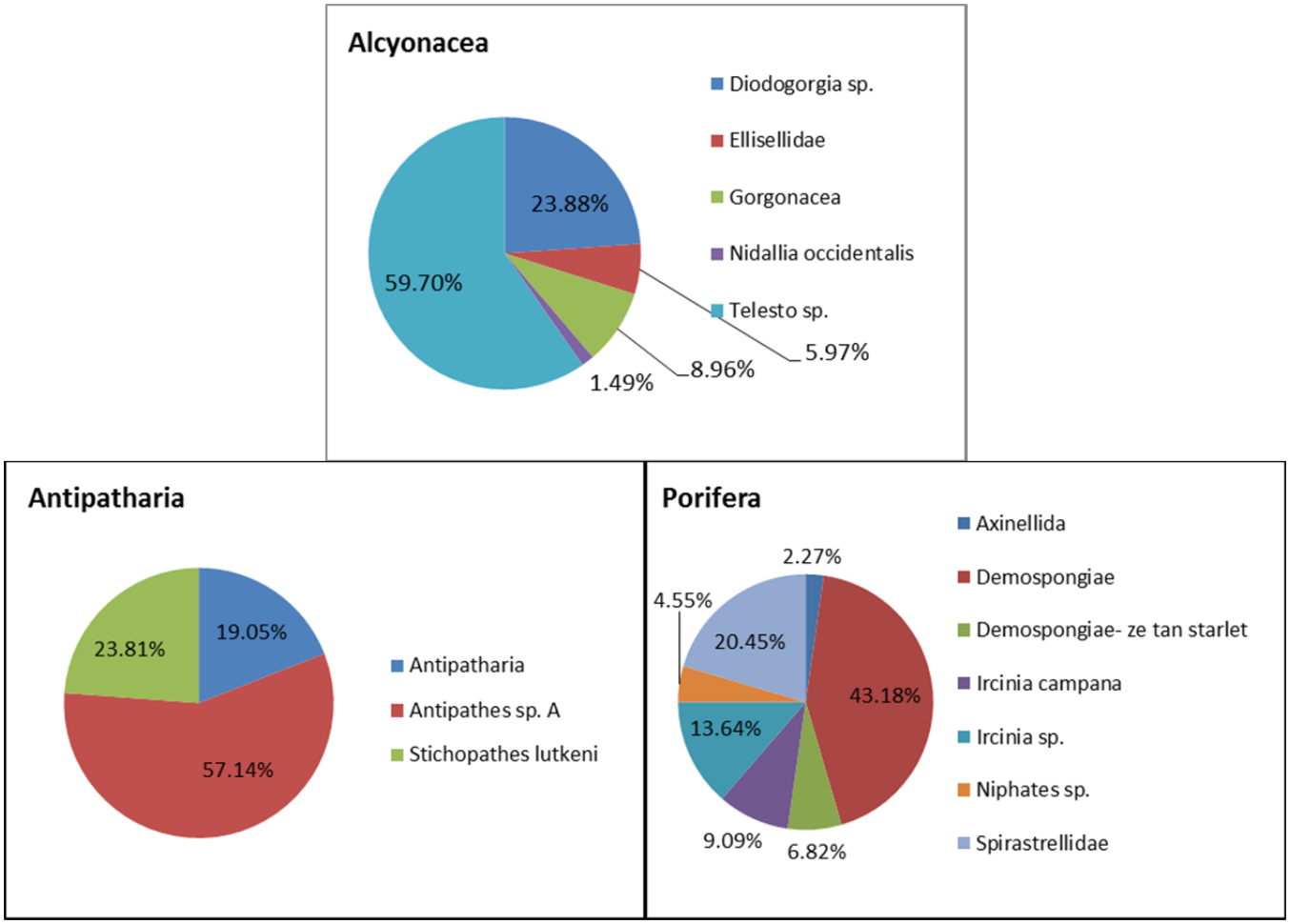


Figure 5. Diversity of corals and sponges at dive site ROV 12-12; CPCe analysis showing percent of total for each taxa category. Coral included Alcyonacea ("gorgonacea" and soft corals) and Antipatharia (black coral); Porifera are Demospongiae.

No hard coral was present at the dive site. Alcyonacea were dominated by *Telesto* sp. (59.7% of the total Alcyonacea), Diodogorgia sp. (23.8%), and Ellisellidae (5.9%). *Antipathes* sp. A comprised 57.1% of the Antipathidae. Sponges were moderately diverse with Spirastrellidae (20.4% of the total Porifera), *Ircinia* sp. (13.6%), *Niphates* sp., Axinellida, and tan starlet demosponges.

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 48 taxa of fish were identified from dive ROV 12 for a total density of 1182.6 individuals/km (Table 3). These were dominated

tomtate (605.5/km), vermilions snapper (262.8), and lionfish (52.2). Managed species included red porgy (20.8/km), amberjack (11.9), scamp (9.6), and gag grouper (0.7).

Table 3. Density of fish for all transects at dive site ROV 12-12 (number individuals/km).

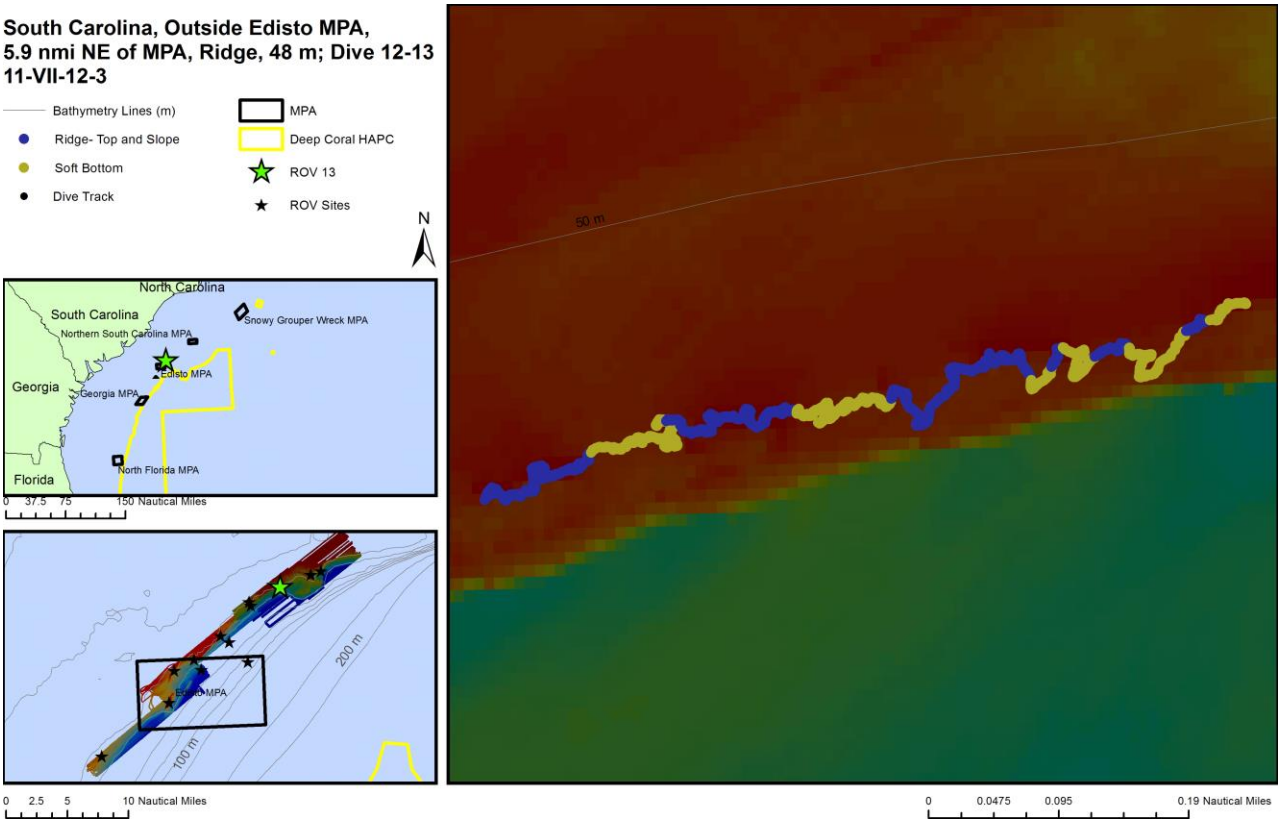
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus sp.	doctorfish	3	2.93	1.0
Apogon pseudomaculatus	twospot cardinalfish	1	2.93	0.3
Balistes capriscus	grey triggerfish	5	2.93	1.7
Bodianus pulchellus	spotfin hogfish	99	2.93	33.8
Calamus sp.	porgy	26	2.93	8.9
Canthigaster rostrata	sharpnose puffer	105	2.93	35.8
Centropristis ocyurus	bank sea bass	1	2.93	0.3
Chaetodon ocellatus	spotfin butterflyfish	26	2.93	8.9
Chaetodon sedentarius	reef butterflyfish	55	2.93	18.8
Chaetodon sp.	butterflyfish	2	2.93	0.7
Chromis enchrysurus	yellowtail reeffish	1	2.93	0.3
Chromis scotti	purple reeffish	71	2.93	24.2
Chromis sp.	damselfish	2	2.93	0.7
Epinephelus cruentatus	graysby	11	2.93	3.8
Equetus umbrosus	cubbyu	8	2.93	2.7
Fistularia tabacaria	bluespotted cornetfish	1	2.93	0.3
Gymnothorax moringa	spotted moray	1	2.93	0.3
Haemulon aurolineatum	tomtate	1774	2.93	605.5
Haemulon plumieri	white grunt	1	2.93	0.3
Halichoeres sp.	wrasse	27	2.93	9.2
Holacanthus bermudensis	blue angelfish	60	2.93	20.5
Lachnolaimus maximus	hogfish	1	2.93	0.3
Lactophrys sp.	cowfish	8	2.93	2.7
Liopropoma eukrines	wrasse bass	1	2.93	0.3
Lutjanus griseus	grey snapper	9	2.93	3.1
Mycteroperca microlepis	gag grouper	2	2.93	0.7
Mycteroperca phenax	scamp	28	2.93	9.6
Mycteroperca sp.	grouper	2	2.93	0.7
Myripristis jacobus	blackbar soldierfish	18	2.93	6.1
Pagrus pagrus	red porgy	61	2.93	20.8
Pomacanthus arcuatus	gray angelfish	3	2.93	1.0
Pomacanthus sp.	angelfish	1	2.93	0.3
Priacanthus arenatus	bigeye	3	2.93	1.0
Pristigenys alta	short bigeye	30	2.93	10.2
Prognathodes aya	bank butterflyfish	3	2.93	1.0
Pseudupeneus maculatus	spotted goatfish	1	2.93	0.3
Pterois volitans	lionfish	153	2.93	52.2

Dive Site: South Carolina, Outside Edisto MPA, 4.5 nmi NE of MPA, Ridge, 48 m; Dive 12-12

Rhomboplites aurorubens	vermilion snapper	770	2.93	262.8
Rypticus maculatus	whitespotted soapfish	1	2.93	0.3
Rypticus sp.	soapfish	3	2.93	1.0
Scorpaenidae	scorpionfish	3	2.93	1.0
Seriola rivoliana	almaco jack	2	2.93	0.7
Seriola sp.	amberjack	32	2.93	10.9
Seriols dumerili	greater amberjack	1	2.93	0.3
Serranus phoebe	tattler	1	2.93	0.3
Sparidae	porgy	38	2.93	13.0
Sphoeroides spengleri	bandtail puffer	9	2.93	3.1
Stegastes partitus	bicolor damselfish	1	2.93	0.3
Total		3465		1182.6

Dive Site: South Carolina, Outside Edisto MPA, 5.9 nmi NE of MPA, Ridge, 48 m; Dive 12-13

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	ed2_wgs84 (Edisto2)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/11/2012
Specimens:	
Digital Photos:	125
DVD:	2
Hard Drive:	1

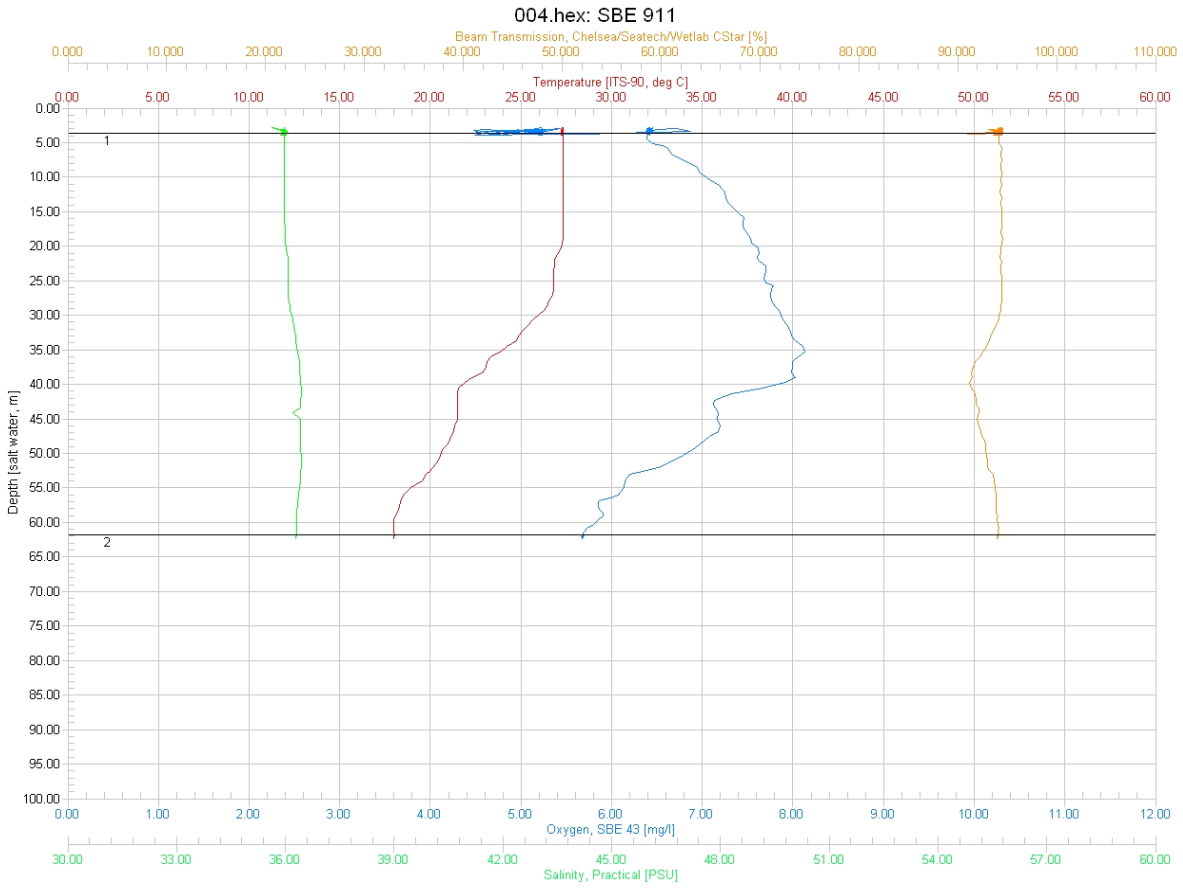
Dive Site: South Carolina, Outside Edisto MPA, 5.9 nmi NE of MPA, Ridge, 48 m; Dive 12-13

Dive Data:

Minimum Bottom Depth (m):	46	**Total Transect Length (km):**	3.431
Maximum Bottom Depth (m):	48	**Surface Current (kn):**	.25
On Bottom (Time- GMT):	10:21	**On Bottom (Lat/Long):**	32.5°N; -78.87°W
Off Bottom (Time- GMT):	12:02	**Off Bottom (Lat/Long):**	32.5°N; -78.86°W
Physical (bottom); Temp (°C):	20.00	**Salinity:** 36.10 **Visibility (ft):** 50	**Current (kn):** 0.25

Physical Environment:

Distance from Dive Site(km): 11.49



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (62 m): temperature- 18, salinity- 36.1, and dissolved oxygen- 5.8. Surface temperature was 27.7 and there was a thermocline near 30-40 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 35 m. Visibility was estimated at 50 ft from the ROV video.

Dive Site: South Carolina, Outside Edisto MPA, 5.9 nmi NE of MPA, Ridge, 48 m; Dive 12-13

Dive Imagery:

Figure 1: -46.2 m
Corallimorpharia on moderate relief ledge.

Figure 2: -44.9 m
Lionfish (13) on moderate relief ridge.

Figure 3: -46 m
Lobsters (*Panulirus argus*) on moderate relief ledge.

Figure 4: -47.4 m
Leopard toadfish on sediment patch at base of low relief ledge.

Dive Site: South Carolina, Outside Edisto MPA, 5.9 nmi NE of MPA, Ridge, 48 m; Dive 12-13

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 13, Site #- 11-VII-12-3. Target Site – ridge outside and north of South Carolina Edisto MPA; 50 m. ROV survey outside MPA; ground truth multibeam sonar of site. Conduct video/photo transect along ridge to NE.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.25 kn from SW.

Site Description/Habitat/Biota:
Low to moderate relief ridge; top 46.5 m, base on sand 48 m. Ridge very narrow 10-15 m; top rock slabs, fractured; west slope 1 m ledges, 2-4 m diameter rock slabs at base. Ridge broken with sand between; very light orange on multibeam. Main ridge ends; mostly soft bottom sand with patches of Cyanophyta; small patch reefs of scattered rock slabs, < 1m relief.

Dominant Benthic Biota: Dense cover dominated by gorgonians, sponges and black coral. Gorgonacea- *Diodogorgia* (10 cm knobby purple), *Telesto*, *Ellisella* (branching), *Swiftia* (30-60 cm orange), *Nicella* (30-50 cm purple fan); Corallimorpharia; Antipatharia- *Stichopathes*, Antipathidae (several spp, large bushy white, white mesh fan); Hydroida; Demospongiae- *Ircinia campana*, Axinellida (several spp), Spirastrellidae; Decapoda- *Panulirus argus*; Ascidiacea- Didemnidae, *Eudistoma*; Phaeophyta- *Dictyota*, *Sargassum*; Rhodophyta- flat, bifurcate blades.
Fish: scamp (common), gag, tomtate (abundant), vermilion snapper, reef butterfly, blue angel, queen angelfish, spotfin hogfish, hogfish, graysby, greater amberjack, squirrelfish, scrawled cowfish, Calamus porgy, cubbyu, gray snapper, southern stingray, short bigeye, rock beauty, lionfish (common, 76).

Dive Site: South Carolina, Outside Edisto MPA, 5.9 nmi NE of MPA, Ridge, 48 m; Dive 12-13

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-13 conducted a survey 5.9 nmi NE of MPA. A zig-zag transect from west to east was made along the ridge which is evident in the multibeam sonar map. Dive transects were divided into two habitat zones: Ridge- Top and Slope and Soft Bottom. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). Six sediment gaps from 45 to 320 m wide break up the 60-m wide NE-SW oriented ridge; the drop-off at the east and west slopes were moderate relief rock slabs with high rugosity at the southern part of the transect, and lower relief towards the north end; 40-48 m depth range.

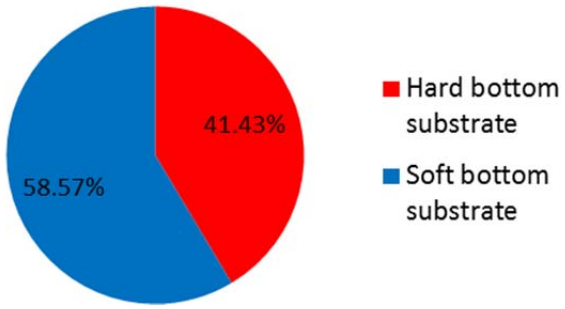


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-13. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-13 was predominately soft bottom (58.57%); hard bottom consisted of rock pavement and 2-3 m diameter rock slabs. Off reef was barren flat sand.

Bare rock substrate without biota covered 5% of the bottom and bare soft bottom was 55.05% (Fig. 2, Table 2). Benthic macro-biota covered 39.94% of the bottom and consisted of 4.7% non-coral Cnidaria (Hydrozoa), 1.4% Porifera, 0.7% Antipatharia, 4.08% Alcyonacea ("gorgonacea"), and 26.56% algae which was dominated by cyanobacteria (19.5%), Phaeophyta (3.9%), and Rhodophyta (2.4%).

Dive Site: South Carolina, Outside Edisto MPA, 5.9 nmi NE of MPA, Ridge, 48 m; Dive 12-13

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-13. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 13	South Carolina, Outside Edisto MPA, 5.9 nmi NE of MPA, Ridge, 48 m; Dive 12-13				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	Zig-zag xs along NE-SW oriented ridge, includes West slope: 45.5 m top, Top and East Slope ~150 m wide 2-3 m diam slabs 1 m relief 15 m wide sed at bottom ; 46.5 m top, ridge 60 m wide.				
	Ridge- Top and Slope	On Reef	HRu	MR	RLF
Transect 2	130 m long sediment gap between reef segments				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 3	46 m on top same habitat as transect 1				
	Ridge- Top and Slope	On Reef	HRu	MR	RLF
Transect 4	320 m long gap between reefs				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 5	45 m reef top, 1 m slabs				
	Ridge- Top and Slope	On Reef	HRu	MR	RLF
Transect 6	Sand gap				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 7	Patchy boulders <0.5 m relief				
	Ridge- Top and Slope	On Reef	LRu	LR	RLF
Transect 8	Sand gap				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 9	Patch boulders <0.5 m relief, 47 m				
	Ridge- Top and Slope	On Reef	LRu	LR	RLF
Transect 10	Patches of boulders, mostly sand				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 11	Low relief				
	Ridge- Top and Slope	On Reef	LRu	LR	RLF
Transect 12	Sediment gap				
	Soft Bottom	Off Reef	LRu	LR	S

Dive Site: South Carolina, Outside Edisto MPA, 5.9 nmi NE of MPA, Ridge, 48 m; Dive 12-13

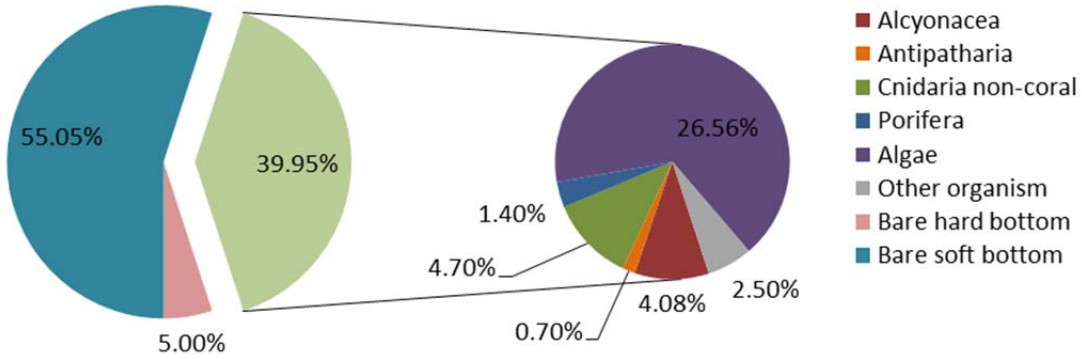


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-13. Non-scleractinian corals include Alcyonacea ("gorgonacea" and soft coral) and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-13.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**32**	**1.40%**
Porifera	**32**	**1.40%**
Cliona sp.	3	0.13%
Demospongiae	14	0.61%
Demospongiae- ze tan starlet	1	0.04%
Ircinia campana	10	0.44%
Spirastrellidae	4	0.18%
Cnidaria non-coral	**107**	**4.70%**
Cnidaria non-coral	**107**	**4.70%**
Hydroidolina	107	4.70%
Antipatharia	**16**	**0.70%**
Antipatharia	**16**	**0.70%**
Antipatharia	3	0.13%
Antipathes sp. A	12	0.53%
Stichopathes lutkeni	1	0.04%
Algae	**605**	**26.56%**
Algae	**605**	**26.56%**
Chlorophyta	4	0.18%
Corallinales/crustose coralline	8	0.35%
Cyanophyta	446	19.58%
Phaeophyta	91	3.99%
Rhodophyta	56	2.46%
Alcyonacea	**93**	**4.08%**
Alcyonacea	**93**	**4.08%**
Alcyonacea	1	0.04%

Dive Site: South Carolina, Outside Edisto MPA, 5.9 nmi NE of MPA, Ridge, 48 m; Dive 12-13

Diodogorgia sp.	7	0.31%
Ellisellidae	1	0.04%
Gorgonacea	2	0.09%
Muricea sp.	5	0.22%
Telesto sp.	77	3.38%
Other organism	**57**	**2.50%**
Annelida	**2**	**0.09%**
Serpulidae	2	0.09%
Bryozoa	**16**	**0.70%**
Bryozoa	6	0.26%
Schizoporella sp.	10	0.44%
Chordata	**24**	**1.05%**
Ascidiacea	20	0.88%
Didemnidae	3	0.13%
Fish	1	0.04%
Echinodermata	**3**	**0.13%**
Crinoidea	2	0.09%
Gorgonocephalidae	1	0.04%
Other organism	**12**	**0.53%**
Other organism	12	0.53%
Hard bottom substrate	**114**	**5.00%**
Hard bottom substrate	**114**	**5.00%**
Bare rock- pavement boulder ledge	111	4.87%
Bare rubble- rock	3	0.13%
Soft bottom substrate	**1254**	**55.05%**
Soft bottom substrate	**1254**	**55.05%**
Bare soft bottom substrate	1254	55.05%
Grand Total	**2278**	**100.00%**

Dive Site: South Carolina, Outside Edisto MPA, 5.9 nmi NE of MPA, Ridge, 48 m; Dive 12-13

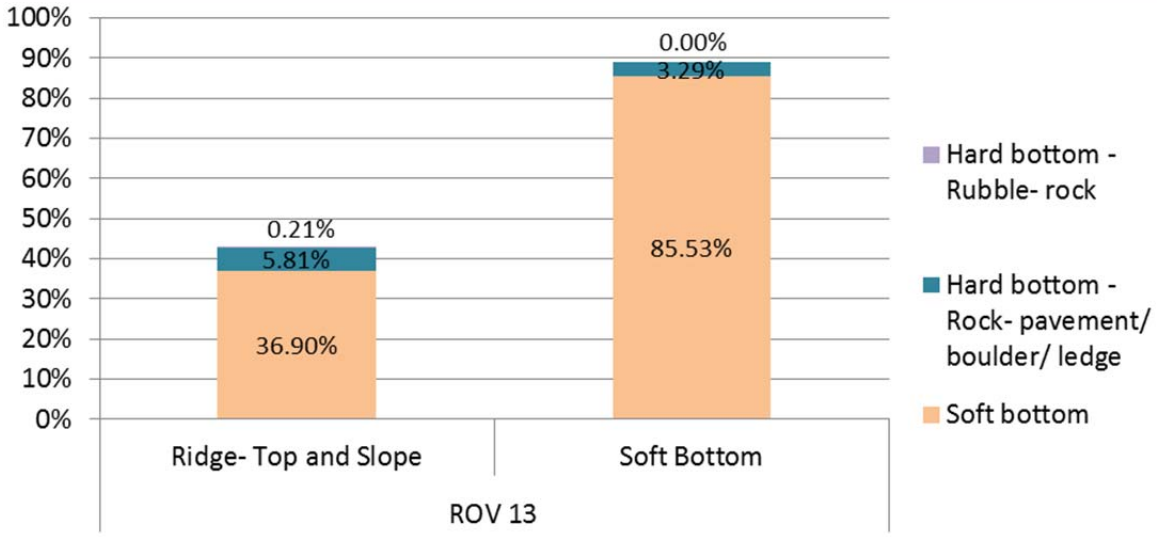


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-13.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The ridge top and slopes had ~40% cover of bare substrate, mostly sediment over pavement (36.9%). Figure 4 shows a fairly dense cover of biota on the ridge and ridge slopes (~58% cover) compared to only 11% cover of biota on the soft bottom off the reef. On the reef were hydroids (7.4%), Alcyonacea (6.0%), Porifera (2.1%), and algae (36.3%).

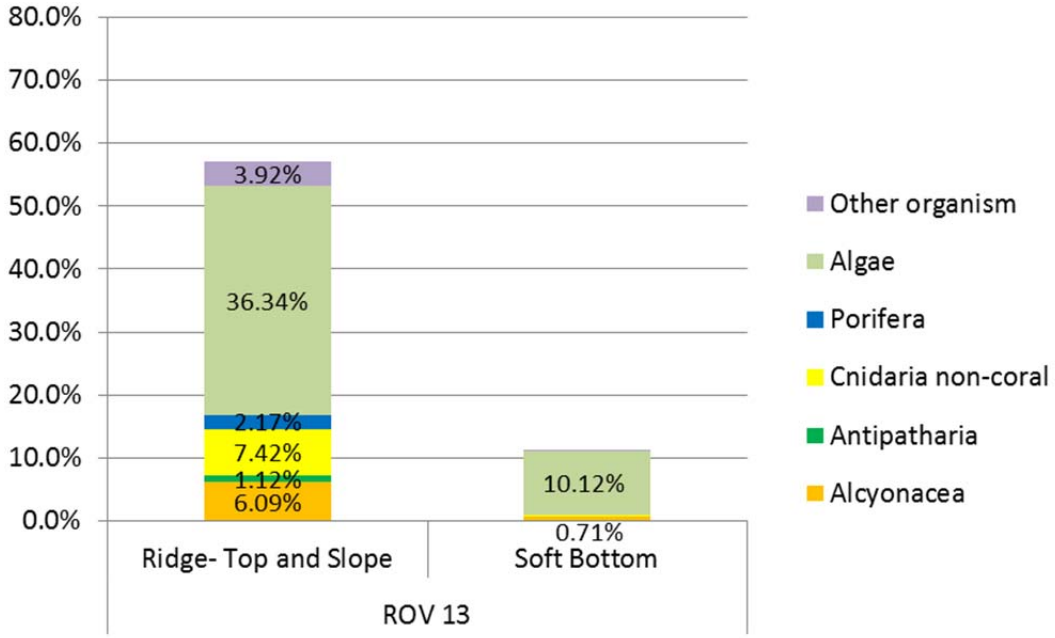


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-13.

Dive Site: South Carolina, Outside Edisto MPA, 5.9 nmi NE of MPA, Ridge, 48 m; Dive 12-13

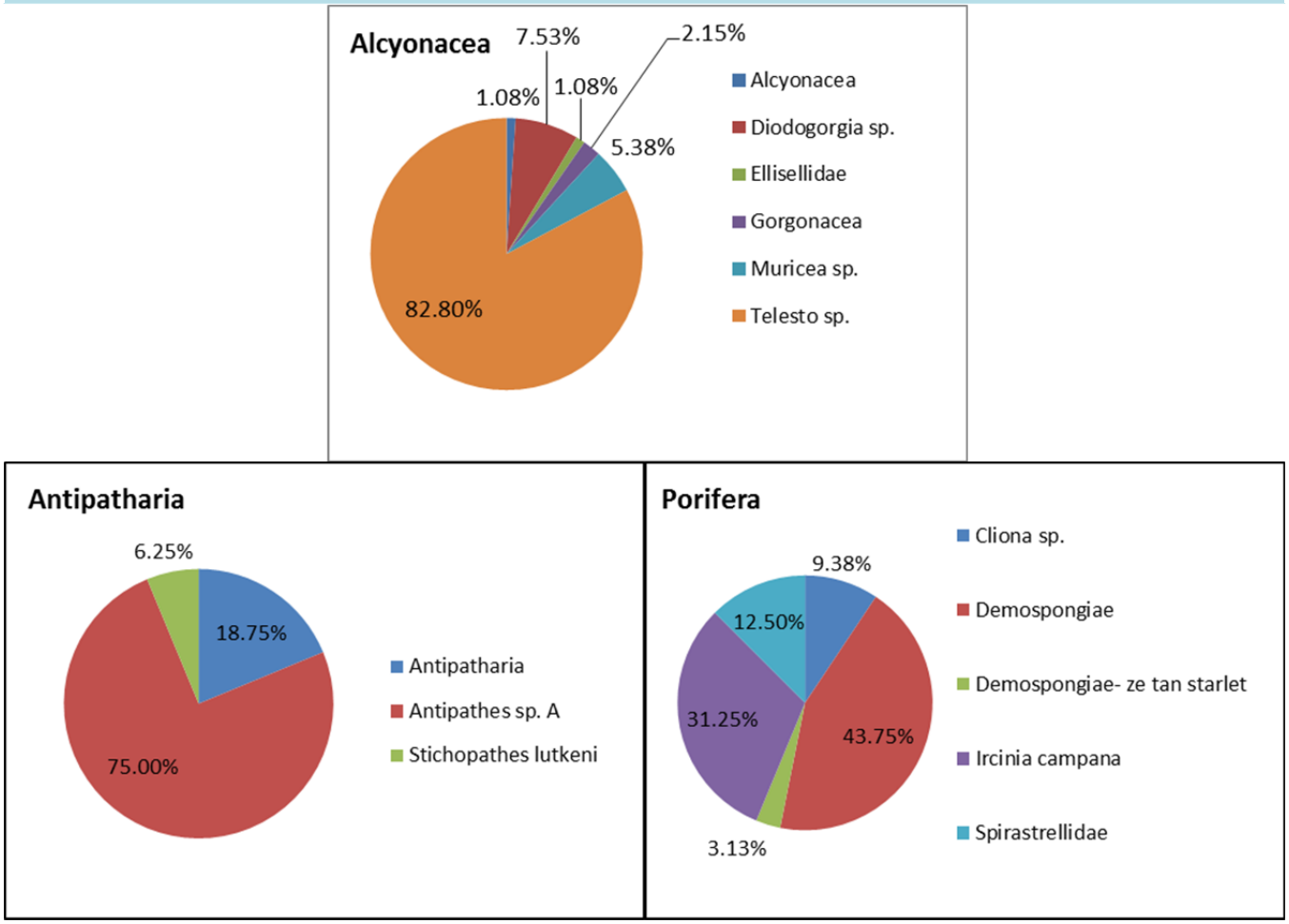


Figure 5. Diversity of corals and sponges at dive site ROV 12-13; CPCe analysis showing percent of total for each taxa category. Corals include Alcyonacea ("gorgonacea" and soft corals) and Antipatharia (black coral); Porifera are Demospongiae.

No hard coral was present at the dive site. Alcyonacea were fairly diverse with *Telesto* sp. (82.8% of the total Alcyonacea), *Diodogorgia* sp. (7.5%), and Muricea sp. (5.3%). *Antipathes* sp. A clearly dominated the Antipatharia (75%). Only 5 taxa of Porifera were identified, including *Ircinia campana* (31.2% of the total Porifera), Spirastrellidae (12.5%), and *Cliona* sp. (9.3%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 46 taxa of fish were identified from dive ROV 13.1 for a total density of 919.8 individuals/km (Table 3). These were by tomtate (441.7/km), grunt (148.1), and purple reeffish (36.4). Managed species included red porgy (25.4/km), scamp (15.7), amberjack (9.1), hogfish (0.3), and gag grouper (0.3).

Dive Site: South Carolina, Outside Edisto MPA, 5.9 nmi NE of MPA, Ridge, 48 m; Dive 12-13

Table 3. Density of fish for all transects at dive site ROV 12-13 (number individuals/km).

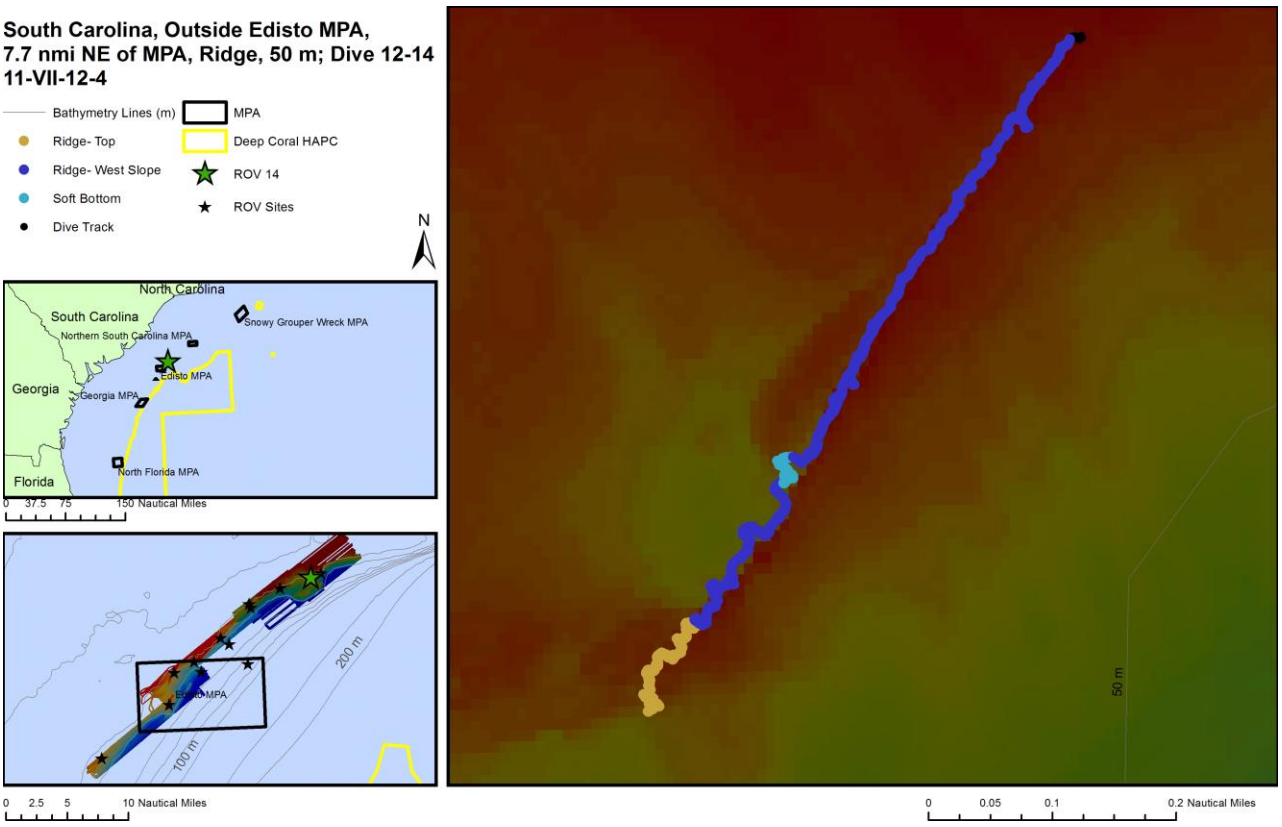
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus bahianus	ocean surgeonfish	1	3.43	0.3
Acanthurus sp.	doctorfish	3	3.43	0.9
Balistes capriscus	grey triggerfish	2	3.43	0.6
Bodianus pulchellus	spotfin hogfish	109	3.43	31.8
Calamus sp.	porgy	33	3.43	9.6
Canthigaster rostrata	sharpnose puffer	123	3.43	35.9
Centropristis ocyurus	bank sea bass	1	3.43	0.3
Chaetodon ocellatus	spotfin butterflyfish	17	3.43	5.0
Chaetodon sedentarius	reef butterflyfish	67	3.43	19.5
Chromis enchrysurus	yellowtail reeffish	14	3.43	4.1
Chromis insolatus	sunshinefish	6	3.43	1.7
Chromis scotti	purple reeffish	125	3.43	36.4
Chromis sp.	damselfish	1	3.43	0.3
Epinephelus adscensionis	rock hind	1	3.43	0.3
Epinephelus cruentatus	graysby	9	3.43	2.6
Equetus umbrosus	cubbyu	21	3.43	6.1
Haemulon aurolineatum	tomtates	1515	3.43	441.7
Haemulon sp.	grunt	508	3.43	148.1
Haemulon striatum	striped grunt	1	3.43	0.3
Halichoeres garnoti	yellowhead wrasse	1	3.43	0.3
Halichoeres sp.	wrasse	121	3.43	35.3
Holacanthus bermudensis	blue angelfish	43	3.43	12.5
Holacanthus tricolor	rock beauty	1	3.43	0.3
Holocentrus sp.	squirrelfish	7	3.43	2.0
Lachnolaimus maximus	hogfish	1	3.43	0.3
Lactophrys quadricornis	scrawled cowfish	2	3.43	0.6
Lutjanus griseus	grey snapper	46	3.43	13.4
Mycteroperca microlepis	gag grouper	1	3.43	0.3
Mycteroperca phenax	scamp	54	3.43	15.7
Myripristis jacobus	blackbar soldierfish	10	3.43	2.9
Opsanus pardus	leopard toadfish	1	3.43	0.3
Pagrus pagrus	red porgy	87	3.43	25.4
Pomacanthus paru	french angelfish	1	3.43	0.3
Pomacanthus sp.	angelfish	5	3.43	1.5
Priacanthus arenatus	bigeye	1	3.43	0.3
Pristigenys alta	short bigeye	20	3.43	5.8
Prognathodes aya	bank butterflyfish	1	3.43	0.3
Pterois volitans	lionfish	115	3.43	33.5
Rypticus sp.	soapfish	3	3.43	0.9

Dive Site: South Carolina, Outside Edisto MPA, 5.9 nmi NE of MPA, Ridge, 48 m; Dive 12-13

Scorpaenidae	scorpionfish	1	3.43	0.3
Seriola dumerili	greater amberjack	17	3.43	5.0
Seriola sp.	amberjack	14	3.43	4.1
Serranus phoebe	tattler	2	3.43	0.6
Sparidae	porgy	36	3.43	10.5
Stegastes partitus	bicolor damselfish	6	3.43	1.7
Thalassoma bifasciatum	bluehead wrasse	1	3.43	0.3
Total		3155		919.8

Dive Site: South Carolina, Outside Edisto MPA, 7.7 nmi NE of MPA, Ridge, 50 m; Dive 12-14

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	ed2_wgs84 (Edisto2)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/11/2012
Specimens:	
Digital Photos:	112
DVD:	2
Hard Drive:	1

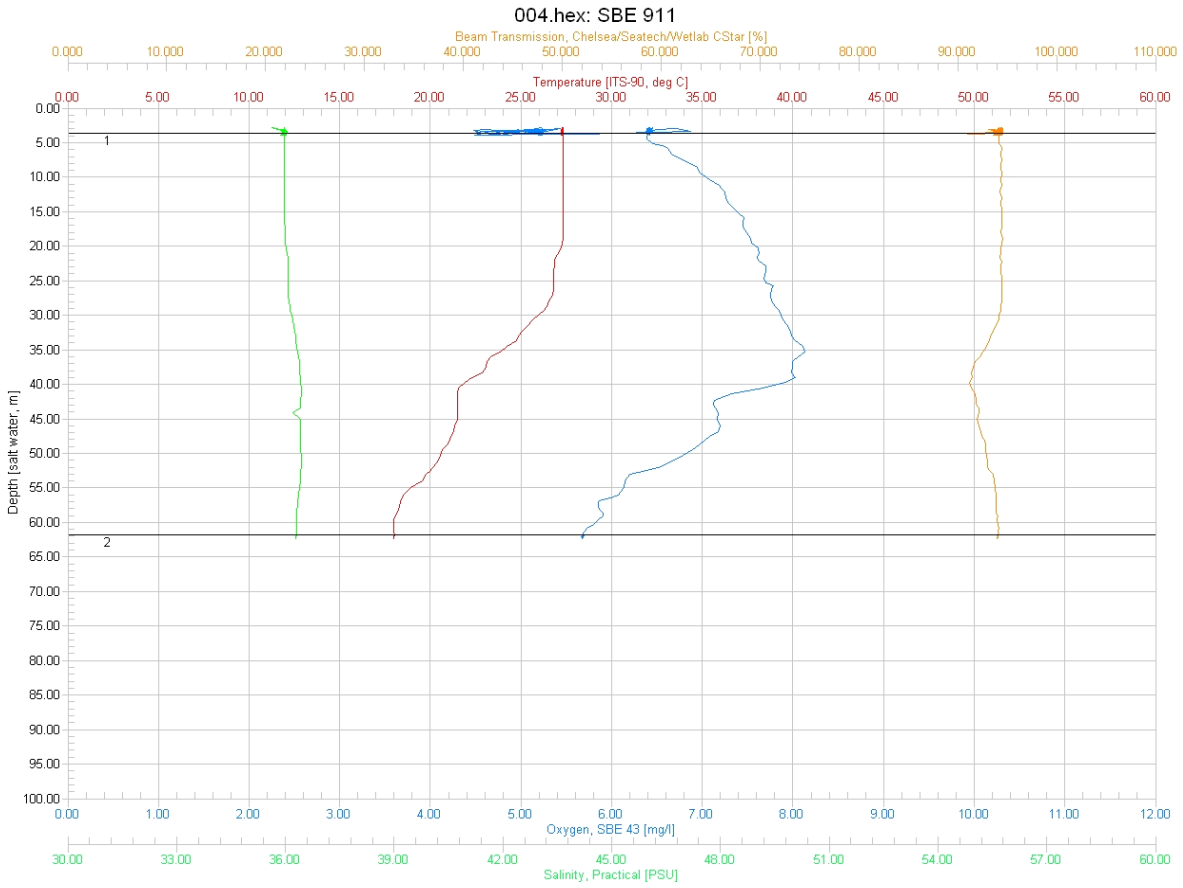
Dive Site: South Carolina, Outside Edisto MPA, 7.7 nmi NE of MPA, Ridge, 50 m; Dive 12-14

Dive Data:

Minimum Bottom Depth (m):	51	**Total Transect Length (km):**	3.011
Maximum Bottom Depth (m):	46	**Surface Current (kn):**	.1
On Bottom (Time- GMT):	12:49	**On Bottom (Lat/Long):**	32.51°N; -78.82°W
Off Bottom (Time- GMT):	14:13	**Off Bottom (Lat/Long):**	32.54°N; -78.81°W
Physical (bottom); Temp (°C):	20.80	**Salinity:** 36.10 **Visibility (ft):** 50	**Current (kn):** 0.2

Physical Environment:

Distance from Dive Site(km): 16.04



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (62 m): temperature- 18, salinity- 36.1, and dissolved oxygen- 5.8. Surface temperature was 27.7 and there was a thermocline near 30-40 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 35 m. Visibility was estimated at 50 ft from the ROV video.

Dive Site: South Carolina, Outside Edisto MPA, 7.7 nmi NE of MPA, Ridge, 50 m; Dive 12-14

Dive Imagery:

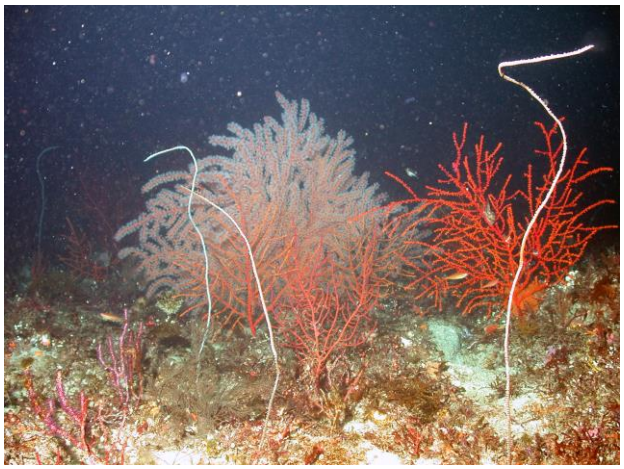


Figure 1: -49.1 m
Swiftia exserta octocorals (with and without expanded polyps) on low relief pavement.

Figure 2: -47.6 m
Scamp grouper on high relief rock habitat.

Figure 3: -50.8 m
Trumpet fish on moderate relief rocky habitat.

Figure 4: -48.1 m
Grouper and lionfish on sediment at base of high relief rock outcrops.

Dive Site: South Carolina, Outside Edisto MPA, 7.7 nmi NE of MPA, Ridge, 50 m; Dive 12-14

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 14, Site #- 11-VII-12-4. Target Site – ridge outside and north of South Carolina Edisto MPA; 50 m. ROV survey outside MPA; ground truth multibeam sonar of site. Single transect along NE-SW oriented ridge.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.25 kn from SW.

Site Description/Habitat/Biota:
Transect starts with low relief rock pavement, sediment veneer; 48.5 m. Ridge begins as rock slabs, 1/2-1 m relief, 50.5 m at base on west side. Ledge increases to extensive high relief feature, 51 m at base and 46 m top. Top of ledge undercut, small zone of rock slabs at base. Large schools of tomtate and scamp. Ledge decreases as go N to 2 m, 47-49 m on west drop-off. Top of ledge is flat rock slab, pavement, 10 m wide then grades into sand with no ledge on east side. At end of transect the west ledge has decreased to 1/2 m relief.

Dominant Benthic Biota: Scleractinia- solitary cup (clusters); Gorgonacea- *Swiftia exserta* (abundant), *Nicella* (30 cm), Diodogorgia, *Telesto*; Hydroida; Antipatharia- *Stichopathes*, other spp; Demospongiae- *Callyspongia vaginalis*, Spirastrellidae, *Axinellida*, *Aplysina*; Crinoid, Comatulid; Holothuroidea; Decapoda- *Panulirus argus*; Chlorophyta- stalked blade, *Codium*, spp; Rhodophyta- flat, bifurcate blade; Phaeophyta- *Dictyota*, *Sargassum*; Ascidiacea- *Eudistoma*.
Fish: scamp (abundant up to 20 in school), gag, greater amberjack, tomtate (huge schools), cornet fish, trumpet fish, southern stingray, rock hind, graysby, cubbyu, blue angelfish, scorpion fish, squirrelfish, surgeonfish, spotfin hogfish, rock beauty, spotted goatfish, jackknife fish, short bigeye, Calamus porgy, lionfish (common, 91).

Dive Site: South Carolina, Outside Edisto MPA, 7.7 nmi NE of MPA, Ridge, 50 m; Dive 12-14

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-14 conducted a survey 7.7 nmi NE of MPA. A SW to NE transect was made along the ridge which is evident in the multibeam sonar map. Dive transects were divided into three habitat zones: Ridge- Top, Ridge-West Slope and Soft Bottom. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). The ridge top was low relief rock pavement, the west drop-off was a narrow slope of moderate relief and high rugosity rock slabs and ledges; 46-50 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-14. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 14	South Carolina, Outside Edisto MPA, 7.7 nmi NE of MPA, Ridge, 50 m; Dive 12-14				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	Transect Across reef, Pavement Sediment <0.5 m relief				
	Ridge- Top	On Reef	LRu	LR	PF
Transect 2	XS along base of slope 1-2 m diam slabs, 0.5-1 m ledges and 2 m ledge				
	Ridge- West Slope	On Reef	LRu	MR	RLF
Transect 3	West of base of reef				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 4	47 m top 50.5 base, single ledge- slope ~ 10 m wide				
	Ridge- West Slope	On Reef	HRu	MR	RLF

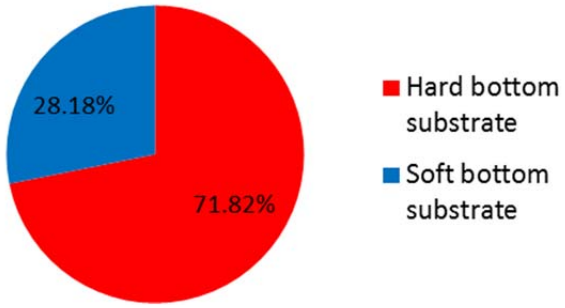


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-14. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on

Dive Site: South Carolina, Outside Edisto MPA, 7.7 nmi NE of MPA, Ridge, 50 m; Dive 12-14

biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-14 was predominately hard bottom (71.82%) consisting of rock pavement, 1-2 m diameter rock slabs and ledges.

Bare rock substrate without biota covered 17.23% of the bottom and bare soft bottom was 27.12% (Fig. 2, Table 2). Benthic macro-biota covered 55.66% of the bottom and consisted of 0.61% hard coral, 6.54% non-coral Cnidaria (Hydrozoa), 4.03% Porifera, 0.55% Antipatharia, 2.57% Alcyonacea ("gorgonacea" and soft coral), and 38.79% algae which included cyanobacteria (19.8%), Phaeophyta (7.0%), Rhodophyta (7.7%), and coralline red algae (2.7%).

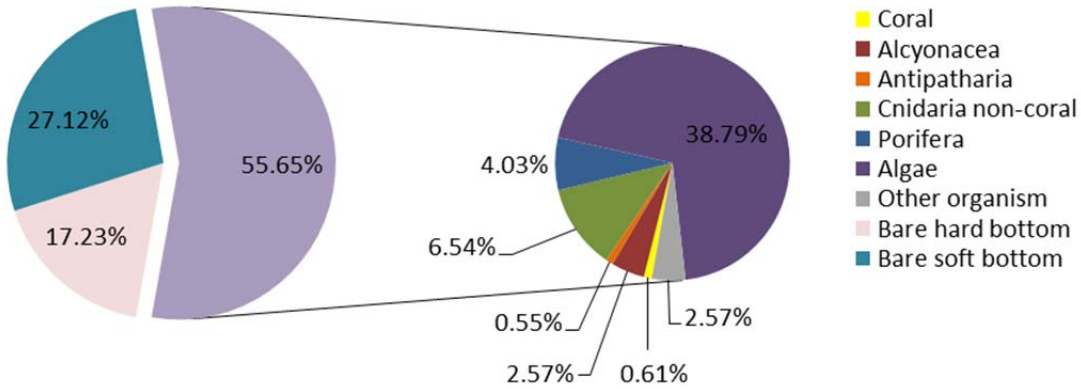


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-14. Corals include solitary coral. Non-scleractinian corals include Alcyonacea ("gorgonacea" and soft coral) and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida and Zoanthidea.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-14.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**66**	**4.03%**
Porifera	**66**	**4.03%**
Agelas sp.	3	0.18%
Aiolochroia crassa	2	0.12%
Cliona sp.	3	0.18%
Demospongiae	25	1.53%
Demospongiae- ze tan starlet	4	0.24%
Holopsamma sp.	1	0.06%
Ircinia sp.	8	0.49%
Spirastrellidae	19	1.16%
Spongia sp.	1	0.06%
Cnidaria non-coral	**107**	**6.54%**
Cnidaria non-coral	**107**	**6.54%**
Hydroidolina	105	6.41%
Zoanthidea	2	0.12%
Antipatharia	**9**	**0.55%**
Antipatharia	**9**	**0.55%**

Dive Site: South Carolina, Outside Edisto MPA, 7.7 nmi NE of MPA, Ridge, 50 m; Dive 12-14

Antipatharia	7	0.43%
Stichopathes lutkeni	1	0.06%
Tanacetipathes hirta	1	0.06%
Algae	**635**	**38.79%**
Algae	**635**	**38.79%**
Chlorophyta	23	1.41%
Corallinales/crustose coralline	45	2.75%
Cyanophyta	325	19.85%
Phaeophyta	115	7.03%
Rhodophyta	127	7.76%
Alcyonacea	**42**	**2.57%**
Alcyonacea	**42**	**2.57%**
Alcyonacea	2	0.12%
Diodogorgia sp.	14	0.86%
Ellisellidae	4	0.24%
Gorgonacea	1	0.06%
Muricea sp.	10	0.61%
Nidallia occidentalis	2	0.12%
Telesto sp.	9	0.55%
Coral	**10**	**0.61%**
Coral	**10**	**0.61%**
Phyllangia americana	10	0.61%
Other organism	**42**	**2.57%**
Annelida	**4**	**0.24%**
Filograna sp.	4	0.24%
Bryozoa	**6**	**0.37%**
Bryozoa	4	0.24%
Schizoporella sp.	2	0.12%
Chordata	**13**	**0.79%**
Ascidiacea	8	0.49%
Didemnidae	5	0.31%
Echinodermata	**4**	**0.24%**
Crinoidea	4	0.24%
Human debris	**1**	**0.06%**
Cans bottles litter	1	0.06%
Other organism	**14**	**0.86%**
Other organism	14	0.86%
Hard bottom substrate	**282**	**17.23%**
Hard bottom substrate	**282**	**17.23%**
Bare rock- pavement boulder ledge	279	17.04%
Bare rubble- rock	3	0.18%
Soft bottom substrate	**444**	**27.12%**

Dive Site: South Carolina, Outside Edisto MPA, 7.7 nmi NE of MPA, Ridge, 50 m; Dive 12-14

Soft bottom substrate	**444**	**27.12%**
Bare soft bottom substrate	444	27.12%
Grand Total	**1637**	**100.00%**

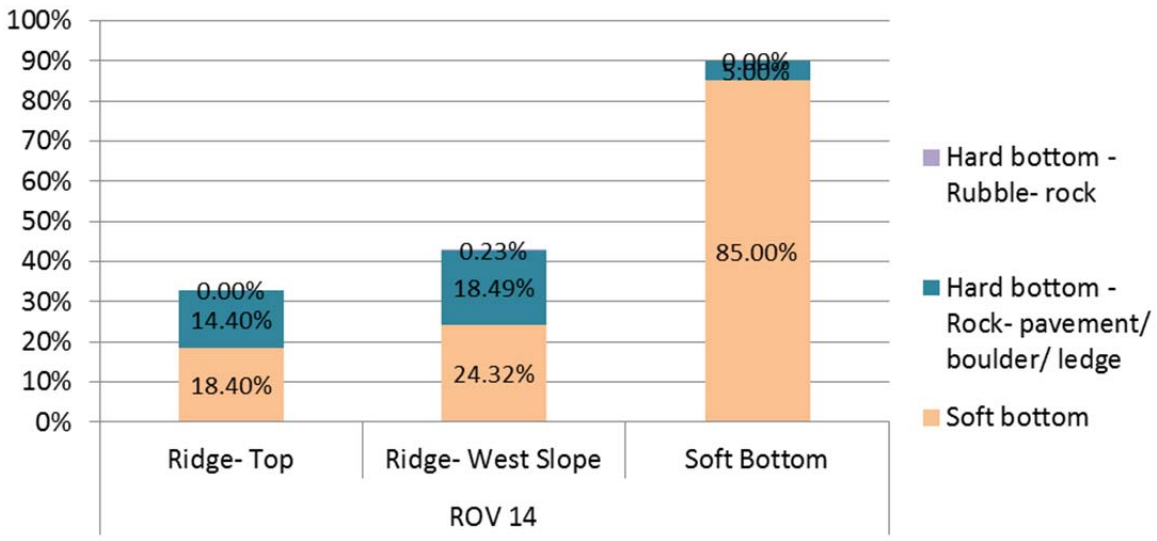


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-14.

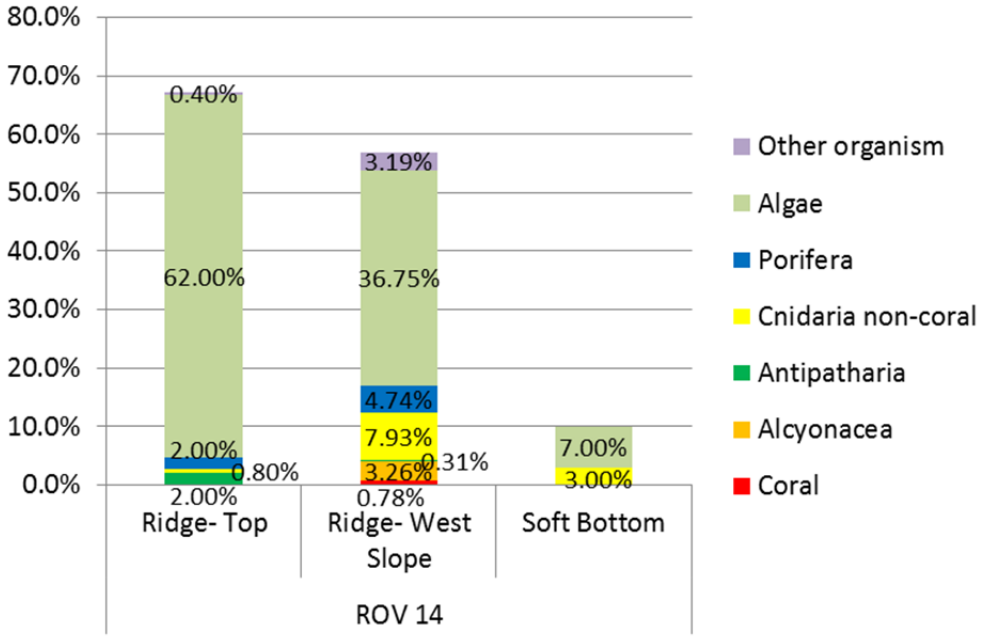


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-14.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The ridge top and ridge-slope had 14 to 18% exposed bare hard bottom and 18 to 24% bare soft bottom which was likely sediment veneer over pavement. Figure 4 shows the ridge and slope habitat zones to have ~55 to 68% cover of biota; algae was predominate on top of the ridge (62%) and less so on the slope (36.7%). Antipatharia occurred on top

Dive Site: South Carolina, Outside Edisto MPA, 7.7 nmi NE of MPA, Ridge, 50 m; Dive 12-14

(2.0%) and gorgonacea were more common on the slope (3.2%). Porifera ranged from 2.0 to 4.7% on the ridge and slope. Only hydroids and algae were present on the soft bottom off the ridge.

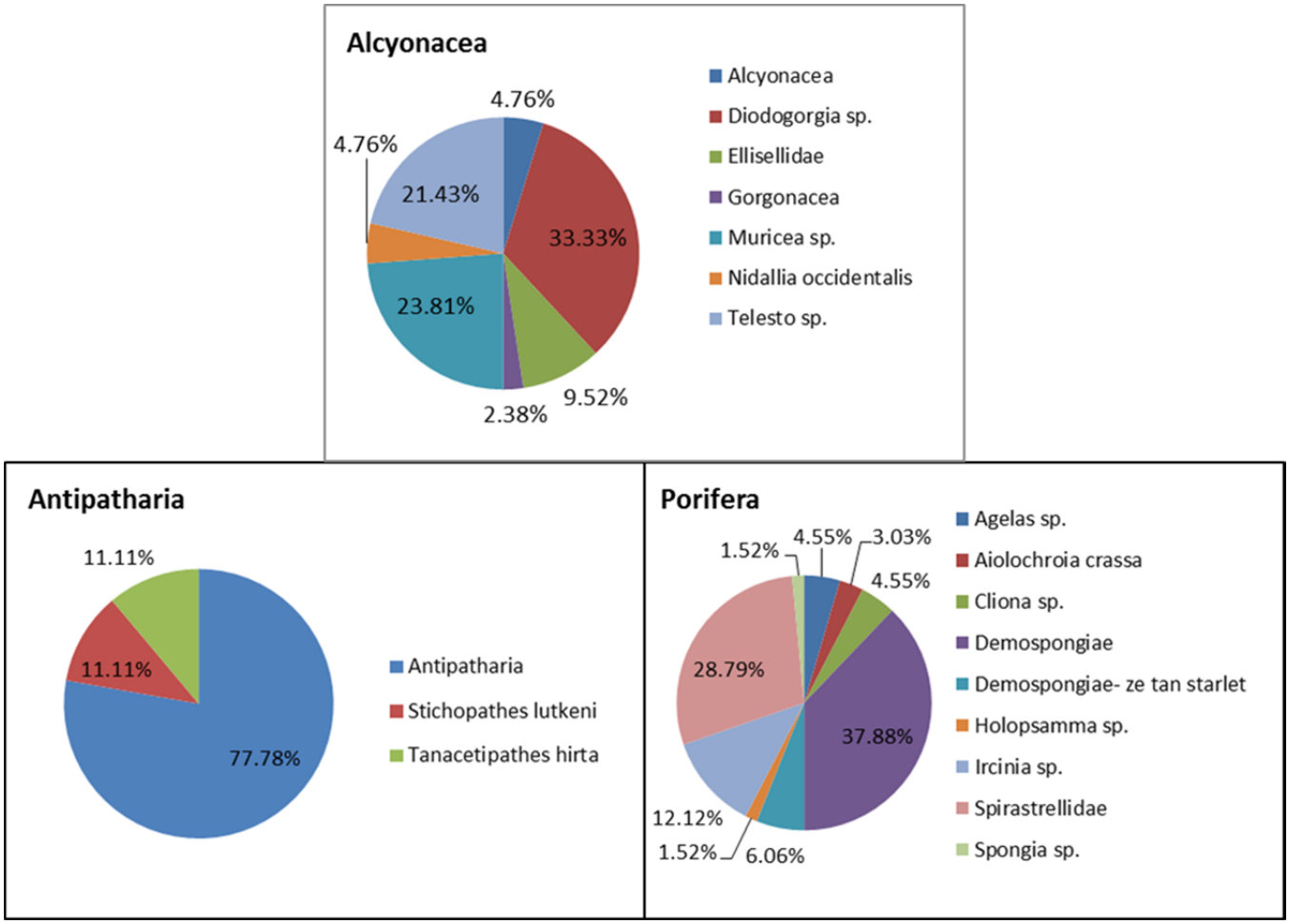


Figure 5. Diversity of corals and sponges at dive site ROV 12-14; CPCe analysis showing percent of total for each taxa category. Non-scleractinian corals include Alcyonacea ("gorgonacea" and soft corals) and Antipatharia (black coral); Porifera are Demospongiae.

Only one scleractinian hard coral was found at the site (*Phyllangia americana*). Alcyonacea were fairly diverse with at least 7 taxa which were dominated by *Diodogorgia* sp. (33.3% of the total Alcyonacea), *Muricea* sp. (23.8%), *Telesto* sp. (21.4%), Ellisellidae (9.5%), and the soft coral *Nidalia occidentalis* (4.7%). Various unidentified black corals dominated (Antipatharia, 77.7%), along with *Stichopathes lutkeni* and *Tanacetipathes hirta* (11% each). Demosponges were diverse (9 taxa) at this site and included Spirastrellidae (28.7% of the total Porifera), *Ircinia* sp. (12.1%), as well as *Cliona* sp., *Agelas* sp., *Holopsamma* sp., and *Aiolochroia crassa*.

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 49 taxa of fish were identified from dive ROV 14 for a total density of 3225.9 individuals/km (Table 3). These were dominated by

tomtate (2469.45/km), grunt (191), and vermilion snapper (147.5). Managed species included scamp (31.2/km), amberjack (12.3), hogfish (2.3), gag grouper (1.3), and red porgy (0.7).

Table 3. Density of fish for all transects at dive site ROV 12-14 (number individuals/km).

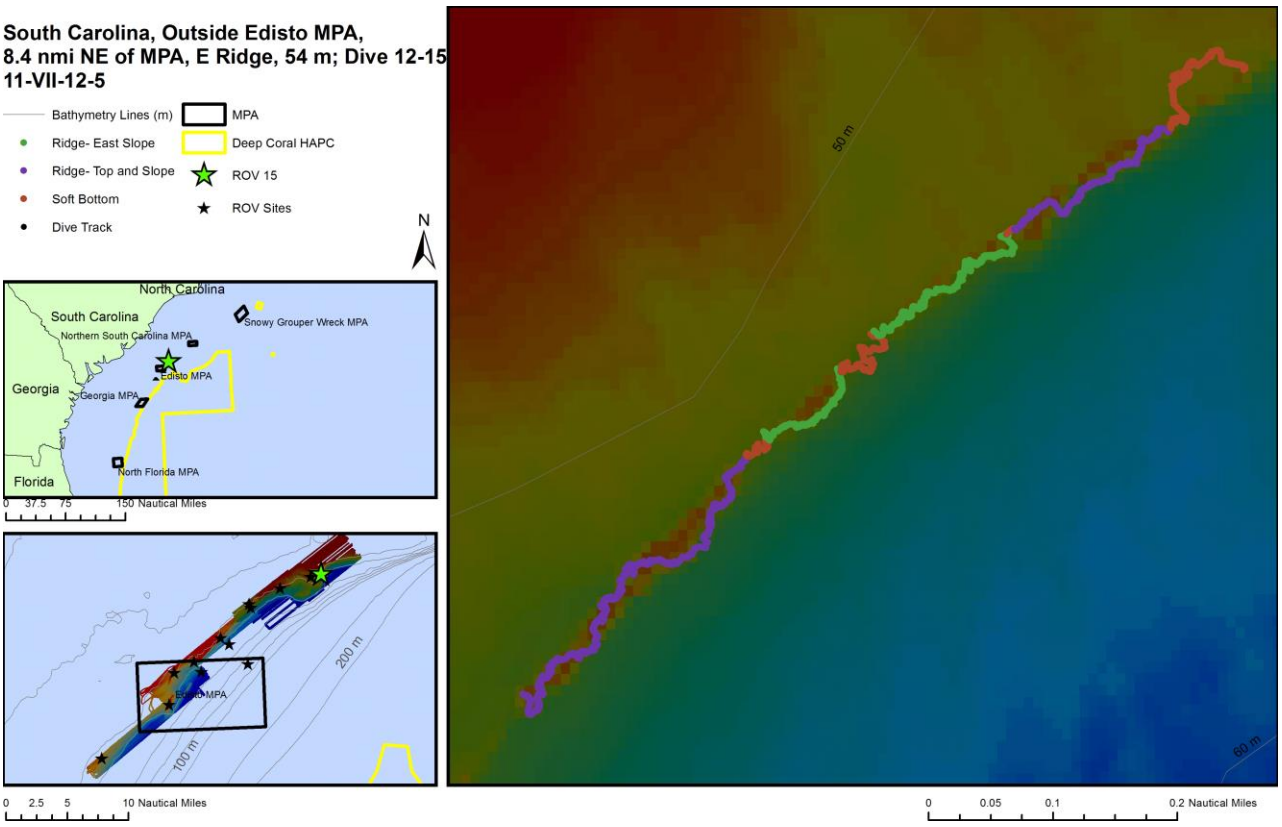
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus sp.	doctorfish	16	3.01	5.3
Apogon pseudomactulatus	twospot cardinalfish	3	3.01	1.0
Aulostomus maculatus	trumpetfish	2	3.01	0.7
Balistes capriscus	grey triggerfish	11	3.01	3.7
Bodianus pulchellus	spotfin hogfish	83	3.01	27.6
Calamus sp.	porgy	20	3.01	6.6
Canthigaster rostrata	sharpnose puffer	127	3.01	42.2
Chaetodon ocellatus	spotfin butterflyfish	23	3.01	7.6
Chaetodon sedentarius	reef butterflyfish	96	3.01	31.9
Chromis enchrysurus	yellowtail reeffish	22	3.01	7.3
Chromis insolatus	sunshinefish	3	3.01	1.0
Chromis scotti	purple reeffish	96	3.01	31.9
Chromis sp.	damselfish	1	3.01	0.3
Diodon sp.	puffer	1	3.01	0.3
Epinephelus adscensionis	rock hind	3	3.01	1.0
Epinephelus cruentatus	graysby	28	3.01	9.3
Equetus lanceolatus	jack-knife fish	3	3.01	1.0
Equetus umbrosus	cubbyu	69	3.01	22.9
Fistularia tabacaria	bluespotted cornetfish	1	3.01	0.3
Haemulon aurolineatum	tomtate	7433	3.01	2469.4
Haemulon plumieri	white grunt	7	3.01	2.3
Haemulon sp.	grunt	575	3.01	191.0
Halichoeres sp.	wrasse	107	3.01	35.5
Holacanthus bermudensis	blue angelfish	82	3.01	27.2
Holacanthus tricolor	rock beauty	1	3.01	0.3
Holocentrus sp.	squirrelfish	68	3.01	22.6
Lachnolaimus maximus	hogfish	7	3.01	2.3
Lactophrys sp.	cowfish	8	3.01	2.7
Mycteroperca microlepis	gag grouper	4	3.01	1.3
Mycteroperca phenax	scamp	94	3.01	31.2
Myripristis jacobus	blackbar soldierfish	21	3.01	7.0
Pagrus pagrus	red porgy	2	3.01	0.7
Pomacanthus paru	french angelfish	2	3.01	0.7
Priacanthus arenatus	bigeye	4	3.01	1.3
Pristigenys alta	short bigeye	14	3.01	4.7
Prognathodes aya	bank butterflyfish	20	3.01	6.6
Pseudupeneus maculatus	spotted goatfish	5	3.01	1.7

Dive Site: South Carolina, Outside Edisto MPA, 7.7 nmi NE of MPA, Ridge, 50 m; Dive 12-14

Pterois volitans	lionfish	133	3.01	44.2
Rhomboplites aurorubens	vermilion snapper	444	3.01	147.5
Rypticus saponaceus	greater soapfish	5	3.01	1.7
Scorpaenidae	scorpionfish	2	3.01	0.7
Seriola dumerili	greater amberjack	22	3.01	7.3
Seriola rivoliana	almaco jack	4	3.01	1.3
Seriola sp.	amberjack	11	3.01	3.7
Serranus phoebe	tattler	8	3.01	2.7
Serranus sp.	sea bass	1	3.01	0.3
Sparidae	porgy	2	3.01	0.7
Stegastes partitus	bicolor damselfish	15	3.01	5.0
Thalassoma bifasciatum	bluehead wrasse	1	3.01	0.3
Total		9710		3225.9

Dive Site: South Carolina, Outside Edisto MPA, 8.4 nmi NE of MPA, E Ridge, 54 m; Dive 12-15

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	ed2_wgs84 (Edisto2)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/11/2012
Specimens:	
Digital Photos:	107
DVD:	2
Hard Drive:	1

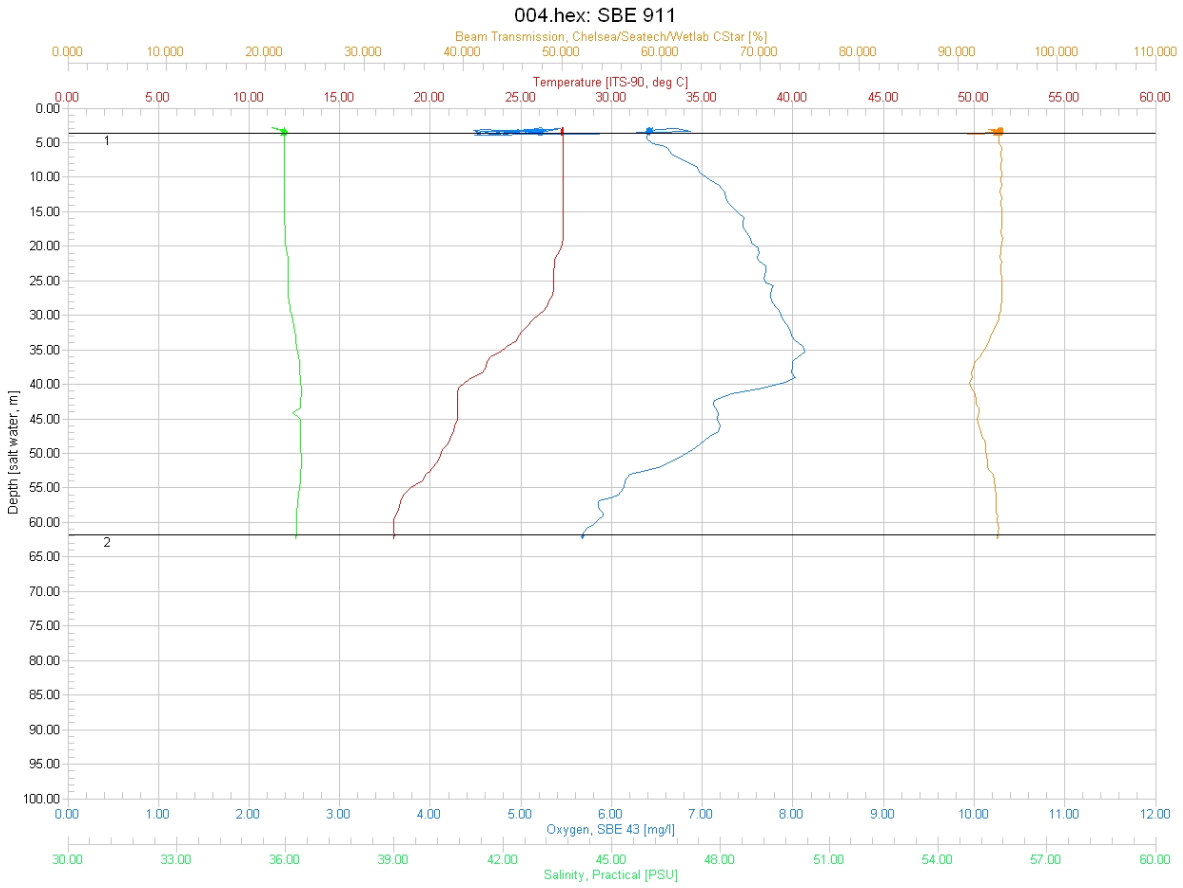
Dive Site: South Carolina, Outside Edisto MPA, 8.4 nmi NE of MPA, E Ridge, 54 m; Dive 12-15

Dive Data:

Minimum Bottom Depth (m):	49	**Total Transect Length (km):**	4.060
Maximum Bottom Depth (m):	54	**Surface Current (kn):**	.25
On Bottom (Time- GMT):	14:50	**On Bottom (Lat/Long):**	32.51°N; -78.8°W
Off Bottom (Time- GMT):	16:41	**Off Bottom (Lat/Long):**	32.52°N; -78.79°W
Physical (bottom); Temp (°C):	20.80	**Salinity:** 36.10 **Visibility (ft):** 30	**Current (kn):** 0.25

Physical Environment:

Distance from Dive Site(km): 17.59



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (62 m): temperature- 18, salinity- 36.1, and dissolved oxygen- 5.8. Surface temperature was 27.96 and there was a thermocline near 30-40 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 35 m. Visibility was estimated at 30 ft from the ROV video.

Dive Site: South Carolina, Outside Edisto MPA, 8.4 nmi NE of MPA, E Ridge, 54 m; Dive 12-15

Dive Imagery:

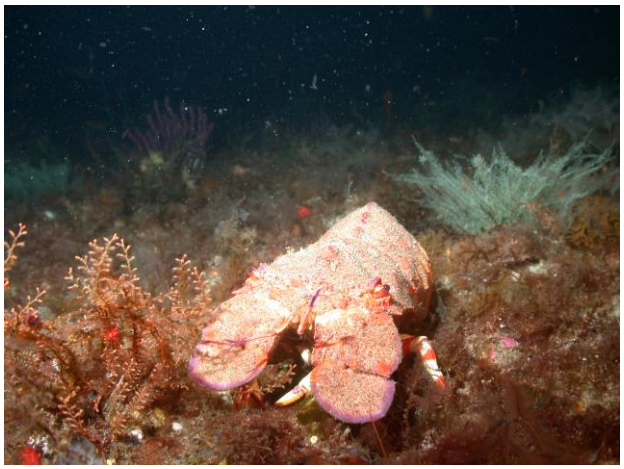


Figure 1: -50.3 m
Slipper lobster on hardbottom ridge.

Figure 2: -51.6 m
Solitary scleractinan cup corals, encrusting demosponges and *Schizoporella* bryozoa on undercut ledge.

Figure 3: -51.2 m
Scorpionfish on moderate relief hardbottom with dense cover of encrusting biota.

Figure 4: -49.1 m
Bottle brush Antipatharian black coral on hardbottom with dense biota.

Dive Site: South Carolina, Outside Edisto MPA, 8.4 nmi NE of MPA, E Ridge, 54 m; Dive 12-15

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 15, Site #- 11-VII-12-5. Target Site – ridge outside and north of South Carolina Edisto MPA; 50 m. ROV survey outside MPA; ground truth multibeam sonar of site. Conduct video/photo transect along SW-NE oriented ridge.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.25 kn from SW.

Site Description/Habitat/Biota:
Narrow linear ridge oriented SW-NE; depth range 49-54 m which shows on multibeam as a well-defined dark orange ridge ~60 m wide. Video confirms this feature. Transected along west slope, top and east slope. Ridge broken in several spots separated by 100-150 m of sediment. Top of main ridge 50 m; upper west slope is high relief ledge 1-2 m, and often undercut 1-2 m; below the ledges is a zone of large rock slabs, 1-4 m diameter, 1 m thick which extends out 10-20+ m from the wall, ending in sediment at 54 m. The east slope of the ridge is similar in morphology as the west; top of east slope 49 m, base in sand is 54 m. The rock slab zone extends out further in parts to 30 m or more. The north end of each reef section decreases in height to 1-2 m, then scattered rock slabs grading into sediment gap.

Dominant Benthic Biota: The dominant sessile fauna are gorgonians, hydroids, sponges, and algae. Gorgonacea- *Swiftia exserta*, *Nicella* (30 cm), Diodogorgia, *Telesto*; Hydroida (2 spp common); Antipatharia- *Stichopathes*, *Antipathes* (bushy gray); Demospongiae- *Ircinia campana*, *Callyspongia vaginalis*, Spirastrellidae, Axinellida, *Aplysina*, *Geodia*; Crinoid- Comatulid; Holothuroidea; Decapoda- *Panulirus argus*; Chlorophyta- stalked blade, *Codium*, spp; Rhodophyta- flat, bifurcate blade; Phaeophyta- *Dictyota*, *Sargassum*; Cyanophyta; Ascidiacea- *Eudistoma*.
Fish: scamp (abundant up to 20+ in school), gag, greater amberjack, tomtate, vermilion snapper, cornet fish, trumpet fish, graysby, blue angelfish, scorpion fish, surgeonfish, spotfin hogfish, rock beauty, purple reef fish, reef butterfly, bank butterfly, rock hind, shortnose puffer, spotted goatfish, jackknife fish, short bigeye, bigeye, Calamus porgy, lionfish (common, 116).

Dive Site: South Carolina, Outside Edisto MPA, 8.4 nmi NE of MPA, E Ridge, 54 m; Dive 12-15

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-15 conducted a survey 8.4 nmi NE of the MPA along a SW-NE oriented ridge which is evident in the multibeam sonar map. Dive transects were divided into three habitat zones: Ridge- East Slope, Ridge- Top and Slope and Soft Bottom. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). The narrow ridge was about 40 m wide and broken by four sediment gaps of about 100 m width; the east and west slopes were moderate to high relief and high rugosity drop-offs with rock slabs and ledges; 47-54 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-15. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 15	South Carolina, Outside Edisto MPA, 8.4 nmi NE of MPA, E Ridge, 54 m; Dive 12-15				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	Top of ridge 50 m, base 54 m. E and W slope similar, 1-2 m ledge undercut, rock slabs over 50 m wide slope, Ridge= 500 m long 40 m wide				
	Ridge- Top and Slope	On Reef	HRu	HR	RLF
Transect 2	90 m long sediment gap				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 3	120 m long ridge, 50 m deep, 0.5-1 m ledges				
	Ridge- East Slope	On Reef	HRu	MR	RLF
Transect 4	120 m long sediment gap, Sed with patch rock slabs				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 5	540 m long ridge 1-2 m ledges, rock slabs on slope, 52 m depth				
	Ridge- East Slope	On Reef	HRu	MR	RLF
Transect 6	sediment gap				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 7	2 m relief ridge, XS on E & W slopes and top. E Slope is broad zone				
	Ridge- Top and Slope	On Reef	HRu	MR	RLF
Transect 8	sediment gap				
	Soft Bottom	Off Reef	LRu	LR	S

Dive Site: South Carolina, Outside Edisto MPA, 8.4 nmi NE of MPA, E Ridge, 54 m; Dive 12-15

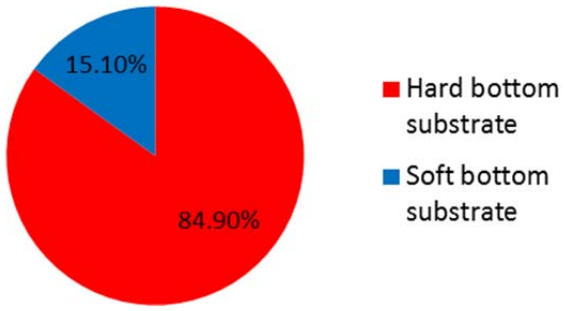


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-15. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-15 was predominately hard bottom (84.9%) consisting of rock pavement and rock slabs and ledges on the slopes.

Bare rock substrate without biota covered 13.08% of the bottom and bare soft bottom was 15.47% (Fig. 2, Table 2). Benthic macro-biota covered 71.44% of the bottom and consisted of 11.47% non-coral Cnidaria (Hydrozoa), 4.29% Porifera, 1.17% Antipatharia, 2.29% Alcyonacea ("gorgonacea"), and 49.1% algae which included cyanobacteria (40.6%), fleshy Rhodophyta (3.4%), Phaeophyta (2.9%), Chlorophyta (1.3%), and coralline algae (0.7%). There was no hard coral.

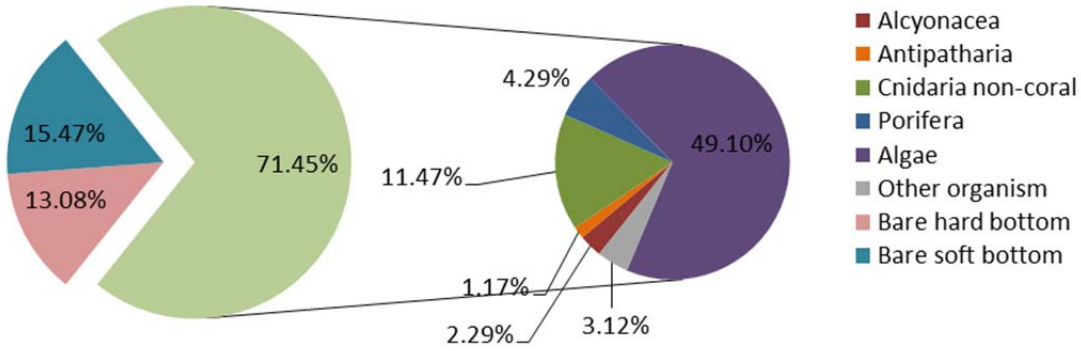


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-15. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-15.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**88**	**4.29%**
Porifera	**88**	**4.29%**
Callyspongia sp.	2	0.10%

Dive Site: South Carolina, Outside Edisto MPA, 8.4 nmi NE of MPA, E Ridge, 54 m; Dive 12-15

Cliona sp.	2	0.10%
Demospongiae	22	1.07%
Demospongiae- ze tan starlet	9	0.44%
Geodia sp.	5	0.24%
Holopsamma sp.	7	0.34%
Ircinia sp.	14	0.68%
Mycale sp.	1	0.05%
Niphates sp.	1	0.05%
Spirastrellidae	25	1.22%
Cnidaria non-coral	**235**	**11.47%**
Cnidaria non-coral	**235**	**11.47%**
Hydroidolina	235	11.47%
Antipatharia	**24**	**1.17%**
Antipatharia	**24**	**1.17%**
Antipatharia	20	0.98%
Stichopathes lutkeni	2	0.10%
Tanacetipathes hirta	2	0.10%
Algae	**1006**	**49.10%**
Algae	**1006**	**49.10%**
Chlorophyta	27	1.32%
Corallinales/crustose coralline	15	0.73%
Cyanophyta	833	40.65%
Phaeophyta	61	2.98%
Rhodophyta	70	3.42%
Alcyonacea	**47**	**2.29%**
Alcyonacea	**47**	**2.29%**
Diodogorgia sp.	7	0.34%
Ellisellidae	3	0.15%
Telesto sp.	37	1.81%
Other organism	**64**	**3.12%**
Annelida	**2**	**0.10%**
Filograna sp.	1	0.05%
Serpulidae	1	0.05%
Arthropoda	**1**	**0.05%**
Stenorhynchus seticornis	1	0.05%
Bryozoa	**19**	**0.93%**
Bryozoa	18	0.88%
Schizoporella sp.	1	0.05%
Chordata	**19**	**0.93%**
Ascidiacea	10	0.49%
Didemnidae	7	0.34%
Fish	2	0.10%

Dive Site: South Carolina, Outside Edisto MPA, 8.4 nmi NE of MPA, E Ridge, 54 m; Dive 12-15

Echinodermata	**5**	**0.24%**
Crinoidea	5	0.24%
Human debris	**1**	**0.05%**
Fishing gear/line/long line	1	0.05%
Other organism	**17**	**0.83%**
Other organism	17	0.83%
Hard bottom substrate	**268**	**13.08%**
Hard bottom substrate	**268**	**13.08%**
Bare rock- pavement boulder ledge	263	12.84%
Bare rubble- rock	5	0.24%
Soft bottom substrate	**317**	**15.47%**
Soft bottom substrate	**317**	**15.47%**
Bare soft bottom substrate	317	15.47%
Grand Total	**2049**	**100.00%**

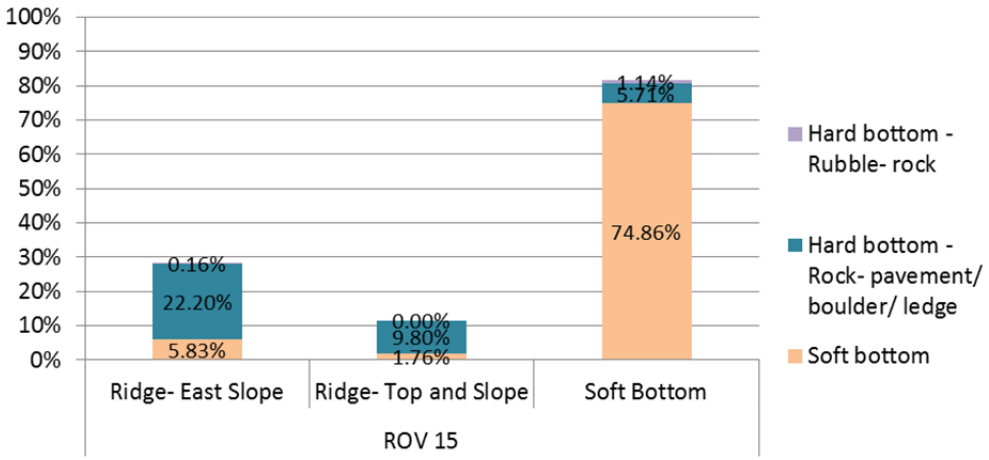


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-15.

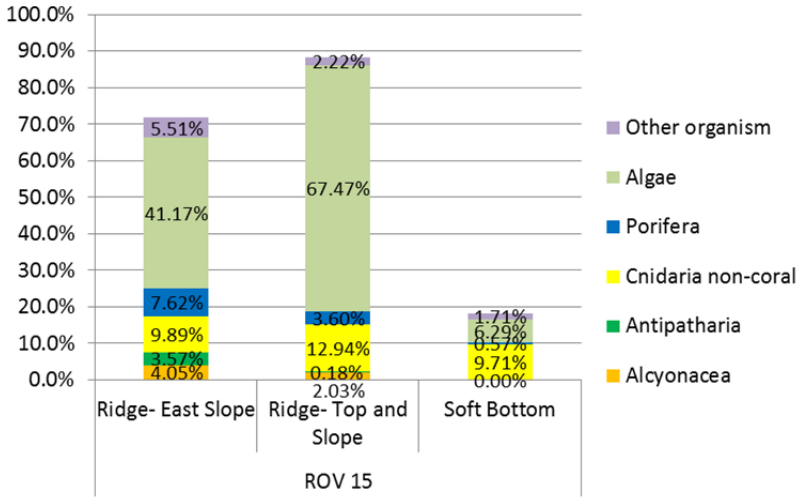


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-15.

Dive Site: South Carolina, Outside Edisto MPA, 8.4 nmi NE of MPA, E Ridge, 54 m; Dive 12-15

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The ridge east slope had ~28% cover of bare exposed substrate (22% hard bottom, 5.8% soft). The soft bottom habitat zone off the ridge was predominately soft sand (74.8%). Figure 4 shows the east slope to have ~70% cover of biota dominated by algae (41.1%), sponges (7.6%), hydroids (9.8%), Antipatharia (3.5%), and gorgonacea (4.0%). The soft bottom off ridge was mostly hydroids (9.7% cover).

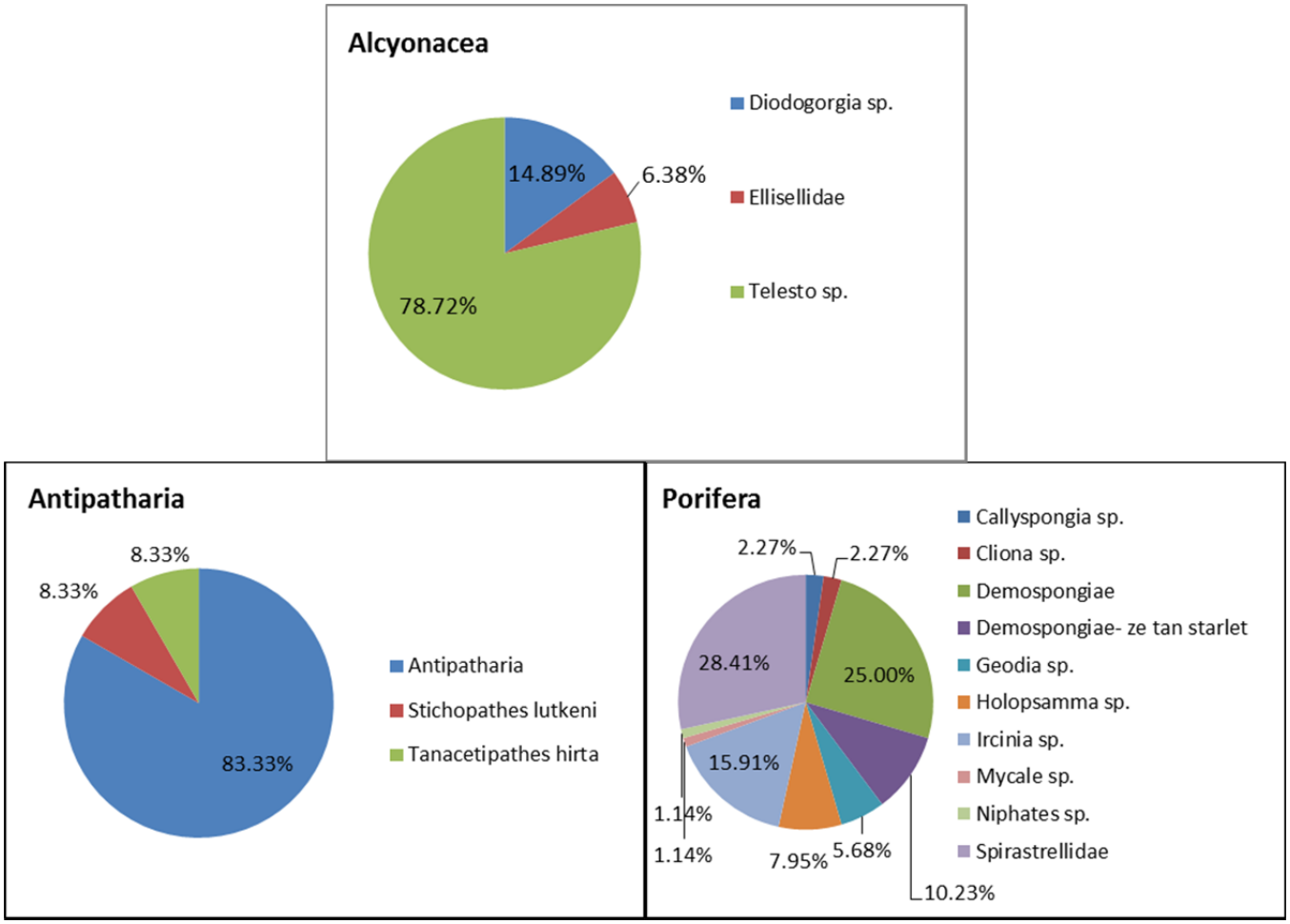


Figure 5. Diversity of corals and sponges at dive site ROV 12-15; CPCe analysis showing percent of total for each taxa category. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral); Porifera are Demospongiae.

No hard coral was present at the dive site. Non-scleractinian corals included 3 taxa of Alcyonacea which were dominated by *Telesto* sp. (78.7% of the total Alcyonacea), *Diodogorgia* sp. (14.8%) and Ellisellidae (6.3%). The majority of Antipatharia were unidentified (83.3% of the total Antipatharia) and could not be collected for verification; *Stichopathes lutkeni* and *Tanacetipathes hirta* consisted of 8.3% of the taxa each. Porifera were relatively diverse with 10 taxa, dominated by Spirastrellidae (28.4% of the total Porifera), *Ircinia* sp. (15.9%), *Holopsamma* sp. (7.9%), *Geodia* sp. (5.6%), and tan starlet Demospongiae (10.2%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (#

individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 49 taxa of fish were identified from dive ROV 15 for a total density of 740.6 individuals/km (Table 3). These were dominated by tomtate (273.6/km), grunt (106.2), and sharpnose puffer (77.8). Managed species included scamp (27.8/km), amberjack (7.1), graysby (4.9), hogfish (0.5), gag grouper (0.7), and red porgy (0.2).

Table 3. Density of fish for all transects at dive site ROV 12-15 (number individuals/km).

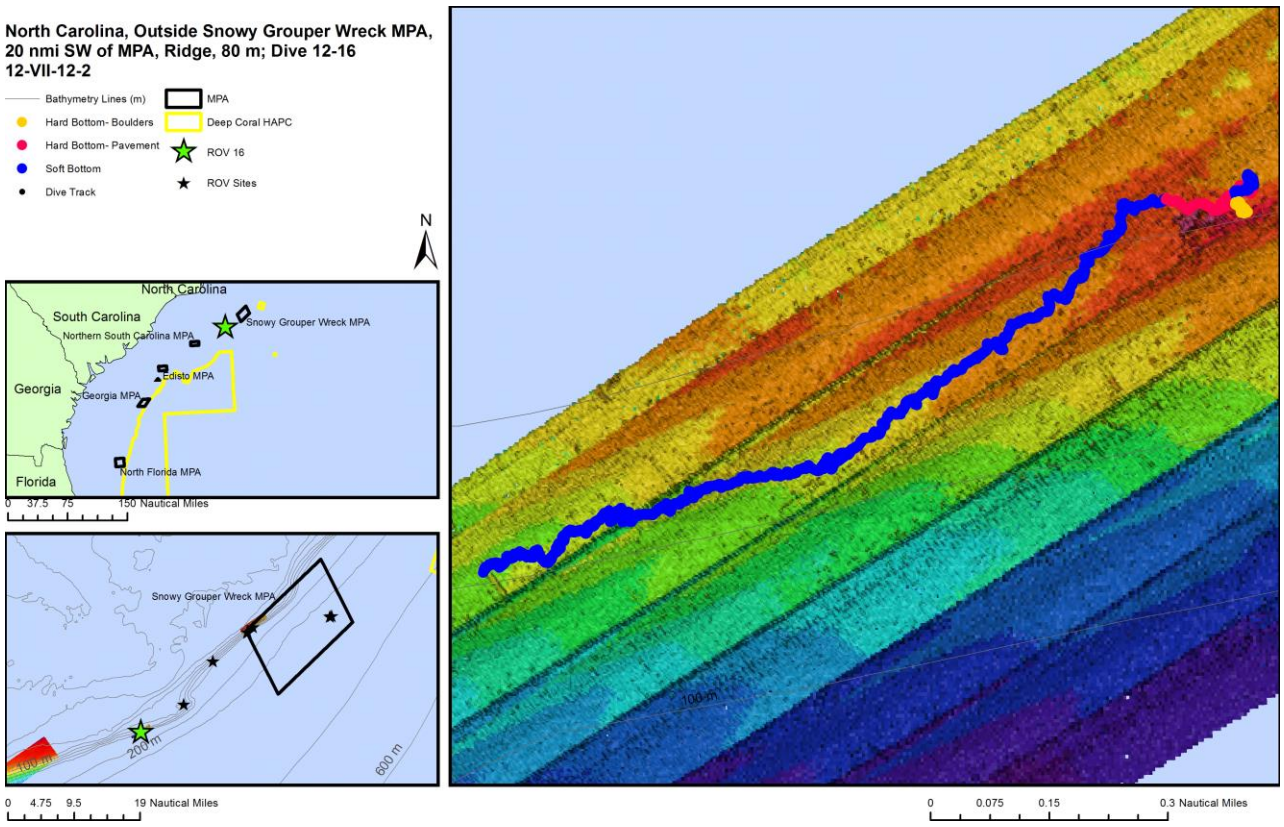
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus bahianus	ocean surgeonfish	3	4.06	0.7
Acanthurus sp.	doctorfish	6	4.06	1.5
Aulostomus maculatus	trumpetfish	5	4.06	1.2
Bodianus pulchellus	spotfin hogfish	97	4.06	23.9
Calamus sp.	porgy	24	4.06	5.9
Canthigaster rostrata	sharpnose puffer	316	4.06	77.8
Chaetodon ocellatus	spotfin butterflyfish	4	4.06	1.0
Chaetodon sedentarius	reef butterflyfish	84	4.06	20.7
Chilomycterus sp.	burrfish	2	4.06	0.5
Chromis enchrysurus	yellowtail reeffish	6	4.06	1.5
Chromis insolatus	sunshinefish	4	4.06	1.0
Chromis scotti	purple reeffish	84	4.06	20.7
Chromis sp.	damselfish	2	4.06	0.5
Epinephelus cruentatus	graysby	20	4.06	4.9
Equetus umbrosus	cubbyu	22	4.06	5.4
Fistularia sp.	cornetfish	2	4.06	0.5
Fistularia tabacaria	bluespotted cornetfish	1	4.06	0.2
Haemulon aurolineatum	tomtate	1111	4.06	273.6
Haemulon sp.	grunt	431	4.06	106.2
Haemulon striatum	striped grunt	111	4.06	27.3
Halichoeres garnoti	yellowhead wrasse	4	4.06	1.0
Halichoeres sp.	wrasse	13	4.06	3.2
Holacanthus bermudensis	blue angelfish	87	4.06	21.4
Holacanthus tricolor	rock beauty	2	4.06	0.5
Holocentridae	soldierfish/squirrelfish	1	4.06	0.2
Holocentrus sp.	squirrelfish	13	4.06	3.2
Lachnolaimus maximus	hogfish	2	4.06	0.5
Lactophrys sp.	cowfish	6	4.06	1.5
Liopropoma eukrines	wrasse bass	4	4.06	1.0
Mycteroperca microlepis	gag grouper	3	4.06	0.7
Mycteroperca phenax	scamp	113	4.06	27.8
Mycteroperca sp.	grouper	3	4.06	0.7
Myripristis jacobus	blackbar soldierfish	13	4.06	3.2
Ophichthidae	snake eel	1	4.06	0.2
Pagrus pagrus	red porgy	1	4.06	0.2
Pomacanthus arcuatus	grey angelfish	4	4.06	1.0

Dive Site: South Carolina, Outside Edisto MPA, 8.4 nmi NE of MPA, E Ridge, 54 m; Dive 12-15

Priacanthus arenatus	bigeye	6	4.06	1.5
Pristigenys alta	short bigeye	37	4.06	9.1
Prognathodes aya	bank butterflyfish	10	4.06	2.5
Pseudupeneus maculatus	spotted goatfish	2	4.06	0.5
Pterois volitans	lionfish	148	4.06	36.5
Rhomboplites aurorubens	vermilion snapper	147	4.06	36.2
Rypticus sp.	soapfish	2	4.06	0.5
Scorpaenidae	scorpionfish	6	4.06	1.5
Seriola sp.	amberjack	29	4.06	7.1
Serranus phoebe	tattler	7	4.06	1.7
Serranus tigrinus	harlequin bass	2	4.06	0.5
Sparidae	porgy	2	4.06	0.5
Sphoeroides spengleri	bandtail puffer	4	4.06	1.0
Total		3007		740.6

Dive Site: North Carolina, Outside Snowy Grouper Wreck MPA, 20 nmi SW of MPA, Ridge, 80 m; Dive 12-16

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	capehope_4m_col (con't Cape_Fear)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	No Sensors Used
Date of Dive:	7/12/2012
Specimens:	
Digital Photos:	249
DVD:	4
Hard Drive:	1

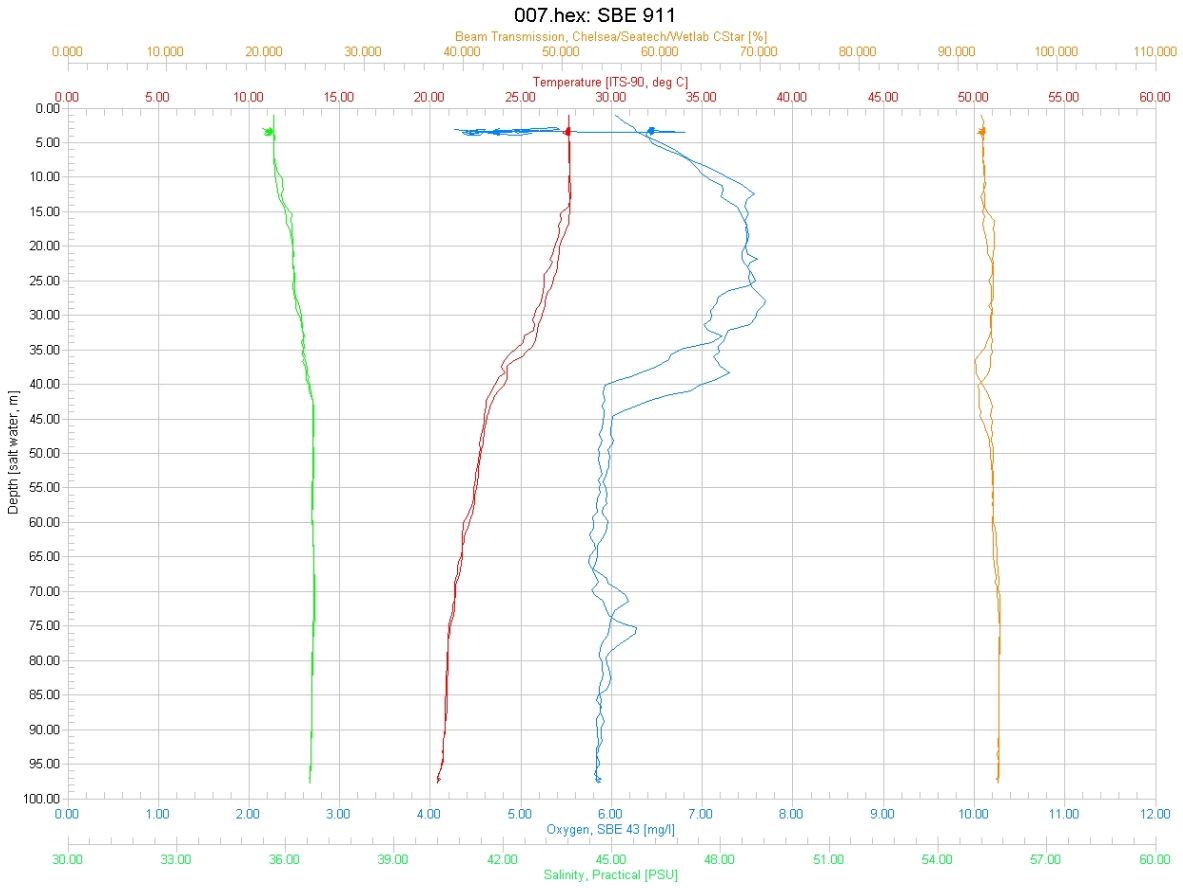
Dive Site: North Carolina, Outside Snowy Grouper Wreck MPA, 20 nmi SW of MPA, Ridge, 80 m; Dive 12-16

Dive Data:

Minimum Bottom Depth (m):	67	**Total Transect Length (km):**	6.928
Maximum Bottom Depth (m):	81	**Surface Current (kn):**	0.6
On Bottom (Time- GMT):	7:45	**On Bottom (Lat/Long):**	33.19°N; -77.4°W
Off Bottom (Time- GMT):	11:41	**Off Bottom (Lat/Long):**	33.2°N; -77.38°W
Physical (bottom); Temp (°C):	17.00	**Salinity:** 36.00 **Visibility (ft):** 30	**Current (kn):** 0.1

Physical Environment:

Distance from Dive Site(km): 0.60



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (97 m): temperature- 21, salinity- 36.1, and dissolved oxygen- 5.8. Surface temperature was 27.7 and there was a thermocline near 25-40 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 27 m. Visibility was estimated at 30 ft from the ROV video.

Dive Site: North Carolina, Outside Snowy Grouper Wreck MPA, 20 nmi SW of MPA, Ridge, 80 m; Dive 12-16

Dive Imagery:

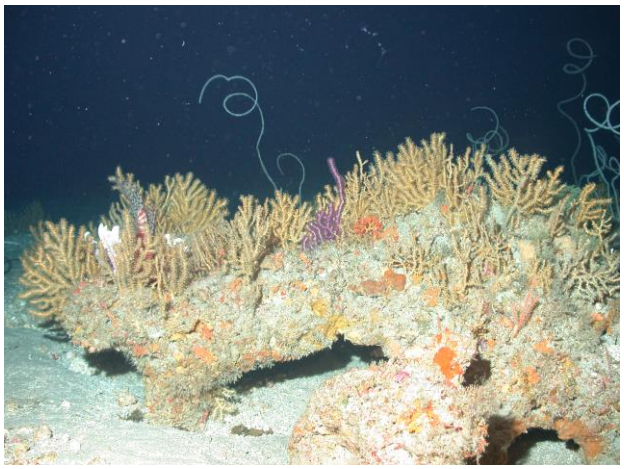


Figure 1: -79.7 m

Bebryce octocorals and lionfish on rock boulder habitat.

Figure 2: -74.7 m

Bigeye on low relief, excavated rock habitat.

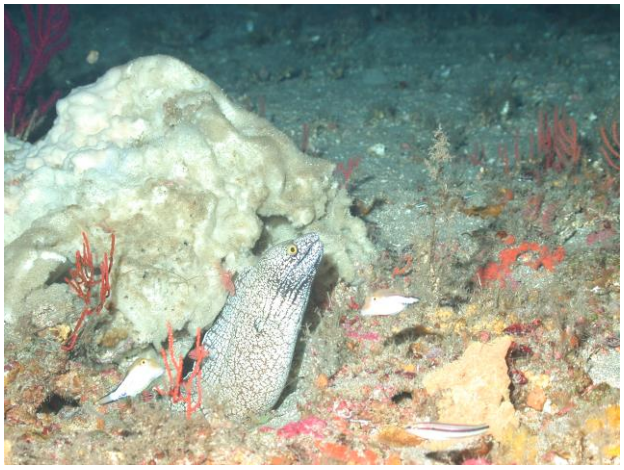


Figure 3: -73.2 m

Eel, sharpnose puffers, and demosponge on exposed pavement.

Figure 4: -67 m

Sargassum triggerfish (*Xanthichthys ringens*) and scattered demosponges on low relief pavement.

Dive Site: North Carolina, Outside Snowy Grouper Wreck MPA, 20 nmi SW of MPA, Ridge, 80 m; Dive 12-16

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 16, Site #- 12-VII-12-2. Target Site – ridge outside and south of North Carolina MPA; 85 m. ROV survey outside MPA; ground truth new Pisces multibeam sonar of site. Conduct video/photo transect over four waypoint features from multibeam which indicated a "drop off", "ridge" and a "bumpy zone".

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.6 kn from SW.

Site Description/Habitat/Biota:
Transect over 4 waypoints of multibeam features. Mostly sand bottom with patchy low relief rock rubble/cobble and patches of exposed pavement and low relief ledges <30 cm relief; depth range 81-67 m. Transect to WP 1: 80 m, flat sediment with 10-30% cover rock rubble, shell hash, small cobble, few small 1/2 m diameter boulders (< 20 cm relief). WP 1- 79m, 10-50% rock cobble, pavement, rock outcrops 10-15 cm relief. WP 4 (mound on multibeam) - 67.5 m, small area of exposed hard bottom, rock ledge and outcrops 30 cm relief.

Dominant Benthic Biota: *Stichopathes*, 10 cm purple gorgonians (*Diodogorgia*?), and 10 cm yellow gorgonians (*Thesea*?) are dominant. Gorgonacea- *Diodogorgia*?, *Thesea*?, *Muricea*? (40 cm white fan); Hydroida; Antipatharia- *Stichopathes*; Demospongiae- *Spirastrellidae*, *Ircinia*?, 20 cm cake (encrusted with yellow sponge); Annelida- *Filograna*; Echinodermata- *Astroporpa annulata*, *Eucidaris*?, *Narcissia trigonaria*; Decapoda- *Stenorhynchus seticornis*.
Fish: scamp (few), tattler, graysby, reef butterfly, spotfin butterfly, spotfin hogfish, bank butterfly, soapfish, sargassum triggerfish, short bigeye, Calamus porgy, creole fish, squirrelfish, blue angelfish, shortnose puffer, soldier fish, snow bass, moray eel, cowfish, rock hind, sand tilefish, greater amberjack (large school), surgeonfish, hogfish, lionfish (few, 21).

Dive Site: North Carolina, Outside Snowy Grouper Wreck MPA, 20 nmi SW of MPA, Ridge, 80 m; Dive 12-16

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-16 conducted a survey 20 nmi SW of the MPA along a SW to NE oriented ridge which is evident in the multibeam sonar map. Dive transects were divided into three habitat zones: Hard Bottom- Boulders, Hard Bottom- Pavement and Soft Bottom. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). Transects were made over four multibeam features; these were mostly low relief soft bottom with patches of rubble, cobble and rock pavement; one area had low relief boulders; 63-81 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-16. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 16	North Carolina, Outside Snowy Grouper Wreck MPA, 20 nmi SW of MPA, Ridge, 80 m; Dive 12-16				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	80 m SB, 10-30% rubble, cobble, pvmt, 10 cm relief				
	Soft Bottom	Off Reef	LRu	LR	SRF
Transect 2	73-78 m deep, 30-50% pvmt, low relief pvmt, rubble,				
	Soft Bottom	Off Reef	LRu	LR	SRF
Transect 3	1-30% HB rubble, pvmt, 75 m depth				
	Soft Bottom	Off Reef	LRu	LR	SRF
Transect 4	67 m deep, pvmt, 15-30 cm rock, 10-30% cover				
	Soft Bottom	Off Reef	LRu	LR	SRF
Transect 5	66 m 10-50% hb rubble, pvmt 30 cm relief				
	Hard Bottom- Pavement	On Reef	LRu	LR	PF
Transect 6	70 M deep				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 7	30 cm relief pvmt, boulders 1-2 m wide, 10 -30 cm relief				
	Hard Bottom- Boulders	On Reef	LRu	LR	RLF

Dive Site: North Carolina, Outside Snowy Grouper Wreck MPA, 20 nmi SW of MPA, Ridge, 80 m; Dive 12-16

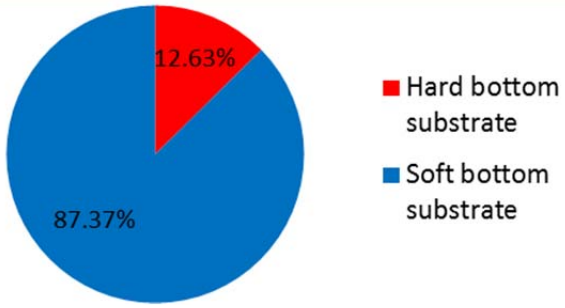


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-16. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-16 was predominately soft bottom (87.37%).

Bare rock substrate without biota covered 8.97% of the bottom and bare soft bottom was 86.11% (Fig. 2, Table 2). Benthic macro-biota covered 4.92% of the bottom and consisted of 1.63% non-coral Cnidaria (Hydrozoa), 0.25% Porifera, 0.85% Antipatharia, 0.5% Alcyonacea ("gorgonacea"), and 1.03% algae. There was no hard coral.

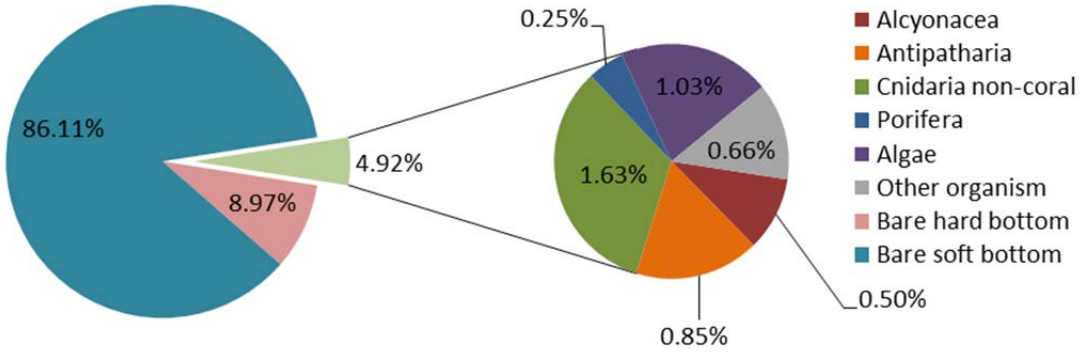


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-16. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-16.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**8**	**0.25%**
Porifera	**8**	**0.25%**
Demospongiae	3	0.09%
Spirastrellidae	5	0.16%
Cnidaria non-coral	**52**	**1.63%**
Cnidaria non-coral	**52**	**1.63%**
Hydroidolina	52	1.63%
Antipatharia	**27**	**0.85%**

Dive Site: North Carolina, Outside Snowy Grouper Wreck MPA, 20 nmi SW of MPA, Ridge, 80 m; Dive 12-16

Antipatharia	**27**	**0.85%**
Antipatharia	1	0.03%
Stichopathes lutkeni	25	0.78%
Tanacetipathes hirta	1	0.03%
Algae	**33**	**1.03%**
Algae	**33**	**1.03%**
Chlorophyta	2	0.06%
Corallinales/crustose coralline	20	0.63%
Cyanophyta	7	0.22%
Rhodophyta	4	0.13%
Alcyonacea	**16**	**0.50%**
Alcyonacea	**16**	**0.50%**
Bebryce sp.	8	0.25%
Diodogorgia sp.	5	0.16%
Ellisella sp.	1	0.03%
Telesto sp.	2	0.06%
Other organism	**21**	**0.66%**
Chordata	**7**	**0.22%**
Didemnidae	1	0.03%
Fish	6	0.19%
Echinodermata	**7**	**0.22%**
Crinoidea	4	0.13%
Eucidaris tribuloides	3	0.09%
Other organism	**7**	**0.22%**
Other organism	7	0.22%
Hard bottom substrate	**286**	**8.97%**
Hard bottom substrate	**286**	**8.97%**
Bare rock- pavement boulder ledge	235	7.37%
Bare rubble- rock	51	1.60%
Soft bottom substrate	**2747**	**86.11%**
Soft bottom substrate	**2747**	**86.11%**
Bare soft bottom substrate	2747	86.11%
Grand Total	**3190**	**100.00%**

Dive Site: North Carolina, Outside Snowy Grouper Wreck MPA, 20 nmi SW of MPA, Ridge, 80 m; Dive 12-16

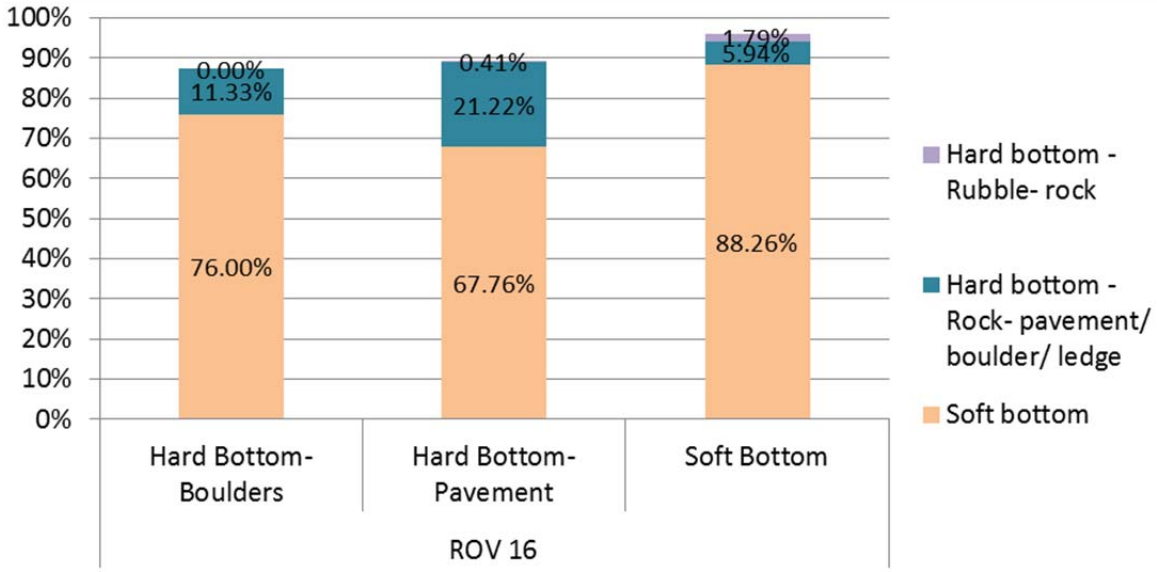


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-16.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The two hard bottom habitat zones (boulder zone and pavement zone) both had relatively high percent cover of sediment which was possibly sediment veneer over pavement. Bare hard bottom covered 11 to 21% of the bottom in both zones. Off reef was predominately soft sediment (88.2% cover). Overall both hard bottom zones had relatively low cover of biota (10-12% cover) which was dominated by algae (4-6%), hydroids (3.3-4.4%), and black coral (1.6-3.3%).

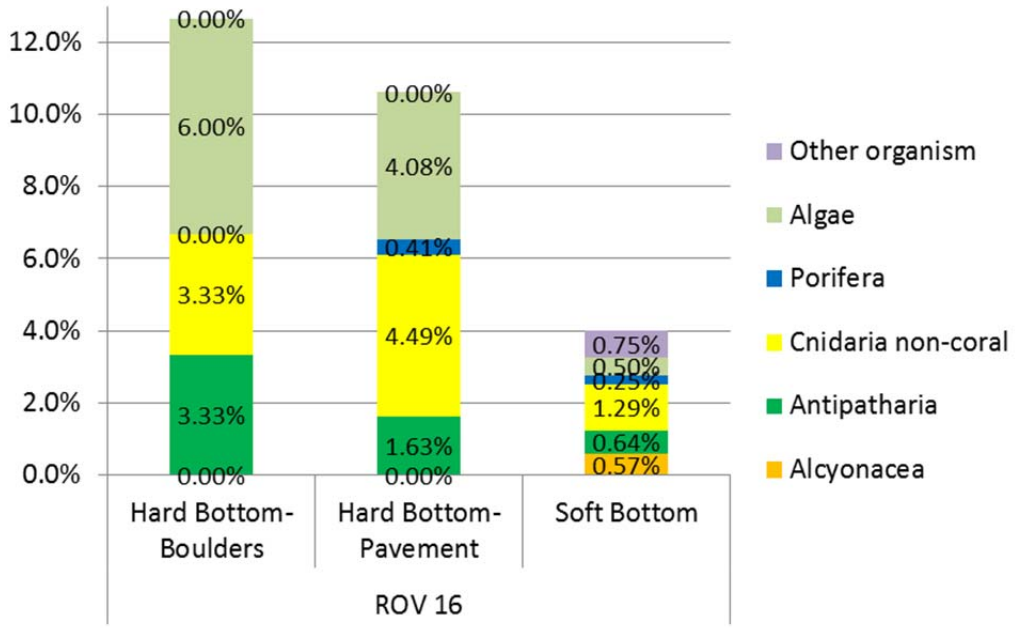


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-16.

Dive Site: North Carolina, Outside Snowy Grouper Wreck MPA, 20 nmi SW of MPA, Ridge, 80 m; Dive 12-16

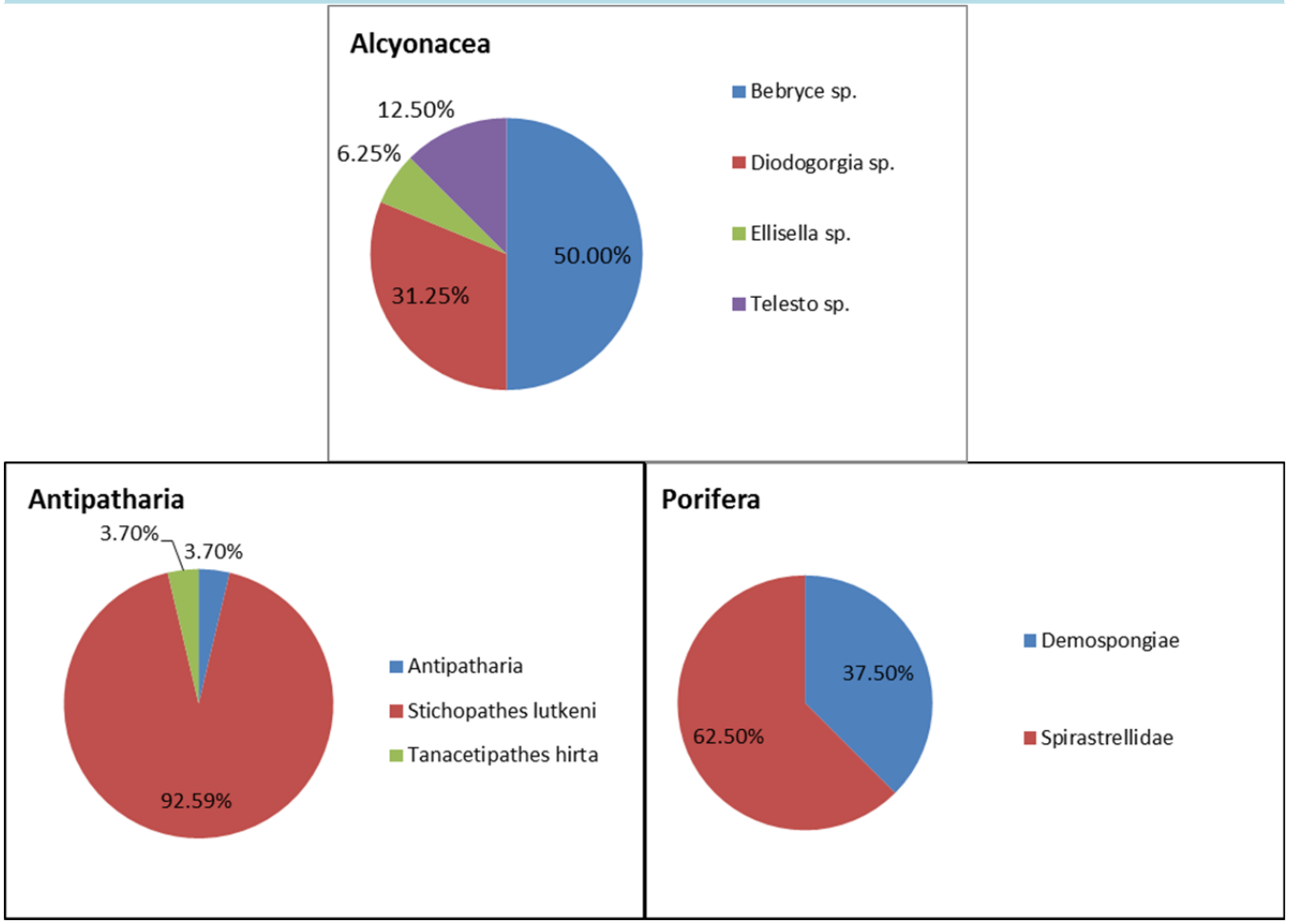


Figure 5. Diversity of corals and sponges at dive site ROV 12-16; CPCe analysis showing percent of total for each taxa category. Non-scleractinia coral includes Alcyonacea ("gorgonacea") and Antipatharia (black coral); Porifera are Demospongiae.

No hard coral was present at the dive site. Gorgonacea were dominated by *Bebryce* sp. (50% of the total Alcyonacea), *Diodogorgia* sp. (31.2%), *Telesto* sp. (12.5%), and *Ellisella* sp. (6.2%). *Stichopathes lutkeni* dominated the black coral (92.5% of the total Antipatharia). Sponges also were of low diversity (Spirastrellidae, 62.5% of the total Porifera; and unidentified demosponges).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 40 taxa of fish were identified from dive ROV 16 for a total density of 485 individuals/km (Table 3). These were dominated by short bigeye (40.3/km), amberjack (30.3), and tattler (26.6). Managed species included amberjack, red porgy (0.4/km), scamp (0.3), graysby (0.3), and hogfish (0.1).

Dive Site: North Carolina, Outside Snowy Grouper Wreck MPA, 20 nmi SW of MPA, Ridge, 80 m; Dive 12-16

Table 3. Density of fish for all transects at dive site ROV 12-16 (number individuals/km).

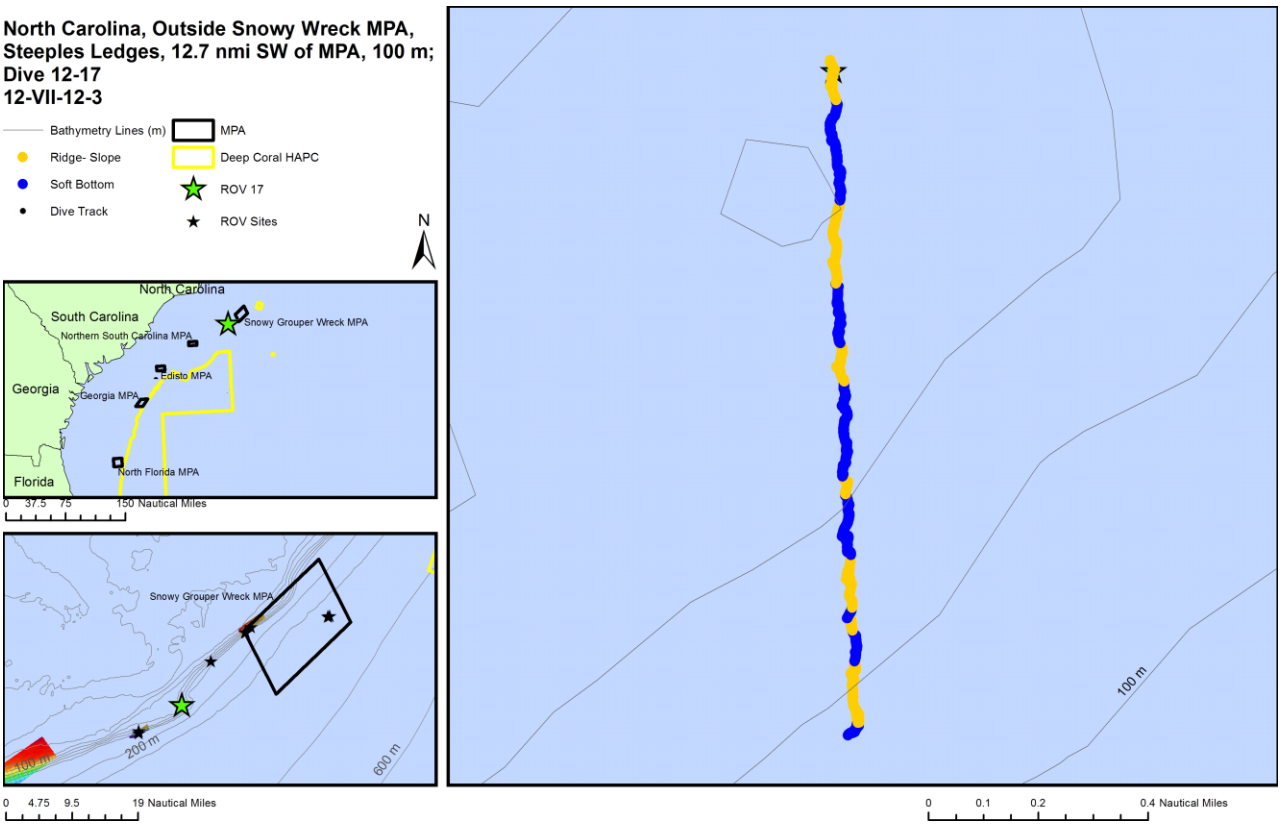
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus sp.	doctorfish	16	6.93	2.3
Apogon pseudomaculatus	twospot cardinalfish	1	6.93	0.1
Balistes capriscus	grey triggerfish	2	6.93	0.3
Bodianus pulchellus	spotfin hogfish	16	6.93	2.3
Calamus sp.	porgy	12	6.93	1.7
Canthigaster rostrata	sharpnose puffer	144	6.93	20.8
Chaetodon ocellatus	spotfin butterflyfish	29	6.93	4.2
Chaetodon sedentarius	reef butterflyfish	58	6.93	8.4
Chromis enchrysurus	yellowtail reeffish	11	6.93	1.6
Chromis insolatus	sunshinefish	7	6.93	1.0
Chromis sp.	damselfish	10	6.93	1.4
Epinephelus adscensionis	rock hind	1	6.93	0.1
Epinephelus cruentatus	graysby	2	6.93	0.3
Equetus umbrosus	cubbyu	90	6.93	13.0
Gymnothorax sp.	moray eel	1	6.93	0.1
Halichoeres sp.	wrasse	123	6.93	17.7
Holacanthus bermudensis	blue angelfish	12	6.93	1.7
Holacanthus tricolor	rock beauty	6	6.93	0.9
Holocentrus sp.	squirrelfish	9	6.93	1.3
Lachnolaimus maximus	hogfish	7	6.93	1.0
Lactophrys quadricornis	scrawled cowfish	1	6.93	0.1
Liopropoma eukrines	wrasse bass	1	6.93	0.1
Malacanthus plumieri	sand tilefish	1	6.93	0.1
Muraenidae	moray eel	2	6.93	0.3
Mycteroperca phenax	scamp	2	6.93	0.3
Pagrus pagrus	red porgy	3	6.93	0.4
Paranthias furcifer	creole-fish	33	6.93	4.8
Priacanthus arenatus	bigeye	1	6.93	0.1
Pristigenys alta	short bigeye	279	6.93	40.3
Prognathodes aya	bank butterflyfish	3	6.93	0.4
Pseudupeneus maculatus	spotted goatfish	1	6.93	0.1
Pterois volitans	lionfish	22	6.93	3.2
Rypticus saponaceus	greater soapfish	1	6.93	0.1
Seriola dumerili	greater amberjack	2	6.93	0.3
Seriola sp.	amberjack	210	6.93	30.3
Serranus annularis	orangeback bass	1	6.93	0.1
Serranus chionariaia	snow bass	1	6.93	0.1
Serranus phoebe	tattler	184	6.93	26.6
Sparidae	porgy	1	6.93	0.1

Dive Site: North Carolina, Outside Snowy Grouper Wreck MPA, 20 nmi SW of MPA, Ridge, 80 m; Dive 12-16

Xanthichthys ringens	sargassum triggerfish	11	6.93	1.6
Total		1317		190.0

Dive Site: North Carolina, Outside Snowy Wreck MPA, Steeples Ledges, 12.7 nmi SW of MPA, 100 m; Dive 12-17

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	None Available
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/12/2012
Specimens:	
Digital Photos:	137
DVD:	3
Hard Drive:	1

Dive Site: North Carolina, Outside Snowy Wreck MPA, Steeples Ledges, 12.7 nmi SW of MPA, 100 m; Dive 12-17

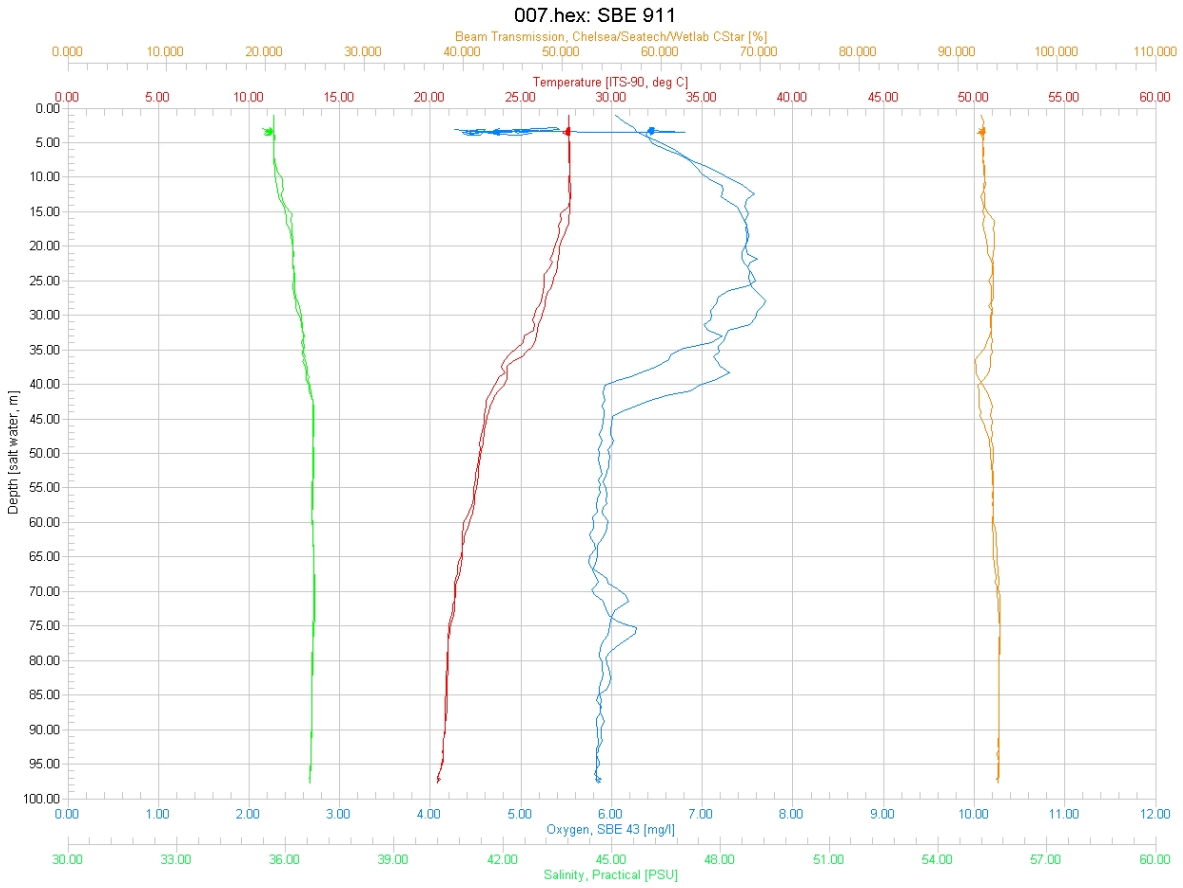
Dive Data:

Minimum Bottom Depth (m):	68	**Total Transect Length (km):**	4.565
Maximum Bottom Depth (m):	102	**Surface Current (kn):**	0.5
On Bottom (Time- GMT):	12:43	**On Bottom (Lat/Long):**	33.23°N; -77.27°W
Off Bottom (Time- GMT):	15:15	**Off Bottom (Lat/Long):**	33.25°N; -77.25°W

Physical (bottom); Temp (°C): 21.80 **Salinity:** 36.00 **Visibility (ft):** 50 **Current (kn):** 0.1

Physical Environment:

Distance from Dive Site(km): 13.83



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (97 m): temperature- 21, salinity- 36.1, and dissolved oxygen- 5.8. Surface temperature was 28.4 and there was a thermocline near 25-40 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 27 m. Visibility was estimated at 50 ft from the ROV video.

Dive Site: North Carolina, Outside Snowy Wreck MPA, Steeples Ledges, 12.7 nmi SW of MPA, 100 m; Dive 12-17

Dive Imagery:

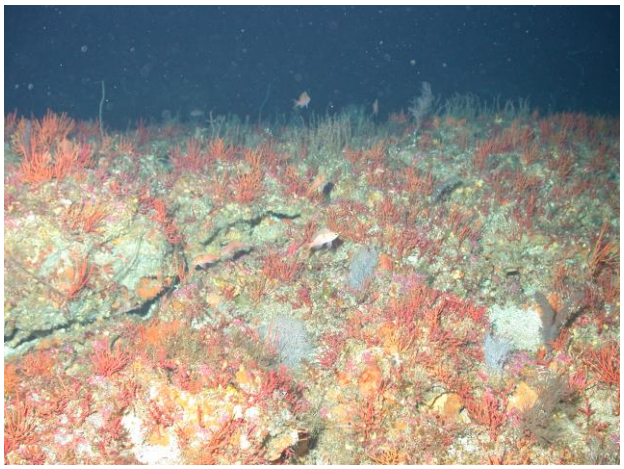


Figure 1: -80.5 m
Field of red gorgonians on moderate relief hardbottom.

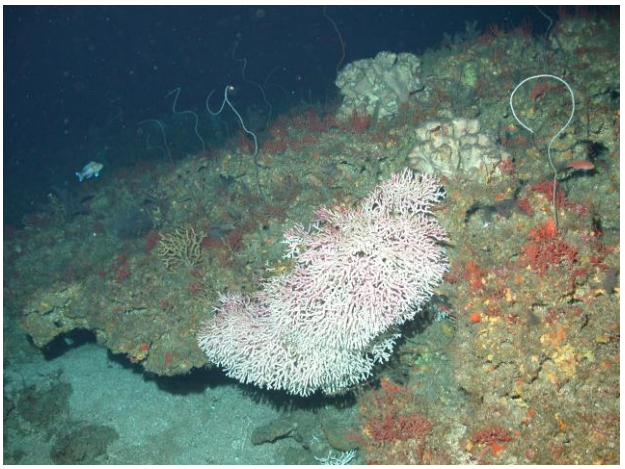


Figure 2: -86 m
Madracis myriaster coral, *Stichopathes* black coral, and demosponges on moderate relief hardbottom.

Figure 3: -84.5 m
Wrasse bass on sediment between rocky outcrops.

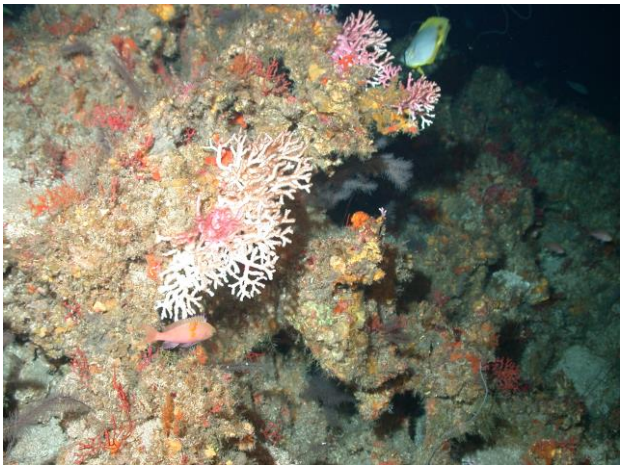


Figure 4: -88.2 m
Madracis myriaster coral on moderate relief hard bottom.

Dive Site: North Carolina, Outside Snowy Wreck MPA, Steeples Ledges, 12.7 nmi SW of MPA, 100 m; Dive 12-17

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 17, Site #- 12-VII-12-3. Target Site – Steeples Ledges outside and south of North Carolina MPA; 85 m. ROV survey outside MPA; no multibeam sonar of site. Conduct video/photo transect over target waypoints from Ross and Quatrini paper.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.5 kn from SW.

Site Description/Habitat/Biota:
Transect heading North across several waypoints. Various hard bottom habitats and patch reefs; depth range 76-101 m. Reef 1, WP 1: 85.5 m sand at reef base; top 82 m. Distinct reef edge, linear reef oriented E-W, rock boulders 2-4 m relief. Vertical face of rock with 10-40 cm Madracis myriaster(?) colonies, encrusting demosponges; Leptogorgia hebes and black coral (4 spp. common) on top. Top of reef eroded rock, 1/2 m relief, north side of reef drops off to 100 m in sand. Reef 2: 1-2 m rock slabs or boulders, 1/2 m relief, 50% cover, 100 m base, 98.5 m top. Reef 3: 95-89 m, eroded rock,1/2 m relief, 45o slope at edge; Madracis (15 cm- 100 cm). Reef 4: 78-79 m, rock boulders, slabs, 50 cm relief; 30 cm Madracis; patchy rock 50% cover. Reef 5: 73-74 m, low relief rock knolls, smooth rock, no ledges, 50% cover. Reef 6: 65-67.5 m, smooth rock knolls, like sand dunes on sand bottom; fairly barren. Reef 7: 69.5 m on top, more rugose, but rock knolls. Reef 8: at end WP; 76 m, smooth rock knolls, some rock ledges, 30 cm relief.

Dominant Benthic Biota: Scleractinia- *Madracis* (*myriaster*?, 10-100 cm), unid. cup coral; Gorgonacea- *Leptogorgia hebes* (yellow and orange); Antipatharia- ~4 spp; Hydroida; Demospongiae- Spirastrellidae (encrusting yellow and orange), Astrophorida? (lumpy white); Echinodermata- basket star; Chlorophyta- leafy green.
Fish: scamp, red grouper (1), speckled hind (1), greater amberjack, bank butterfly, reef butterfly, bigeye, blackbar soldierfish, blue angelfish, roughtongue bass (anthiids), graysby, Calamus porgy, hogfish, spotfin hog, rock beauty, sand tilefish, Spanish flag, striped bass, soapfish, tattler, tomtate, vermilion snapper, lionfish (few- 8).

Location: North Carolina, Outside Snowy Wreck MPA, Steeples Ledges, 12.7 nmi SW of MPA, 100 m; Dive 12-17

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-17 conducted a S-N survey of 'The Steeples', 12.7 nmi SW of the MPA. There is no multibeam sonar for this site. Dive transects were divided into two habitat zones: Ridge-Slope and Soft Bottom. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). Waypoints were selected from a Ross and Quatrini publication; transects crossed seven moderate to high-relief (2-12 m relief), smooth rock knolls, which had smooth rock slopes, and low relief rock slabs and boulders with low rugosity; 66-102 m depth range.

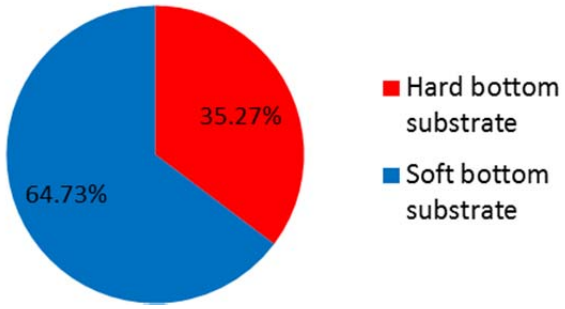


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-17. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-17 was predominately soft bottom (64.73%); the hard bottom substrate consisted of rock boulders, rock slabs and rock knolls.

Bare rock substrate without biota covered 19.21% of the bottom and bare soft bottom was 66.21% (Fig. 2, Table 2). Benthic macro-biota covered 14.58% of the bottom and consisted of 0.11% hard coral, 3.23% non-coral Cnidaria (Hydrozoa), 2.62% Porifera, 0.84% Antipatharia, 1.14% Alcyonacea ("gorgonacea"), and 5.5% algae.

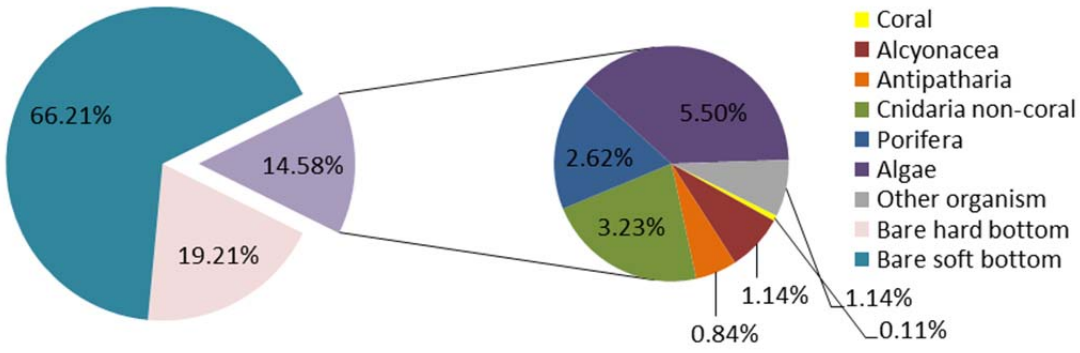


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-17.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-17. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Location: North Carolina, Outside Snowy Wreck MPA, Steeples Ledges, 12.7 nmi SW of MPA, 100 m; Dive 12-17

Dive Number	Location				
ROV 17	North Carolina, Outside Snowy Wreck MPA, Steeples Ledges, 12.7 nmi SW of MPA, 100 m; Dive 12-17				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	88 m				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 2	81 m top, 85 m base, 2-4 m diam boulders, 1m relief				
	Ridge- Slope	On Reef	HRu	HR	RLF
Transect 3	89-100 m 12 m total relief, 45° slope, pvmt, ledges				
	Ridge- Slope	On Reef	HRu	HR	RLF
Transect 4	100 m depth, base of reef, sand and rubble				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 5	Reef #2 90-98 m, 50% cover, 1-2 m diam rock slabs 0.5 m relief				
	Ridge- Slope	On Reef	HRu	HR	RLF
Transect 6	100 m sand				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 7	95-82 m, top of reef, 50-70% cover, boulders, 1m diam 30 cm relief, 35o slope				
	Ridge- Slope	On Reef	HRu	HR	RLF
Transect 8	Sand some pvmt, patchy rubble				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 9	79-85 m reef #4, low relief outcrops, rubble, pvmt				
	Ridge- Slope	On Reef	LRu	HR	RLF
Transect 10	Sand shell hash, rubble				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 11	Reef # 5 74-79 m, 5 m relief, 2 m diam rock, 15 cm relief, 60% cover, knolls, pvmt,				
	Ridge- Slope	On Reef	LRu	HR	RLF
Transect 12	70 m smooth sand				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 13	Reef #6 66-68 m, knolls, pvmt, no ledges				
	Ridge- Slope	On Reef	LRu	MR	PF
Transect 14	72 m sediment, patches pvmt, knolls, rubble				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 15	On reef #7 & 8 69-76 m smooth rock knolls, pvmt, 50% HB, 2-4 m diam rock Slabs 0.5 m relief.				
	Ridge- Slope	On Reef	LRu	HR	RLF

Location: North Carolina, Outside Snowy Wreck MPA, Steeples Ledges, 12.7 nmi SW of MPA, 100 m; Dive 12-17

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-17.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**69**	**2.62%**
Porifera	**69**	**2.62%**
Demospongiae	44	1.67%
Scopalina sp.	1	0.04%
Spirastrellidae	24	0.91%
Cnidaria non-coral	**85**	**3.23%**
Cnidaria non-coral	**85**	**3.23%**
Hydroidolina	85	3.23%
Antipatharia	**22**	**0.84%**
Antipatharia	**22**	**0.84%**
Antipatharia	8	0.30%
Stichopathes lutkeni	7	0.27%
Tanacetipathes hirta	7	0.27%
Algae	**145**	**5.50%**
Algae	**145**	**5.50%**
Chlorophyta	2	0.08%
Corallinales/crustose coralline	86	3.26%
Cyanophyta	50	1.90%
Phaeophyta	1	0.04%
Rhodophyta	6	0.23%
Alcyonacea	**30**	**1.14%**
Alcyonacea	**30**	**1.14%**
Alcyonacea	1	0.04%
Bebryce sp.	1	0.04%
Ellisella sp.	1	0.04%
Ellisellidae	1	0.04%
Gorgonacea	26	0.99%
Coral	**3**	**0.11%**
Coral	**3**	**0.11%**
Scleractinia solitary	3	0.11%
Other organism	**30**	**1.14%**
Annelida	**13**	**0.49%**
Annelida	1	0.04%
Filograna sp.	12	0.46%
Echinodermata	**2**	**0.08%**
Asteroidea	1	0.04%
Crinoidea	1	0.04%
Natural detritus	**1**	**0.04%**
Natural detritus	1	0.04%
Other organism	**14**	**0.53%**

Location: North Carolina, Outside Snowy Wreck MPA, Steeples Ledges, 12.7 nmi SW of MPA, 100 m; Dive 12-17

Other organism	14	0.53%
Hard bottom substrate	**506**	**19.21%**
Hard bottom substrate	**506**	**19.21%**
Bare rock- pavement boulder ledge	498	18.91%
Bare rubble- rock	8	0.30%
Soft bottom substrate	**1744**	**66.21%**
Soft bottom substrate	**1744**	**66.21%**
Bare soft bottom substrate	1744	66.21%
Grand Total	**2634**	**100.00%**

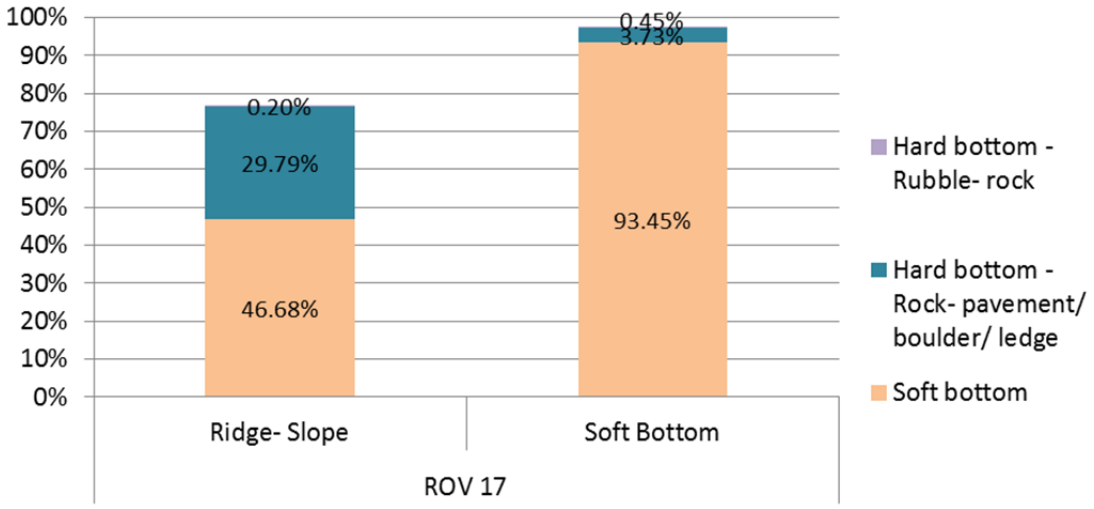


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-17.

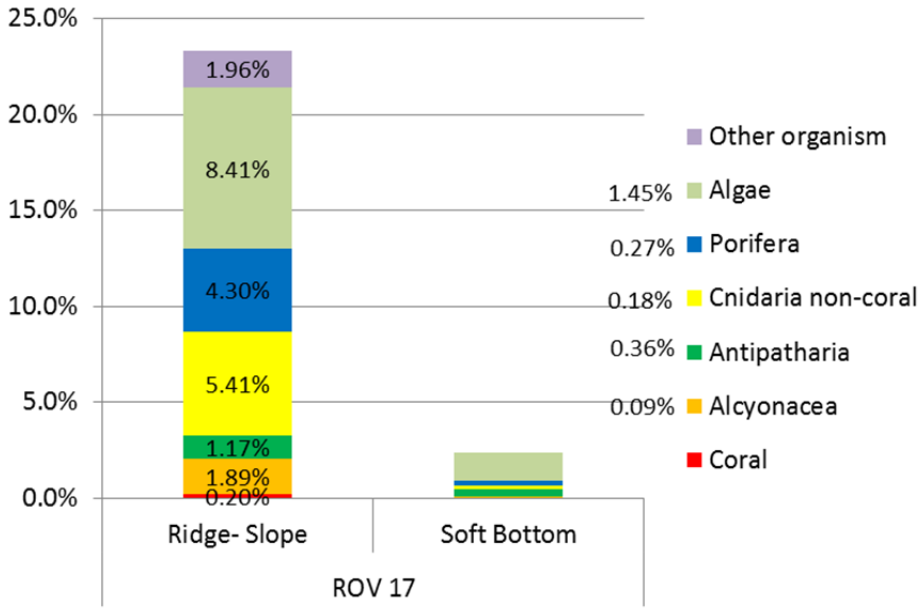


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-17.

Location: North Carolina, Outside Snowy Wreck MPA, Steeples Ledges, 12.7 nmi SW of MPA, 100 m; Dive 12-17

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The hard bottom habitat consisted of the ridge slope zone which was 30% cover of bare hard bottom. Off ridge was predominately barren sand (93.4% cover). Figure 4 shows the hard bottom habitat zone to have about 23% cover of biota that was dominated by algae (8.4% cover), hydroids (5.4%), Porifera (4.3%), Antipatharia (1.1%), and gorgonacea (1.8%). There was very little biota off reef on the sand bottom.

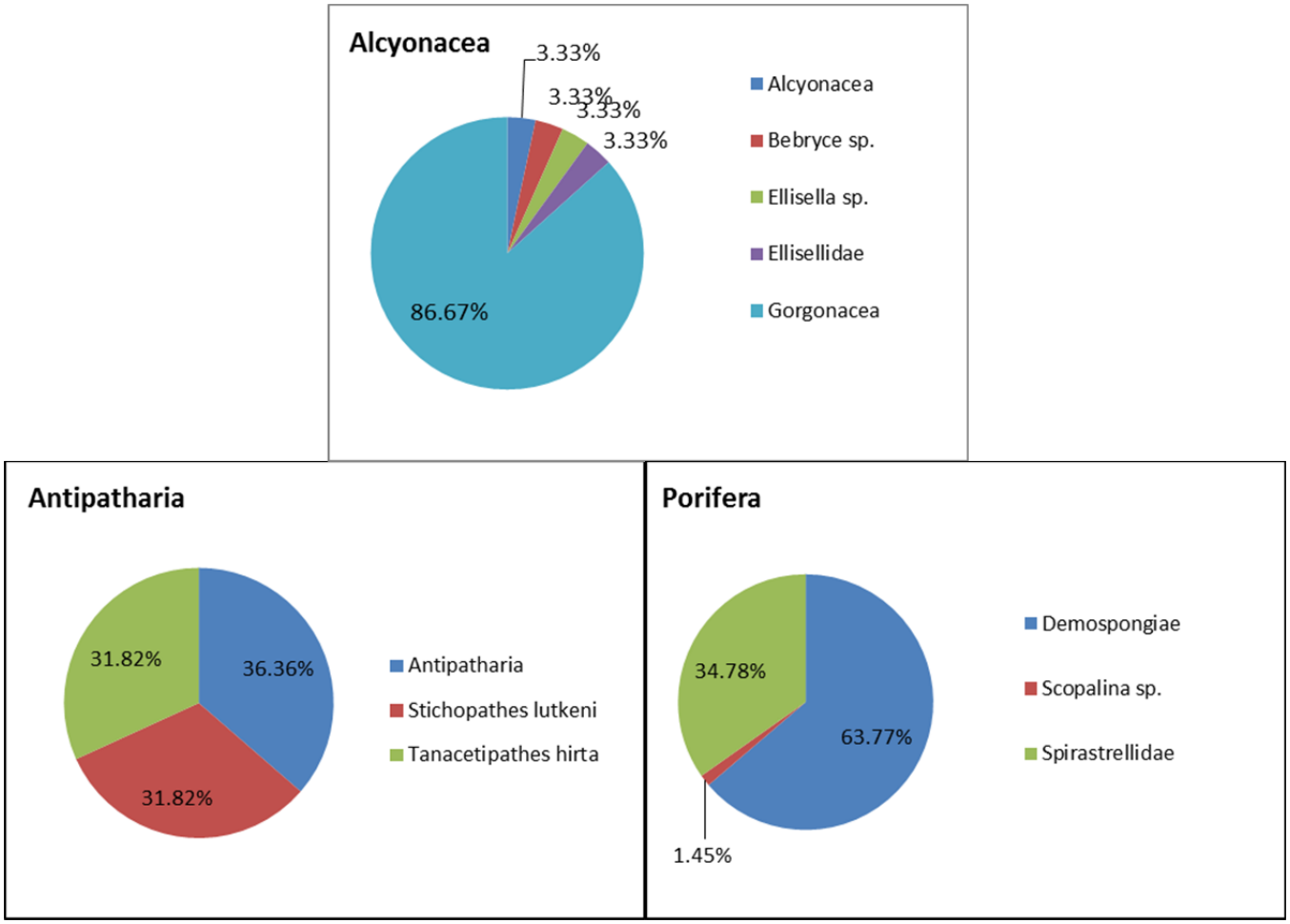


Figure 5. Diversity of corals and sponges at dive site ROV 12-17; CPCe analysis showing percent of total for each taxa category. Non-scleractinian coral includes Alcyonacea ("gorgonacea" and soft corals) and Antipatharia (black coral); Porifera are Demospongiae.

Only one solitary coral species was present at this site. Non-scleractinian coral consisted of 5 taxa of Alcyonacea, mostly an unidentified gorgonacea (86.6% of the total Alcyonacea). Black corals were dominated by *Tanacetipathes hirta* (31.8%), *Stichopathes lutkeni* (31.8%), and other unidentified Antipatharia. Sponges were of low diversity, consisting of Spirastrellidae (34.7% of the total Porifera), *Scopalina* sp. (1.4%), and various unidentified Demospongiae (63.7%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 41 taxa of fish were

Location: North Carolina, Outside Snowy Wreck MPA, Steeples Ledges, 12.7 nmi SW of MPA, 100 m; Dive 12-17

identified from dive ROV 17 for a total density of 424.9 individuals/km (Table 3). These were dominated by striped grunt (120.4/km), anthiids (71.1), and vermilion snapper (66.3). Managed species included amberjack (6.1/km), hogfish (0.9), scamp (2.0), graysby (0.2), red porgy (0.2), red grouper (0.2), and vermilions.

Table 3. Density of fish for all transects at dive site ROV 12-17 (number individuals/km).

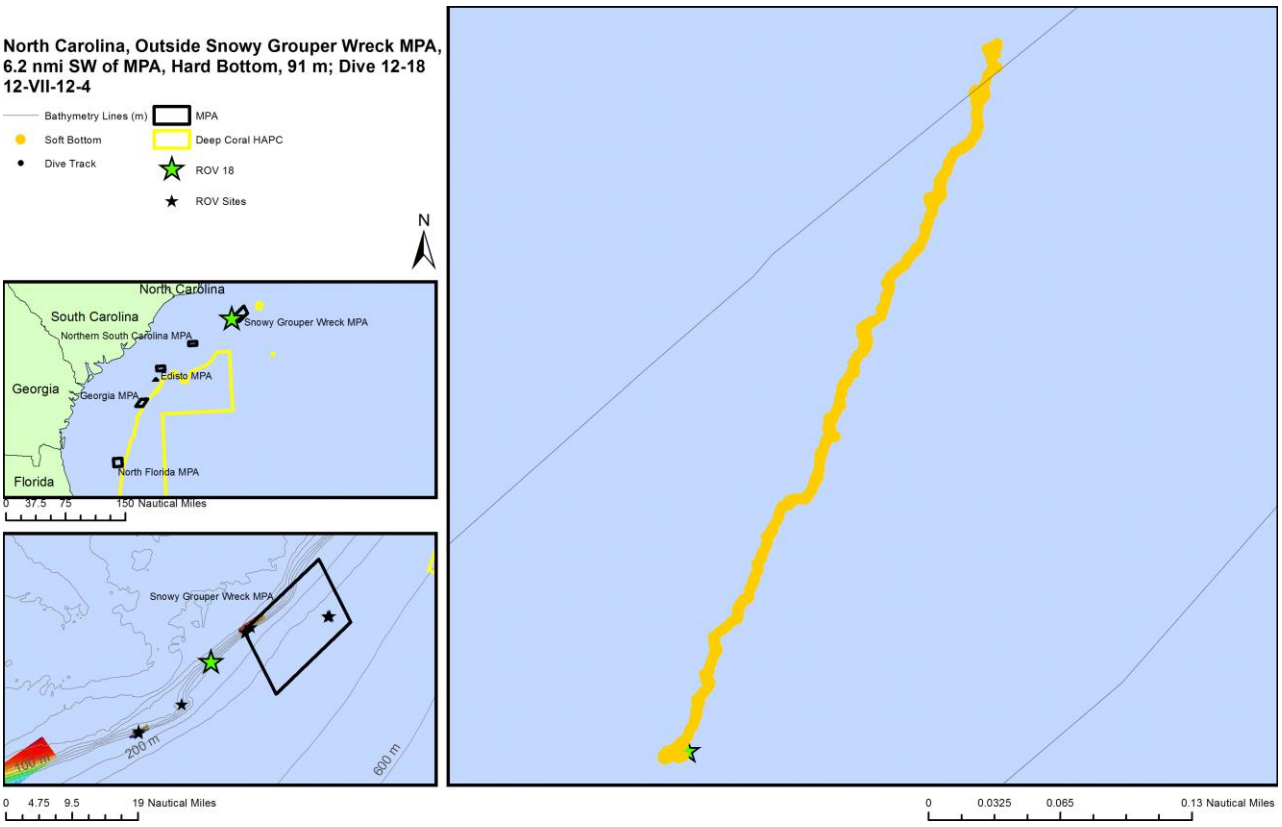
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus sp.	doctorfish	2	4.57	0.4
Anthiinae	anthiids	325	4.57	71.1
Balistes capriscus	gray triggerfish	1	4.57	0.2
Bodianus pulchellus	spotfin hogfish	16	4.57	3.5
Calamus sp.	porgy	4	4.57	0.9
Canthigaster rostrata	sharpnose puffer	20	4.57	4.4
Chaetodon ocellatus	spotfin butterflyfish	6	4.57	1.3
Chaetodon sedentarius	reef butterflyfish	37	4.57	8.1
Chromis enchrysurus	yellowtail reeffish	11	4.57	2.4
Chromis insolatus	sunshinefish	4	4.57	0.9
Chromis sp.	damselfish	11	4.57	2.4
Epinephelus cruentatus	graysby	1	4.57	0.2
Epinephelus drummondhayi	speckled hind	1	4.57	0.2
Epinephelus morio	red grouper	1	4.57	0.2
Equetus umbrosus	cubbyu	36	4.57	7.9
Gonioplectrus hispanus	spanish flag	3	4.57	0.7
Haemulon aurolineatum	tomtate	28	4.57	6.1
Haemulon striatum	striped grunt	550	4.57	120.4
Halichoeres sp.	wrasse	101	4.57	22.1
Hemanthias vivanus	red barbier	55	4.57	12.0
Holacanthus bermudensis	blue angelfish	16	4.57	3.5
Holacanthus tricolor	rock beauty	7	4.57	1.5
Holocentridae	soldierfish	2	4.57	0.4
Holocentrus sp.	squirrelfish	3	4.57	0.7
Lachnolaimus maximus	hogfish	4	4.57	0.9
Lactophrys sp.	cowfish	1	4.57	0.2
Liopropoma eukrines	wrasse bass	6	4.57	1.3
Malacanthus plumieri	sand tilefish	3	4.57	0.7
Mycteroperca phenax	scamp	9	4.57	2.0
Paranthias furcifer	creole-fish	10	4.57	2.2
Priacanthus arenatus	bigeye	2	4.57	0.4
Prognathodes aya	bank butterflyfish	7	4.57	1.5
Pronotogrammus martinicensis	roughtongue bass	289	4.57	63.2
Pterois volitans	lionfish	10	4.57	2.2
Rhomboplites aurorubens	vermilion snapper	303	4.57	66.3
Rypticus sp.	soapfish	1	4.57	0.2

Location: North Carolina, Outside Snowy Wreck MPA, Steeples Ledges, 12.7 nmi SW of MPA, 100 m; Dive 12-17

Seriola dumerili	greater amberjack	8	4.57	1.8
Seriola rivoliana	almaco jack	4	4.57	0.9
Seriola sp.	amberjack	24	4.57	5.3
Serranus phoebe	tattler	15	4.57	3.3
Sparidae	porgy	5	4.57	1.1
Total		1942		424.9

Dive Site: North Carolina, Outside Snowy Grouper Wreck MPA, 6.2 nmi SW of MPA, Hard Bottom, 91 m; Dive 12-18

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	None Available
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/12/2012
Specimens:	
Digital Photos:	68
DVD:	1
Hard Drive:	1

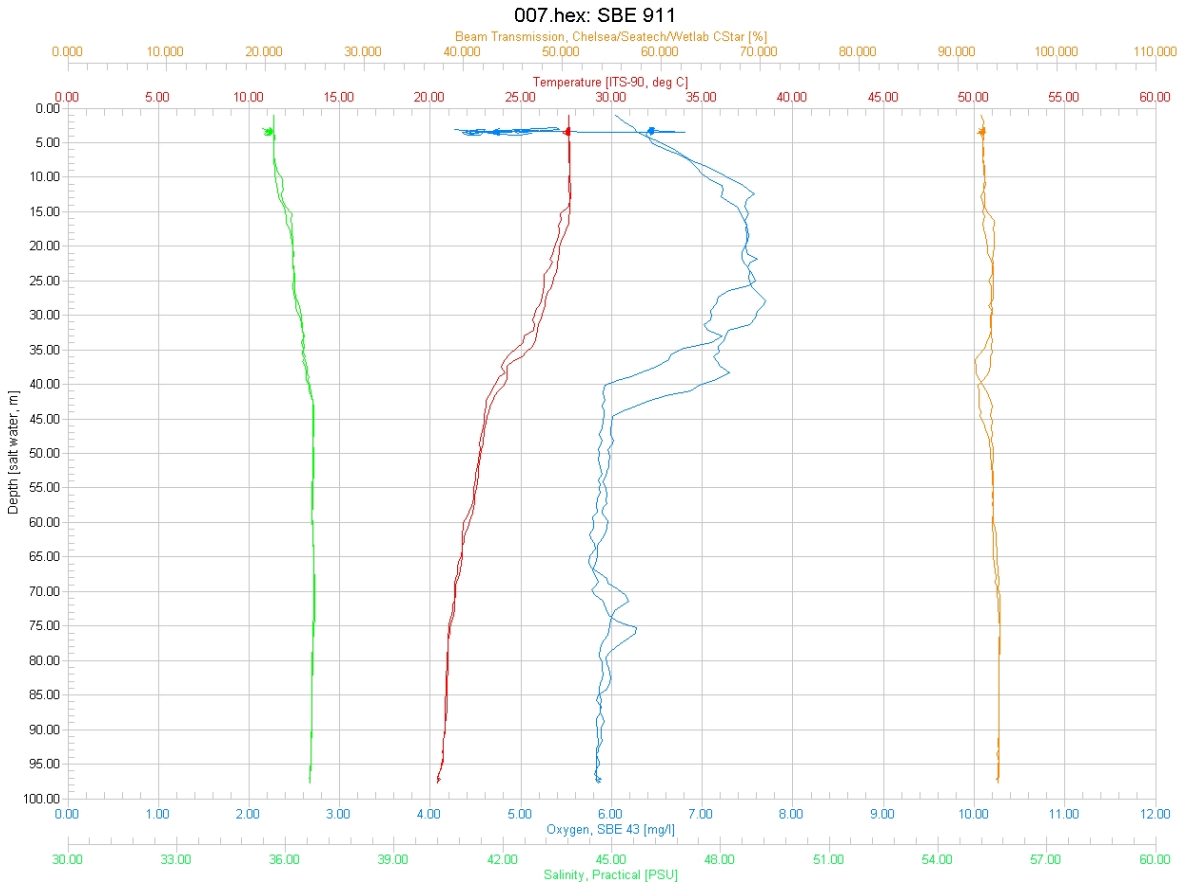
Dive Site: North Carolina, Outside Snowy Grouper Wreck MPA, 6.2 nmi SW of MPA, Hard Bottom, 91 m; Dive 12-18

Dive Data:

Minimum Bottom Depth (m):	78	**Total Transect Length (km):**	1.758
Maximum Bottom Depth (m):	91	**Surface Current (kn):**	.4
On Bottom (Time- GMT):	16:31	**On Bottom (Lat/Long):**	33.35°N; -77.18°W
Off Bottom (Time- GMT):	17:28	**Off Bottom (Lat/Long):**	33.36°N; -77.18°W
Physical (bottom); Temp (°C):	21.73	**Salinity:** 36.00 **Visibility (ft):** 30	**Current (kn):** 0.1

Physical Environment:

Distance from Dive Site(km): 27.26



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (97 m): temperature- 21, salinity- 36.1, and dissolved oxygen- 5.4. Surface temperature was 28.3 and there was a thermocline near 25-40 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 27 m. Visibility was estimated at 30 ft from the ROV video.

Dive Site: North Carolina, Outside Snowy Grouper Wreck MPA, 6.2 nmi SW of MPA, Hard Bottom, 91 m; Dive 12-18

Dive Imagery:

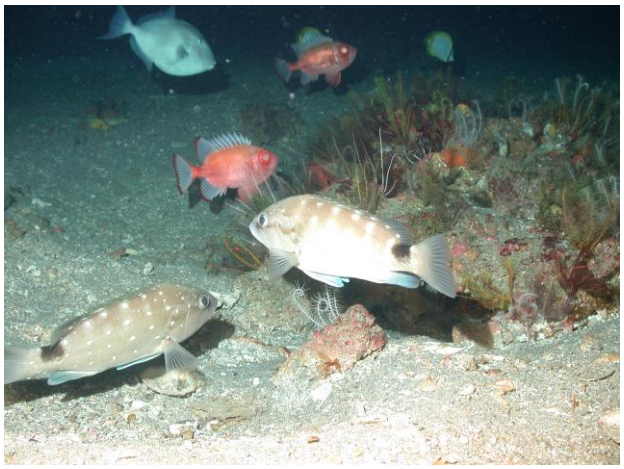


Figure 1: -78.7 m
Snowy grouper, short bigeyes and butterflyfish near crinoid covered rock outcrop.

Figure 2: -91.6 m
Crinoid thicket on scattered rock boulders.

Figure 3: -77.4 m
Crinoid thicket and eel on exposed rock and sand shell hash.

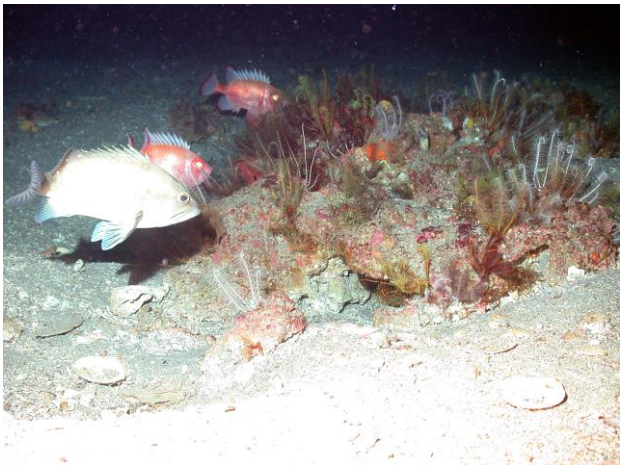


Figure 4: -78.9 m
Crinoid thicket with snowy grouper and short bigeyes.

Dive Site: North Carolina, Outside Snowy Grouper Wreck MPA, 6.2 nmi SW of MPA, Hard Bottom, 91 m; Dive 12-18

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 18, Site #- 12-VII-12-4. Target Site – outside and south of North Carolina MPA; 85 m. ROV survey outside MPA; no multibeam sonar of the site. Conduct single video/photo transect of target waypoints from David and Harter previous dives.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.1 kn from S.

Site Description/Habitat/Biota:
Transect heading northeast across selected waypoints. Various hard bottom habitats and patch reefs; depth range 78-91 m. Flat slope, mostly sand shell hash with patches of scattered rock rubble, cobble and small boulders 0.5-3 m diameter and <30 cm relief. Dense cover of Comactinia? crinoids on all available hard substrate.

Dominant Benthic Biota: Pennatulacea; Antipatharia- *Stichopathes*; Demospongiae- *Verongida*?; Arthropoda- *Stenorhynchus seticornis*, hermit crabs; Echinodermata- *Comactinia*? crinoids (abundant); Asteroidea; Chlorophyta- leafy green; Rhodophyta- *Rhodomenia*?.
Fish- scamp grouper, snowy grouper, blue angelfish; butterflyfish, reef butterflyfish, eels (a few spp), high hat, short bigeye, soapfish, tattler, triggerfish.

Location: North Carolina, Outside Snowy Grouper Wreck MPA, 6.2 nmi SW of MPA, Hard Bottom, 91 m; Dive 12-18

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-18 conducted a survey 6.2 nmi SW of MPA. No multibeam is available; waypoints were selected from previous Harter and David dives. Dive transects were divided into one habitat zone: Soft Bottom. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This site was predominately flat, low relief sand bottom with patches of rubble, and small 10-30 cm boulders; 76-92 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-18. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 18	North Carolina, Outside Snowy Grouper Wreck MPA, 6.2 nmi SW of MPA, Hard Bottom, 91 m; Dive 12-18				
Transect #	Habitat Zone	On/Off Reef	Rugosity	Relief	SEADESC Code
Transect 1	78-91 m, flat, mostly sand, shell hash, sm patches of rubble, occasional boulder 10-30 cm most with crinoids				
	Soft Bottom	Off Reef	LRu	LR	SRF

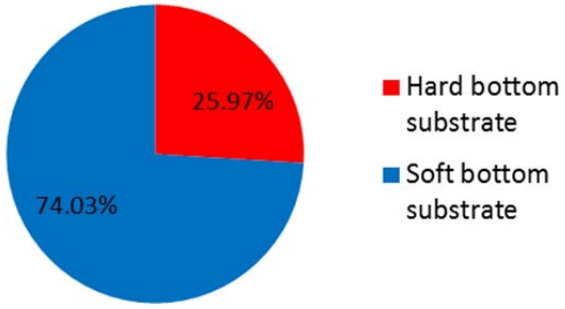


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-18. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-18 was predominately soft bottom (74.03%).

Bare rock substrate without biota covered 10.54% of the bottom and bare soft bottom was 73.29% (Fig. 2, Table 2). Benthic macro-biota covered 16.17% of the bottom and consisted of 0.09% non-coral Cnidaria (Hydrozoa), 0.09% Porifera, 1.29% algae, and 14.7% other organisms (Arthropoda, fish and crinoids). There were no hard coral, Alcyonacea, or Antipatharia.

Location: North Carolina, Outside Snowy Grouper Wreck MPA, 6.2 nmi SW of MPA, Hard Bottom, 91 m; Dive 12-18

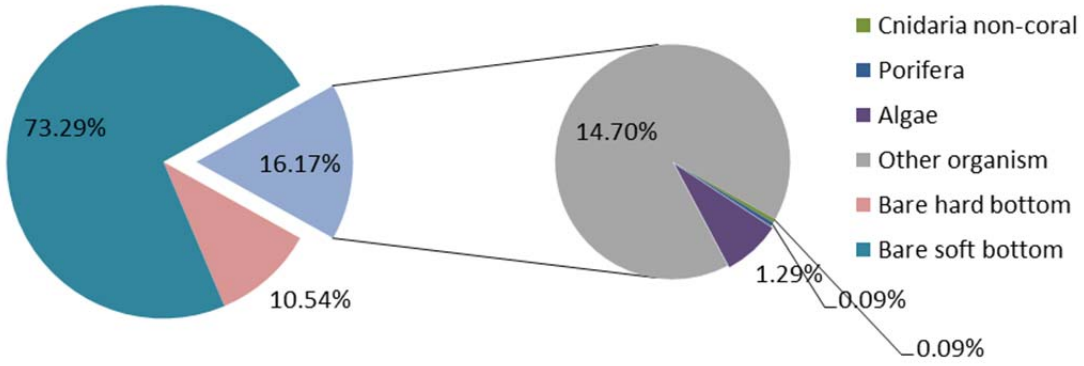


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-18. Corals include framework scleractinian coral and solitary coral. Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-18.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**1**	**0.09%**
Porifera	**1**	**0.09%**
Demospongiae	1	0.09%
Cnidaria non-coral	**1**	**0.09%**
Cnidaria non-coral	**1**	**0.09%**
Hydroidolina	1	0.09%
Algae	**14**	**1.29%**
Algae	**14**	**1.29%**
Chlorophyta	1	0.09%
Corallinales/crustose coralline	4	0.37%
Cyanophyta	1	0.09%
Phaeophyta	8	0.74%
Other organism	**159**	**14.70%**
Arthropoda	**3**	**0.28%**
Penaeidae	1	0.09%
Stenorhynchus seticornis	2	0.18%
Chordata	**8**	**0.74%**
Fish	8	0.74%
Echinodermata	**148**	**13.68%**
Crinoidea	148	13.68%
Hard bottom substrate	**114**	**10.54%**
Hard bottom substrate	**114**	**10.54%**
Bare rock- pavement boulder ledge	52	4.81%
Bare rubble- rock	62	5.73%
Soft bottom substrate	**793**	**73.29%**

Location: North Carolina, Outside Snowy Grouper Wreck MPA, 6.2 nmi SW of MPA, Hard Bottom, 91 m; Dive 12-18

Soft bottom substrate	**793**	**73.29%**
Bare soft bottom substrate	793	73.29%
Grand Total	**1082**	**100.00%**

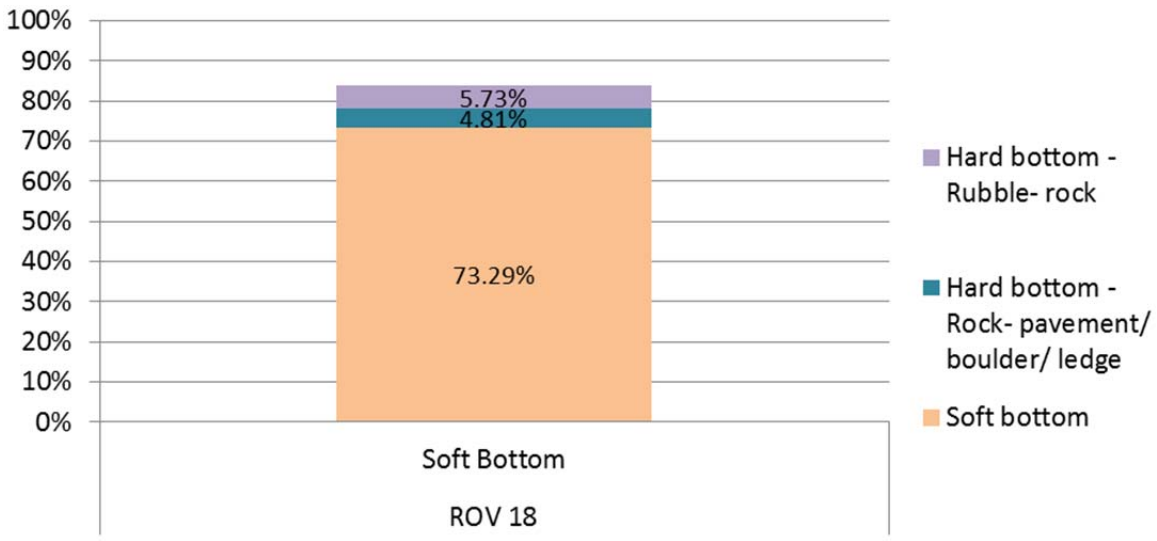


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-18.

Figure 3 shows the percent cover of bare substrate type for the single habitat zone at the dive site. Figure 4 shows the cover of biota along this single habitat zone.

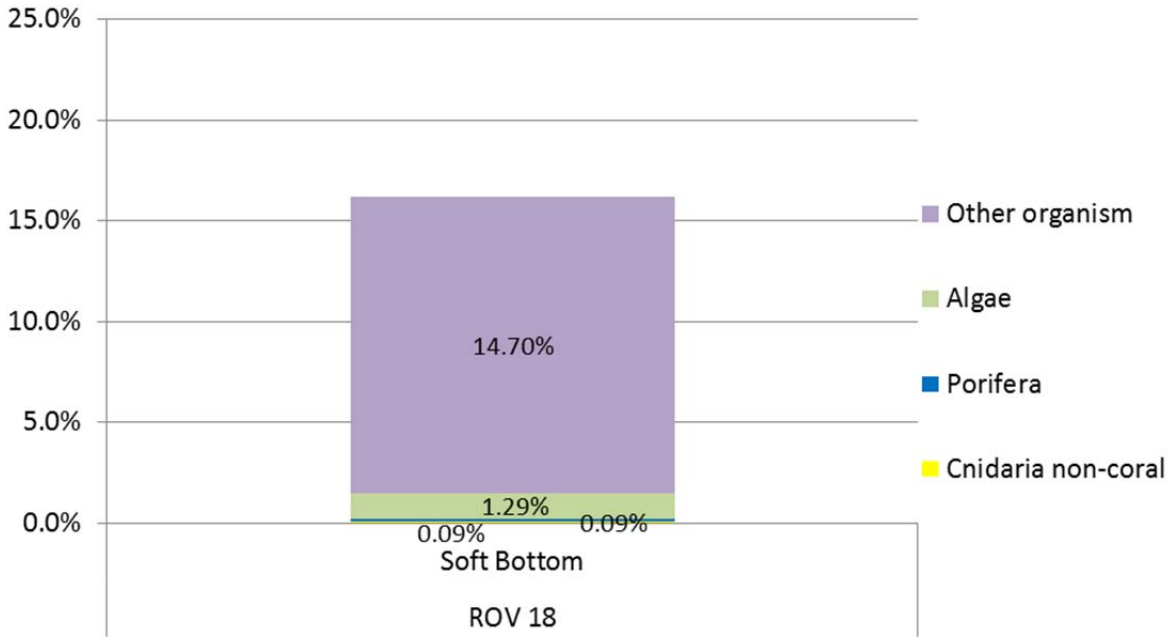


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-18.

Location: North Carolina, Outside Snowy Grouper Wreck MPA, 6.2 nmi SW of MPA, Hard Bottom, 91 m; Dive 12-18

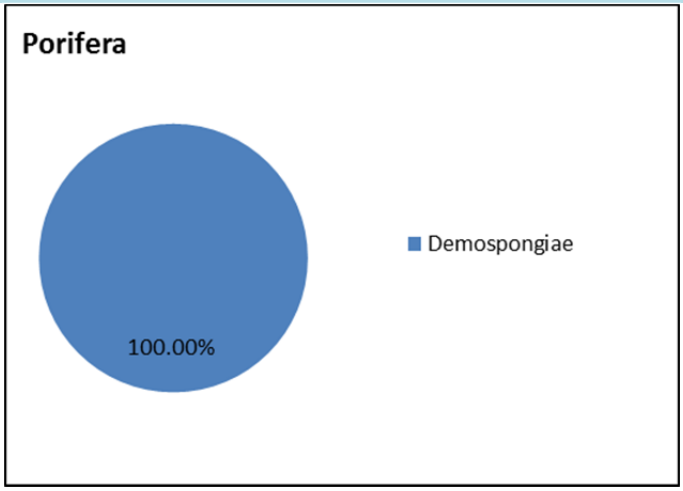


Figure 5. Diversity of corals and sponges at dive site ROV 12-18; CPCe analysis showing percent of total for each taxa category.

No scleractinian hard coral or non-scleractinian coral (Alcyonacea and Antipatharia) were present at the dive site. All demosponges were small unidentified species.

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 21 taxa of fish were identified from dive ROV 18 for a total density of 163.1 individuals/km (Table 3). These were dominated by vermilion snapper (56.8/km), short bigeye (29), and wrasse (22.7). Managed species included snowy grouper (2.3/km), amberjack (7.9), scamp (0.6), and vermilions.

Table 3. Density of fish for all transects at dive site ROV 12-18 (number individuals/km).

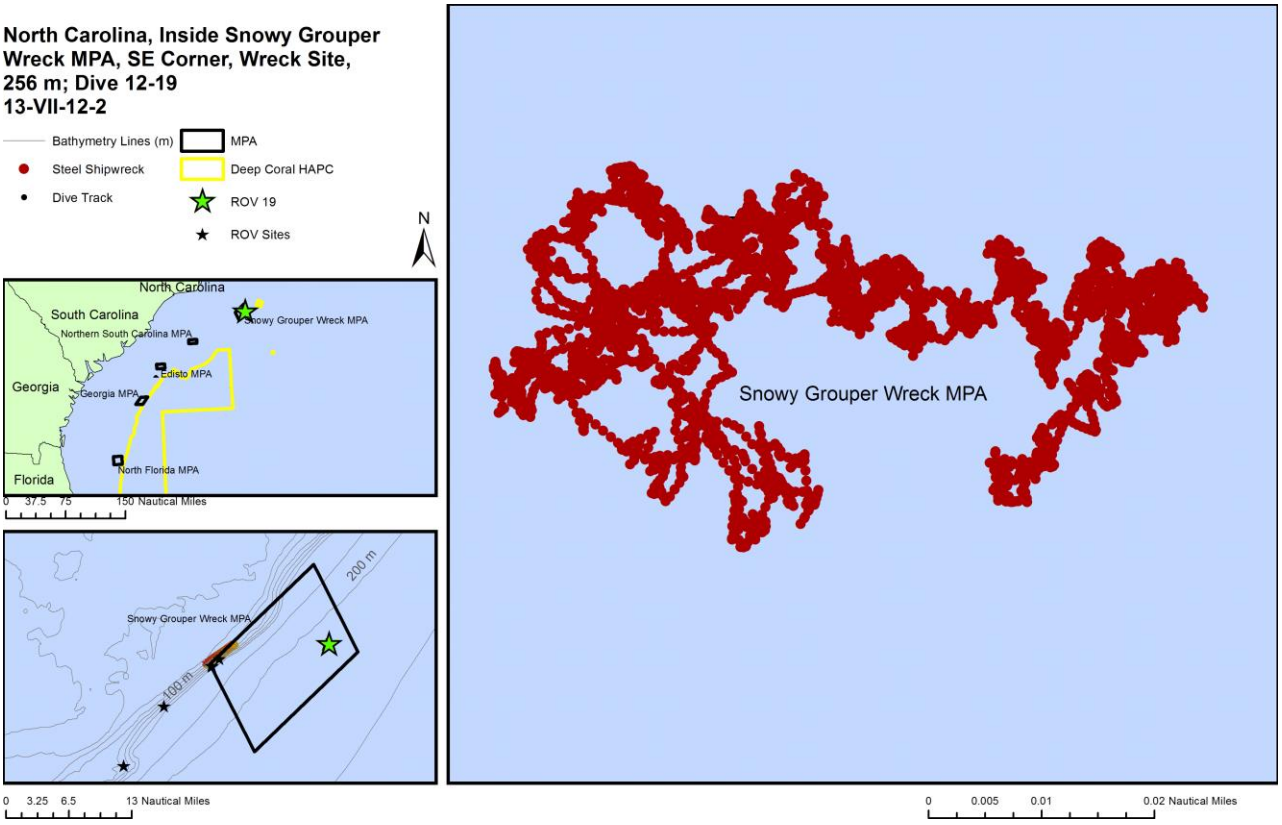
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Balistes capriscus	grey triggerfish	6	1.76	3.4
Canthigaster rostrata	sharpnose puffer	6	1.76	3.4
Centropristis philadelphica	rock sea bass	1	1.76	0.6
Chaetodon ocellatus	spotfin butterflyfish	4	1.76	2.3
Chaetodon sedentarius	reef butterflyfish	11	1.76	6.3
Chromis enchrysurus	yellowtail reeffish	1	1.76	0.6
Epinephelus niveatus	snowy grouper	4	1.76	2.3
Equetus lanceolatus	jack-knife fish	1	1.76	0.6
Gymnothorax ocellatus	ocellated moray	1	1.76	0.6
Halichoeres sp.	wrasse	40	1.76	22.7
Holacanthus bermudensis	blue angelfish	7	1.76	4.0
Muraenidae	moray eel	2	1.76	1.1
Mycteroperca phenax	scamp	1	1.76	0.6

Location: North Carolina, Outside Snowy Grouper Wreck MPA, 6.2 nmi SW of MPA, Hard Bottom, 91 m; Dive 12-18

Pristigenys alta	short bigeye	51	1.76	29.0
Rhomboplites aurorubens	vermilion snapper	100	1.76	56.8
Rypticus sp.	soapfish	1	1.76	0.6
Serranus sp.	sea bass	1	1.76	0.6
Seriola dumerili	greater amberjack	2	1.76	1.1
Seriola sp.	amberjack	12	1.76	6.8
Serranus notospilus	saddle bass	1	1.76	0.6
Serranus phoebe	tattler	34	1.76	19.3
Total		287		163.1

Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SE Corner, Wreck Site, 256 m; Dive 12-19

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andrew W. David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	None Available
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/13/2012
Specimens:	
Digital Photos:	123
DVD:	2
Hard Drive:	1

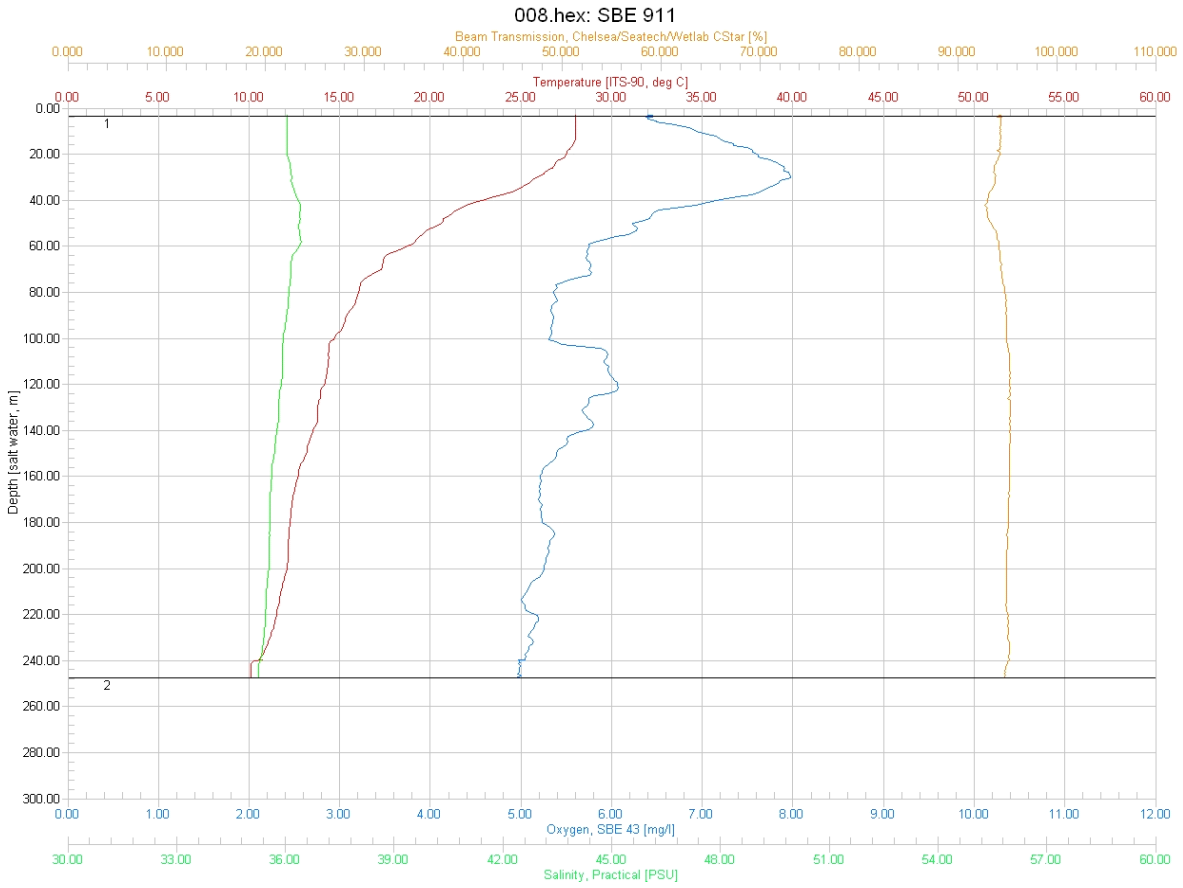
Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SE Corner, Wreck Site, 256 m; Dive 12-19

Dive Data:

Minimum Bottom Depth (m):	242	**Total Transect Length (km):**	3.435
Maximum Bottom Depth (m):	256	**Surface Current (kn):**	0.5
On Bottom (Time- GMT):	8:10	**On Bottom (Lat/Long):**	33.44°N; -76.83°W
Off Bottom (Time- GMT):	9:29	**Off Bottom (Lat/Long):**	33.44°N; -76.83°W
Physical (bottom); Temp (°C):	10.00	**Salinity:** 36.00 **Visibility (ft):**	10-15 **Current (kn):** 0.25

Physical Environment:

Distance from Dive Site(km): 0.59



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (244 m): temperature- 10, salinity- 35, and dissolved oxygen- 5. Surface temperature was 27.06 and there was a thermocline near 20-75 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 30 m. Visibility was estimated at 10-15 ft from the ROV video.

Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SE Corner, Wreck Site, 256 m; Dive 12-19

Dive Imagery:

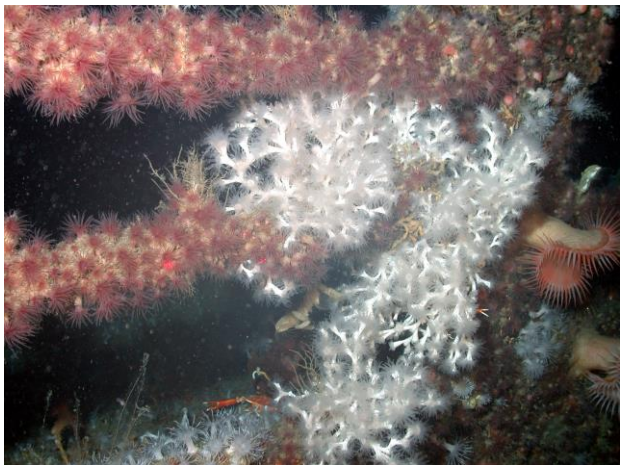


Figure 1: -250.2 m

Lophelia coral thicket, galatheid crab, *Actinoscyphia* fly-trap anemone, and red anemones on 'Snowy Grouper Shipwreck' railing.

Figure 2: -246.3 m

Lophelia coral thicket, *Actinoscyphia* fly-trap anemones, and white anemones on 'Snowy Grouper Shipwreck' railing.

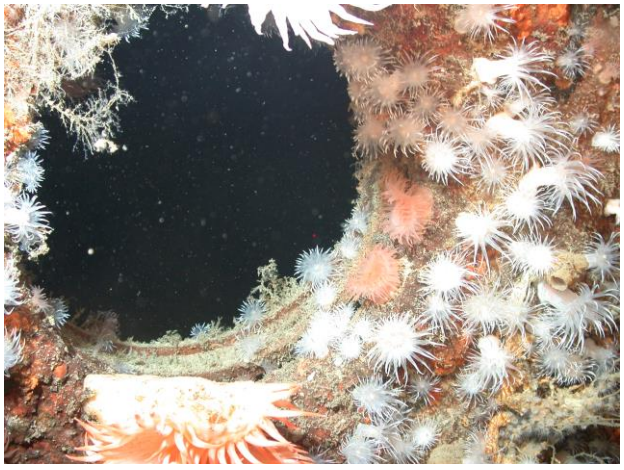


Figure 3: -250.7 m

Actinoscyphia anemones and white anemones on 'Snowy Grouper Shipwreck' porthole.

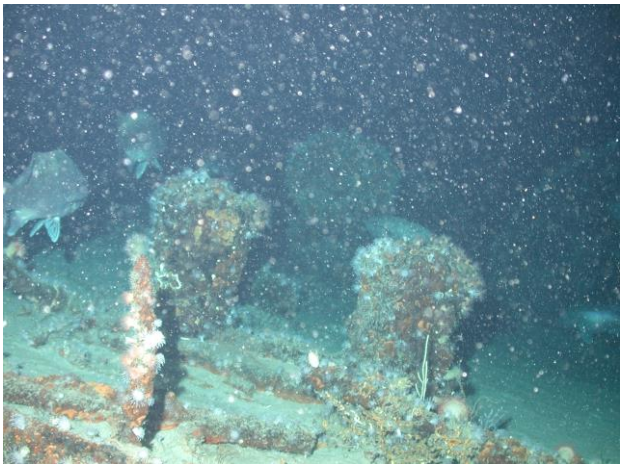


Figure 4: -246.5 m

Snowy grouper on deck of 'Snowy Grouper Shipwreck'.

Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SE Corner, Wreck Site, 256 m; Dive 12-19

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 19, Site #- 13-VII-12-2. Target Site – North Carolina MPA, Snowy Wreck Site; actual ROV WP fix-wreck stern: port side, maximum depth at sediment- 256 m; deck depth 245-250 m. Conduct video/photo survey of shipwreck and ground truth new Pisces multibeam sonar map.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.5 kn; bottom 0 kn; visibility 10-15', dense particulate organic matter.

Site Description/Habitat/Biota:
Transect along port hull from bow to stern and on deck; ship oriented E-W, bow to west. Maximum depth is 256 m on port side at sediment; bow at deck level- 247 m; deck level on port side- 245 m; crane on main deck 242 m. No debris visible on port side on sediment. Port anchor in place. Port hull toward the stern is cracked vertically; does not appear to be bent inward or out. Rounded stern intact; deck plates open; port davits in deployed position over side; two pairs of davits.

Dominant Benthic Biota: Anemones and hydroids cover the wreck, *Lophelia* coral common but not abundant, mostly 10-50 cm live white colonies; most on vertical mast or pipes; sparse on vertical hull structure; very few on deck. Scleractinia- *Lophelia pertusa* (10-30 cm, common; 40-50 cm rare); Actiniaria- 3-4 spp, *Actinoscyphia* (venus fly trap, pink, 10 cm, very common), *Sagartiid* (pink lip, rare), white (2 cm, abundant); Hydroida; Gorgonacea- *Muricea*? (white fan, 15 cm), Ellisellidae (sparse eb, white); Demospongiae- yellow-orange encrusting; Decapoda- Galatheidae, *Eumunida*?.
Fish: snowy grouper (large school on wreck, hundreds?), *Laemonema* sp.

Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SE Corner, Wreck Site, 256 m; Dive 12-19

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-19 conducted a survey of the 'Snowy Grouper Shipwreck Site' at the eastern corner of the MPA. A transect was made along the sides and top of shipwreck. There was one habitat zone: Steel Shipwreck. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This dive site was a steel ship of unknown age, 245-256 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-19. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 19	North Carolina, Inside Snowy Grouper Wreck MPA, SE Corner, Wreck Site, 256 m; Dive 12-19				
Transect #	Habitat Zone	On/Off Reef	Rugosity	Relief	SEADESC Code
Transect 1	245-256 m deep				
	Steel Shipwreck	On Reef	HRu	HR	A

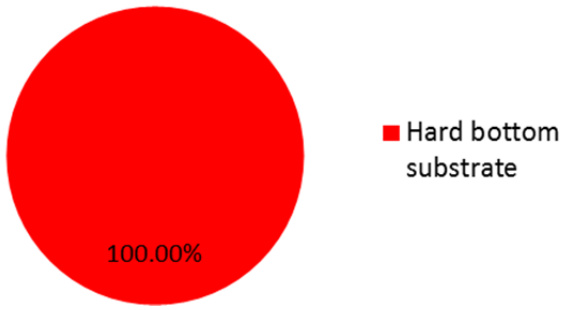


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-19. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-19 was all hard bottom (100%) consisting of the steel ship.

Most of the steel substrate was covered with some encrusting biota (Fig. 2, Table 2). Benthic macro-biota consisted of 4.68% hard coral (*Lophelia pertusa*), 37.6% non-coral Cnidaria (36.0% Actiniaria, 1.5 Hydroida), 2.2% Porifera, 0.41% Alcyonacea ("gorgonacea"), and 55.1% other organisms (13.6% Annelida, 0.4% Arthropoda, 0.2% Ascidiacea).

Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SE Corner, Wreck Site, 256 m; Dive 12-19

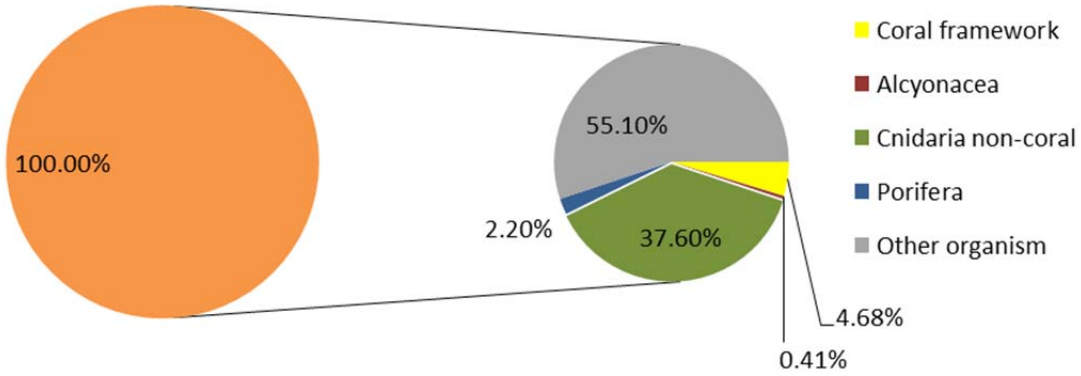


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-19. Corals include framework scleractinian coral and solitary coral. Non-scleractinian corals include Alcyonacea. Cnidaria non-coral are primarily Hydroida and Actiniaria.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-19.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**16**	**2.20%**
Porifera	**16**	**2.20%**
Lithistida	1	0.14%
Spirastrellidae	15	2.07%
Cnidaria non-coral	**273**	**37.60%**
Cnidaria non-coral	**273**	**37.60%**
Actiniaria	262	36.09%
Hydroidolina	11	1.52%
Alcyonacea	**3**	**0.41%**
Alcyonacea	**3**	**0.41%**
Alcyonacea	3	0.41%
Coral	**34**	**4.68%**
Coral	**34**	**4.68%**
Lophelia pertusa	34	4.68%
Other organism	**400**	**55.10%**
Annelida	**99**	**13.64%**
Annelida	1	0.14%
Serpulidae	98	13.50%
Arthropoda	**3**	**0.41%**
Eumunida picta	1	0.14%
Paguridae	2	0.28%
Chordata	**3**	**0.41%**
Ascidiacea	2	0.28%
Fish	1	0.14%
Human debris	**249**	**34.30%**

Human debris- other	249	34.30%
Other organism	**46**	**6.34%**
Other organism	46	6.34%
Grand Total	**726**	**100.00%**

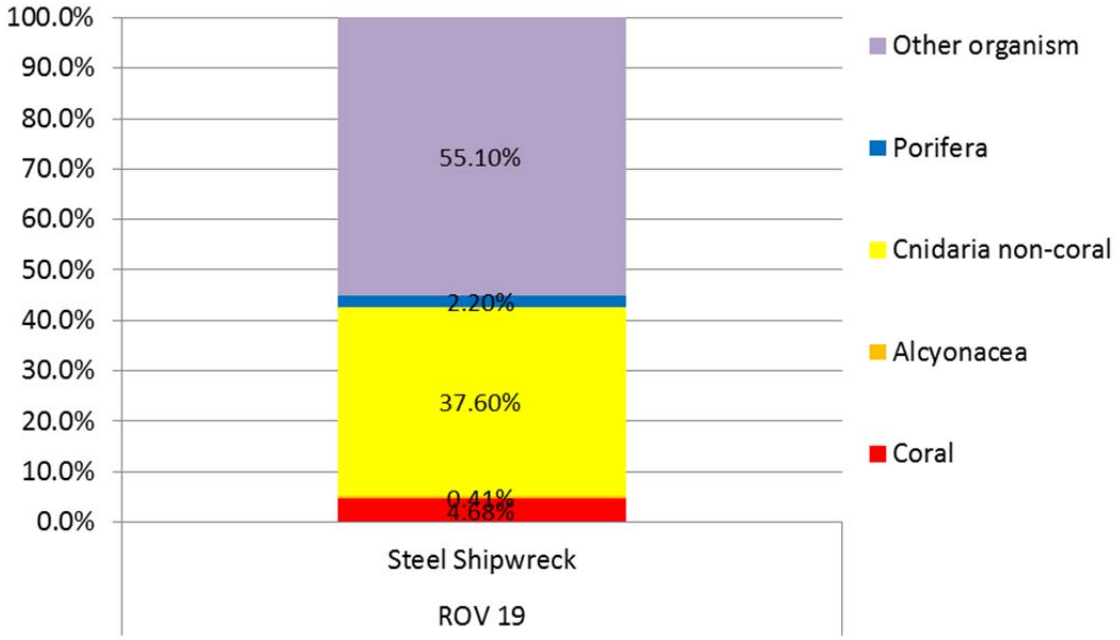


Figure 3. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-19.

Figure three shows the percent cover of benthic biota on the wreck.

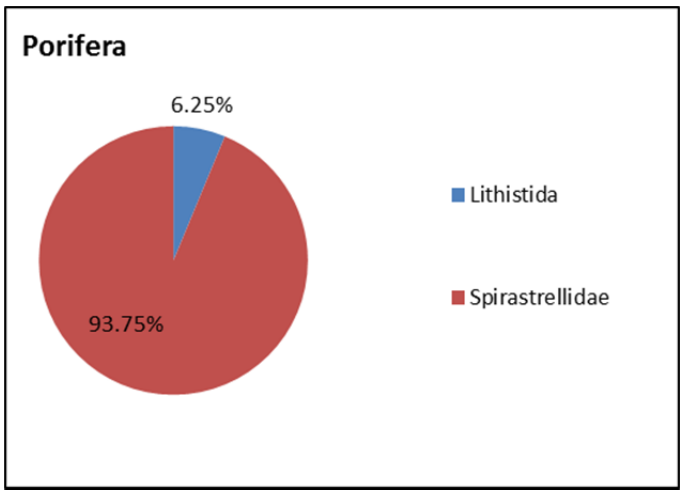


Figure 5. Diversity sponges at dive site ROV 12-19; CPCe analysis showing percent of total for each taxa category.

100% of the hard coral was *Lophelia pertusa* which were common but not abundant. These were 10-50 cm white colonies that grew primarily on the vertical mast and pipes but were very sparse on the vertical hull structure or the deck. In general, *L. pertusa* grow ~1 – 1.5 cm/year, so these could be 30-50 years old. There

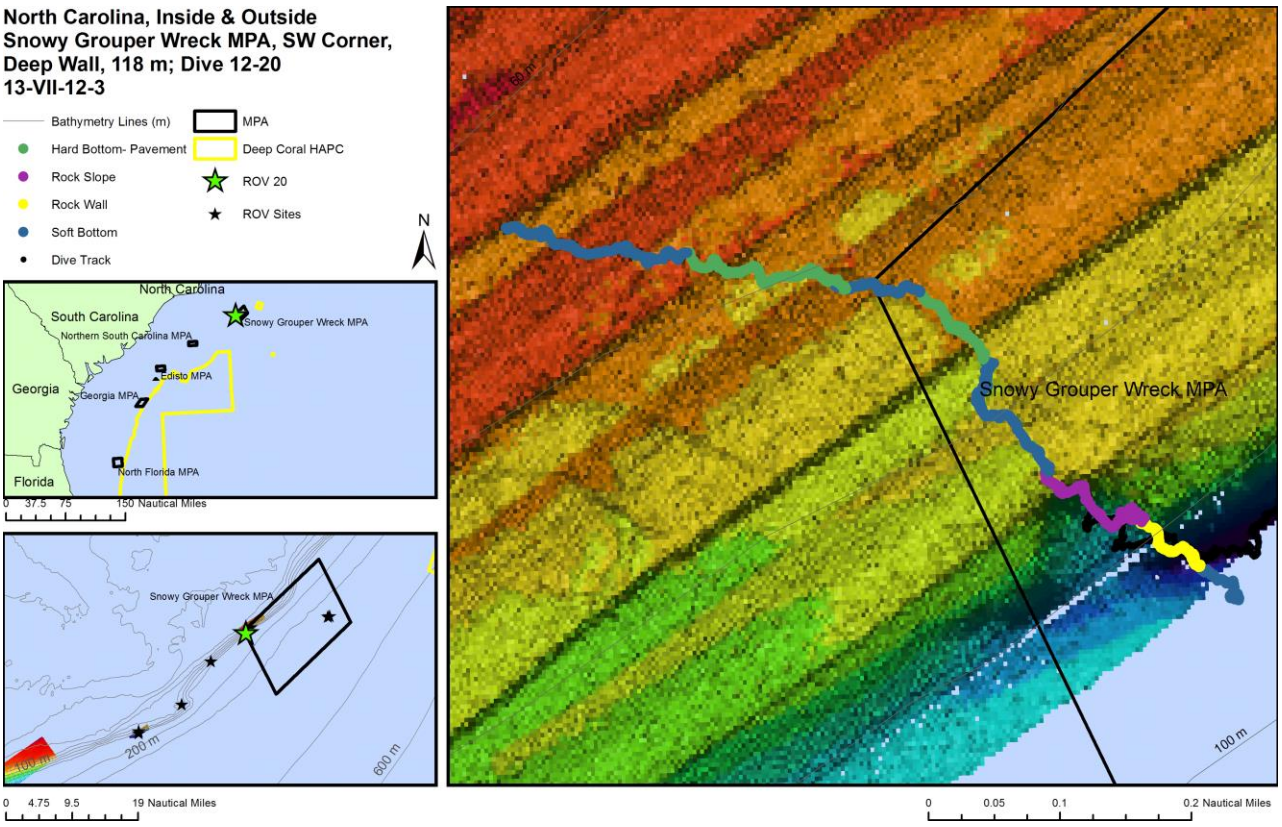
were no black coral and gorgonians were sparse with only one species evident in the video. Thin encrusting red-orange Spirastrellidae were the dominant sponges (93.7% of the the total Porifera).

Fish Data Analysis:

Dive 19 was a shipwreck and was not a transecting dive, therefore densities were not calculated. Fish species observed on the Snowy Wreck included: yellowfin bass (about a dozen of them), snowy grouper (at least 80-100 individuals at the bow area of the wreck, 40 mid ship, and 80-100 at the stern), one lizardfish out in the sand surrounding the wreck, two conger eels running along the base of the wreck, and about a dozen *Laemonema* spp.

Dive Site: North Carolina, Inside & Outside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 118 m; Dive 12-20

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andrew W. David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	SGW_dive32_33_5Mres (Snowy_Wreck_MPA)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/13/2012
Specimens:	
Digital Photos:	118
DVD:	2
Hard Drive:	1

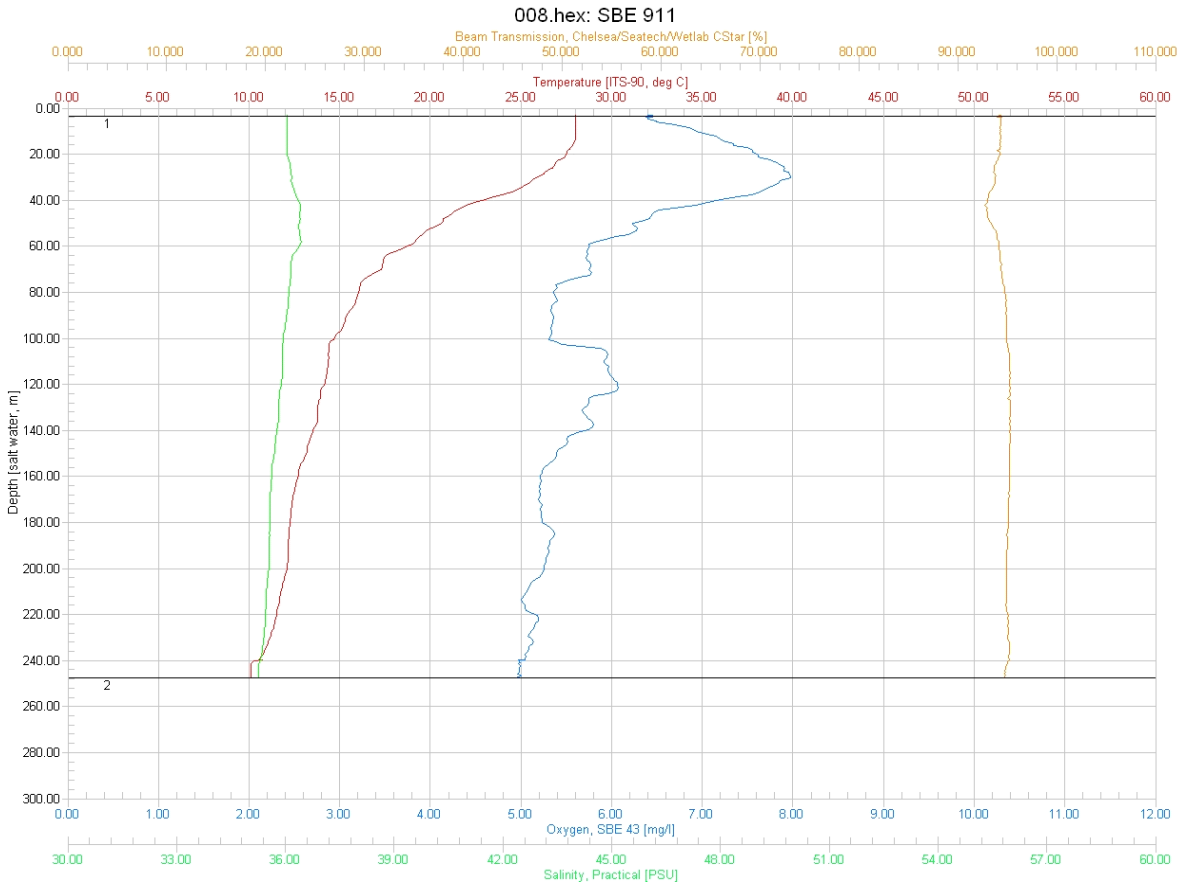
Dive Site: North Carolina, Inside & Outside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 118 m; Dive 12-20

Dive Data:

Minimum Bottom Depth (m):	85	**Total Transect Length (km):**	3.106
Maximum Bottom Depth (m):	118	**Surface Current (kn):**	0.5
On Bottom (Time- GMT):	13:24	**On Bottom (Lat/Long):**	33.41°N; -77.08°W
Off Bottom (Time- GMT):	14:51	**Off Bottom (Lat/Long):**	33.42°N; -77.09°W
Physical (bottom); Temp (°C):	18.00	**Salinity:** 36.00 **Visibility (ft):** 50	**Current (kn):** 0.1

Physical Environment:

Distance from Dive Site(km): 22.23



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (244 m): temperature- 10, salinity- 35, and dissolved oxygen- 5. Surface temperature was 28.3 and there was a thermocline near 20-75 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 30 m. Visibility was estimated at 50 ft from the ROV video.

Dive Site: North Carolina, Inside & Outside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 118 m; Dive 12-20

Dive Imagery:

Figure 1: -64.3 m
Didemnidae tunicates, *Dictyota* algae and hydroids on rock outcrop.

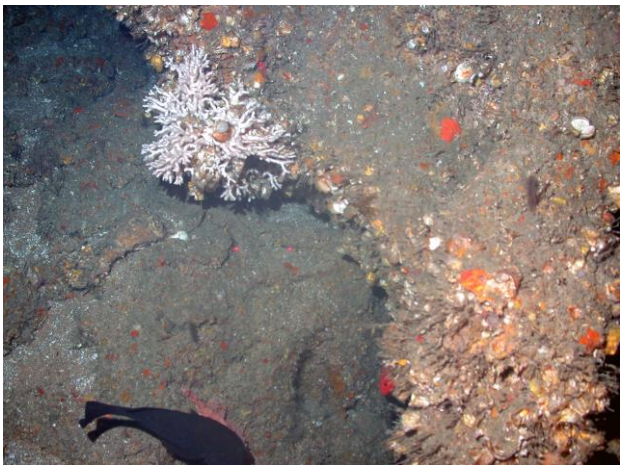


Figure 2: -116.4 m
Madracis myriaster coral on rock outcrop.

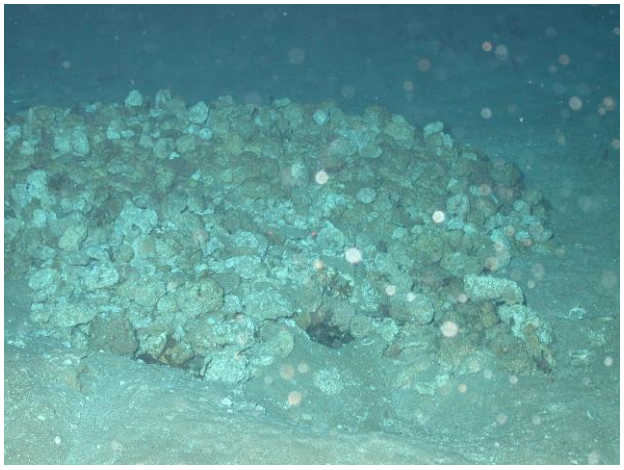


Figure 3: -71.2 m
Sand tilefish burrow.

Figure 4: -68.3 m
Narcissia trigonaria starfish on soft bottom.

Dive Site: North Carolina, Inside & Outside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 118 m; Dive 12-20

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 20, Site #- 13-VII-12-3. Target Site – inside and outside of northwest border North Carolina MPA; 90 m. ROV survey inside and outside MPA and ground truth new Pisces multibeam sonar of the site. Conduct video/photo transect of several multibeam features.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.5 kn from S; bottom 0.1 kn.

Site Description/Habitat/Biota:
Transect heading northwest across selected waypoints from new multibeam. WP 1 is deep drop-off from multibeam within MPA. Base of reef slope 118 m, top 75 m. 1-2 m rock boulders near base with Madracis coral colonies on vertical faces mostly near base of slope. Reef slope 10-30o, of very eroded rock, rock boulders, outcrops, 1/2 - 1 m relief. 85 m- rounded rock, top of mound, but gradual slope up to 71 m and flat sand. WP 2 to 3 is mostly sand with patchy rock rubble/cobble, and patchy low relief pavement (<30 cm exposed ledges). WP 3 to 4 at end; is outside MPA, 72-62.5 m, flat sand, sparse rubble, exposed pavement, low ledges; sand tilefish burrows common.

Dominant Benthic Biota: Sparse biota on rock, mostly encrusting sponges and hydroids. *Madracis* coral colonies common near the base of reef 1 (110 m) but not present higher up on reef. Scleractinia- *Madracis myriaster*? (20 cm diameter, white); Gorgonacea- *Diodogorgia*? (purple); Hydroida; Antipatharia- *Stichopathes*; Demospongiae- Spirastrellidae (yellow and red encrusting), *Aplysina*? (cluster, thick walled hollow tubes).
Fish: scamp grouper (uncommon), red grouper (several); graysby, sand tilefish (common on top in sand), hogfish, amberjack, bigeye, blue angelfish, greenband wrasse, grey trigger, razorfish, reef butterfly, rock beauty, soapfish, Spanish flag, spotfin butterfly, squirrelfish, tattler, tomtate, wrasse, wrasse bass, lionfish (24).

Location: North Carolina, Inside & Outside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 118 m; Dive 12-20

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-20 conducted a survey inside and outside the MPA near the SW corner. The dive was made up the deep wall and slope which is evident in the multibeam sonar map. Dive transects were divided into four habitat zones: Hard Bottom- Pavement, Rock Slope, Rock Wall and Soft Bottom. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This dive was a transect up a steep, rugged rock wall, from 116 m to 76 m; the upper slope from 75 m to 60 m was low relief patchy soft bottom; and rock pavement and rubble occurred from 66 to 58 m.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-20. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 20	North Carolina, Inside & Outside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 118 m; Dive 12-20				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	104 m Sand shell hash				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 2	Ledges, 111 top- 118 bottom, rugged eroded 1-2 m relief, 84 m on top, solid eroded rock				
	Rock Wall	On Reef	LRu	HR	RLF
Transect 3	85-92 m 35 ° slope 1-2 m ledges, scattered 1 m boulders, Top of Wall; 76 m 50% pvmt, gentle slope				
	Rock Slope	On Reef	LRu	HR	RLF
Transect 4	71 m Soft bottom, some rock				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 5	71 m Soft bottom, some rock - Outside MPA				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 6	66 m mostly pvmt, rubble; 5 cm.				
	Hard Bottom- Pavement	On Reef	LRu	LR	PF
Transect 7	63 m Soft Bottom. Change Heading				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 8	62 pvmt, SB and HB 0-0.5 m relief				
	Hard Bottom- Pavement	On Reef	LRu	LR	PF
Transect 9	58-60 m SB w patchy rubble pvmt				
	Soft Bottom	Off Reef	LRu	LR	S

Location: North Carolina, Inside & Outside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 118 m; Dive 12-20

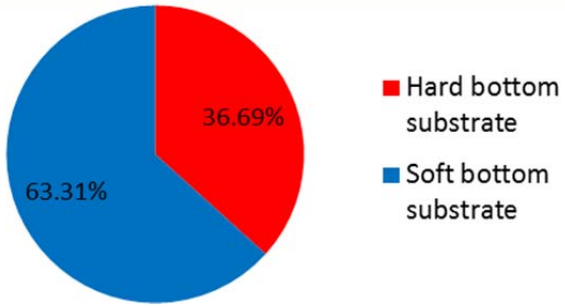


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-20. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-20 was predominately soft bottom (63.31%); the hard bottom substrate consisted of scattered rubble, boulders, rock slabs, rugged rock fissures.

Bare rock substrate without biota covered 25.06% of the bottom and bare soft bottom was 60% (Fig. 2, Table 2). Benthic macro-biota covered 14.94% of the bottom and consisted of 0.15% hard coral, 2.61% non-coral Cnidaria (Hydrozoa), 1.25% Porifera, 0.2% Antipatharia, 0.05% Alcyonacea ("gorgonacea"), and 8.32% algae which was mostly Phaeophyta (2.7%), fleshy macro Rhodophyta (2.5%), and coralline algae (2.4%).

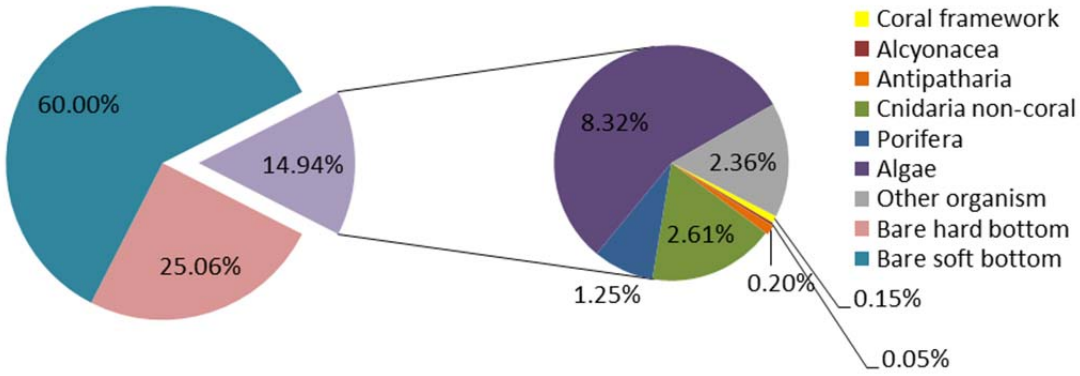


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-20. Corals include framework scleractinian coral. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-20.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**25**	**1.25%**
Porifera	**25**	**1.25%**
Agelas sp.	5	0.25%
Demospongiae	4	0.20%
Porifera	3	0.15%
Spirastrellidae	13	0.65%

Location: North Carolina, Inside & Outside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 118 m; Dive 12-20

Cnidaria non-coral	**52**	**2.61%**
Cnidaria non-coral	**52**	**2.61%**
Hydroidolina	52	2.61%
Antipatharia	**4**	**0.20%**
Antipatharia	**4**	**0.20%**
Antipatharia	4	0.20%
Algae	**166**	**8.32%**
Algae	**166**	**8.32%**
Chlorophyta	3	0.15%
Corallinales/crustose coralline	48	2.41%
Cyanophyta	9	0.45%
Phaeophyta	55	2.76%
Rhodophyta	51	2.56%
Alcyonacea	**1**	**0.05%**
Alcyonacea	**1**	**0.05%**
Ellisella sp.	1	0.05%
Coral	**3**	**0.15%**
Coral	**3**	**0.15%**
Oculina varicosa	3	0.15%
Other organism	**47**	**2.36%**
Annelida	**3**	**0.15%**
Annelida	1	0.05%
Filograna sp.	1	0.05%
Sabellidae	1	0.05%
Arthropoda	**2**	**0.10%**
Stenorhynchus seticornis	2	0.10%
Chordata	**5**	**0.25%**
Fish	5	0.25%
Mollusca	**1**	**0.05%**
Bivalvia	1	0.05%
Natural detritus	**4**	**0.20%**
Natural detritus	4	0.20%
Other organism	**32**	**1.60%**
Other organism	32	1.60%
Hard bottom substrate	**500**	**25.06%**
Hard bottom substrate	**500**	**25.06%**
Bare rock- pavement boulder ledge	387	19.40%
Bare rubble- rock	113	5.66%
Soft bottom substrate	**1197**	**60.00%**
Soft bottom substrate	**1197**	**60.00%**
Bare soft bottom substrate	1197	60.00%
Grand Total	**1995**	**100.00%**

Location: North Carolina, Inside & Outside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 118 m; Dive 12-20

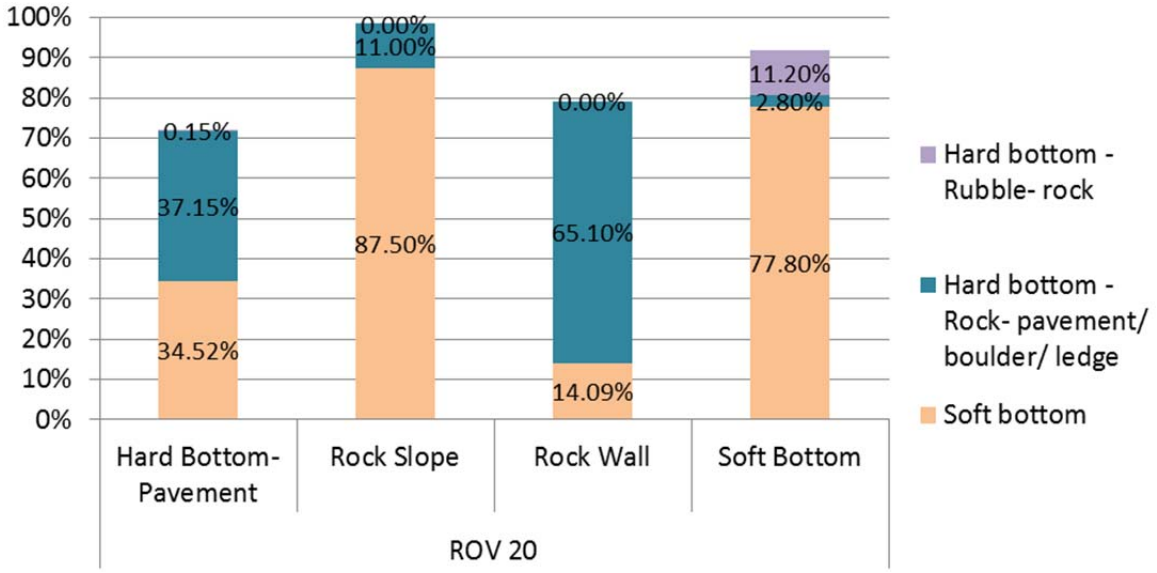


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-20.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The deep rock wall was predominately bare hard bottom (65.1% cover). The pavement zone also had high cover of barren rock (37.1%). The upper slope appeared to be mostly soft substrate but it was probably mostly a thin veneer of sediment over pavement. Figure 4 shows the zones of pavement and deep wall to have the greatest cover of biota (~21-28% cover). Algae dominated the flat pavement areas (17.6% cover), but was uncommon on the wall (0.6%). Sponges dominated the wall (8.7%), along with hydroids (3.3%), and hard corals (2.0%). For reasons unknown the rock slope was relatively barren.

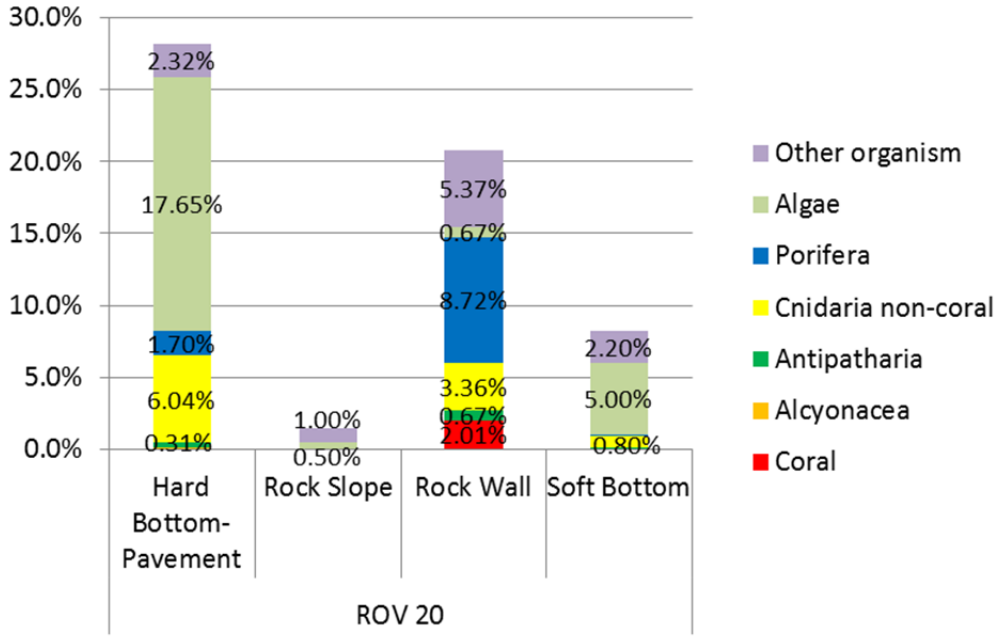


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-20.

Location: North Carolina, Inside & Outside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 118 m; Dive 12-20

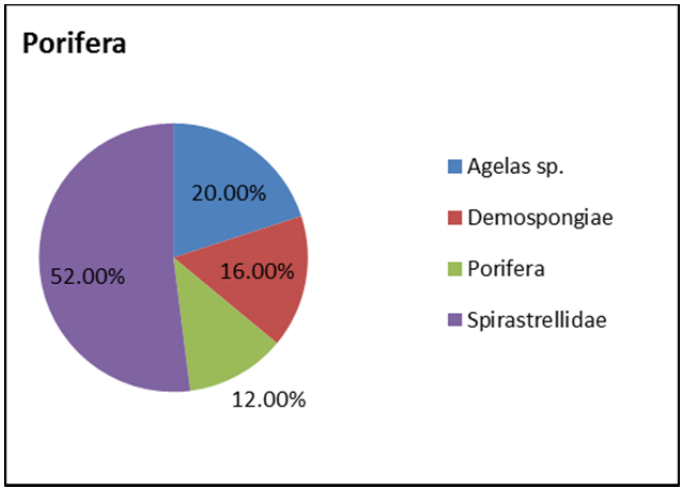


Figure 5. Diversity of sponges at dive site ROV 12-20; CPCe analysis showing percent of total for each taxa category.

Scleractinian hard coral consisted of *Oculina varicosa*. Non-scleractinian corals included one unidentified species of Antipatharia and one species of gorgonanian (*Ellisella* sp.). Sponges had low diversity, consisting of Spirastrellidae (52.0% of the total Porifera), 20.0% *Agelas* sp., and 28% of other unidentified species.

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 37 taxa of fish were identified from dive ROV 20 for a total density of 404.2 individuals/km (Table 3). These were dominated by anthiids (124.8/km), tomtate (91.6), and roughtongue bass (35.7). Managed species included amberjack (17/km), red porgy (4.8), vermilion snapper (1.3), red grouper (0.6), scamp (0.6), hogfish (0.3), and graysby (0.3).

Table 3. Density of fish for all transects at dive site ROV 12-20 (number individuals/km).

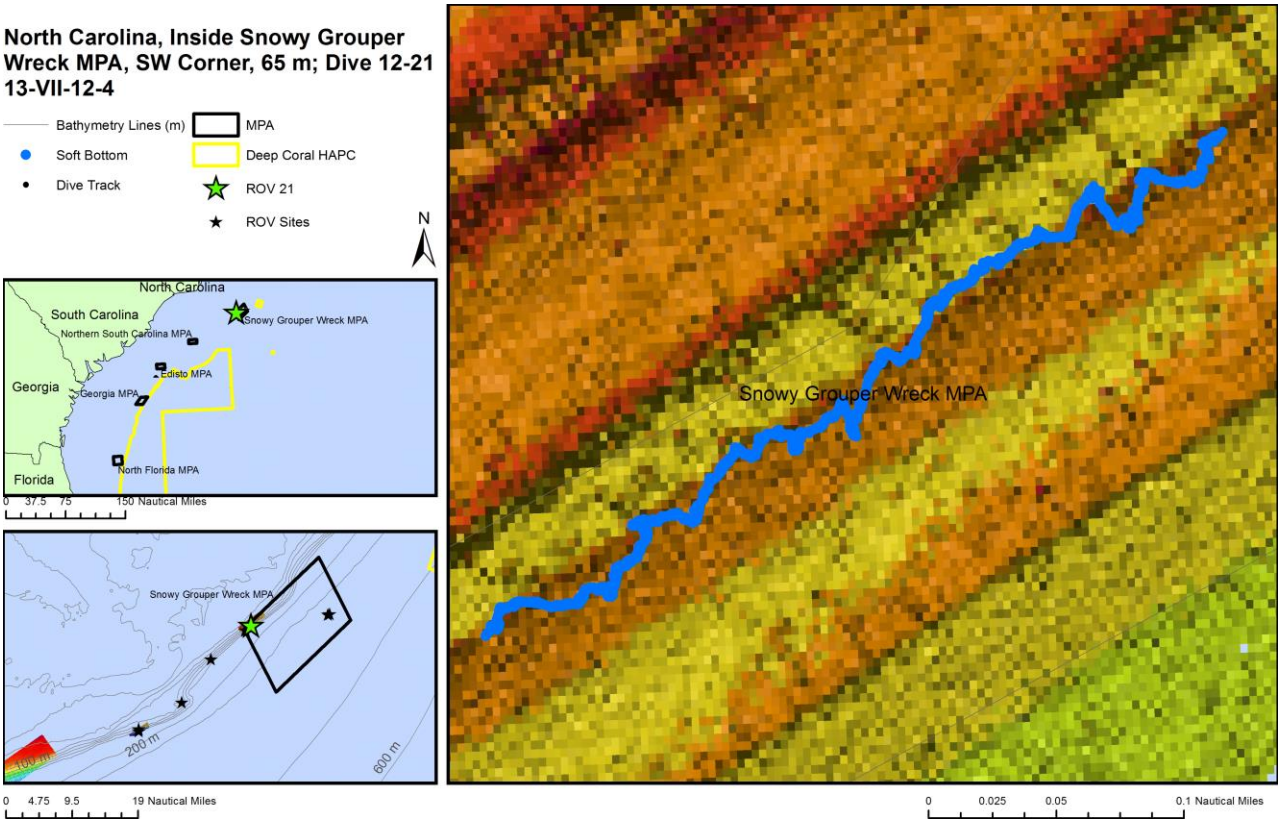
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Anthiinae	anthiid	388	3.11	124.8
Balistes capriscus	grey triggerfish	1	3.11	0.3
Bodianus pulchellus	spotfin hogfish	16	3.11	5.1
Canthigaster rostrata	sharpnose puffer	12	3.11	3.9
Chaetodon ocellatus	spotfin butterflyfish	3	3.11	1.0
Chaetodon sedentarius	reef butterflyfish	16	3.11	5.1
Chromis enchrysurus	yellowtail reeffish	64	3.11	20.6
Epinephelus cruentatus	graysby	1	3.11	0.3
Epinephelus morio	red grouper	2	3.11	0.6
Equetus lanceolatus	jack-knife fish	1	3.11	0.3
Equetus umbrosus	cubbyu	38	3.11	12.2
Haemulon aurolineatum	tomtate	285	3.11	91.6
Halichoeres bathyphilus	greenband wrasse	13	3.11	4.2

Location: North Carolina, Inside & Outside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 118 m; Dive 12-20

Halichoeres sp.	wrasse	96	3.11	30.9
Holacanthus bermudensis	blue angelfish	3	3.11	1.0
Holacanthus tricolor	rock beauty	1	3.11	0.3
Holocentridae	squirrelfish	11	3.11	3.5
Lachnolaimus maximus	hogfish	1	3.11	0.3
Lactophrys sp.	cowfish	3	3.11	1.0
Liopropoma eukrines	wrasse bass	3	3.11	1.0
Malacanthus plumieri	sand tilefish	3	3.11	1.0
Mycteroperca phenax	scamp	2	3.11	0.6
Pagrus pagrus	red porgy	15	3.11	4.8
Paranthias furcifer	creole-fish	2	3.11	0.6
Pareques iwamotoi	blackbar drum	1	3.11	0.3
Priacanthus arenatus	bigeye	1	3.11	0.3
Pristigenys alta	short bigeye	7	3.11	2.3
Prognathodes aya	bank butterflyfish	5	3.11	1.6
Pronotogrammus martinicensis	roughtongue bass	111	3.11	35.7
Pterois volitans	lionfish	34	3.11	10.9
Rhomboplites aurorubens	vermilion snapper	4	3.11	1.3
Rypticus saponaceus	greater soapfish	1	3.11	0.3
Rypticus sp.	soapfish	1	3.11	0.3
Scorpaenidae	scorpionfish	1	3.11	0.3
Seriola dumerili	greater amberjack	1	3.11	0.3
Seriola sp.	amberjack	52	3.11	16.7
Serranus phoebe	tattler	58	3.11	18.6
Total		1257		404.2

Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, 65 m; Dive 12-21

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andrew W. David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	SGW_dive32_33_5Mres (Snowy_Wreck_MPA)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/13/2012
Specimens:	
Digital Photos:	57
DVD:	1
Hard Drive:	1

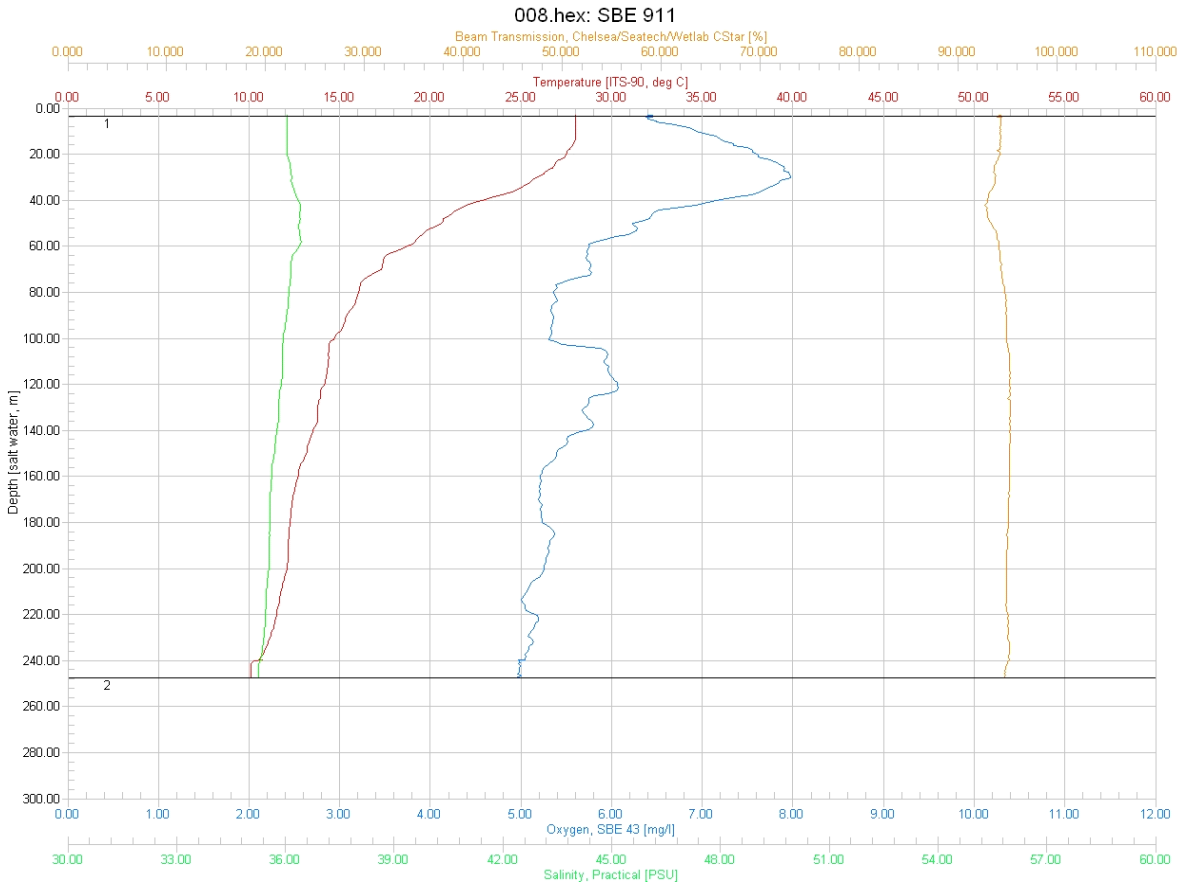
Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, 65 m; Dive 12-21

Dive Data:

Minimum Bottom Depth (m):	65	**Total Transect Length (km):**	1.580
Maximum Bottom Depth (m):	66	**Surface Current (kn):**	1.0
On Bottom (Time- GMT):	15:23	**On Bottom (Lat/Long):**	33.43°N; -77.06°W
Off Bottom (Time- GMT):	16:03	**Off Bottom (Lat/Long):**	33.43°N; -77.06°W
Physical (bottom); Temp (°C):	22.31	**Salinity:** 36.00 **Visibility (ft):** 50	**Current (kn):** 0.1

Physical Environment:

Distance from Dive Site(km): 20.65



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (244 m): temperature- 10, salinity- 35, and dissolved oxygen- 5. Surface temperature was 28 and there was a thermocline near 20-75 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 30 m. Visibility was estimated at 50 ft from the ROV video.

Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, 65 m; Dive 12-21

Dive Imagery:

Figure 1: -64.7 m
Red grouper and lionfish on patch of exposed rock.

Figure 2: -65.3 m
Lionfish on patch of exposed rock.

Figure 3: -65.1 m
Demosponge on soft bottom.

Figure 4: -63.7 m
Clypeaster sea biscuit on sediment.

Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, 65 m; Dive 12-21

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 21, Site #- 13-VII-12-4. Target Site – North Carolina MPA, inside MPA near NW border; 70 m. ROV survey inside MPA and ground truth new Pisces multibeam sonar of the site. Conduct video/photo transect over multibeam targets.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 1.0 kn from S; bottom 0.1.

Site Description/Habitat/Biota:
Mostly soft bottom sediment; with scattered 2-3 m diameter patches of exposed rock, 10-20 cm relief; appear to be excavated bedrock and cobble.

Dominant Benthic Biota: Sparse fauna on cobble. Each patch of exposed bedrock with short bigeyes and tattlers; no tilefish observed; sparse area of tilefish burrows. Gorgonacea- *Diodogorgia*? (10 cm purple fan); Hydroida; Antipatharia- *Stichopathes*; Demospongiae- *Aplysina*, *Geodia*; Annelida- *Filograna*; Echinoidea- *Clypeaster*; Asteroidea- *Narcissia trigonaria*; Chlorophyta- stalked blade; Rhodophyta (2 spp); Phaeophyta- *Dictyota*?.
Fish: red grouper (few), bank seabass,tattlerr, short bigeye, blue angelfish, wrasse and lionfish (12).

Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, 65 m; Dive 12-21

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-21 conducted a survey near the SW corner of the MPA along a relatively featureless multibeam sonar map. The dive had one habitat zone: Soft Bottom. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This site was mostly featureless on the multibeam, and consisted of low relief soft bottom with patches of cobble, rubble and some pavement; 63-65 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-21. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 21	North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, 65 m; Dive 12-21				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	Featureless MB all 65 m flat, SB w patches of cobble, rubble and some pvmt, some excavated bedrock				
	Soft Bottom	Off Reef	LRu	LR	SRF

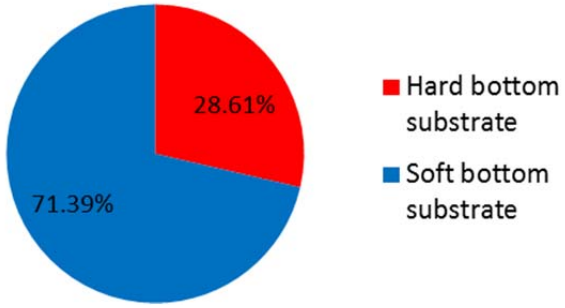


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-21. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-21 was predominately soft bottom (71.39%); hard bottom substrate consisted of rock pavement, rubble and cobble.

Bare rock substrate without biota covered 13.09% of the bottom and bare soft bottom was 64.04% (Fig. 2, Table 2). Benthic macro-biota covered 22.87% of the bottom and consisted 2.97% non-coral Cnidaria (Hydrozoa), 0.4% Porifera, 0.54% Antipatharia, 0.13% Alcyonacea ("gorgonacea"), and 11.74% algae which was dominated by fleshy macro Rhodophyta (6.0% cover), Phaeophyta (2.9%), and coralline red algae (2.4%).

Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, 65 m; Dive 12-21

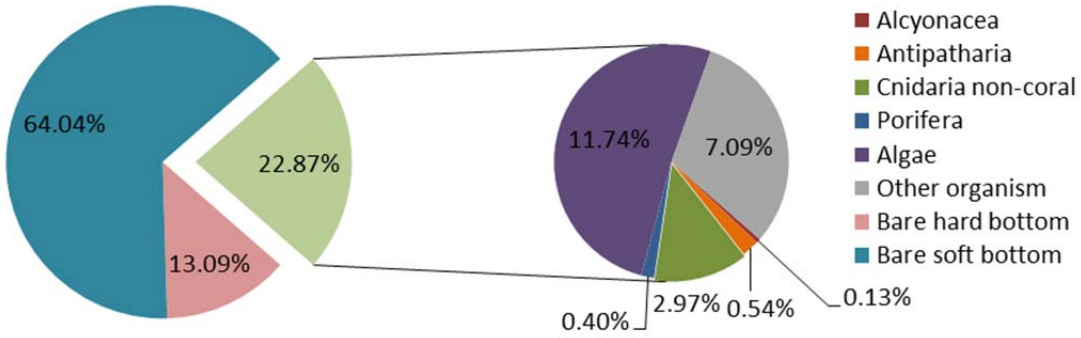


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-21. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-21.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**6**	**0.40%**
Porifera	**6**	**0.40%**
Demospongiae	2	0.13%
Spirastrellidae	4	0.27%
Cnidaria non-coral	**44**	**2.97%**
Cnidaria non-coral	**44**	**2.97%**
Hydroidolina	44	2.97%
Antipatharia	**8**	**0.54%**
Antipatharia	**8**	**0.54%**
Stichopathes lutkeni	8	0.54%
Algae	**174**	**11.74%**
Algae	**174**	**11.74%**
Chlorophyta	4	0.27%
Corallinales/crustose coralline	36	2.43%
Cyanophyta	1	0.07%
Phaeophyta	43	2.90%
Rhodophyta	90	6.07%
Alcyonacea	**2**	**0.13%**
Alcyonacea	**2**	**0.13%**
Ellisella sp.	1	0.07%
Ellisellidae	1	0.07%
Other organism	**105**	**7.09%**
Chordata	**10**	**0.67%**
Fish	10	0.67%
Natural detritus	**1**	**0.07%**

Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, 65 m; Dive 12-21

Natural detritus	1	0.07%
Other organism	**94**	**6.34%**
Other organism	94	6.34%
Hard bottom substrate	**194**	**13.09%**
Hard bottom substrate	**194**	**13.09%**
Bare rock- pavement boulder ledge	189	12.75%
Bare rubble- rock	5	0.34%
Soft bottom substrate	**949**	**64.04%**
Soft bottom substrate	**949**	**64.04%**
Bare soft bottom substrate	949	64.04%
Grand Total	**1482**	**100.00%**

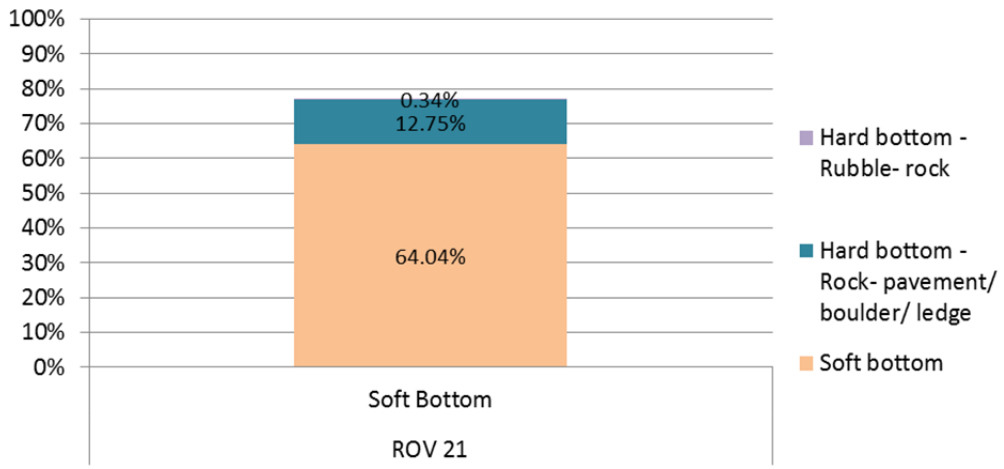


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-21.

Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, 65 m; Dive 12-21

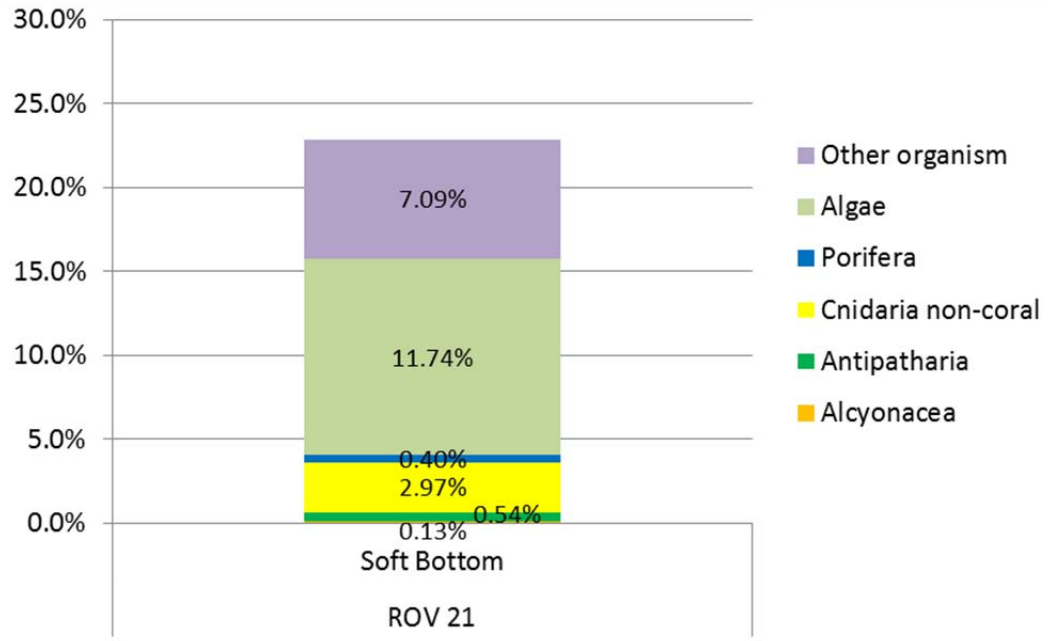


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-21.

Figure 3 shows the percent cover of bare substrate type for the single habitat zone of the dive site. Figure 4 shows the percent cover of biota for this single habitat zone.

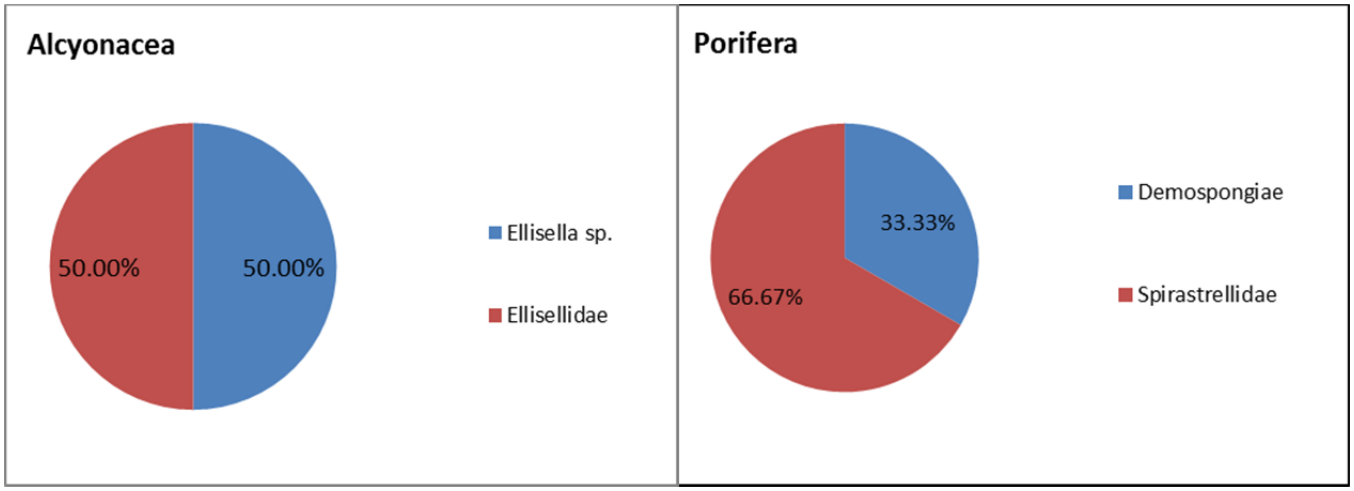


Figure 5. Diversity of corals and sponges at dive site ROV 12-21; CPCe analysis showing percent of total for each taxa category. Non-scleractinian coral includes Alcyonacea ("gorgonacea") and Antipatharia (black coral); Porifera (Demospongiae).

No hard coral was present at the dive site. Non-scleractinian coral included one species of Antipatharia (*Stichopathes lutkeni*) and two species of Alcyonacea (*Ellisella* sp. and unidentified Ellisellidae). Porifera were primarily Spirastrellidae (66.6% of the total Porifera).

Fish Data Analysis:

Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, 65 m; Dive 12-21

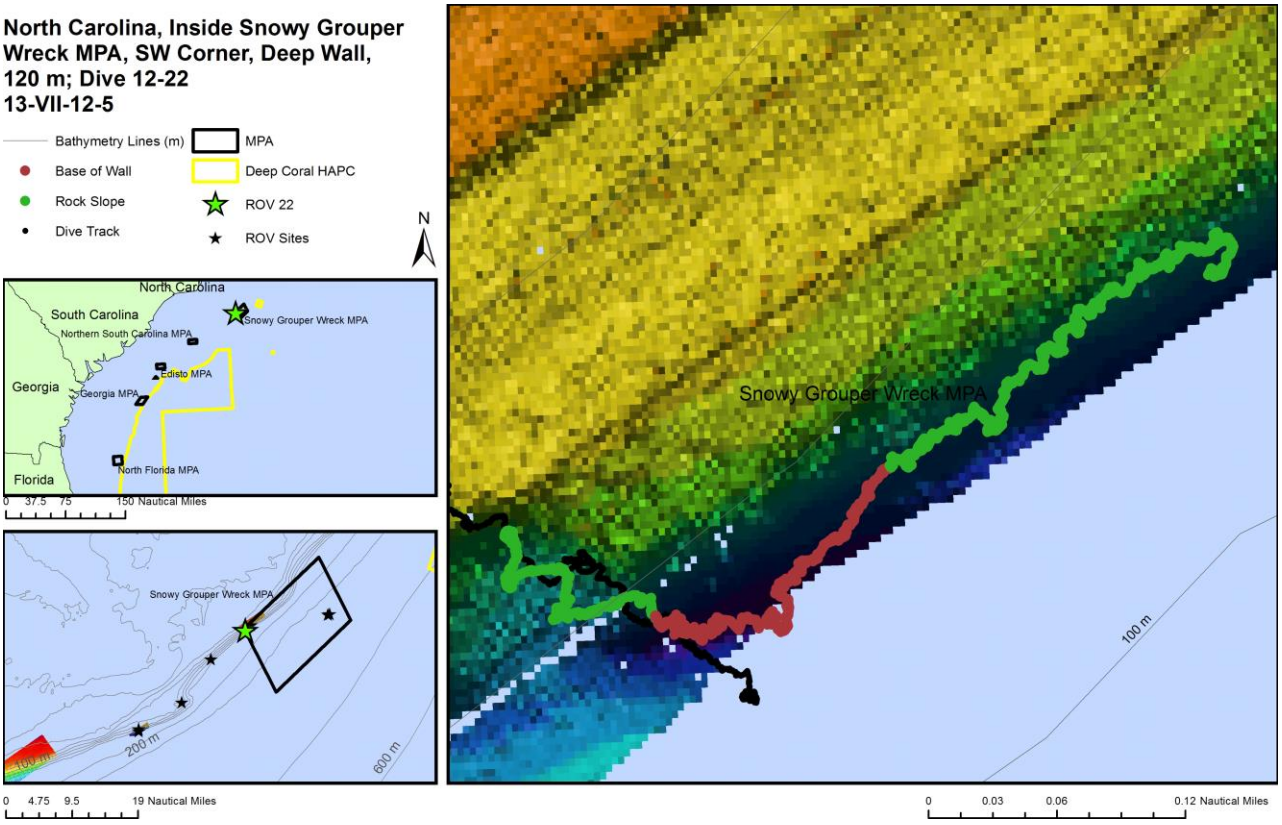
Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 13 taxa of fish were identified from dive ROV 21 for a total density of 144.3 individuals/km (Table 3). These were dominated by wrasse (38.6/km), yellowtail reeffish (29.7), and tattler (20.9). Managed species included only one species: red grouper (1.9/km).

Table 3. Density of fish for all transects at dive site ROV 12-21 (number individuals/km).

Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Canthigaster rostrata	sharpnose puffer	8	1.58	5.1
Centropristis ocyurus	bank sea bass	9	1.58	5.7
Chaetodon ocellatus	spotfin butterflyfish	6	1.58	3.8
Chaetodon sedentarius	reef butterflyfish	10	1.58	6.3
Chromis enchrysurus	yellowtail reeffish	47	1.58	29.7
Chromis sp.	damselfish	4	1.58	2.5
Epinephelus morio	red grouper	3	1.58	1.9
Halichoeres sp.	wrasse	61	1.58	38.6
Holacanthus bermudensis	blue angelfish	1	1.58	0.6
Holocentrus sp.	squirrelfish	5	1.58	3.2
Pristigenys alta	short bigeye	29	1.58	18.4
Pterois volitans	lionfish	12	1.58	7.6
Serranus phoebe	tattler	33	1.58	20.9
Total		228		144.3

Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 120 m; Dive 12-22

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andrew W. David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	SGW_dive32_33_5Mres (Snowy_Wreck_MPA)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/13/2012
Specimens:	
Digital Photos:	93
DVD:	1
Hard Drive:	1

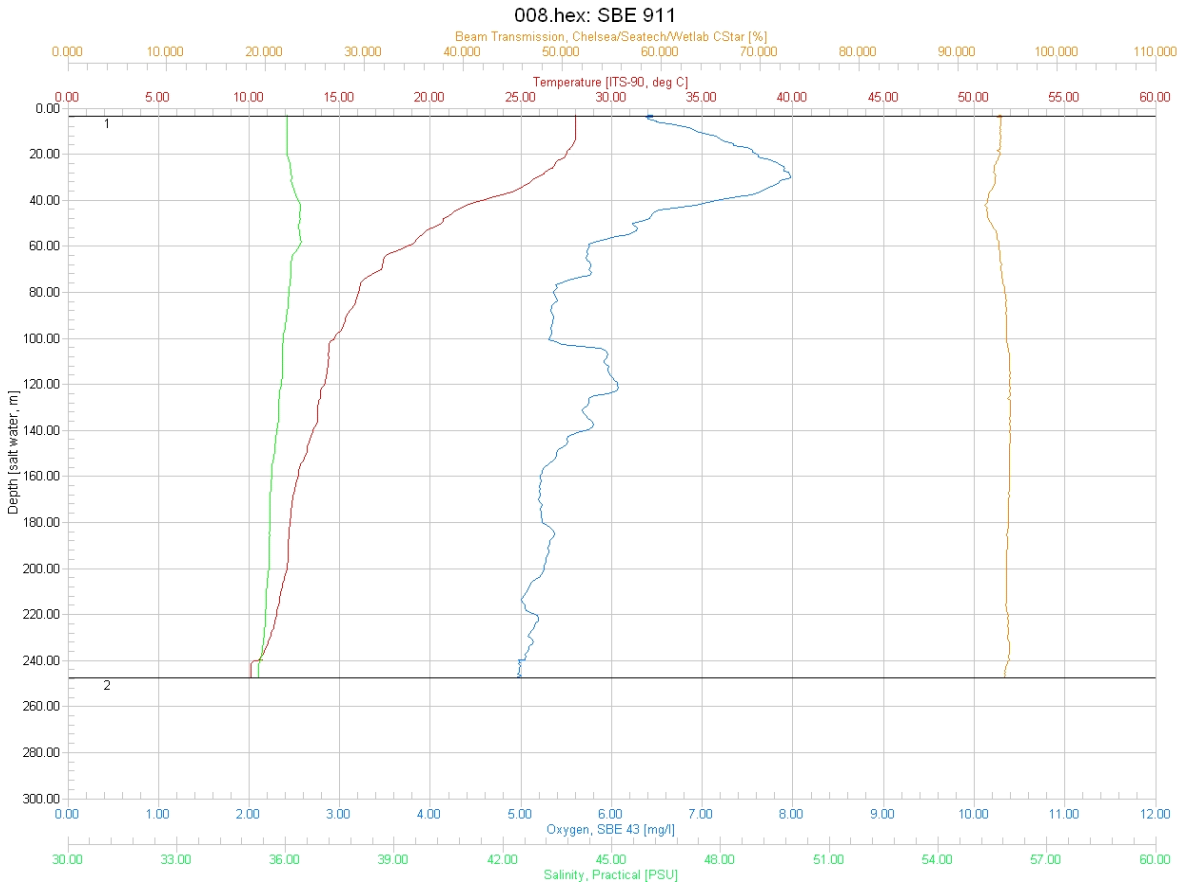
Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 120 m; Dive 12-22

Dive Data:

Minimum Bottom Depth (m):	83	**Total Transect Length (km):**	2.494
Maximum Bottom Depth (m):	123	**Surface Current (kn):**	.75
On Bottom (Time- GMT):	16:43	**On Bottom (Lat/Long):**	33.42°N; -77.08°W
Off Bottom (Time- GMT):	17:42	**Off Bottom (Lat/Long):**	33.42°N; -77.07°W
Physical (bottom); Temp (°C):	22.27	**Salinity:** 36.00 **Visibility (ft):** 50	**Current (kn):** 0.1

Physical Environment:

Distance from Dive Site(km): 22.34



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (244 m): temperature- 10, salinity- 35, and dissolved oxygen- 5. Surface temperature was 28.5 and there was a thermocline near 20-75 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 30 m. Visibility was estimated at 50 ft from the ROV video.

Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 120 m; Dive 12-22

Dive Imagery:

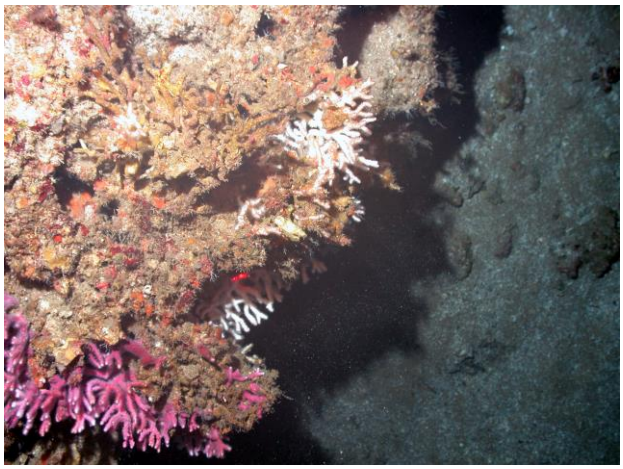


Figure 1: -95.1 m
Madracis myriaster coral on boulder.

Figure 2: -88.7 m
Scamp groupers on scattered boulder habitat.

Figure 3: -88.2 m
Scamp groupers on scattered boulder habitat.

Figure 4: -85.5 m
Cubbyu on scattered boulder habitat.

Dive Site: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 120 m; Dive 12-22

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 22, Site #- 13-VII-12-5. Target Site – North Carolina MPA; 90 m. ROV survey inside MPA and ground truth new Pisces multibeam sonar of the site. Conduct video/photo transect along deep drop-off of new Pisces multibeam sonar. Start at same WP 1 as Dive 20.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 1.0 kn from S; bottom 0.1.

Site Description/Habitat/Biota:
Transect heading northeast parallel to face of deep drop-off of multibeam map; depth range 123-92 m. Base of reef 121 m, top 83 m. WP 1 in cove of multibeam- 83 m, 50% cover with 1/2-1 m diameter rock boulders, 1/2 m relief. Head to northeast along face of deep drop-off of multibeam. 93 m- rock cobble and 1/2 m boulders, 50% rock cover; 97 m- 45o slope. 101 m- flattens out, 10-30% rock cobble, 2 m diameter boulders, 1/2 m relief. 97 m- 20-30o slope, cobble and 1 m boulders; 15-30 cm Madracis coral colonies common. Madracis from 97-112 m. Series of 30-45o drop-offs and terraces on slope down to 110 m where it flattens out. Most of slope is rugged, eroded rock with 1/2-1 m relief. 123 m- flat sand and shell-hash. Lots of fishing line on bottom.

Dominant Benthic Biota: Sparse fauna on rock, mostly encrusting sponges, small orange gorgonians, *Ellisella* whip gorgonians, *Madracis* coral, and wire black coral. Scleractinia- *Madracis* (*myriaster*?); Gorgonacea- *Thesea*? (5 cm orange fan), *Ellisella* (1/.2 m white whip), *Diodogorgia*? (10 cm purple); Antipatharia- *Stichopathes*; Hydroida; Decapoda- *Panulirus argus*.
Fish: gag grouper, scamp (few), red grouper, roughtongue bass, Calamus porgy, red porgy, hogfish, short bigeye, scorpionfish, tattler, cubbyu, eel, short bigeye, roughtongue bass, wrasse bass, tomtate, soapfish, spiny cheek or cardinal soldierfish, reef butterfly, blue angelfish, lionfish (23).

Location: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 120 m; Dive 12-22

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-22 conducted a survey of the SW corner of the MPA on a deep wall. A dog-leg transect was made along the deep wall and then up the slope which is evident in the multibeam sonar map. Dive transects were divided into two habitat zones: Base of Wall and Rock Slope. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This dive site was high relief, 45° rock slope with high rugosity, eroded rock outcrops and low relief boulders; 83-124 m.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-22. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 22	North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 120 m; Dive 12-22				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	Transect downslope 83 to base at 105 m 45o rock slope 2 m diam boulders, 0.5 m relief,				
	Rock Slope	On Reef	HRu	HR	RLF
Transect 2	105-121 m xs parallel along base of wall, pvmt, cobble, 10-20 cm relief, eroded rock				
	Base of Wall	On Reef	LRu	HR	RLF
Transect 3	94-97 m base of wall, boulders 1-3 m tall 10o slope, on reef				
	Rock Slope	On Reef	HRu	HR	RLF

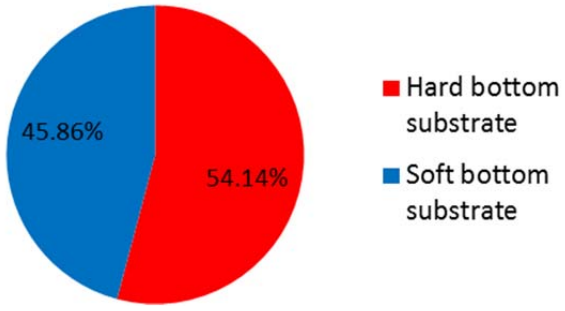


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-22. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-22 was predominately hard bottom (54.14%) consisting of rock pavement, 1-3 m boulders, cobble and rubble.

Location: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 120 m; Dive 12-22

Bare rock substrate without biota covered 42.01% of the bottom and bare soft bottom was 44.25% (Fig. 2, Table 2). Benthic macro-biota covered 13.74% of the bottom and consisted of 1.4% hard coral, 2.24% non-coral Cnidaria (Hydrozoa), 2.88% Porifera, 0.98% Antipatharia, 0.91% Alcyonacea ("gorgonacea"), and 1.12% algae.

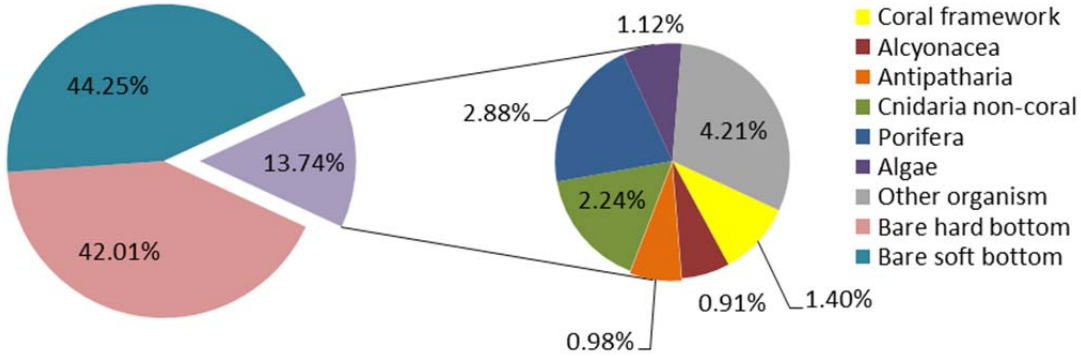


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-22. Corals include framework scleractinian coral. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-22.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**41**	**2.88%**
Porifera	**41**	**2.88%**
Demospongiae	28	1.96%
Spirastrellidae	13	0.91%
Cnidaria non-coral	**32**	**2.24%**
Cnidaria non-coral	**32**	**2.24%**
Hydroidolina	32	2.24%
Antipatharia	**14**	**0.98%**
Antipatharia	**14**	**0.98%**
Antipatharia	1	0.07%
Antipathes sp. A	1	0.07%
Stichopathes lutkeni	9	0.63%
Tanacetipathes hirta	3	0.21%
Algae	**16**	**1.12%**
Algae	**16**	**1.12%**
Corallinales/crustose coralline	2	0.14%
Phaeophyta	5	0.35%
Rhodophyta	9	0.63%
Alcyonacea	**13**	**0.91%**
Alcyonacea	**13**	**0.91%**
Ellisellidae	3	0.21%
Gorgonacea	10	0.70%

Location: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 120 m; Dive 12-22

Coral	**20**	**1.40%**
Coral	**20**	**1.40%**
Madracis myriaster	20	1.40%
Other organism	**60**	**4.21%**
Annelida	**1**	**0.07%**
Serpulidae	1	0.07%
Arthropoda	**2**	**0.14%**
Panulirus argus	2	0.14%
Chordata	**5**	**0.35%**
Fish	5	0.35%
Echinodermata	**11**	**0.77%**
Crinoidea	11	0.77%
Human debris	**4**	**0.28%**
Fishing gear/line/long line	4	0.28%
Mollusca	**8**	**0.56%**
Bivalvia	8	0.56%
Other organism	**29**	**2.03%**
Other organism	29	2.03%
Hard bottom substrate	**599**	**42.01%**
Hard bottom substrate	**599**	**42.01%**
Bare rock- pavement boulder ledge	589	41.30%
Bare rubble- coral	2	0.14%
Bare rubble- rock	7	0.49%
Standing dead coral	1	0.07%
Soft bottom substrate	**631**	**44.25%**
Soft bottom substrate	**631**	**44.25%**
Bare soft bottom substrate	631	44.25%
Grand Total	**1426**	**100.00%**

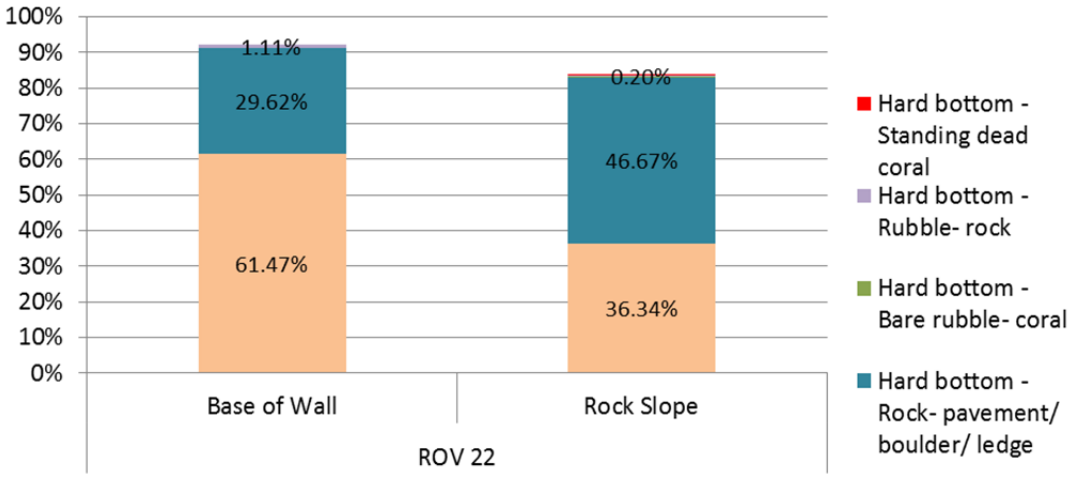


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-22.

Location: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 120 m; Dive 12-22

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The base of the wall had more bare sediment (or sediment veneer over rock pavement). The slope was primarily bare rock (46.%) and sediment (36.3%). Figure 4 shows the slope to have the greater cover of biota than the wall (~16% and 8%, respectively). Both zones were dominated with Porifera (2.4-3.0% cover), hard coral (1.0-2.2%), and hydroids (1.3-2.6%). The slope had more 'other' organisms which included Serpulidae, *Panularis argus* (spiny lobster), Crinoida, and bivalves.

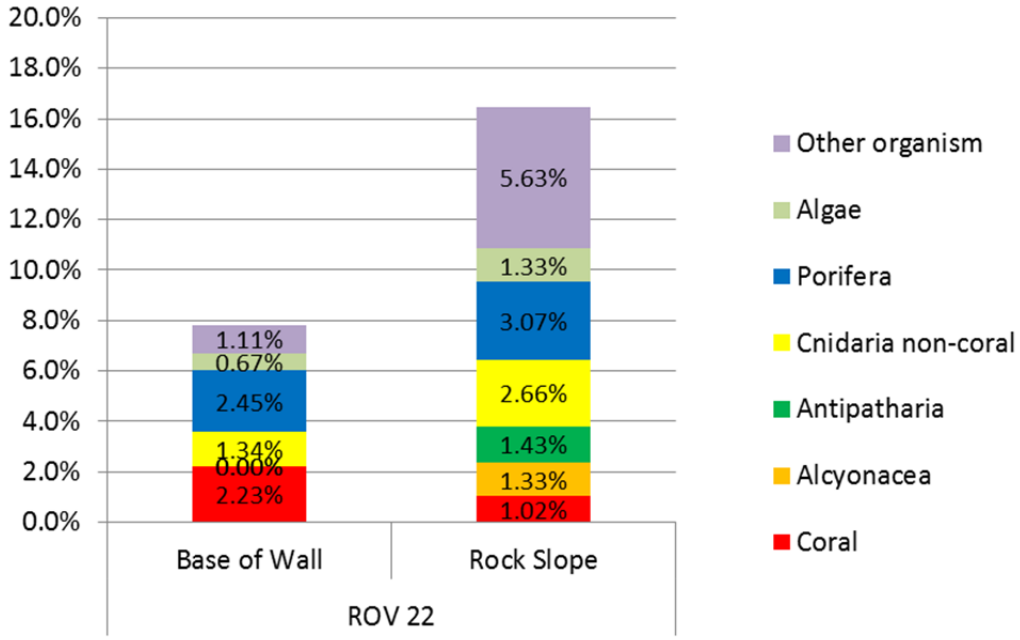


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-22.

Location: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 120 m; Dive 12-22

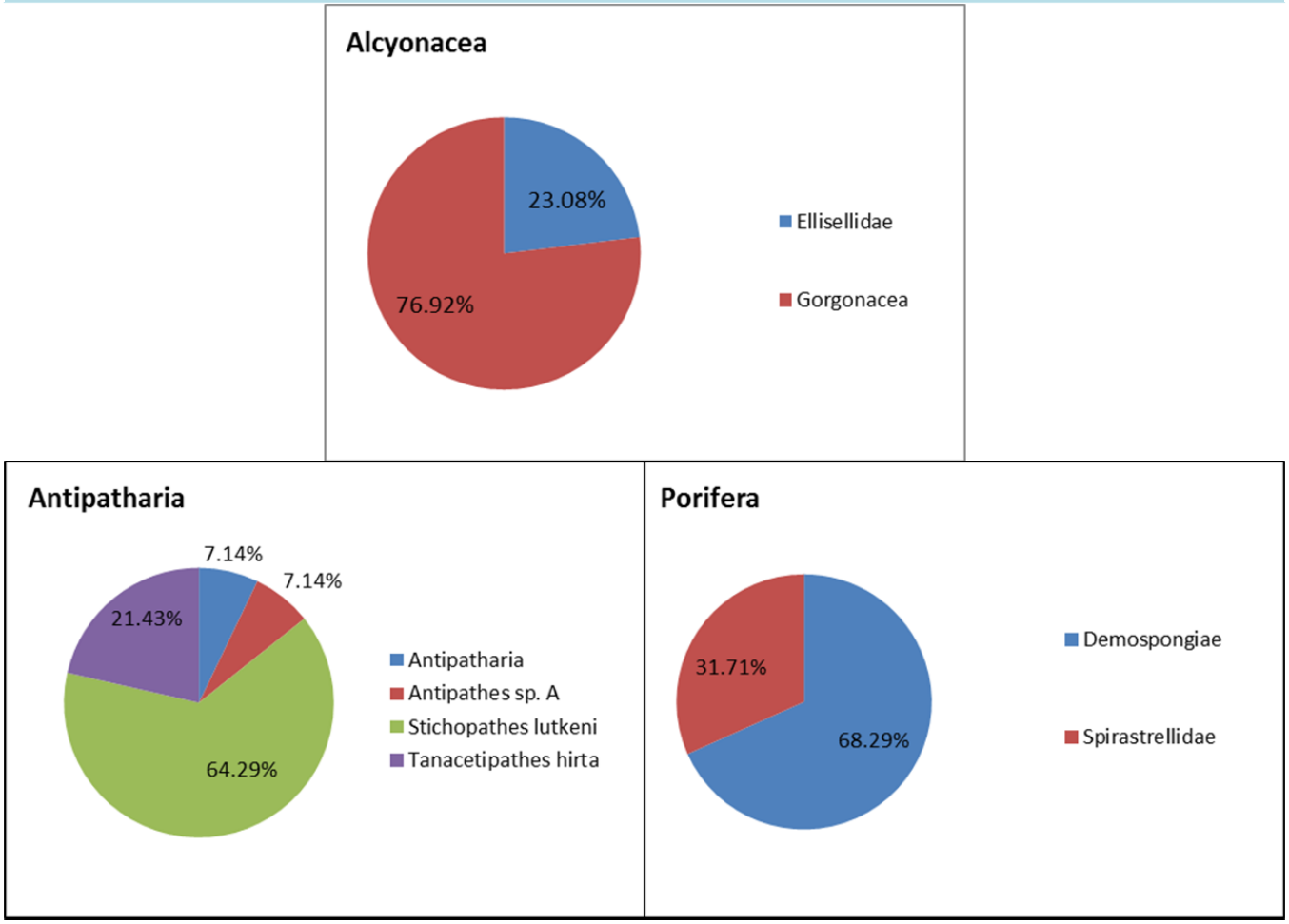


Figure 5. Diversity of corals and sponges at dive site ROV 12-22; CPCe analysis showing percent of total for each taxa category. Non-scleractinian coral includes Alcyonacea ("gorgonacea") and Antipatharia (black coral); Porifera are Demospongiae.

One species of scleractinian coral (*Madracis myriaster*) was present and fairly common; 20 colonies were in the photo transects. Non-scleractinian coral included Alcyonacea which were dominated by Ellisellidae (23.0% of the the total Alcyonacea) and other unidentified gorgonacea. *Stichopathes lutkeni* dominated the black corals (64.2% of the total Antipatharia) along with *Tanacetipathes hirta* (21.4%), and *Antipathes* sp. A (7.1%). Sponges could only be identified as Spirastrellidae (31.7% of the total Demospongiae) and other unidentified Demospongiae (68.2%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 32 taxa of fish were identified from dive ROV 22 for a total density of 746.6 individuals/km (Table 3). These were dominated by roughtongue bass (241.4/km), anthiids (194.4), and tomtate (105.6). Managed species included red porgy (22.5), scamp (3.6), gag grouper and red grouper (0.4, 0.4).

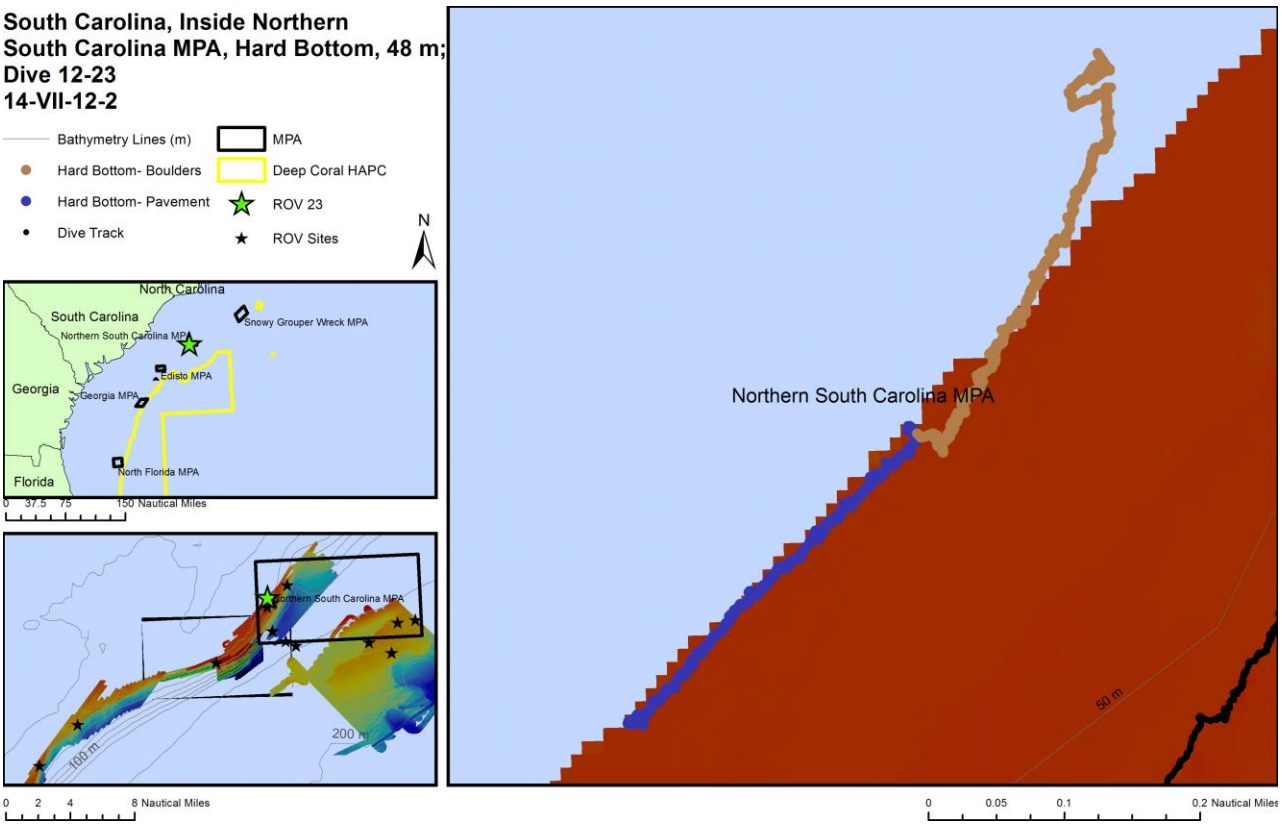
Location: North Carolina, Inside Snowy Grouper Wreck MPA, SW Corner, Deep Wall, 120 m; Dive 12-22

Table 3. Density of fish for all transects at dive site ROV 12-22 (number individuals/km).

Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Anthiinae	anthiid	484	2.49	194.4
Bodianus pulchellus	spotfin hogfish	8	2.49	3.2
Calamus sp.	porgy	5	2.49	2.0
Canthigaster rostrata	sharpnose puffer	18	2.49	7.2
Chaetodon ocellatus	spotfin butterflyfish	10	2.49	4.0
Chaetodon sedentarius	reef butterflyfish	21	2.49	8.4
Chromis enchrysurus	yellowtail reeffish	2	2.49	0.8
Chromis scotti	purple reeffish	1	2.49	0.4
Decodon puellaris	red hogfish	1	2.49	0.4
Epinephelus morio	red grouper	1	2.49	0.4
Equetus umbrosus	cubbyu	251	2.49	100.8
Gonioplectrus hispanus	spanish flag	1	2.49	0.4
Haemulon aurolineatum	tomtate	263	2.49	105.6
Halichoeres sp.	wrasse	17	2.49	6.8
Holacanthus bermudensis	blue angelfish	1	2.49	0.4
Holacanthus tricolor	rock beauty	1	2.49	0.4
Holocentridae	soldierfish/squirrelfish	22	2.49	8.8
Lachnolaimus maximus	hogfish	2	2.49	0.8
Liopropoma eukrines	wrasse bass	8	2.49	3.2
Muraenidae	moray eel	1	2.49	0.4
Mycteroperca microlepis	gag	1	2.49	0.4
Mycteroperca phenax	scamp	9	2.49	3.6
Pagrus pagrus	red porgy	56	2.49	22.5
Priacanthus arenatus	bigeye	1	2.49	0.4
Pristigenys alta	short bigeye	16	2.49	6.4
Prognathodes aya	bank butterflyfish	15	2.49	6.0
Pronotogrammus martinicensis	roughtongue bass	601	2.49	241.4
Pterois volitans	lionfish	27	2.49	10.8
Rypticus sp.	soapfish	1	2.49	0.4
Rypticus subbifrenatus	spotted soapfish	1	2.49	0.4
Scorpaenidae	scorpionfish	5	2.49	2.0
Serranus phoebe	tattler	8	2.49	3.2
Total		1859		746.6

Dive Site: South Carolina, Inside Northern South Carolina MPA, Hard Bottom, 48 m; Dive 12-23

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andrew W. David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	OE_Block2 (Unknown)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/14/2012
Specimens:	
Digital Photos:	112
DVD:	2
Hard Drive:	1

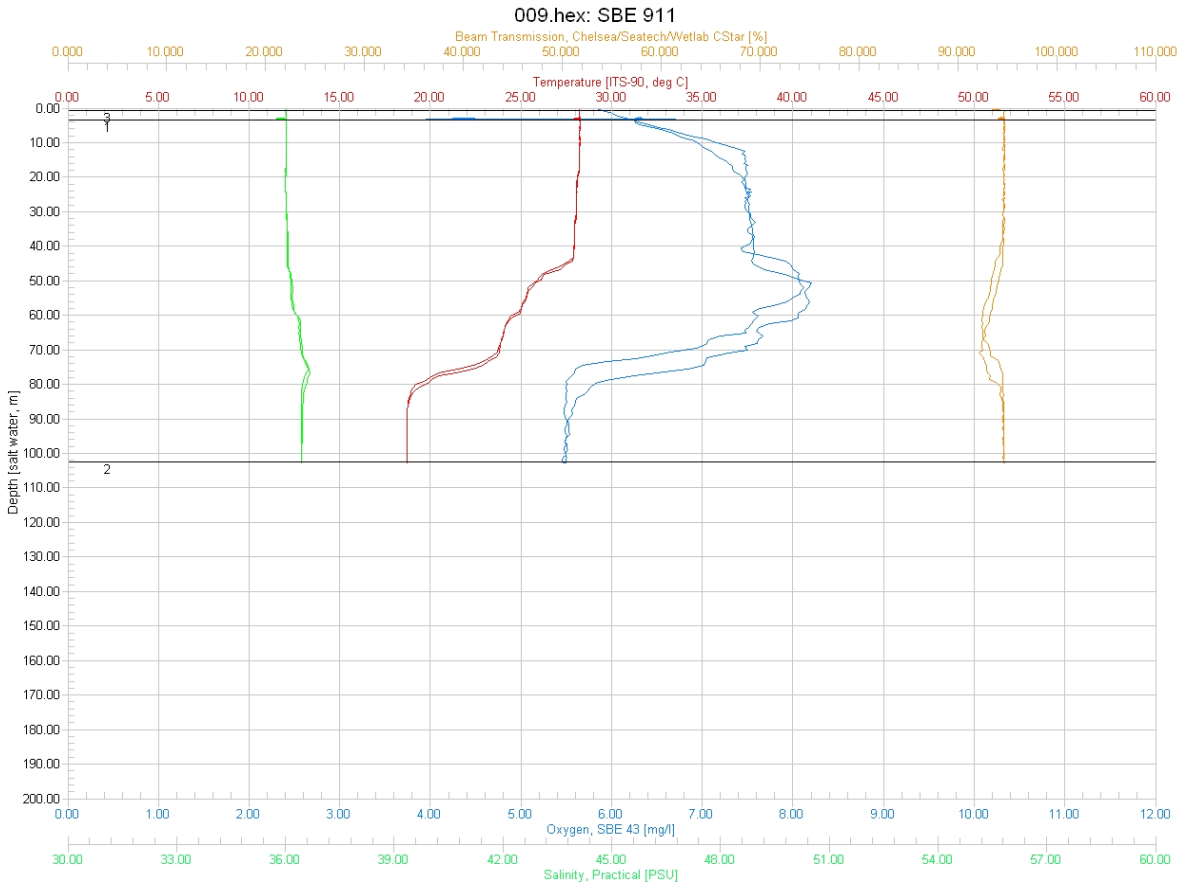
Dive Site: South Carolina, Inside Northern South Carolina MPA, Hard Bottom, 48 m; Dive 12-23

Dive Data:

Minimum Bottom Depth (m):	47	**Total Transect Length (km):**	3.212
Maximum Bottom Depth (m):	48	**Surface Current (kn):**	0.4
On Bottom (Time- GMT):	7:45	**On Bottom (Lat/Long):**	32.85°N; -78.27°W
Off Bottom (Time- GMT):	9:08	**Off Bottom (Lat/Long):**	32.86°N; -78.26°W
Physical (bottom); Temp (°C):	23.20	**Salinity:** 36.20 **Visibility (ft):** 30	**Current (kn):** 0.1

Physical Environment:

Distance from Dive Site(km): 3.95



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (101 m): temperature- 18, salinity- 36.2, and dissolved oxygen- 5.2. Surface temperature was 28.4 and there was a thermocline near 42-50 and 70-80 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 50 m. Visibility was estimated at 30 ft from the ROV video.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Hard Bottom, 48 m; Dive 12-23

Dive Imagery:

Figure 1: -47.8 m
Red grouper on algal dominated pavement.

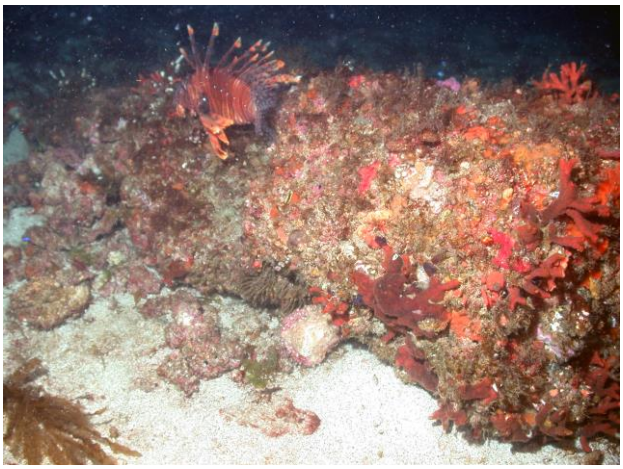


Figure 2: -47.4 m
Lionfish on rock outcrop habitat.

Figure 3: -47.8 m
Lizardfish on algal dominated rock pavement.

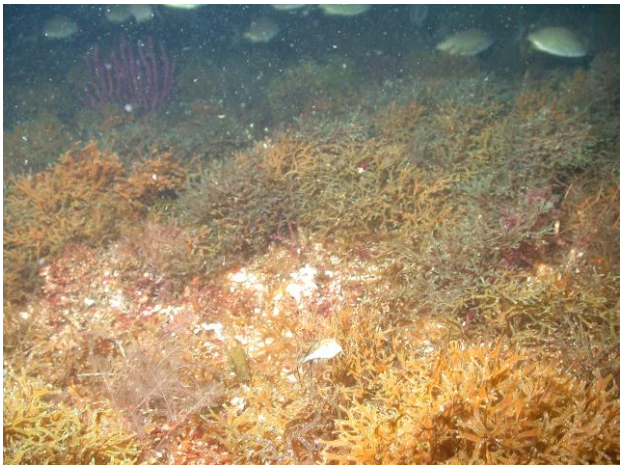


Figure 4: -47.6 m
Dictyota algal field on rock pavement.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Hard Bottom, 48 m; Dive 12-23

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 23, Site #- 14-VII-12-2. Target Site – South Carolina, Northern S.C. MPA; 55 m. ROV survey inside MPA and ground truth multibeam sonar of the site. Conduct video/photo transect on low relief features of multibeam.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.4 kn from S; bottom 0.1.

Site Description/Habitat/Biota:
Transect mostly low relief rock pavement with sediment veneer, with 30-50% cover of dense algae dominated by Phaeophyta, mostly Dictyota and some Codium on cobble and exposed rock. Patches of exposed rock, 10 cm relief, probably excavated by fish, most had bigeyes associated. Some areas with sparse 1/2-1 m diameter flat boulders, <1.2 m relief, Near end waypoint appears to be low relief rock ledge, 1/2 m relief, and about 10 m wide, oriented NE-SW which appears faintly on multibeam. Total depth range 47.5-48.5 m

Dominant Benthic Biota: Gorgonacea- Ellisellidae, *Nicella*, *Titanideum frauenfeldii*; Hydroida; Demospongiae- *Aplysina*, *Callyspongia vaginalis*, Microcionidae?, *Geodia*; Asteroidea- *Narcissia trigonaria*; Ascidiacea- Didemnidae, *Eudistoma*; Chlorophyta- *Codium*; Phaeophyta- *Dictyota*, *Padina*?, *Sargassum*; Rhodophyta- spp.
Fish: blue angelfish, graysby grouper, red grouper (several), scamp, hogfish, sand diver, red porgy, Calamus porgy, cowfish, puffer, cubbyu, french angelfish (adult and juvenile), goatfish, scorpion fish, short bigeye, spotfin butterflyfish, scorpionfish, spotfin hogfish, tang, tattler, yellowhead wrasse, lionfish (10).

Dive Site: South Carolina, Inside Northern South Carolina MPA, Hard Bottom, 48 m; Dive 12-23

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-23 conducted a survey near the west border of the MPA from SW to NE along hard bottom which is not very evident in the multibeam sonar map and which is very poor resolution. Dive transects were divided into two habitat zones: Hard Bottom- Boulders and Hard Bottom- Pavement. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This site was a low relief ridge, about 10 m wide, of hard bottom pavement and few low relief boulders; 46-48 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-23. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 23	South Carolina, Inside Northern South Carolina MPA, Hard Bottom, 48 m; Dive 12-23				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	48 m pvmt, sed veneer, flat few outcrops <0.5 m				
	Hard Bottom- Pavement	On Reef	LRu	LR	PF
Transect 2	Sediment @ 48.5 m top of rock 47.5, 0.5- 1 m relief, rounded boulders and 10 m wide rock ridge.				
	Hard Bottom- Boulders	On Reef	LRu	LR	RLF

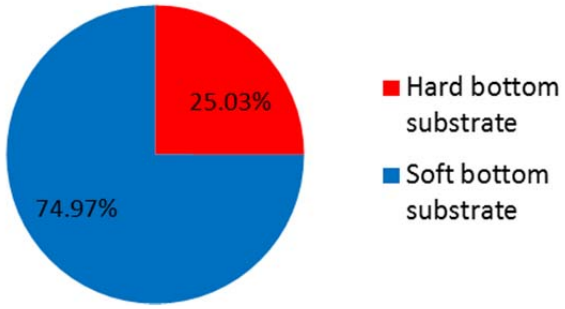


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-23. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-23 was predominately soft bottom (74.97%); the hard bottom substrate consisted of rock pavement, 0.5 to 1 m boulders and some low relief rock outcrops.

Bare rock substrate without biota covered 4.54% of the bottom and bare soft bottom was 55.35% (Fig. 2, Table 2). Benthic macro-biota covered 40.1% of the bottom and consisted of 0.05% hard coral, 0.65% non-coral

Dive Site: South Carolina, Inside Northern South Carolina MPA, Hard Bottom, 48 m; Dive 12-23

Cnidaria (Hydrozoa), 1.85% Porifera, 0.51% Alcyonacea ("gorgonacea"), and 29.62% algae which included 17.6% Phaeophyta, 8.7% cyanobacteria, and 2.0% fleshy macro-Rhodophyta.

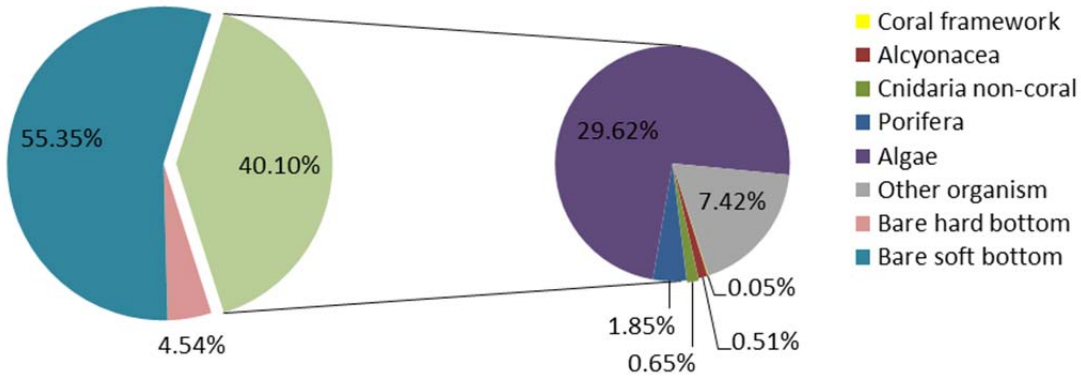


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-23. Non-scleractinian corals include Alcyonacea (primarily "gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-23.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**40**	**1.85%**
Porifera	**40**	**1.85%**
Agelas sp.	2	0.09%
Axinellida	5	0.23%
Callyspongia sp.	1	0.05%
Callyspongia vaginalis	1	0.05%
Demospongiae	9	0.42%
Demospongiae- ze tan starlet	5	0.23%
Dictyoceratida	1	0.05%
Haliclona sp.	8	0.37%
Ircinia campana	4	0.19%
Spirastrellidae	4	0.19%
Cnidaria non-coral	**14**	**0.65%**
Cnidaria non-coral	**14**	**0.65%**
Hydroidolina	14	0.65%
Algae	**639**	**29.62%**
Algae	**639**	**29.62%**
Chlorophyta	19	0.88%
Corallinales/crustose coralline	5	0.23%
Cyanophyta	189	8.76%
Phaeophyta	381	17.66%
Rhodophyta	45	2.09%

Dive Site: South Carolina, Inside Northern South Carolina MPA, Hard Bottom, 48 m; Dive 12-23

Alcyonacea	**11**	**0.51%**
Alcyonacea	**11**	**0.51%**
Ellisella sp.	1	0.05%
Ellisellidae	3	0.14%
Muricea sp.	6	0.28%
Titanideum frauenfeldii	1	0.05%
Coral	**1**	**0.05%**
Coral	**1**	**0.05%**
Scleractinia colonial	1	0.05%
Other organism	**160**	**7.42%**
Bryozoa	**41**	**1.90%**
Bryozoa	40	1.85%
Schizoporella sp.	1	0.05%
Chordata	**19**	**0.88%**
Ascidiacea	1	0.05%
Didemnidae	3	0.14%
Fish	15	0.70%
Natural detritus	**1**	**0.05%**
Natural detritus	1	0.05%
Other organism	**99**	**4.59%**
Other organism	99	4.59%
Hard bottom substrate	**98**	**4.54%**
Hard bottom substrate	**98**	**4.54%**
Bare rock- pavement boulder ledge	97	4.50%
Bare rubble- rock	1	0.05%
Soft bottom substrate	**1194**	**55.35%**
Soft bottom substrate	**1194**	**55.35%**
Bare soft bottom substrate	1194	55.35%
Grand Total	**2157**	**100.00%**

Dive Site: South Carolina, Inside Northern South Carolina MPA, Hard Bottom, 48 m; Dive 12-23

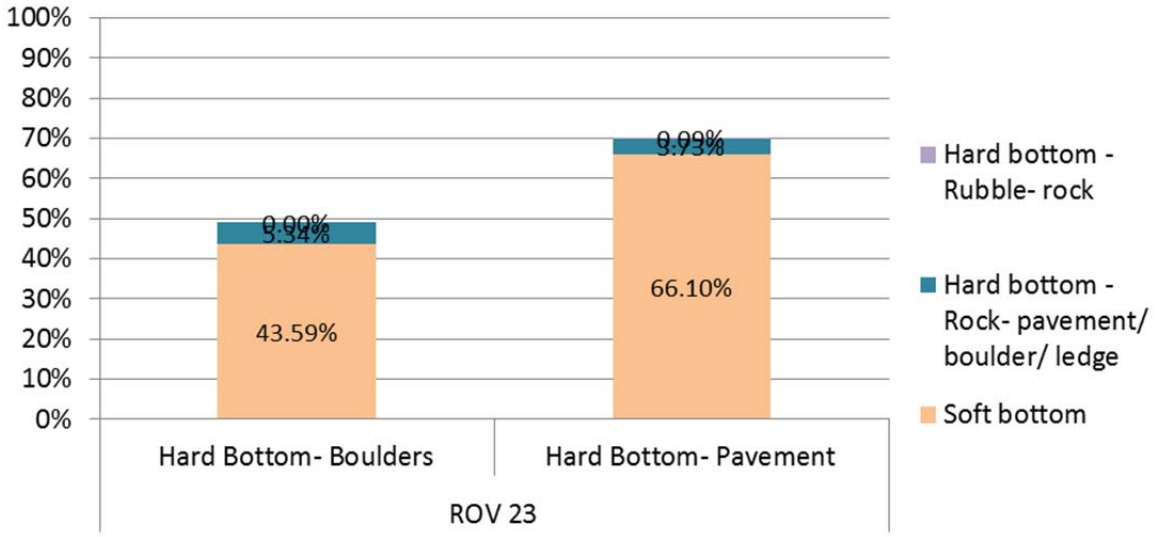


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-23.

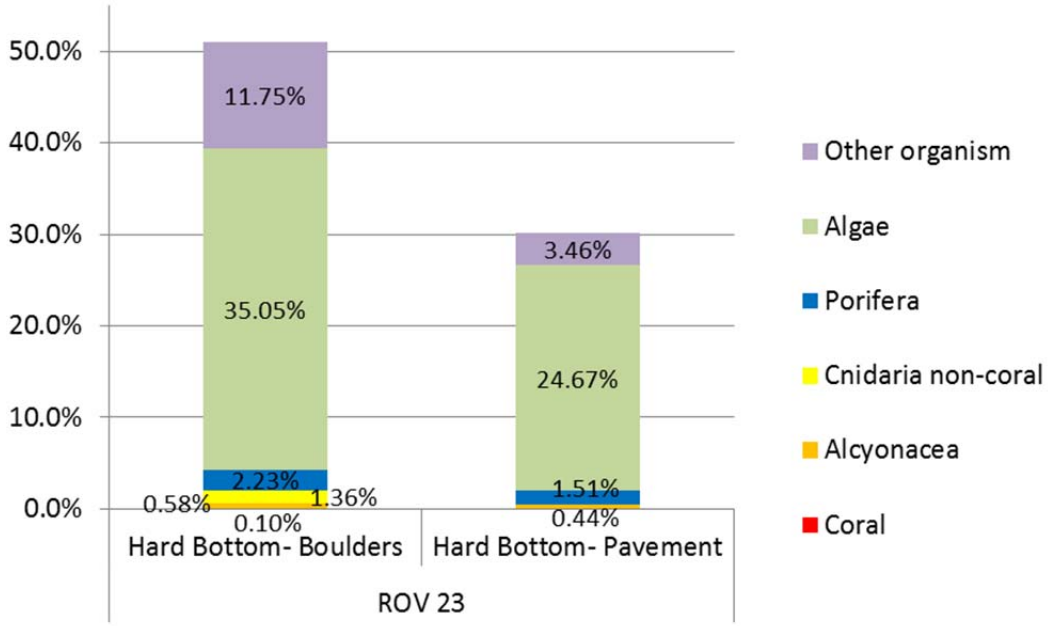


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-23.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. Both the boulder zone and the rock pavement zone had low cover of bare rock (5% cover) and 45-66% cover of bare sediment which may be sediment veneer over pavement. Figure 4 shows the boulder habitat zone to have nearly 50% cover of biota compared to 30% in the pavement areas. Both zones were dominated by algae (35.0 and 24.6%, respectively), but sparse hydroids, sponges and Alcyonacea.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Hard Bottom, 48 m; Dive 12-23

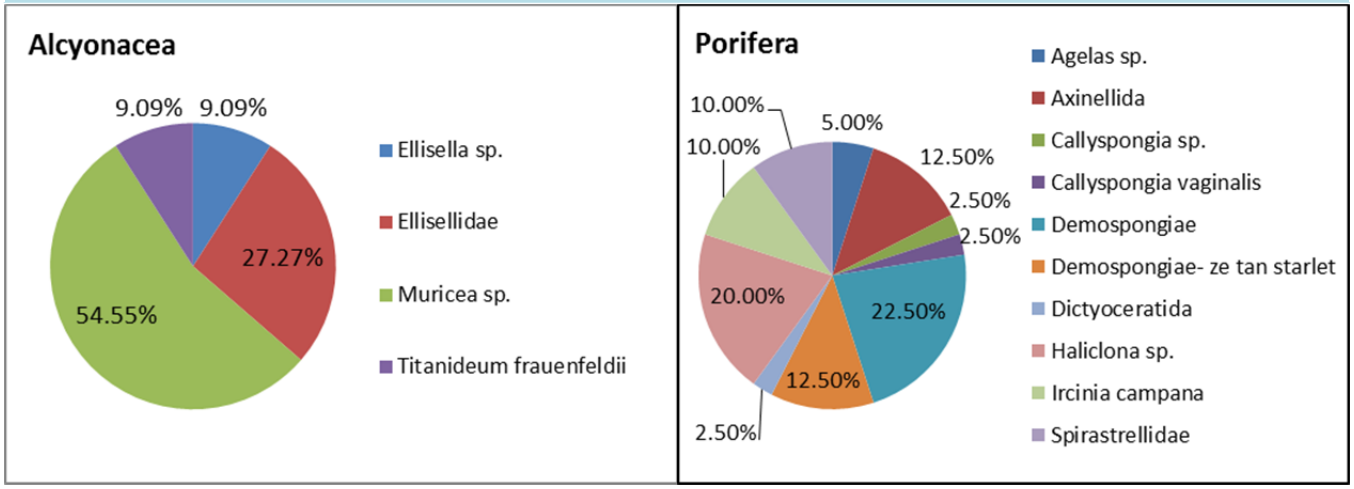


Figure 5. Diversity of corals and sponges at dive site ROV 12-23; CPCe analysis showing percent of total for each taxa category. Non-scleractinian coral includes Alcyonacea ("gorgonacea"); Porifera are Demospongiae.

Only one unidentified scleractinian coral was counted at this site. No Antipatharia were counted. Non-scleractinian coral included 3 taxa of Alcyonacea of which *Muricea* sp. accounted for 54.5% of the total Alcyonacea, unidentified Ellisellidae were 27.2%, *Ellisella* sp. 9.0%, and *Titanideum frauenfeldii* 9.0%. Sponges were relatively diverse with 10 taxa dominated by *Haliclona* sp. (20% of the total Porifera), tan starlet Demospongiae (12.5%), Axinellida (12.5%), *Ircinia campana* (10%), and Spirastrellidae (10%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 37 taxa of fish were identified from dive ROV 23 for a total density of 1348.3 individuals/km (Table 3). These were dominated by tomtate (1137.7/km), grunts (48.3), and sharpnose puffer (39.6). Managed species included scamp (6.5/km), red porgy (2.2),hogfish (1.2), graysby (0.9), and red grouper (0.9).

Table 3. Density of fish for all transects at dive site ROV 12-23 (number individuals/km).

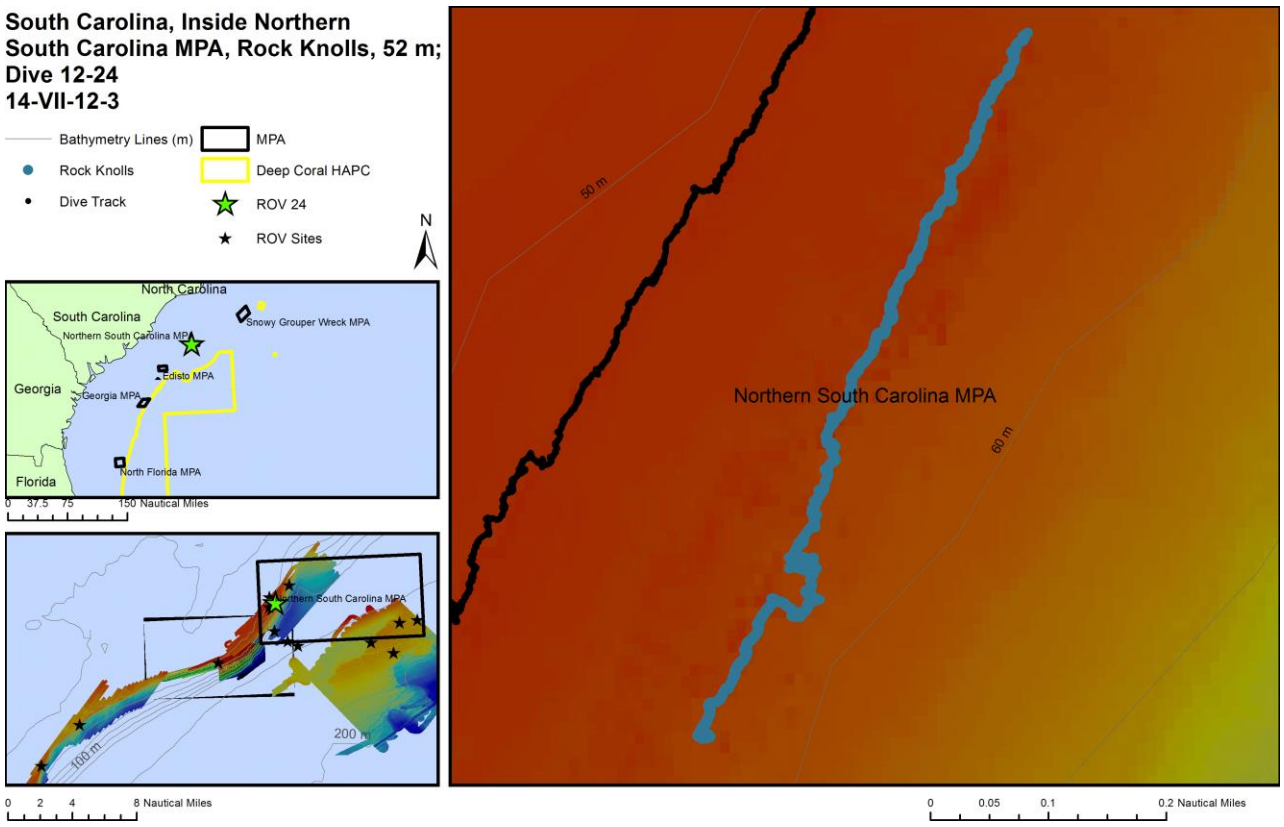
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus sp.	doctorfish	19	3.21	5.9
Bodianus pulchellus	spotfin hogfish	10	3.21	3.1
Calamus sp.	porgy	24	3.21	7.5
Canthigaster rostrata	sharpnose puffer	127	3.21	39.6
Chaetodon ocellatus	spotfin butterflyfish	13	3.21	4.0
Chaetodon sedentarius	reef butterflyfish	20	3.21	6.2
Chromis enchrysurus	yellowtail reeffish	7	3.21	2.2
Diodon sp.	pufferfish	1	3.21	0.3
Epinephelus cruentatus	graysby	3	3.21	0.9
Epinephelus morio	red grouper	3	3.21	0.9
Equetus lanceolatus	jack-knife fish	1	3.21	0.3
Equetus umbrosus	cubbyu	59	3.21	18.4

Dive Site: South Carolina, Inside Northern South Carolina MPA, Hard Bottom, 48 m; Dive 12-23

Haemulon aurolineatum	tomtate	3652	3.21	1137.7
Haemulon plumierii	white grunt	2	3.21	0.6
Haemulon sp.	grunts	155	3.21	48.3
Halichoeres garnoti	yellowhead wrasse	4	3.21	1.2
Halichoeres sp.	wrasse	118	3.21	36.8
Holacanthus bermudensis	blue angelfish	14	3.21	4.4
Holacanthus tricolor	rock beauty	1	3.21	0.3
Holocentridae	soldierfish/squirrelfish	10	3.21	3.1
Lachnolaimus maximus	hogfish	4	3.21	1.2
Lactophrys sp.	cowfish	2	3.21	0.6
Liopropoma eukrines	wrasse bass	1	3.21	0.3
Malacanthus plumieri	sand tilefish	1	3.21	0.3
Mycteroperca phenax	scamp	21	3.21	6.5
Pagrus pagrus	red porgy	7	3.21	2.2
Pareques iwamotoi	blackbar drum	2	3.21	0.6
Pomacanthus paru	french angelfish	4	3.21	1.2
Pristigenys alta	short bigeye	3	3.21	0.9
Prognathodes aya	bank butterflyfish	2	3.21	0.6
Pseudupeneus maculatus	spotted goatfish	1	3.21	0.3
Pterois volitans	lionfish	16	3.21	5.0
Rypticus sp.	soapfish	1	3.21	0.3
Scorpaenidae	scorpionfish	4	3.21	1.2
Serranus phoebe	tattler	14	3.21	4.4
Sparidae	porgy	1	3.21	0.3
Sphoeroides spengleri	bandtail puffer	1	3.21	0.3
Total		4328		1348.3

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 52 m; Dive 12-24

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andrew W. David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	OE_Block2 (Unknown)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/14/2012
Specimens:	
Digital Photos:	124
DVD:	2
Hard Drive:	1

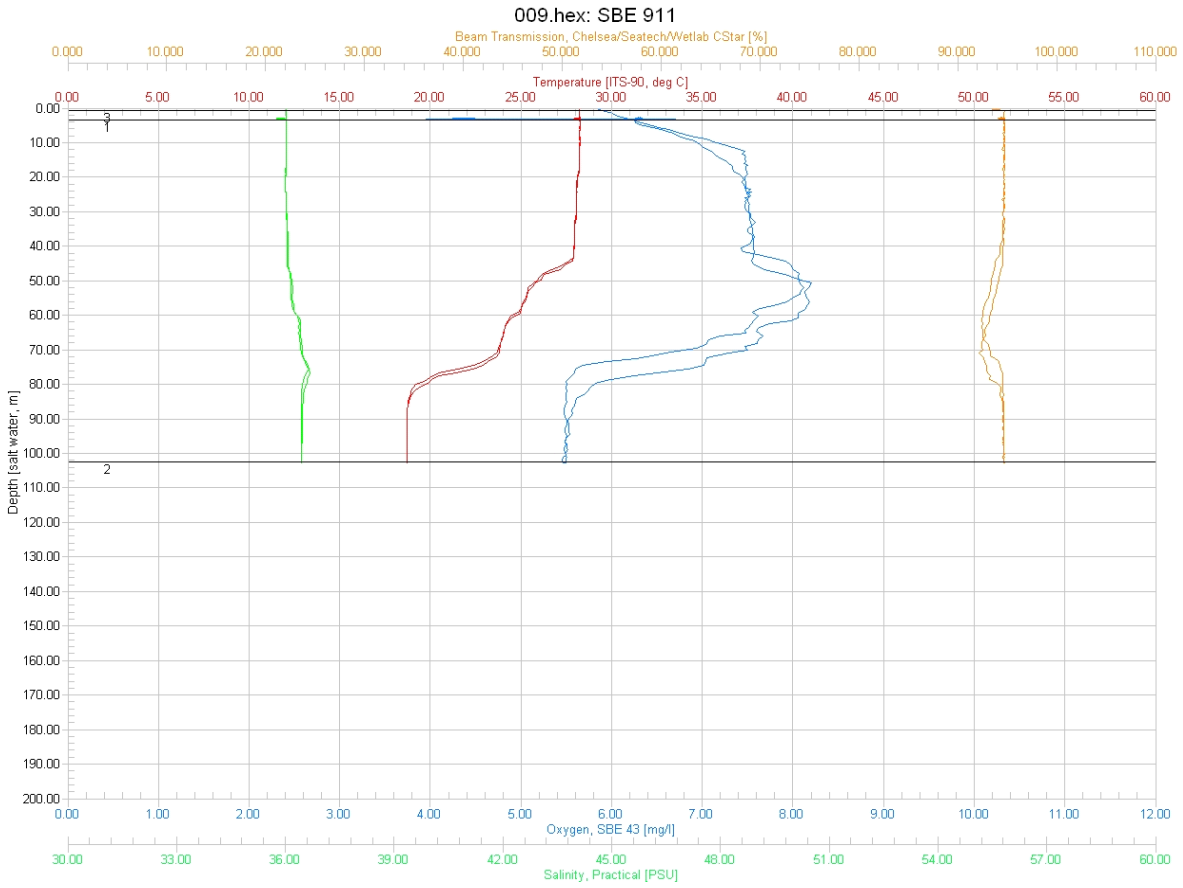
Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 52 m; Dive 12-24

Dive Data:

Minimum Bottom Depth (m):	48	**Total Transect Length (km):**	3.106
Maximum Bottom Depth (m):	52	**Surface Current (kn):**	0.4
On Bottom (Time- GMT):	9:45	**On Bottom (Lat/Long):**	32.84°N; -78.26°W
Off Bottom (Time- GMT):	11:16	**Off Bottom (Lat/Long):**	32.85°N; -78.26°W
Physical (bottom); Temp (°C):	23.70	**Salinity:** 36.20 **Visibility (ft):** 50	**Current (kn):** 0.1

Physical Environment:

Distance from Dive Site(km): 3.28



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (101 m): temperature- 18, salinity- 36.2, and dissolved oxygen- 5.2. Surface temperature was 28.5 and there was a thermocline near 42-50 and 70-80 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 50 m. Visibility was estimated at 50 ft from the ROV video.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 52 m; Dive 12-24

Dive Imagery:

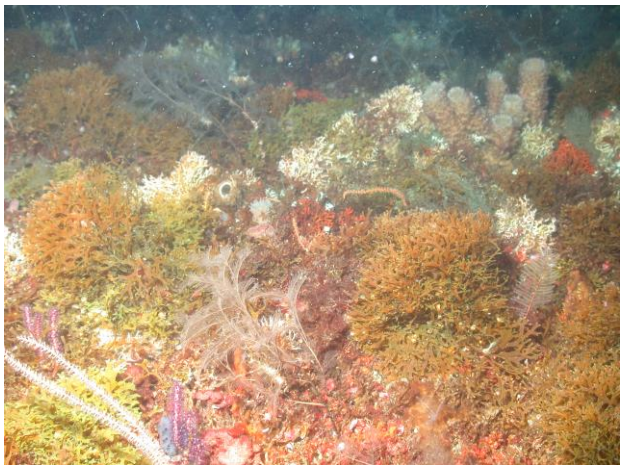


Figure 1: -47.4 m
Dense *Dictyota* algae, *Callyspongia vaginalis* tube sponge, and hydroids on low relief hardbottom.

Figure 2: -48.3 m
Hogfish on algal dominated rock pavement.

Figure 3: -49.7 m
Agelas demosponge, gorgonians, and algae on hardbottom.

Figure 4: -48.1 m
Dictyota algae, *Filograna* polychaete colonies, plexaurid octocorals, and hydroids on hardbottom.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 52 m; Dive 12-24

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 24, Site #- 14-VII-12-3. Target Site – South Carolina, Northern S.C. MPA; 60 m. ROV survey inside MPA and ground truth multibeam sonar of the site. Conduct video/photo transect over rock mound habitat visible on multibeam sonar; lumps on the MB.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.4 kn from S; bottom 0.1.

Site Description/Habitat/Biota:
Transect starts on flat rock pavement with sediment veneer; with patchy 2-3 m diameter exposed rock patches, excavated pavement with 10 cm relief. Low relief rock knolls on flat bottom dominated by Phaeophyta. The second part of the transect crossed numerous high relief rock mounds that are relatively smooth and rounded, 20-30 m diameter, and 3 m relief with 30-45o slope, but few ledges. Most are about 48 m at the top and 51 m at the base on sediment on pavement. Moderate relief mounds are about 10 m diameter and 1 m relief. All the mounds have nearly 100% cover of algae and epifauna.

Dominant Benthic Biota: Gorgonacea- *Briareum*?, Diodogorgia, Ellisellidae, *Iciligorgia schrammi*, *Swiftia exserta*; Hydroida; Antipathidae- bottle brush, Tanacetipathes, white fan mesh, *Stichopathes*; Demospongiae- *Agelas*, Axinellida, *Callyspongia vaginalis*, Spirastrellidae; Echinodermata- Asteroidea, Gorgonocephalidae; Annelida- *Filograna*; Ascidiacea - Didemnidae, *Eudistoma*; Cyanophyta; Chlorophyta; Phaeophyta- *Dictyota*, *Sargassum*; Rhodophyta.
Fish: blue angelfish, Calamus porgy, hogfish, graysby, parrotfish, orange back bass, purple reeffish, scamp grouper, sharpnose puffer, snake eel, spotfin butterfly, squirrelfish, sunshine fish, tattler, yellowtail reeffish, lionfish (18).

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 52 m; Dive 12-24

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-24 conducted a survey near the west border of the MPA from SW to NE along hardbottom which is barely evident in the multibeam sonar map. Dive transects were divided into one habitat zone: Rock Knolls. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This dive site was primarily fairly flat bottom with high relief rock knolls; some 3-4 m relief and 10-30 m diameter but of low rugosity with 35° smooth rock slopes which have few ledges; 47-52 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-24. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 24	South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 52 m; Dive 12-24				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	Numerous smooth rock mounds, some 1-2 m, some 3-4 m relief. Tops 47-48 m, base 51.5 m between mounds, pvmt w sed, cobble, dense biota 35o slope 10-30 m diam				
	Rock Knolls	On Reef	LRu	HR	RLF

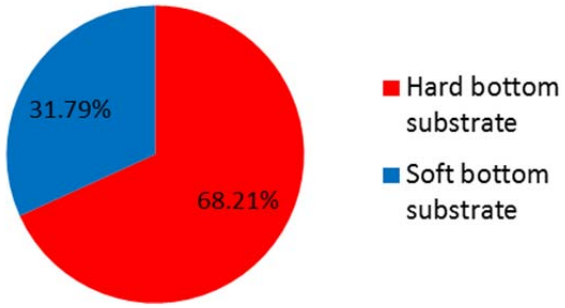


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-24. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-24 was predominately hard bottom (68.21%) consisting of smooth rock, pavement and rubble.

Bare rock substrate without biota covered 10.42% of the bottom and bare soft bottom was 24.82% (Fig. 2, Table 2). Benthic macro-biota covered 64.77% of the bottom and consisted of 2.54% non-coral Cnidaria (Hydrozoa), 2.3% Porifera, 0.86% Antipatharia, 1.93% Alcyonacea ("gorgonacea"), and 29.86% algae which included 10% cyanobacteria, 9.9% Phaeophyta, 7.7% fleshy Rhodophyta, and 1.4% crustose corallines.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 52 m; Dive 12-24

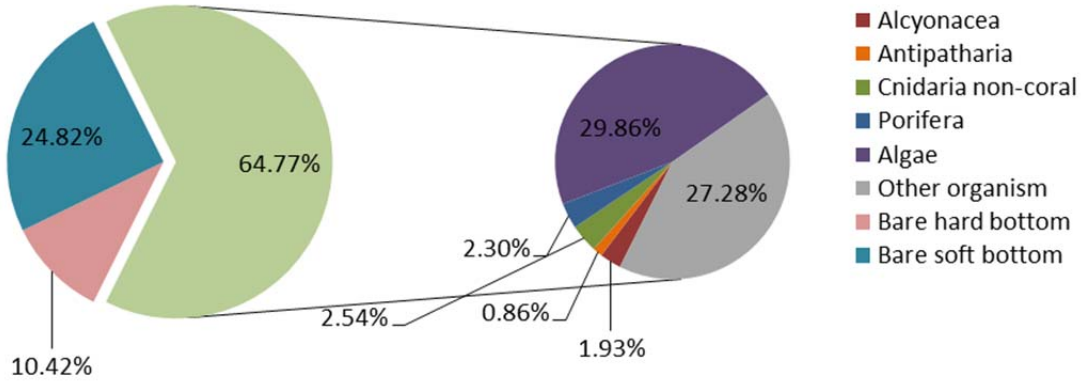


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-24. Non-scleractinian corals include Alcyonacea (primarily "gorgonacea" and soft coral) and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-24.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**56**	**2.30%**
Porifera	**56**	**2.30%**
Agelas sp.	28	1.15%
Axinellida	1	0.04%
Demospongiae	22	0.90%
Ircinia sp.	1	0.04%
Niphates sp.	1	0.04%
Spirastrellidae	3	0.12%
Cnidaria non-coral	**62**	**2.54%**
Cnidaria non-coral	**62**	**2.54%**
Hydroidolina	62	2.54%
Antipatharia	**21**	**0.86%**
Antipatharia	**21**	**0.86%**
Antipatharia	7	0.29%
Antipathes sp. A	6	0.25%
Stichopathes lutkeni	8	0.33%
Algae	**728**	**29.86%**
Algae	**728**	**29.86%**
Chlorophyta	14	0.57%
Corallinales/crustose coralline	36	1.48%
Cyanophyta	246	10.09%
Phaeophyta	242	9.93%
Rhodophyta	190	7.79%
Alcyonacea	**47**	**1.93%**
Alcyonacea	**47**	**1.93%**

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 52 m; Dive 12-24

Diodogorgia sp.	6	0.25%
Ellisella sp.	3	0.12%
Ellisellidae	16	0.66%
Gorgonacea	21	0.86%
Nephtheidae	1	0.04%
Other organism	**665**	**27.28%**
Annelida	**71**	**2.91%**
Annelida	3	0.12%
Filograna sp.	67	2.75%
Serpulidae	1	0.04%
Arthropoda	**2**	**0.08%**
Cirripedia	2	0.08%
Bryozoa	**42**	**1.72%**
Bryozoa	17	0.70%
Schizoporella sp.	25	1.03%
Chordata	**56**	**2.30%**
Ascidiacea	53	2.17%
Didemnidae	2	0.08%
Fish	1	0.04%
Other organism	**494**	**20.26%**
Other organism	494	20.26%
Hard bottom substrate	**254**	**10.42%**
Hard bottom substrate	**254**	**10.42%**
Bare rock- pavement boulder ledge	252	10.34%
Bare rubble- rock	2	0.08%
Soft bottom substrate	**605**	**24.82%**
Soft bottom substrate	**605**	**24.82%**
Bare soft bottom substrate	605	24.82%
Grand Total	**2438**	**100.00%**

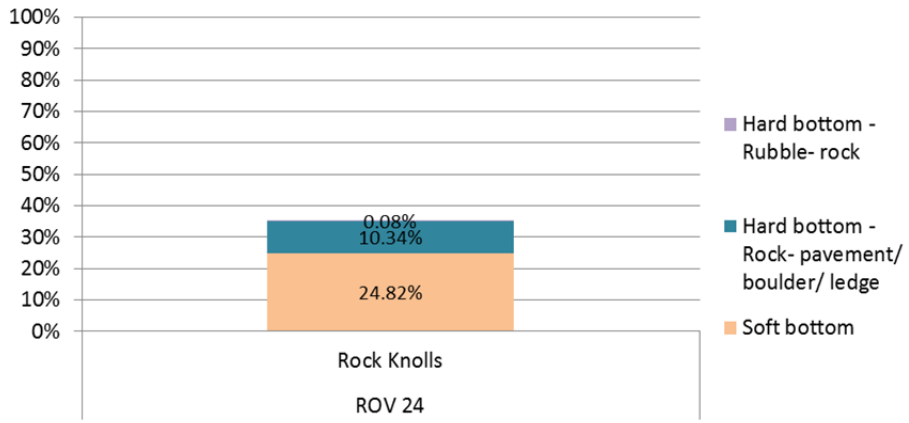


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-24.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 52 m; Dive 12-24

Figure 3 shows the percent cover of bare substrate type for the one habitat zone of the dive site. Bare rock covered ~10% of the rock knolls, and 24.8% was bare sediment which was likely a thin layer over pavement. Figure 4 shows the rock knolls to have 64% cover of biota which were dominated by algae (29.8% cover), and few Porifera (2.3%), hydroids (2.5%), Antipatharia (0.8%), and Alcyonacea (1.9%).

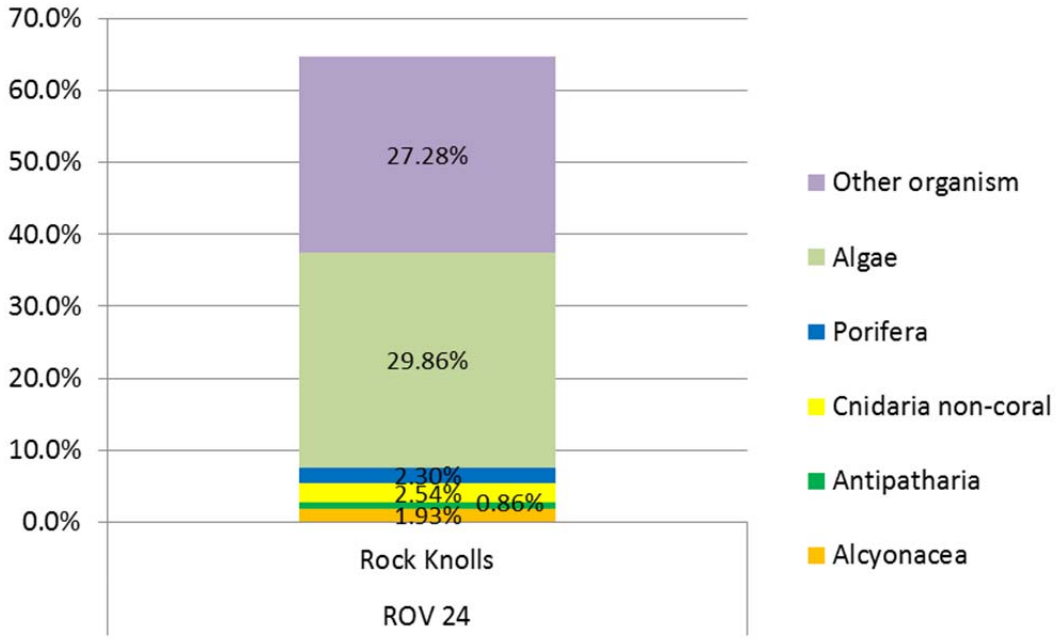


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-24.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 52 m; Dive 12-24

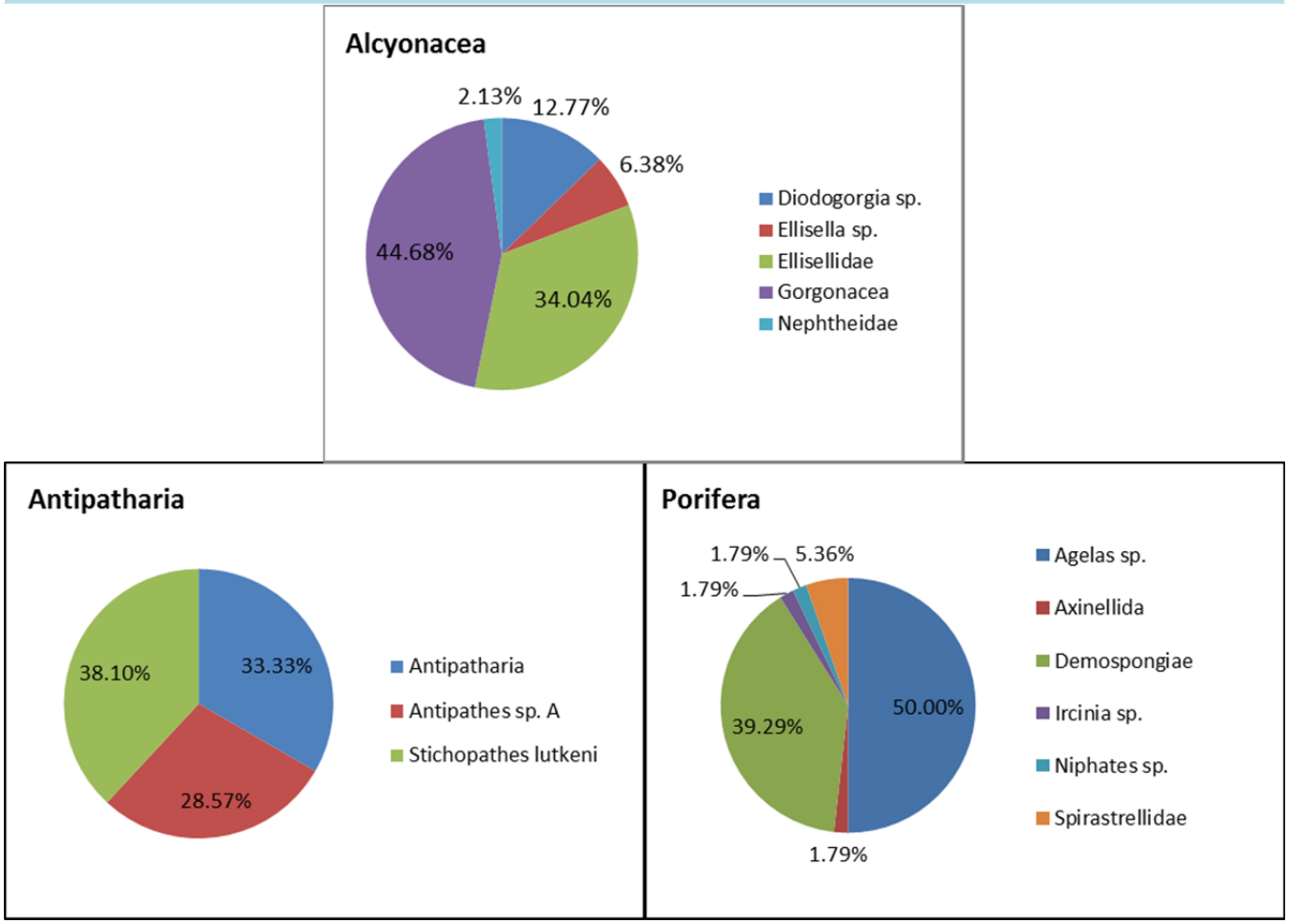


Figure 5. Diversity of corals and sponges at dive site ROV 12-24; CPCe analysis showing percent of total for each taxa category. Non-scleractinian coral includes Alcyonacea ("gorgonacea" and soft corals) and Antipatharia (black coral); Porifera are Demospongiae.

No hard coral was present at the dive site. Non-scleractinian coral included at least 5 taxa of Alcyonacea including unidentified Ellisellidae (34% of the total Alcyonacea), *Diodogorgia* sp. (12.7%), *Ellisella* sp. (6.3), and a soft coral Nephtheidae (2.1%). Antipatharia were dominated by *Stichopathes lutkeni* (38.1% of the total Antipatharia), *Antipathes* sp. A (28.5%), and other unidentified Antipatharia (33.3%). Sponges included *Agelas* sp. (50% of the total Porifera), unidentified Demospongiae (39.2%), and Spirastrellidae (5.3%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 27 taxa of fish were identified from dive ROV 24 for a total density of 214.5 individuals/km (Table 3). These were dominated by shaprnose puffer (54.7/km), wrasse (45.7), and damselfish (16.7). Managed species included hogfish (1.3/km), graysby (0.6), scamp (0.6), and amberjack (0.3).

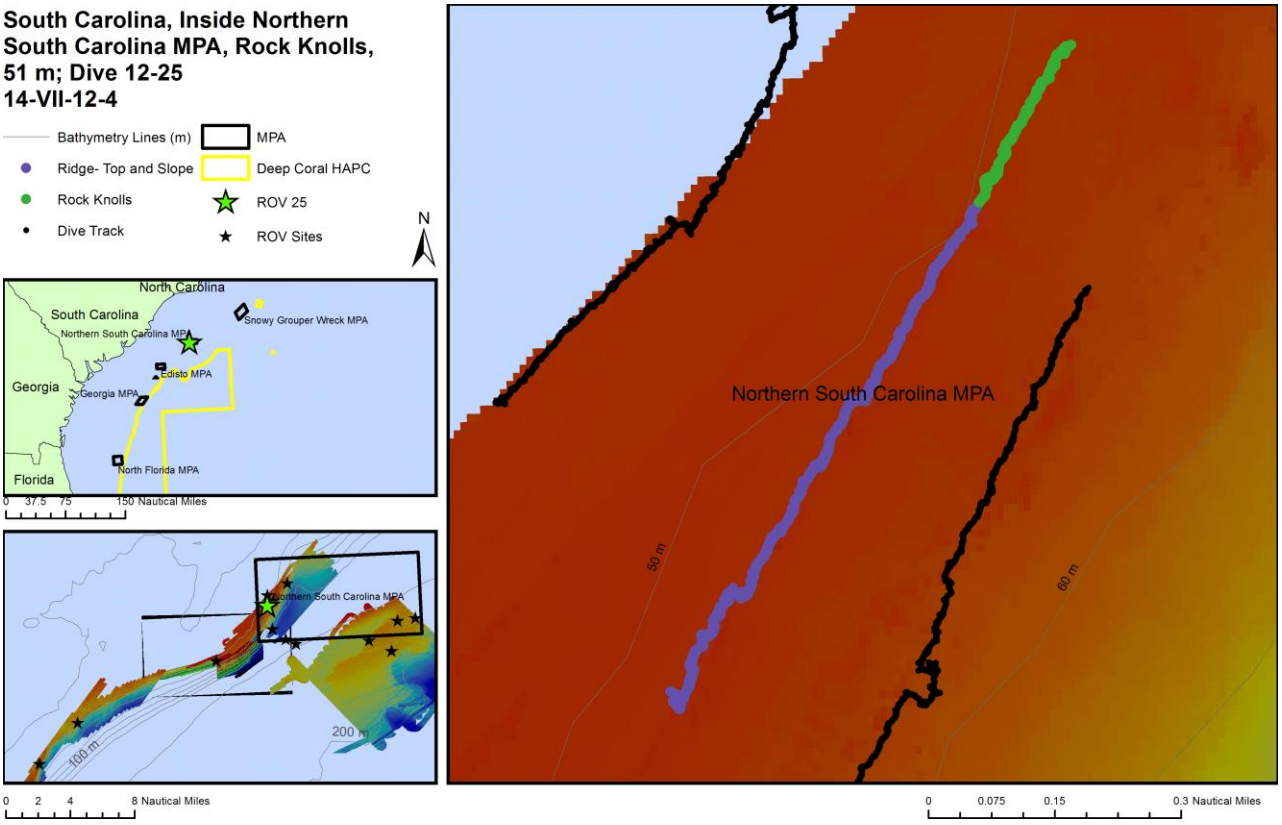
Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 52 m; Dive 12-24

Table 3. Density of fish for all transects at dive site ROV 12-24 (number individuals/km).

Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Bodianus pulchellus	spotfin hogfish	12	3.11	3.9
Calamus sp.	porgy	14	3.11	4.5
Canthigaster rostrata	sharpnose puffer	170	3.11	54.7
Centropyge argi	cherubfish	2	3.11	0.6
Chaetodon ocellatus	spotfin butterflyfish	10	3.11	3.2
Chaetodon sedentarius	reef butterflyfish	45	3.11	14.5
Chromis enchrysurus	yellowtail reeffish	22	3.11	7.1
Chromis insolatus	sunshinefish	33	3.11	10.6
Chromis scotti	purple reeffish	20	3.11	6.4
Chromis sp.	damselfish	52	3.11	16.7
Epinephelus cruentatus	graysby	2	3.11	0.6
Halichoeres garnoti	yellowhead wrasse	3	3.11	1.0
Halichoeres sp.	wrasse	142	3.11	45.7
Holacanthus bermudensis	blue angelfish	12	3.11	3.9
Holacanthus tricolor	rock beauty	5	3.11	1.6
Holocentrus sp.	squirrelfish	13	3.11	4.2
Lachnolaimus maximus	hogfish	4	3.11	1.3
Liopropoma eukrines	wrasse bass	3	3.11	1.0
Mycteroperca phenax	scamp	2	3.11	0.6
Myrichthys ocellatus	goldspotted snake eel	1	3.11	0.3
Pterois volitans	lionfish	23	3.11	7.4
Rypticus sp.	soapfish	1	3.11	0.3
Seriola sp.	amberjack	1	3.11	0.3
Serranus annularis	orangeback bass	12	3.11	3.9
Serranus phoebe	tattler	32	3.11	10.3
Sparisoma atomarium	greenblotch parrotfish	18	3.11	5.8
Stegastes partitus	bicolor damselfish	13	3.11	4.2
Total		667		214.5

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 51 m; Dive 12-25

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andrew W. David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	OE_Block2 (Unknown)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/14/2012
Specimens:	
Digital Photos:	144
DVD:	2
Hard Drive:	1

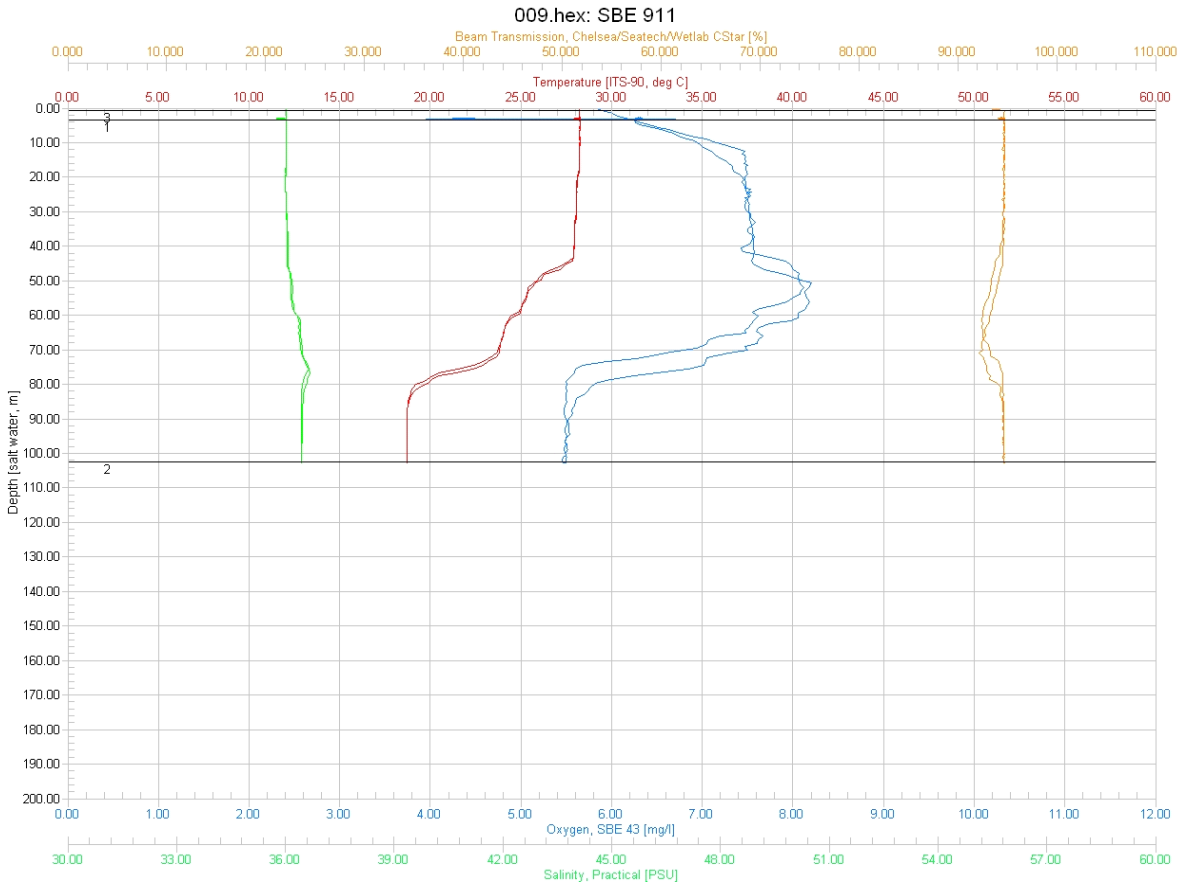
Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 51 m; Dive 12-25

Dive Data:

Minimum Bottom Depth (m):	48	**Total Transect Length (km):**	4.151
Maximum Bottom Depth (m):	50	**Surface Current (kn):**	0.5
On Bottom (Time- GMT):	12:05	**On Bottom (Lat/Long):**	32.84°N; -78.27°W
Off Bottom (Time- GMT):	14:01	**Off Bottom (Lat/Long):**	32.86°N; -78.26°W
Physical (bottom); Temp (°C):	23.88	**Salinity:** 36.20 **Visibility (ft):** 30	**Current (kn):** 0.1

Physical Environment:

Distance from Dive Site(km): 2.84



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (101 m): temperature- 18, salinity- 36.2, and dissolved oxygen- 5.2. Surface temperature was 28.5 and there was a thermocline near 42-50 and 70-80 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 50 m. Visibility was estimated at 30 ft from the ROV video.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 51 m; Dive 12-25

Dive Imagery:

Figure 1: -46.8 m
Dense *Dictyota* algae on rocky hardbottom.

Figure 2: -48.7 m
Scamp grouper on *Dictyota* algal covered rock boulders.

Figure 3: -49.7 m
Jackknife fish shoal near *Dictyota* algal covered rock outcrops.

Figure 4: -49.3 m
Grunt on *Dictyota* algal covered rock outcrops.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 51 m; Dive 12-25

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 25, Site #- 14-VII-12-4. Target Site – South Carolina, Northern S.C. MPA; 50 m. ROV survey inside MPA and ground truth multibeam sonar of the site. Conduct video/photo transect of new site; very faint, light orange ridge on multibeam.
ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.4 kn from S; bottom 0.1.

Site Description/Habitat/Biota:
Transect starts on flat rock pavement and scattered 1/2 m rock boulders with dense Phaeophyta cover. Reef areas with 1/2 - 1 m relief rock and ledges with nearly 100% cover of algae. Part of transect along narrow rock ridge, 1/2 m relief, oriented NE-SW. End of transect on flat sediment and pavement with scattered smooth, rounded rock mounds, 10-20 m diameter, 2 m relief, 48 m at top and 50 m at base.

Dominant Benthic Biota: Gorgonacea- Diodogorgia, *Ellisella* (whip), Ellisellidae, *Leptogorgia*, *Telesto*, *Swiftia exserta*; Hydroida; Demospongiae- *Agelas*, *Aplysina*, *Callyspongia vaginalis*, *Ircinia campana*; Annelida- *Filograna*; Asteroidea- *Narcissia trigonaria*; Ascidiacea- Didemnidae, *Eudistoma*; Chlorophyta- *Codium*, stalk blades; Phaeophyta- *Dictyota* (abundant), *Padina*, *Sargassum*, *Spatoglossum*; Rhodophyta- stalked blades, *Halymenia*?, *Rhodomenia*?.
Fish: bank butterfly, greater amberjack, blue angelfish, cowfish, cubbyu, graysby, hogfish, jackknife fish, parrotfish, reef butterflyfish, rock beauty, rock hind, scamp (few), snowy (1), soapfish, Spanish hogfish, spotfin hogfish, tang, squirrelfish, tattler, tomtate, white grunt (common), wrasse bass, yellowhead wrasse, lionfish (24).

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 51 m; Dive 12-25

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-25 conducted a survey near the west border of the MPA along a SW-NE oriented ridge which was barely evident in the multibeam sonar map. Dive transects were divided into two habitat zones: Ridge- Top and Slope, and Rock Knolls. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). The site was a narrow SW-NE oriented ridge of rock pavement and low relief on the west slope; at the base was a series of 1-2 m tall rock knolls; 47-51 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-25. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 25	South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 51 m; Dive 12-25				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	Narrow Ridge, NE-SW, 48-49 m 0.5-1 m relief, mostly rock pvmt and low relief west ridge				
	Ridge- Top and Slope	On Reef	LRu	LR	RLF
Transect 2	Series of 1-2 m rock smooth knolls, 49 m on top, 51 base				
	Rock Knolls	On Reef	LRu	MR	RLF

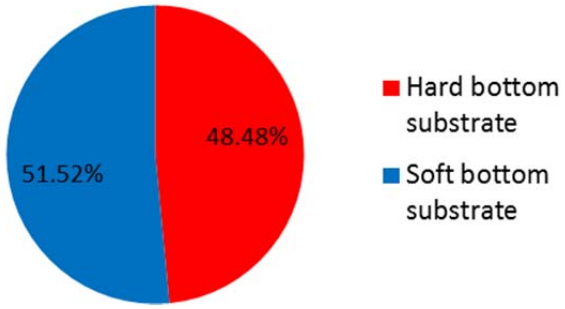


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-25. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-25 was nearly equal cover of soft bottom (51%) and hard bottom (48%) which was primarily rock pavement and 1-2 m smooth rock knolls.

Bare rock substrate without biota covered 3.12% of the bottom and bare soft bottom was 28.24% (Fig. 2, Table 2). Benthic macro-biota covered 68.64% of the bottom and consisted of 0.56% non-coral Cnidaria (Hydrozoa),

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 51 m; Dive 12-25

0.71% Porifera, 0.08% Antipatharia, 0.19% Alcyonacea ("gorgonacea"), and 50.43% algae which was dominated by Phaeophyta (38.9% cover), fleshy Rhodophyta (4.2%), cyanobacteria (6.1%), and Chlorophyta (0.7%).

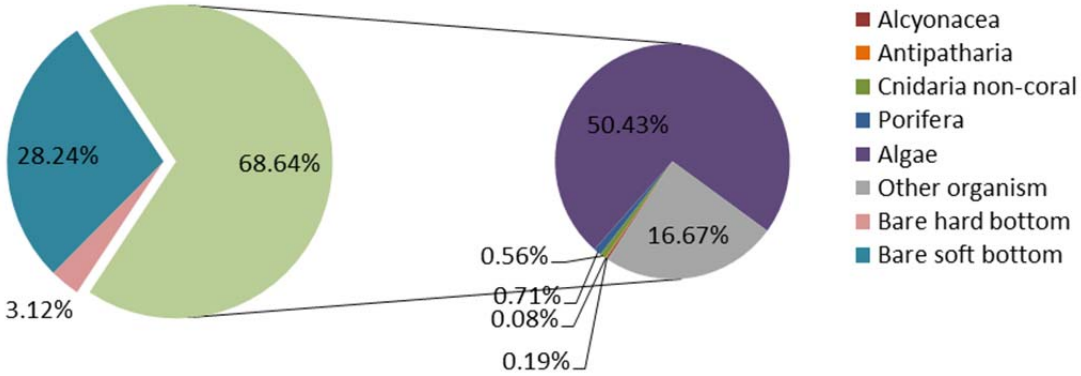


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-25. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-25.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**19**	**0.71%**
Porifera	**19**	**0.71%**
Agelas sp.	3	0.11%
Chondrosia sp.	2	0.08%
Demospongiae	3	0.11%
Geodia sp.	2	0.08%
Ircinia campana	6	0.23%
Ircinia sp.	1	0.04%
Niphates sp.	2	0.08%
Cnidaria non-coral	**15**	**0.56%**
Cnidaria non-coral	**15**	**0.56%**
Hydroidolina	15	0.56%
Antipatharia	**2**	**0.08%**
Antipatharia	**2**	**0.08%**
Antipatharia	2	0.08%
Algae	**1343**	**50.43%**
Algae	**1343**	**50.43%**
Chlorophyta	21	0.79%
Corallinales/crustose coralline	7	0.26%
Cyanophyta	163	6.12%
Phaeophyta	1038	38.98%
Rhodophyta	114	4.28%
Alcyonacea	**5**	**0.19%**

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 51 m; Dive 12-25

Alcyonacea	**5**	**0.19%**
Ellisella sp.	4	0.15%
Ellisellidae	1	0.04%
Other organism	**444**	**16.67%**
Annelida	**12**	**0.45%**
Filograna sp.	12	0.45%
Bryozoa	**35**	**1.31%**
Bryozoa	32	1.20%
Schizoporella sp.	3	0.11%
Chordata	**25**	**0.94%**
Ascidiacea	23	0.86%
Fish	2	0.08%
Other organism	**372**	**13.97%**
Other organism	372	13.97%
Hard bottom substrate	**83**	**3.12%**
Hard bottom substrate	**83**	**3.12%**
Bare rock- pavement boulder ledge	83	3.12%
Soft bottom substrate	**752**	**28.24%**
Soft bottom substrate	**752**	**28.24%**
Bare soft bottom substrate	752	28.24%
Grand Total	**2663**	**100.00%**

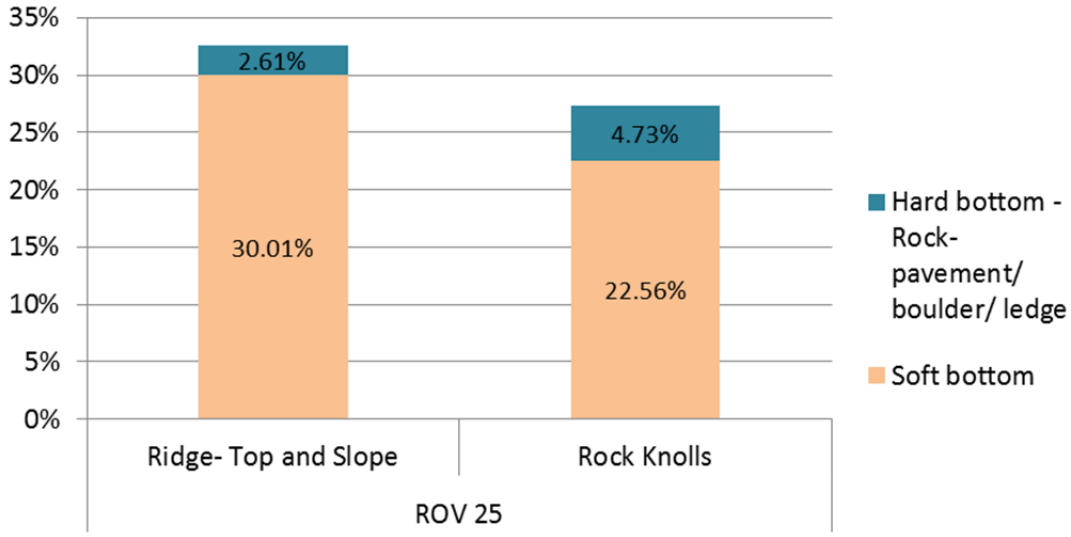


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-25.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The ridge top and slope had about 2.6% cover of bare rock substrate compared to 4.7% for the rock knolls at the base of the ridge. Some of the exposed bare soft sediment may be a thin layer over rock pavement. Figure 4 shows about equal cover of biota on the ridge (~68%) compared to the rock knolls habitat zone (~72%). Both zones were predominately covered with algae (52.7 and 42.9%, respectively), and low cover of other Cnidaria and sponges.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 51 m; Dive 12-25

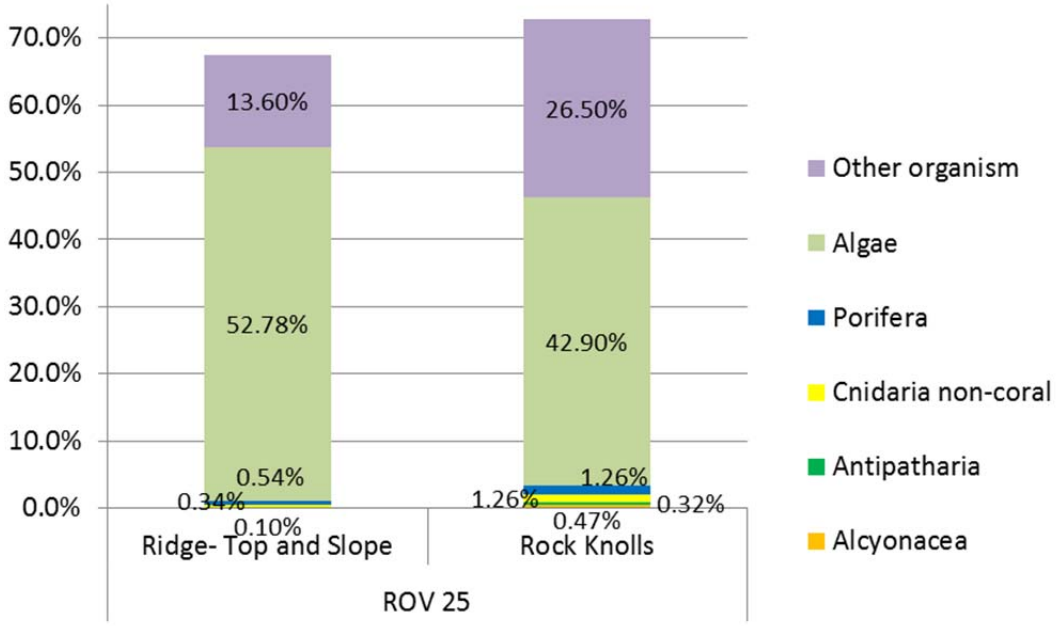


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-25.

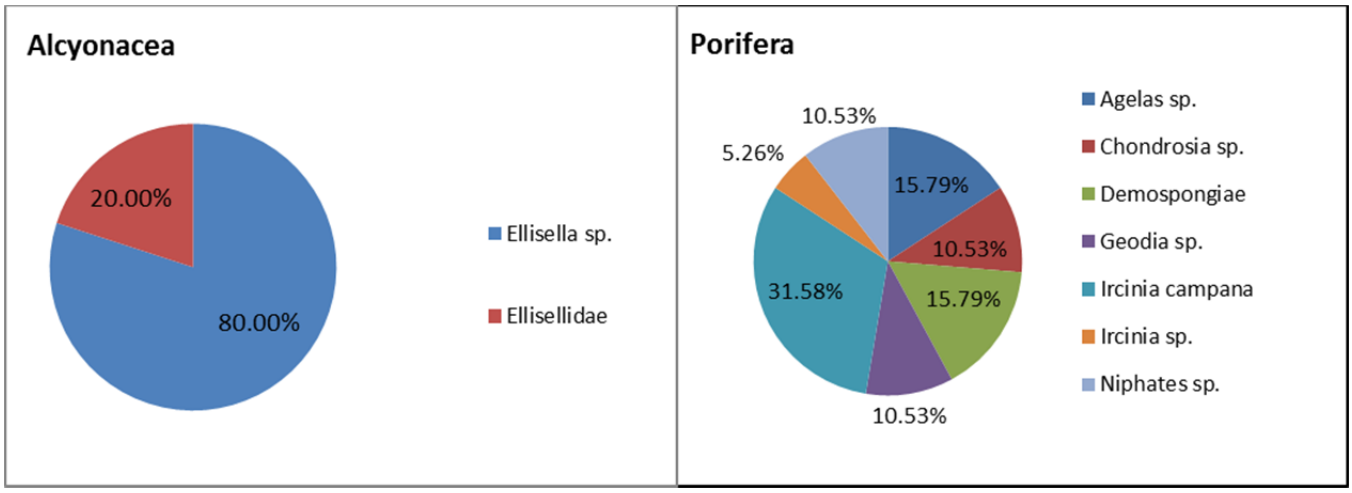


Figure 5. Diversity of corals and sponges at dive site ROV 12-25; CPCe analysis showing percent of total for each taxa category. Non-scleractinian coral includes Alcyonacea ("gorgonacea") and Antipatharia (black coral); Porifera are Demospongiae.

No hard coral was present at the dive site. One species of Antipatharia was counted. Alcyonacea consisted of *Ellisella* sp. (80% of the total Alcyonacea) and other unidentified Ellisellidae (20%). Sponges were relatively diverse with *Ircinia campana* (31.5% of the total Porifera), *Agelas* sp. (15.7%), *Chondrosia* sp. (10.5%), *Geodia* sp. (10.5%), and *Niphates* sp. (10.5%).

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 51 m; Dive 12-25

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 45 taxa of fish were identified from dive ROV 25 for a total density of 598.1 individuals/km (Table 3). These were dominated by tomtate (345.3/km), sharpnose puffer (70.4), and wrasse (34.7). Managed species included scamp (2.9/km), hogfish (0.7), red grouper (0.5), red porgy (0.5), graysby (1.0), snowy grouper (0.2), and rock hind (0.2).

Table 3. Density of fish for all transects at dive site ROV 12-25 (number individuals/km).

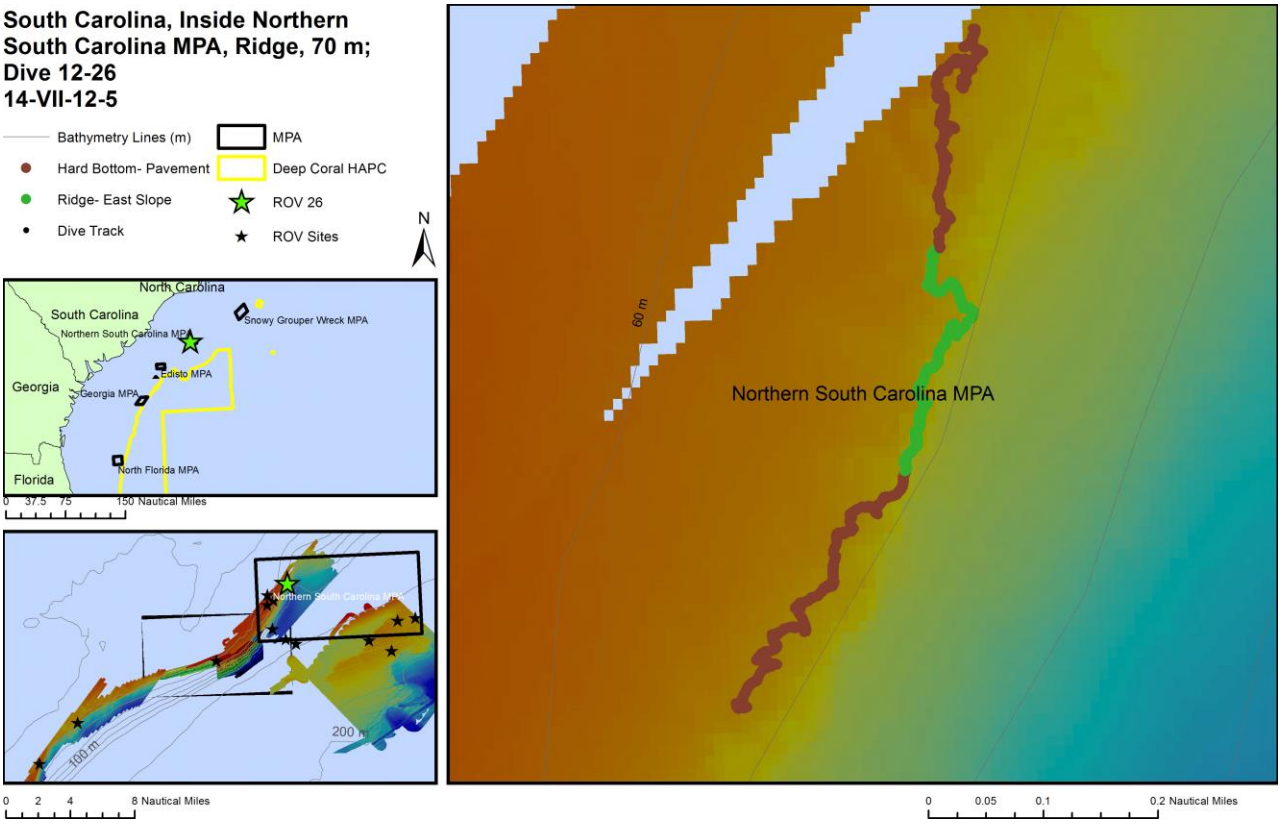
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus sp.	doctorfish	31	4.15	7.5
Balistes capriscus	grey triggerfish	1	4.15	0.2
Bodianus pulchellus	spotfin hogfish	42	4.15	10.1
Calamus sp.	porgy	41	4.15	9.9
Canthigaster rostrata	sharpnose puffer	292	4.15	70.4
Centropristis ocyurus	bank sea bass	4	4.15	1.0
Chaetodon ocellatus	spotfin butterflyfish	27	4.15	6.5
Chaetodon sedentarius	reef butterflyfish	40	4.15	9.6
Chromis cyanea	blue chromis	11	4.15	2.7
Chromis enchrysurus	yellowtail reeffish	8	4.15	1.9
Chromis insolatus	sunshinefish	4	4.15	1.0
Chromis scotti	purple reeffish	28	4.15	6.7
Chromis sp.	damselfish	10	4.15	2.4
Epinephelus adscensionis	rock hind	1	4.15	0.2
Epinephelus cruentatus	graysby	4	4.15	1.0
Epinephelus morio	red grouper	2	4.15	0.5
Epinephelus niveatus	snowy grouper	1	4.15	0.2
Equetus lanceolatus	jack-knife fish	15	4.15	3.6
Equetus umbrosus	cubbyu	111	4.15	26.7
Haemulon aurolineatum	tomtate	1433	4.15	345.3
Haemulon plumieri	white grunt	14	4.15	3.4
Halichoeres garnoti	yellowhead wrasse	14	4.15	3.4
Halichoeres sp.	wrasse	144	4.15	34.7
Holacanthus bermudensis	blue angelfish	19	4.15	4.6
Holacanthus tricolor	rock beauty	11	4.15	2.7
Holocentrus sp.	squirrelfish	30	4.15	7.2
Lachnolaimus maximus	hogfish	3	4.15	0.7
Lactophrys sp.	cowfish	2	4.15	0.5
Liopropoma eukrines	wrasse bass	4	4.15	1.0
Lutjanus sp.	snapper	2	4.15	0.5
Mycteroperca phenax	scamp	12	4.15	2.9
Myrichthys ocellatus	goldspotted snake eel	1	4.15	0.2

Dive Site: South Carolina, Inside Northern South Carolina MPA, Rock Knolls, 51 m; Dive 12-25

Myripristis jacobus	blackbar soldierfish	1	4.15	0.2
Pagrus pagrus	red porgy	2	4.15	0.5
Pomacanthus paru	french angelfish	2	4.15	0.5
Priacanthus arenatus	bigeye	2	4.15	0.5
Prognathodes aya	bank butterflyfish	3	4.15	0.7
Pseudupeneus maculatus	spotted goatfish	9	4.15	2.2
Pterois volitans	lionfish	26	4.15	6.3
Rypticus sp.	soapfish	1	4.15	0.2
Seriola rivoliana	almaco jack	1	4.15	0.2
Serranus annularis	orangeback bass	5	4.15	1.2
Serranus phoebe	tattler	19	4.15	4.6
Sparisoma atomarium	greenblotch parrotfish	38	4.15	9.2
Stegastes partitus	bicolor damselfish	11	4.15	2.7
Total		2482		598.1

Dive Site: South Carolina, Inside Northern South Carolina MPA, Ridge, 70 m; Dive 12-26

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andrew W. David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	OE_Block2 (Unknown)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/14/2012
Specimens:	
Digital Photos:	81
DVD:	2
Hard Drive:	1

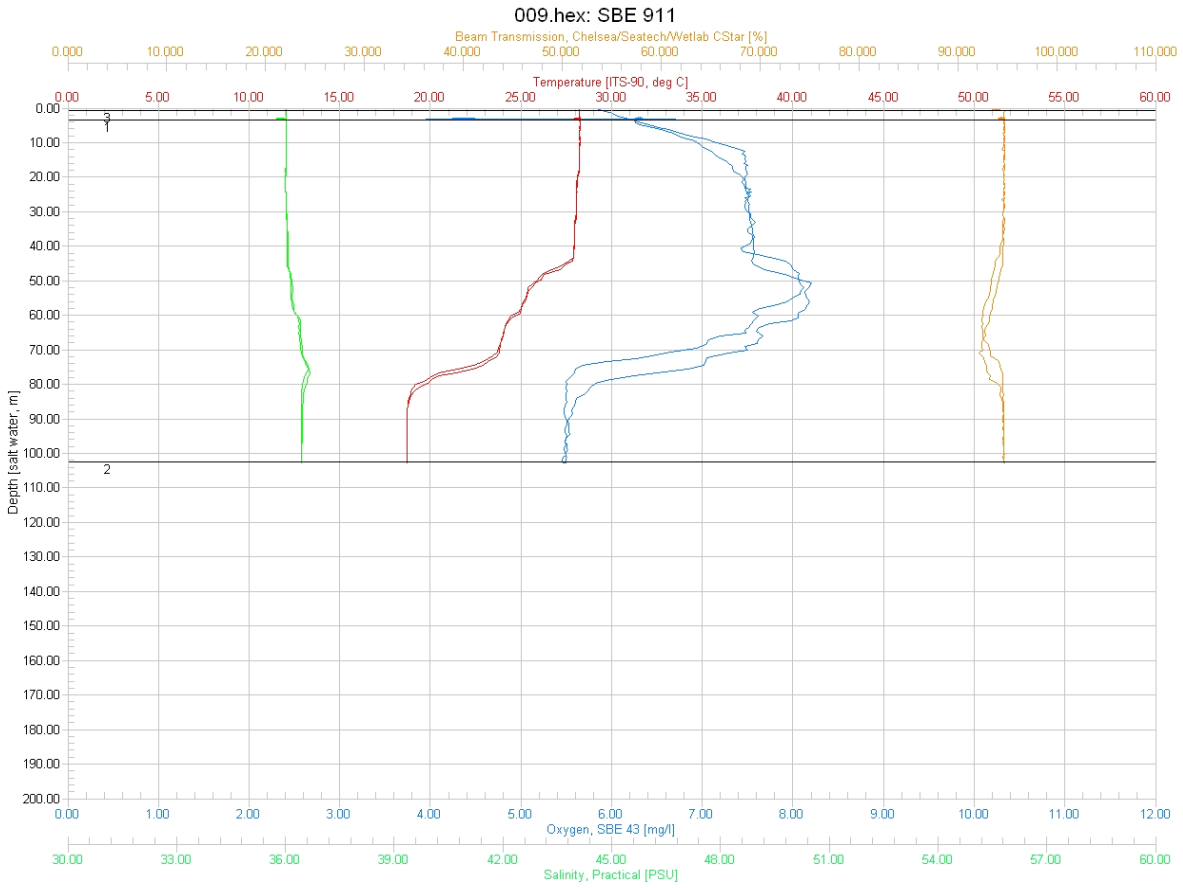
Dive Site: South Carolina, Inside Northern South Carolina MPA, Ridge, 70 m; Dive 12-26

Dive Data:

Minimum Bottom Depth (m):	63	**Total Transect Length (km):**	3.450
Maximum Bottom Depth (m):	70	**Surface Current (kn):**	.25
On Bottom (Time- GMT):	14:35	**On Bottom (Lat/Long):**	32.87°N; -78.24°W
Off Bottom (Time- GMT):	16:11	**Off Bottom (Lat/Long):**	32.88°N; -78.24°W
Physical (bottom); Temp (°C):	20.80	**Salinity:** 36.20 **Visibility (ft):** 30	**Current (kn):** 0.2

Physical Environment:

Distance from Dive Site(km): 5.58



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (101 m): temperature- 18, salinity- 36.2, and dissolved oxygen- 5.2. Surface temperature was 28.7 and there was a thermocline near 42-50 and 70-80 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 50 m. Visibility was estimated at 30 ft from the ROV video.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Ridge, 70 m; Dive 12-26

Dive Imagery:

Figure 1: -66.4 m
Hogfish (male) over sediment veneered hard bottom.

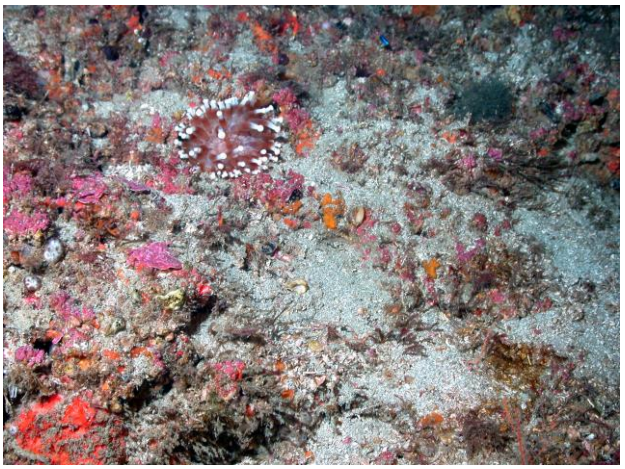


Figure 2: -62.6 m
Anemone on low relief pavement.

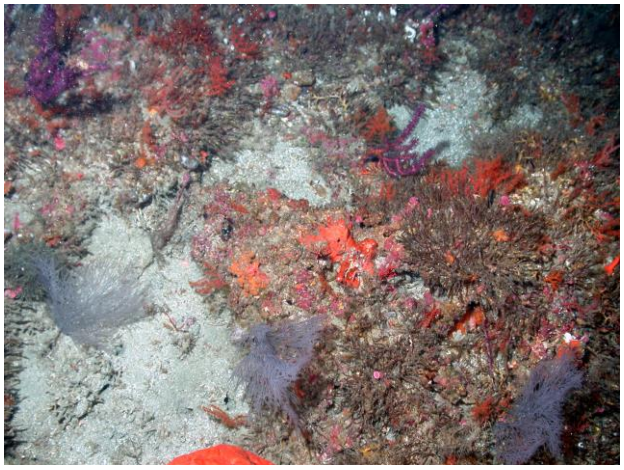


Figure 3: -68.5 m
White mesh antipatharians, gorgonians, and encrusting sponges on low relief hardbottom.

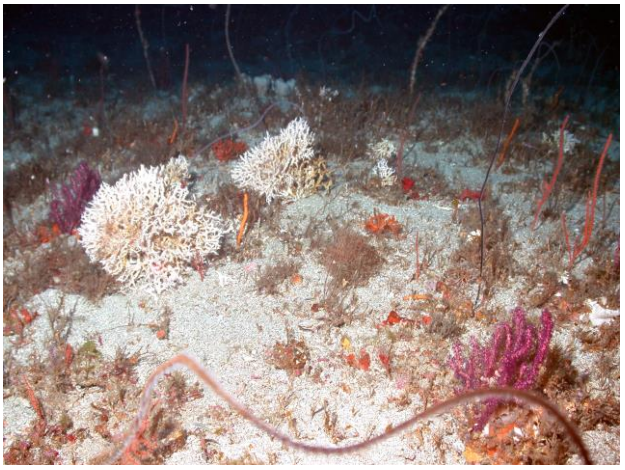


Figure 4: -65.1 m
Filograna polychaete colonies, purple plexaurids and *Stichopathes* black coral on low relief hardbottom.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Ridge, 70 m; Dive 12-26

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 26, Site #- 14-VII-12-5. Target Site – South Carolina, Northern S.C. MPA; 65 m. ROV survey inside MPA and ground truth multibeam sonar of the site. Conduct video/photo transect of new site multibeam.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.25 kn from S; bottom 0.2 kn.

Site Description/Habitat/Biota:
Transect starts at 65 m on flat rock pavement with sediment veneer, rubble, and cobble; sparse 1 m diameter exposed rock, excavated by fish, 10 cm relief, about 10-30% exposed rock cover. Few 1/4 m boulders, fairly barren rock. Rock ridge from 65 to 70 m with 10o slope to the east, some 1 m ledges and eroded exposed rock at 69 m. Continue transect parallel to rock slope to the NE. Sediment and rock pavement at the base of the slope at 70 m.

Dominant Benthic Biota: Gorgonacea- *Diodogorgia*?, *Ellisella* (whip), Ellisellidae, *Titanideum frauenfeldii*; Hydroida; Antipatharia- *Stichopathes*, spp; Actiniaria; Demospongiae- *Agelas*?, *Aplysina*, *Astrophorida*, *Cinachyra*?, *Ircinia campana*; Asteroidea- *Narcissia trigonaria*; Crinoidea; Annelida- *Filograna*; Chlorophyta; Phaeophyta- unid. spp.
Fish: greater amberjack, bank butterfly, reef butterfly, cubbyu, graysby, hogfish, porgy, scamp (few), short bigeye, spotfin butterfly, tattler, white grunt, wrasse bass, yellowtail reeffish, lionfish (12).

Dive Site: South Carolina, Inside Northern South Carolina MPA, Ridge, 70 m; Dive 12-26

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-26 conducted a survey near the west border of the MPA along a S-N oriented ridge which is evident in the multibeam sonar map. Dive transects were divided into two habitat zones: Hard Bottom- Pavement and Ridge- East Slope. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). The east slope of the ridge was a 5-m drop-off of high rugosity with 1-2 m ledges on a 10-20^{o} slope; 56-70 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-26. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 26	South Carolina, Inside Northern South Carolina MPA, Ridge, 70 m; Dive 12-26				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	65 m Flat Pvmt, sed veneer, east edge of HB zone				
	Hard Bottom- Pavement	On Reef	LRu	LR	PF
Transect 2	East Edge of ridge, 70 m base, 65 m top. 10-20 ° slope, ledges 1-2 m; 67m base 62m top				
	Ridge- East Slope	On Reef	HRu	HR	RLF
Transect 3	56 m pvmt, sed veneer.				
	Hard Bottom- Pavement	On Reef	LRu	LR	PF

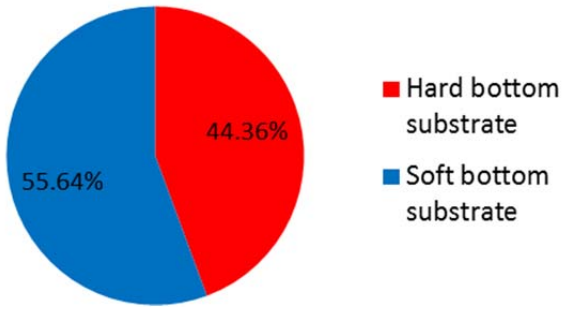


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-26. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-26 was predominately soft bottom (55.64%); the hard bottom substrate consisted of rock pavement, rock slabs and 1-2 m ledges.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Ridge, 70 m; Dive 12-26

Bare rock substrate without biota covered 20.13% of the bottom and bare soft bottom was 52.02% (Fig. 2, Table 2). Benthic macro-biota covered 27.85% of the bottom and consisted of 1.13% non-coral Cnidaria (Hydrozoa), 1.6% Porifera, 1.6% Antipatharia, 3.27% Alcyonacea ("gorgonacea"), and 2.08% algae.

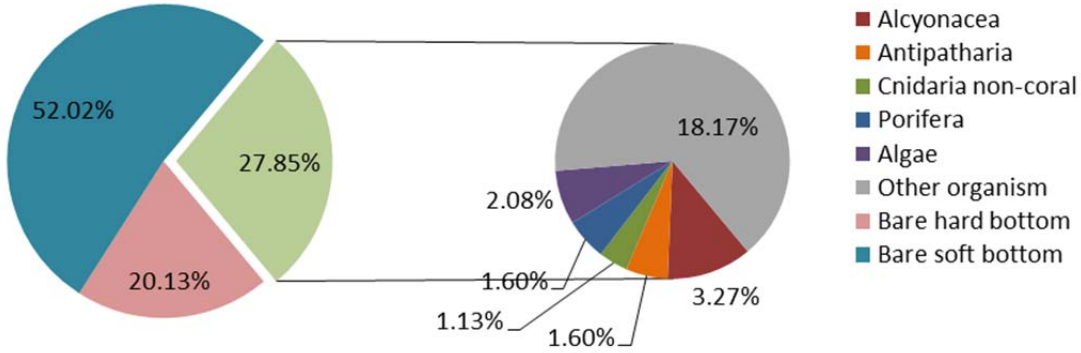


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-26. Non-scleractinian corals include Alcyonacea ("gorgonacea" and soft coral) and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida, Zoanthidea, and Corallimorpharia.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-26.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**27**	**1.60%**
Porifera	**27**	**1.60%**
Agelas sp.	3	0.18%
Demospongiae	18	1.07%
Polymastia sp.	1	0.06%
Spirastrellidae	5	0.30%
Cnidaria non-coral	**19**	**1.13%**
Cnidaria non-coral	**19**	**1.13%**
Corallimorpharia	2	0.12%
Hydroidolina	16	0.95%
Zoanthidea	1	0.06%
Antipatharia	**27**	**1.60%**
Antipatharia	**27**	**1.60%**
Antipatharia	10	0.59%
Stichopathes lutkeni	17	1.01%
Algae	**35**	**2.08%**
Algae	**35**	**2.08%**
Chlorophyta	2	0.12%
Corallinales/crustose coralline	26	1.54%
Cyanophyta	5	0.30%
Rhodophyta	2	0.12%
Alcyonacea	**55**	**3.27%**

Dive Site: South Carolina, Inside Northern South Carolina MPA, Ridge, 70 m; Dive 12-26

Alcyonacea	**55**	**3.27%**
Diodogorgia sp.	19	1.13%
Ellisella sp.	1	0.06%
Ellisellidae	8	0.48%
Gorgonacea	24	1.43%
Nidallia occidentalis	1	0.06%
Titanideum frauenfeldii	2	0.12%
Other organism	**306**	**18.17%**
Annelida	**40**	**2.38%**
Annelida	31	1.84%
Filograna sp.	9	0.53%
Bryozoa	**49**	**2.91%**
Bryozoa	41	2.43%
Schizoporella sp.	8	0.48%
Chordata	**38**	**2.26%**
Ascidiacea	18	1.07%
Didemnidae	14	0.83%
Fish	6	0.36%
Echinodermata	**2**	**0.12%**
Crinoidea	2	0.12%
Mollusca	**1**	**0.06%**
Bivalvia	1	0.06%
Natural detritus	**2**	**0.12%**
Natural detritus	2	0.12%
Other organism	**174**	**10.33%**
Other organism	174	10.33%
Hard bottom substrate	**339**	**20.13%**
Hard bottom substrate	**339**	**20.13%**
Bare rock- pavement boulder ledge	322	19.12%
Bare rubble- rock	17	1.01%
Soft bottom substrate	**876**	**52.02%**
Soft bottom substrate	**876**	**52.02%**
Bare soft bottom substrate	876	52.02%
Grand Total	**1684**	**100.00%**

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The hard bottom pavement was mostly barren substrate of bare rock (12.3% cover) and bare sediment (55.7%) which is possibly thin layer of sediment over the rock. The rocky eastern slope of the ridge had more bare rock (31.3%). Figure 4 shows the ridge east slope zone to have nearly 45% cover of biota compared to ~20% on the ridge pavement. Algae was the dominant biota (11.6 and 30%, respectively). Alcyonacea were common on the slope (6%), along with sponges and Antipatharia (1.8%).

Dive Site: South Carolina, Inside Northern South Carolina MPA, Ridge, 70 m; Dive 12-26

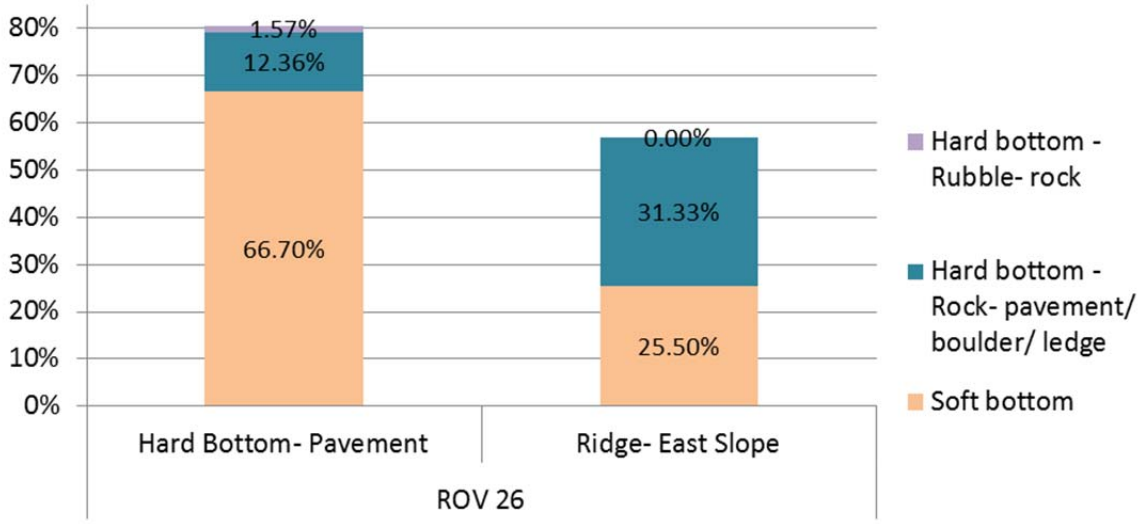


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-26.

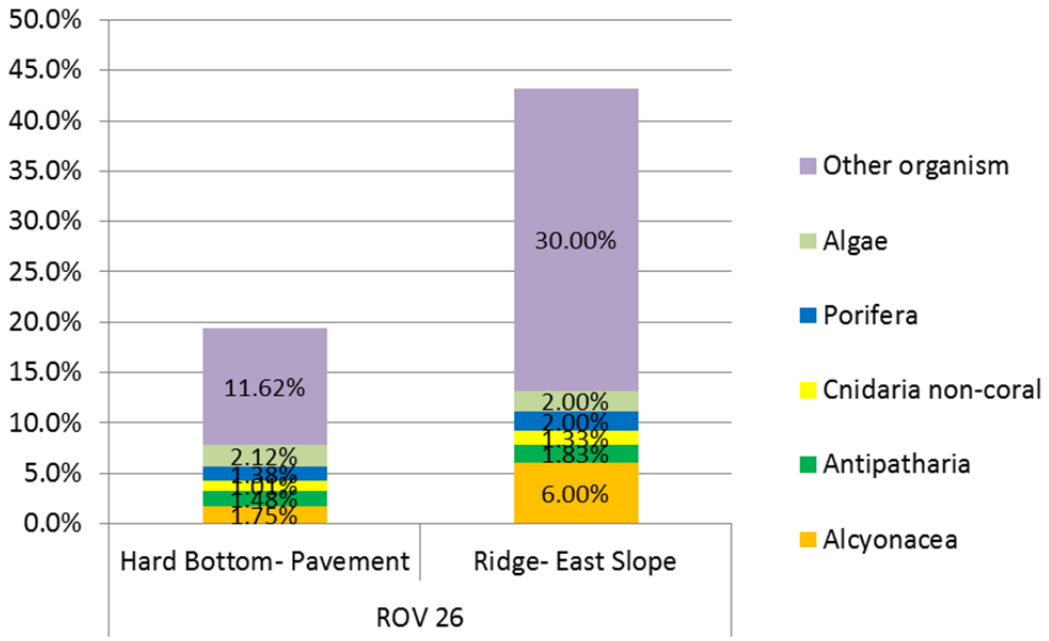


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-26.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Ridge, 70 m; Dive 12-26

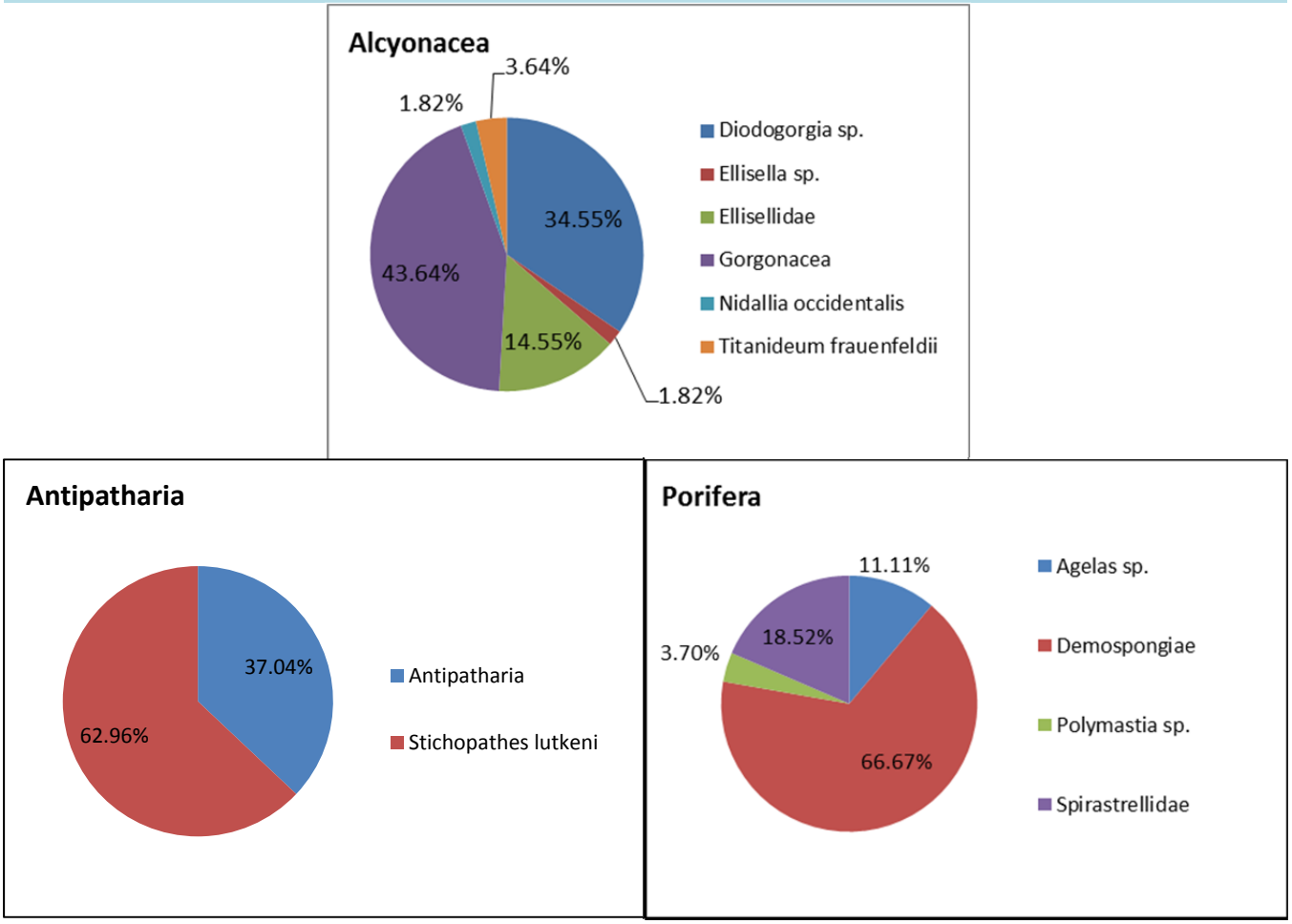


Figure 5. Diversity of corals and sponges at dive site ROV 12-26; CPCe analysis showing percent of total for each taxa category. Non-scleractinian corals include Alcyonacea ("gorgonacea" and soft corals) and Antipatharia (black coral); Porifera are Demospongiae.

No hard coral was present at the dive site. Non-scleractinian hard coral included 6 taxa of Alcyonacea which were dominated by *Diodogorgia* sp. (34.5% of the total Alcyonacea), Ellisellidae (14.5%), *Titanideum frauenfeldii* (3.6%), and the soft coral *Nidalia occidentalis* (1.8%). Sixty two percent of the Antipatharia were *Stichopathes lutkeni*, the rest were unidentified Antipatharia. Porifera were dominated by Spirastrellidae (18.5% of the total Porifera), *Agelas* sp. (11.1%), *Polymastia* sp. (3.7%), and other unidentified demosponges (66.6%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 34 taxa of fish were identified from dive ROV 26 for a total density of 339.7 individuals/km (Table 3). These were dominated by wrasse (133.9/km), yellowtail reeffish (53.6), and sharpnose puffer (27.5). Managed species included red porgy (4.6/km), amberjack (3.7), scamp (2.3), hogfish (1.4), graysby (0.6), and gag grouper (0.6).

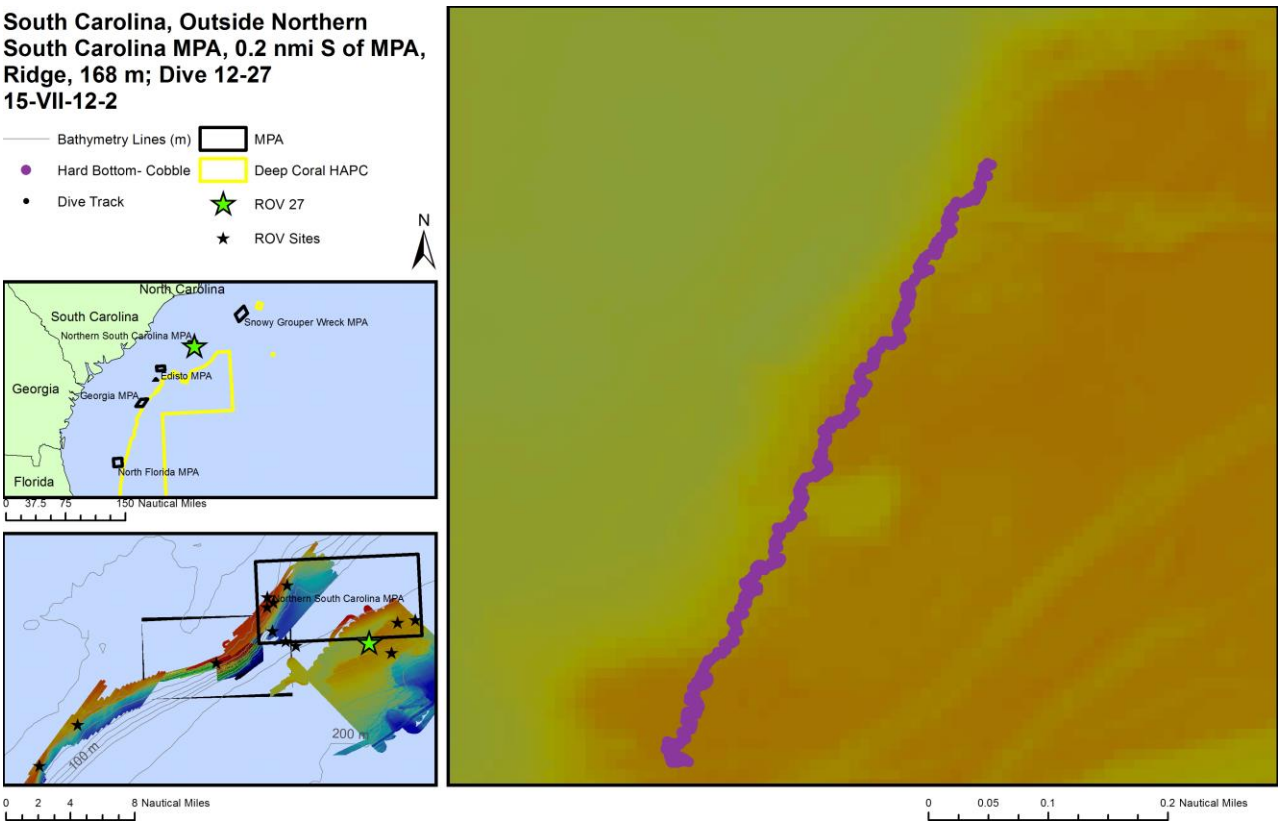
Dive Site: South Carolina, Inside Northern South Carolina MPA, Ridge, 70 m; Dive 12-26

Table 3. Density of fish for all transects at dive site ROV 12-26 (number individuals/km).

Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Anthiinae	anthiids	37	3.45	10.7
Balistes capriscus	grey triggerfish	1	3.45	0.3
Bodianus pulchellus	spotfin hogfish	9	3.45	2.6
Calamus sp.	porgy	23	3.45	6.7
Canthigaster rostrata	sharpnose puffer	95	3.45	27.5
Chaetodon ocellatus	spotfin butterflyfish	10	3.45	2.9
Chaetodon sedentarius	reef butterflyfish	54	3.45	15.7
Chromis enchrysurus	yellowtail reeffish	185	3.45	53.6
Chromis insolatus	sunshinefish	8	3.45	2.3
Chromis scotti	purple reeffish	2	3.45	0.6
Chromis sp.	damselfish	5	3.45	1.4
Epinephelus cruentatus	graysby	2	3.45	0.6
Equetus umbrosus	cubbyu	51	3.45	14.8
Haemulon plumieri	white grunt	1	3.45	0.3
Halichoeres sp.	wrasse	462	3.45	133.9
Holacanthus bermudensis	blue angelfish	13	3.45	3.8
Holocentrus sp.	squirrelfish	10	3.45	2.9
Lachnolaimus maximus	hogfish	5	3.45	1.4
Lactophrys sp.	cowfish	1	3.45	0.3
Liopropoma eukrines	wrasse bass	4	3.45	1.2
Mycteroperca microlepis	gag grouper	2	3.45	0.6
Mycteroperca phenax	scamp	8	3.45	2.3
Pagrus pagrus	red porgy	16	3.45	4.6
Pristigenys alta	short bigeye	17	3.45	4.9
Prognathodes aya	bank butterflyfish	21	3.45	6.1
Pronotogrammus martinicensis	roughtongue bass	11	3.45	3.2
Pterois volitans	lionfish	17	3.45	4.9
Seriola dumerili	greater amberjack	5	3.45	1.4
Seriola rivoliana	almack jack	2	3.45	0.6
Seriola sp.	amberjack	6	3.45	1.7
Serranus annularis	orangeback bass	4	3.45	1.2
Serranus phoebe	tattler	83	3.45	24.1
Sparidae	porgy	1	3.45	0.3
Stegastes partitus	bicolor damselfish	1	3.45	0.3
Total		1172		339.7

Dive Site: South Carolina, Outside Northern South Carolina MPA, 0.2 nmi S of MPA, Ridge, 168 m; Dive 12-27

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andrew W. David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	OE_Block2 (Unknown)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/15/2012
Specimens:	
Digital Photos:	158
DVD:	2
Hard Drive:	1

Dive Site: South Carolina, Outside Northern South Carolina MPA, 0.2 nmi S of MPA, Ridge, 168 m; Dive 12-27

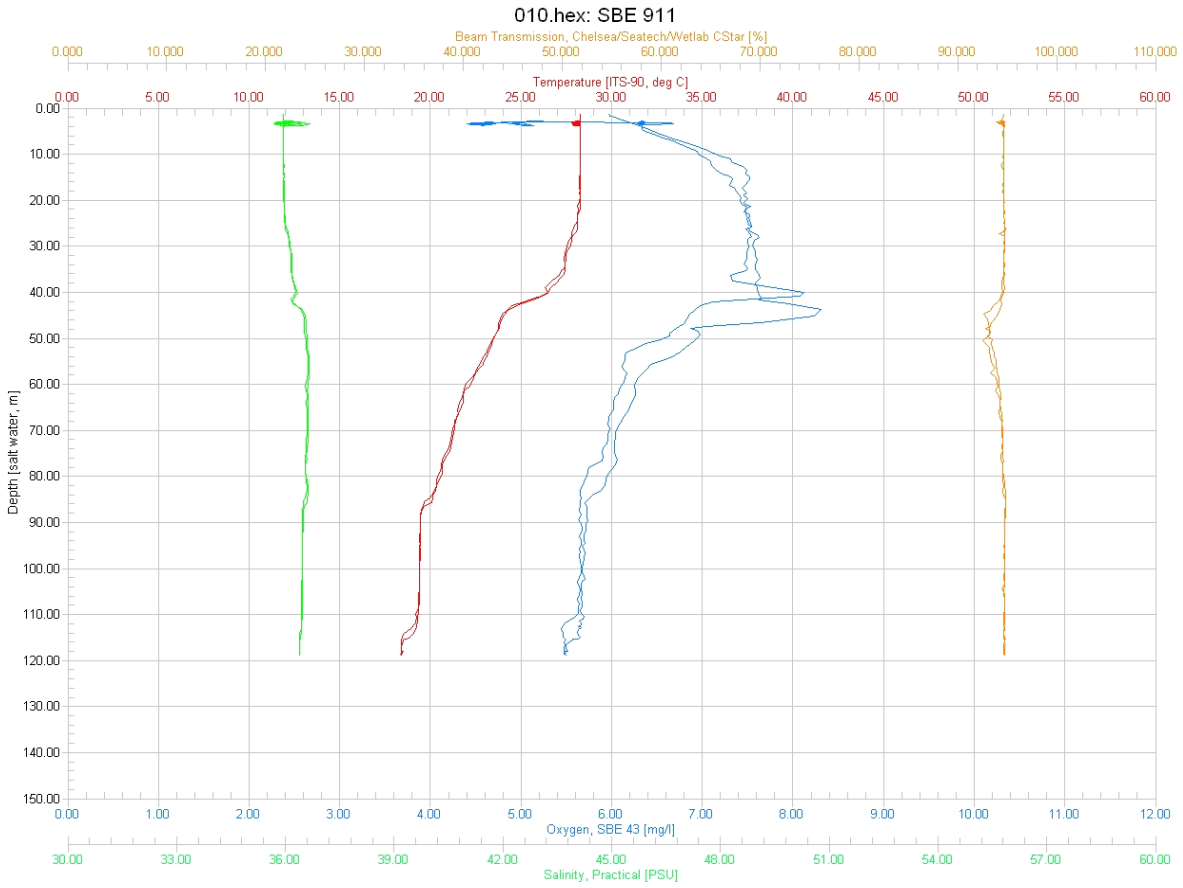
Dive Data:

Minimum Bottom Depth (m):	162	**Total Transect Length (km):**	4.242
Maximum Bottom Depth (m):	167	**Surface Current (kn):**	0.25
On Bottom (Time- GMT):	8:02	**On Bottom (Lat/Long):**	32.79°N; -78.13°W
Off Bottom (Time- GMT):	9:35	**Off Bottom (Lat/Long):**	32.8°N; -78.15°W

Physical (bottom); Temp (°C): 12.80 **Salinity:** 36.00 **Visibility (ft):** 15 **Current (kn):** 0.2

Physical Environment:

Distance from Dive Site(km): 9.59



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (119 m): temperature- 18.5, salinity- 36.1, and dissolved oxygen- 5.4. Surface temperature was 28.24 and there was a thermocline near 40 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 48 m. Visibility was estimated at 15 ft from the ROV video.

Dive Site: South Carolina, Outside Northern South Carolina MPA, 0.2 nmi S of MPA, Ridge, 168 m; Dive 12-27

Dive Imagery:

Figure 1: -167 m
Snowy grouper (left) and blueline tilefish on low relief hardbottom.

Figure 2: -161.7 m
Leiodermatium demosponge on low relief hardbottom.

Figure 3: -162 m
Holothuroidea, *Paracolochirus mysticus*, on low relief hardbottom.

Figure 4: -165.1 m
Majidae crab and hexactinellid sponges on low relief hardbottom.

Dive Site: South Carolina, Outside Northern South Carolina MPA, 0.2 nmi S of MPA, Ridge, 168 m; Dive 12-27

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 27, Site #- 15-VII-12-2. Target Site – outside and south of South Carolina, Northern S.C. MPA; 175 m. ROV survey outside MPA and ground truth new Pisces multibeam sonar map of the site. Conduct video/photo transect on low relief hard bottom of multibeam.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.25 kn from S; bottom 0.2.

Site Description/Habitat/Biota:
Rock pavement with sediment veneer, 10 cm cobble, 30-80% cover, 30 cm exposed rock; 162 m at start of transect, 167 m at end.

Dominant Benthic Biota: Gorgonacea- Swiftia; Demospongiae- Astrophorida, *Desmacella*, *Leiodermatium*, Pachastrellidae, *Spongosorites*, *Zyzzya*; Hexactinellida- *Farrea*; Annelida- Serpulidae; Echinoidea- Cidaroidea; Holothuroidea: *Holothuria lentiginosa enodis*?, *Paracolochirus mysticus*; Gastropoda- *Perotrochus quoyanus*?, *Volutidae*?; Arthropods- Decapoda crabs, hermit crabs, Majidae.
Fish: anthiids, apricot bass, bank butterflyfish, black bellied rosefish, blackbar drum, blueline tilefish, boarfish, French butterflyfish, Gephyroberyx, Laemonema, longspine snipefish, red hogfish, red porgy, saddle bass, saddleback, scorpion fish, sea robin, short bigeye, snipe, snowy grouper, squirrelfish, NO LIONFISH.

Dive Site: South Carolina, Outside Northern South Carolina MPA, 0.2 nmi S of MPA, Ridge, 168 m; Dive 12-27

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-27 conducted a survey 0.2 nmi S of the MPA along a S-N oriented ridge which is evident in the multibeam sonar map. Dive transects were divided into one habitat zone: Hard Bottom- Cobble. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This dive site was low relief hard bottom habitat, mostly rock pavement with rock cobble and small boulders (<0.5 m); 161-169 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-27. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 27	South Carolina, Outside Northern South Carolina MPA, 0.2 nmi S of MPA, Ridge, 168 m; Dive 12-27				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	162-169 m flat, Rock pavement with 5-30 cm cobble 30-70% cover. Occasional 0.25 - .5 m boulder				
	Hard Bottom- Cobble	On Reef	LRu	LR	RLF

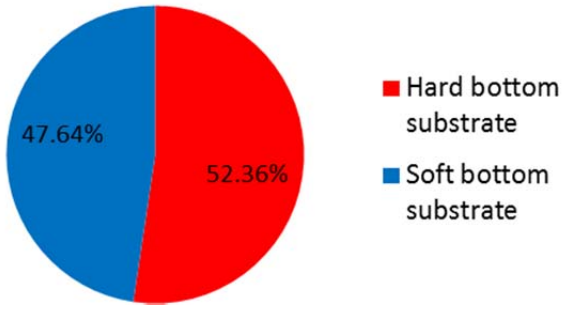


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-27. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-27 was predominately hard bottom (52.36%) consisting of rock pavement, rubble, cobble and small boulders.

Bare rock substrate without biota covered 38.34% of the bottom and bare soft bottom was 47.07% (Fig. 2, Table 2). Benthic macro-biota covered 14.6% of the bottom and consisted of 0.04% hard coral, 0.28% non-coral Cnidaria (Hydrozoa), 5% Porifera, 2.18% Alcyonacea ("gorgonacea"), and 7% other organisms which included numerous small holothurians (*Paracolochirus mysticus*, 1.1%).

Dive Site: South Carolina, Outside Northern South Carolina MPA, 0.2 nmi S of MPA, Ridge, 168 m; Dive 12-27

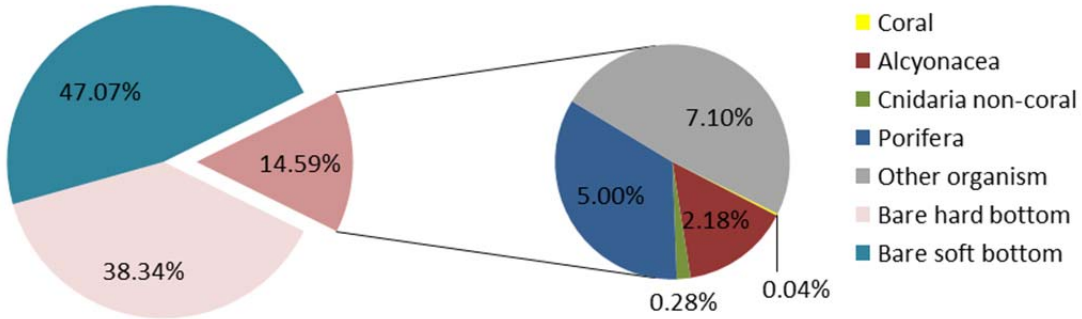


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-27. Corals include solitary coral. Non-scleractinian corals include Alcyonacea ("gorgonacea" and soft coral) and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-27.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**126**	**5.00%**
Porifera	**126**	**5.00%**
Astrophorida	10	0.40%
Demospongiae	32	1.27%
Farrea sp.	4	0.16%
Geodia sp.	10	0.40%
Hexactinellida	11	0.44%
Hymedesmia- blue	3	0.12%
Leiodermatium sp.	45	1.78%
Porifera	10	0.40%
Spongia sp.	1	0.04%
Cnidaria non-coral	**7**	**0.28%**
Cnidaria non-coral	**7**	**0.28%**
Hydroidolina	7	0.28%
Alcyonacea	**55**	**2.18%**
Alcyonacea	**55**	**2.18%**
Alcyonacea	1	0.04%
Gorgonacea	49	1.94%
Nicella sp.	5	0.20%
Coral	**1**	**0.04%**
Coral	**1**	**0.04%**
Scleractinia solitary	1	0.04%
Other organism	**179**	**7.10%**
Annelida	**58**	**2.30%**
Serpulidae	58	2.30%

Dive Site: South Carolina, Outside Northern South Carolina MPA, 0.2 nmi S of MPA, Ridge, 168 m; Dive 12-27

Arthropoda	**15**	**0.59%**
Decapoda	4	0.16%
Majidae	9	0.36%
Paguridae	2	0.08%
Bryozoa	**3**	**0.12%**
Bryozoa	3	0.12%
Chordata	**16**	**0.63%**
Fish	16	0.63%
Echinodermata	**33**	**1.31%**
Echinoidea	2	0.08%
Holothuria lentigenosa enodis	3	0.12%
Paracolochirus mysticus	28	1.11%
Human debris	**1**	**0.04%**
Human debris- other	1	0.04%
Other organism	**53**	**2.10%**
Other organism	53	2.10%
Hard bottom substrate	**967**	**38.34%**
Hard bottom substrate	**967**	**38.34%**
Bare rock- pavement boulder ledge	929	36.84%
Bare rubble- rock	38	1.51%
Soft bottom substrate	**1187**	**47.07%**
Soft bottom substrate	**1187**	**47.07%**
Bare soft bottom substrate	1187	47.07%
Grand Total	**2522**	**100.00%**

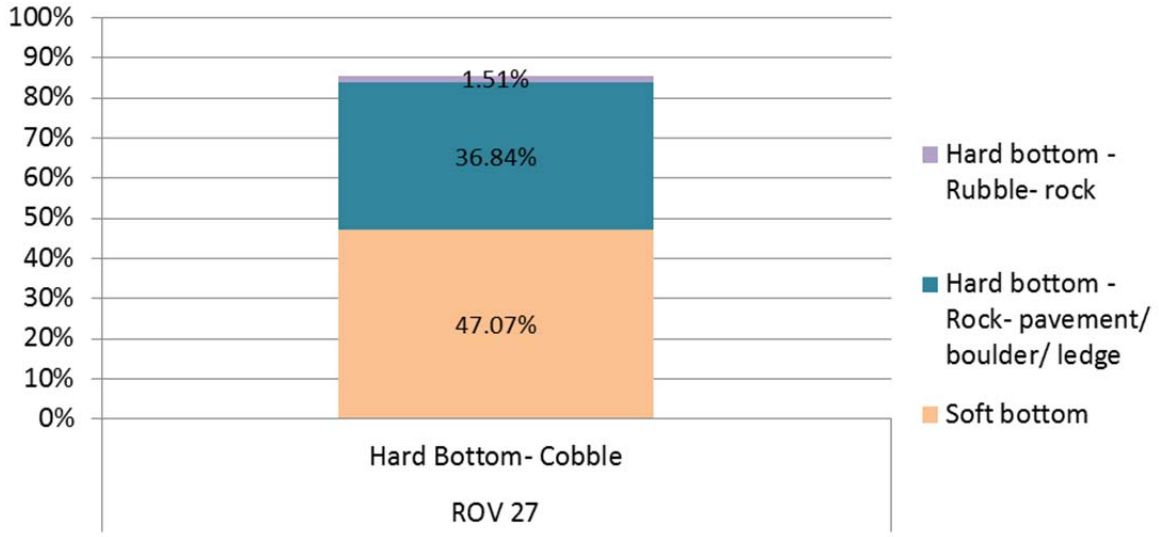


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-27.

Figure 3 shows the percent cover of bare substrate type for the single habitat zone of the dive site. Figure 4 shows the cover of biota for the cobble habitat zone.

Dive Site: South Carolina, Outside Northern South Carolina MPA, 0.2 nmi S of MPA, Ridge, 168 m; Dive 12-27

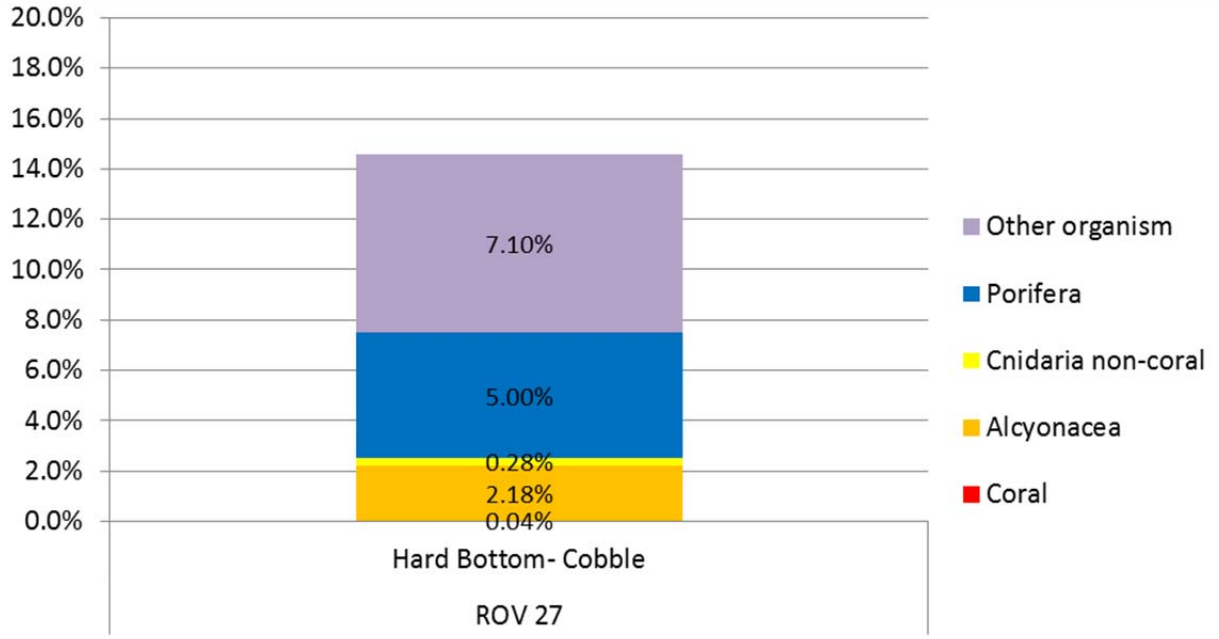


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-27.

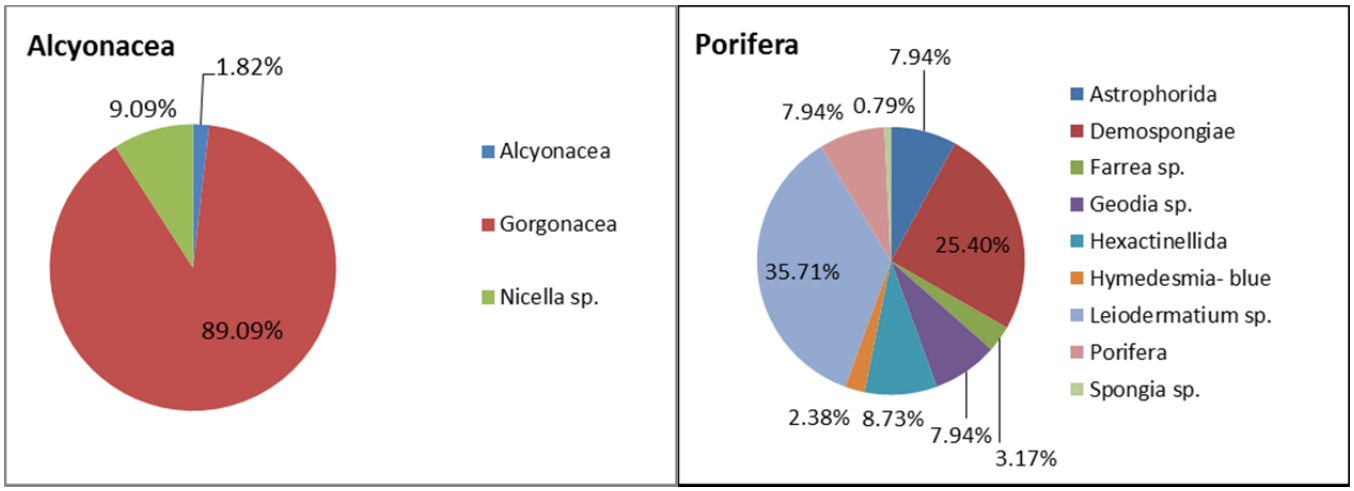


Figure 5. Diversity of corals and sponges at dive site ROV 12-27; CPCe analysis showing percent of total for each taxa category. Non-scleractinian coral include Alcyonacea ("gorgonacea" and soft corals); Porifera include both Demospongiae and Hexactinellida.

No framework hard coral was present at the dive site and there were no black coral. Non-scleractinian coral included *Nicella* sp. (9.0% of the total Alcyonacea) and numerous small unidentified gorgonacea (89%). Sponges were relatively diverse with 9 taxa consisting of *Leiodermatium* sp. (35.7% of the total Porifera), *Geodia* sp. (7.9%), and the glass sponges *Farrea* sp. (3.1%) and unidentified Hexactinellida (8.7%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 21 taxa of fish were

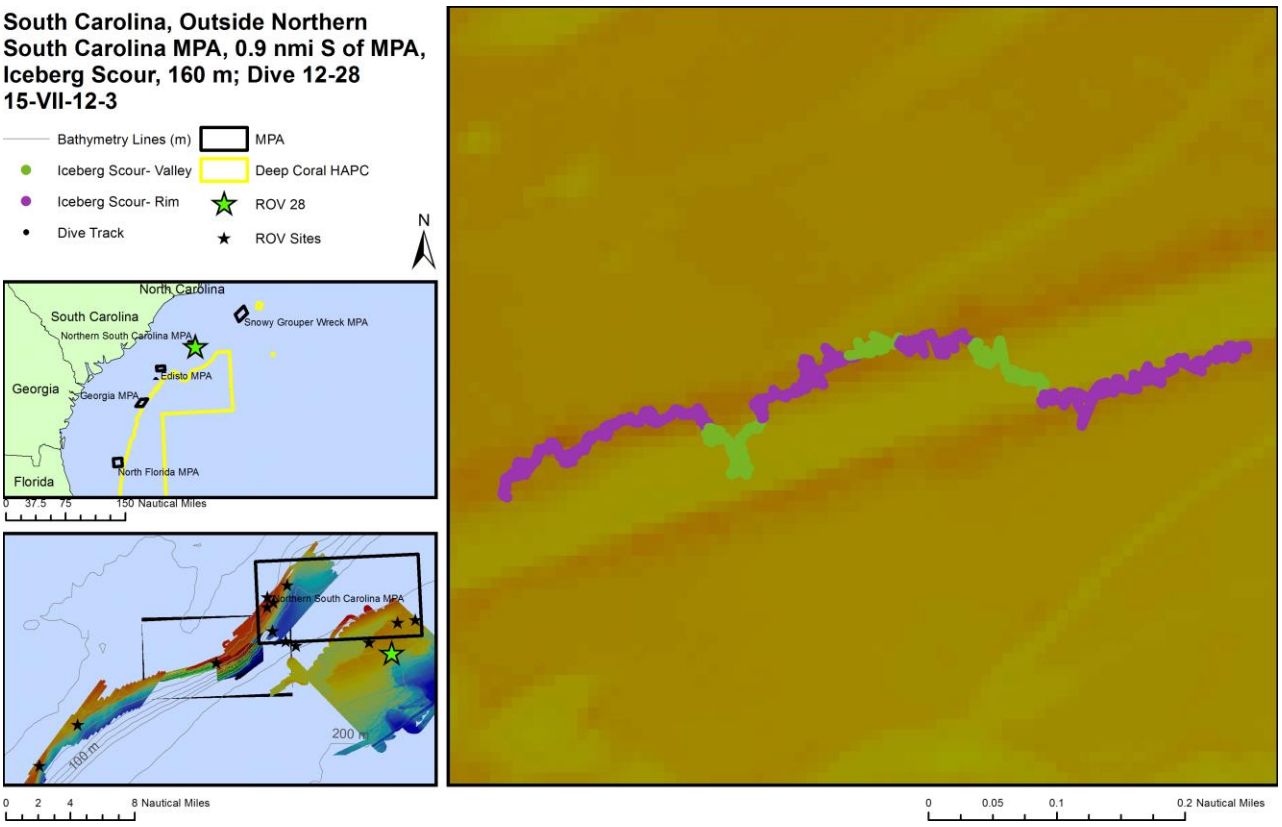
identified from dive ROV 27 for a total density of 101.4 individuals/km (Table 3). These were dominated by boarfish (34/km), anthiids (20.3), and scorpionfish (11.3). Managed species included snowy grouper (2.7), red grouper (0. 7), and slimehead (0.2).

Table 3. Density of fish for all transects at dive site ROV 12-27 (number individuals/km).

Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Anthias nicholsi	yellowfin bass	9	4.24	2.1
Anthiinae	anthiid	86	4.24	20.3
Antigonia sp.	boarfish	144	4.24	34.0
Caulolatilus microps	blueline tilefish	5	4.24	1.2
Cookeolus boops	bulleye	1	4.24	0.2
Decodon puellaris	red hogfish	14	4.24	3.3
Epinephelus niveatus	snowy grouper	11	4.24	2.6
Gephyroberyx darwinii	Darwin's slimehead	1	4.24	0.2
Holocentridae	soldierfish	6	4.24	1.4
Laemonema sp.	mora cod	8	4.24	1.9
Liopropoma eukrines	wrasse bass	1	4.24	0.2
Macroramphosus scolopax	longspine snipefish	4	4.24	0.9
Pagrus pagrus	red porgy	3	4.24	0.7
Pareques iwamotoi	blackbar drum	5	4.24	1.2
Plectranthias garrupellus	apricot bass	39	4.24	9.2
Priacanthus arenatus	bigeye	1	4.24	0.2
Pristigenys alta	short bigeye	17	4.24	4.0
Prognathodes aya	bank butterflyfish	1	4.24	0.2
Prognathodes guyanensis	french butterflyfish	1	4.24	0.2
Scorpaenidae	scorpionfish	48	4.24	11.3
Serranus notospilus	saddle bass	25	4.24	5.9
Total		430		101.4

Dive Site: South Carolina, Outside Northern S Carolina MPA, 0.9 nmi S of MPA, Iceberg Scour, 160 m; Dive 12-28

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andrew W. David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	OE_Block2 (Unknown)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/15/2012
Specimens:	
Digital Photos:	113
DVD:	2
Hard Drive:	1

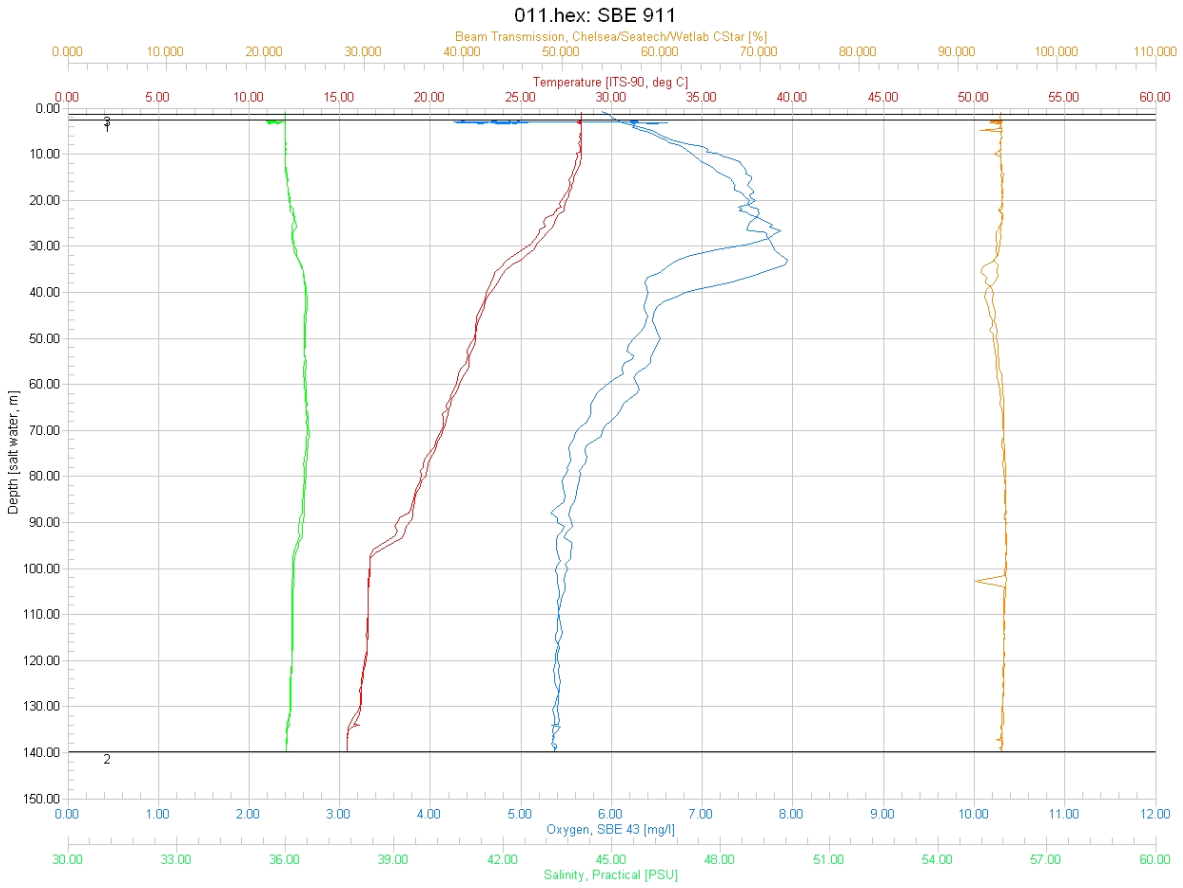
Dive Site: South Carolina, Outside Northern S Carolina MPA, 0.9 nmi S of MPA, Iceberg Scour, 160 m; Dive 12-28

Dive Data:

Minimum Bottom Depth (m):	157	**Total Transect Length (km):**	4.501
Maximum Bottom Depth (m):	169	**Surface Current (kn):**	0.2
On Bottom (Time- GMT):	10:15	**On Bottom (Lat/Long):**	32.79°N; -78.14°W
Off Bottom (Time- GMT):	11:44	**Off Bottom (Lat/Long):**	32.79°N; -78.13°W
Physical (bottom); Temp (°C):	12.85	**Salinity:** 36.00 **Visibility (ft):** 10	**Current (kn):** 0.5

Physical Environment:

Distance from Dive Site(km): 11.03



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (140 m): temperature- 15.5, salinity- 36, and dissolved oxygen- 5.4. Surface temperature was 28.2 and there was a thermocline near 30-40 and 92-98 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 32 m. Visibility was estimated at 10 ft from the ROV video.

Dive Site: South Carolina, Outside Northern S Carolina MPA, 0.9 nmi S of MPA, Iceberg Scour, 160 m; Dive 12-28

Dive Imagery:

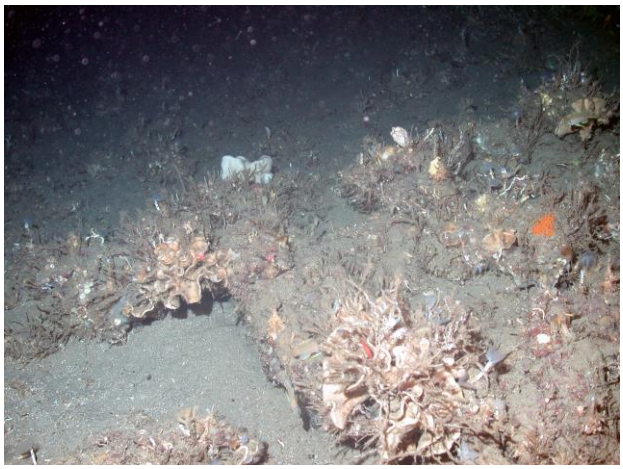


Figure 1: -160.3 m
Leiodermatium sponges and Holothuroidea (*Paracolochirus mysticus*) on low relief hardbottom.

Figure 2: -167.4 m
Cancer borealis on sediment.

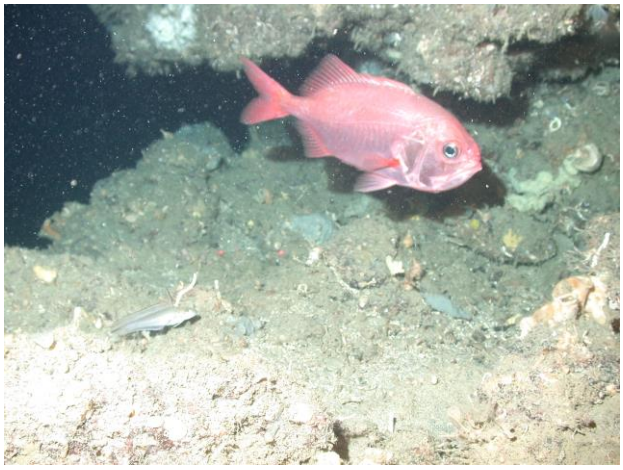


Figure 3: -165.1 m
Gyphoberyx roughy on moderate relief boulder habitat.

Figure 4: -165.1 m
Plastic bag debris on low relief scattered hardbottom.

Dive Site: South Carolina, Outside Northern S Carolina MPA, 0.9 nmi S of MPA, Iceberg Scour, 160 m; Dive 12-28

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 28, Site #- 15-VII-12-3. Target Site – outside and south of South Carolina, Northern S.C. MPA; 175 m. ROV survey outside MPA and ground truth new Pisces multibeam sonar of the site. Conduct video/photo transects along apparent glacial iceberg scour (~142 m wide).

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.2 kn from S; bottom 0.2-0.5 kn.

Site Description/Habitat/Biota:
Start transect at 162.5 m on rock pavement with cobble, and 30 cm boulders; begin transect heading east along north rim of E-W oriented ice berg scour. Top of rocky rim 162-157 m, rugged, eroded rock, 30-50 cm boulders; some 1-2 m ledges on upper slope. North rim is ~40 m wide. North slope of rim about 30o down to 167 m at base in sand and cobble. Transect across scour valley: flat, ~80 m wide, maximum depth 169 m, all fine dark sediment. Base of south rim 167 m, slope with 1-2 m ledges and 1 m boulders, rugged 45° slope, eroded rock. Top of south rim 160 m.

Dominant Benthic Biota: Dominant fauna are dense and abundant *Leiodermatium* sponges, pachastrellid plate sponges, corallistid plate and cup sponges, and small holothurians (*Paracolochirus mysticus*). Gorgonacea- orange fan; Hydroida; Demospongiae- Corallistidae, *Leiodermatium*, *Lithistida*, Pachastrellidae; Echinoidea- Cidaroidea; Holothuroidea- *Paracolochirus mysticus*; Asteroidea; Gastropoda- *Perotrochus quoyanus*?, Arthropoda- *Cancer*, hermit crabs; Annelida- Serpulidae.
Fish: amberjack, apricot bass, bigeye, blackbar drum, blueline tilefish, cardinal soldierfish, French butterflyfish, Gephyroberyx (roughies), Laemonema, scorpion fish, snowy grouper (many), soldierfish, yellowfin bass.

Dive Site: South Carolina, Outside Northern S Carolina MPA, 0.9 nmi S of MPA, Iceberg Scour, 160 m; Dive 12-28

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-28 conducted a survey of an apparent ice-berg scar from last glacial period (~20,000 years B.P.), 0.9 nmi S of the MPA. The transects followed the E-W oriented scour which is evident in the multibeam sonar map. Dive transects were divided into two habitat zones: Iceberg Scour- Rim and Iceberg Scour- Valley. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). The transect paralleled the linear scour mark which was ~140 m wide. The base of the scour was ~167 m deep and flat sand and cobble; the edges of the scour were rugged 30-45^{o} slopes with 1-2 m ledges, 1 m boulders and eroded rock; the top of the rims were 157-162 m.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-28. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 28	South Carolina, Outside Northern S Carolina MPA, 0.9 nmi S of MPA, Iceberg Scour, 160 m; Dive 12-28				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	N rim of iceberg scour, top rim 157-162 m, Rock outcrops, 20-40 ° slope, base of ridge- 164 m cobble, .05-1m outcrops, very eroded				
	Iceberg Scour- Rim	On Reef	HRu	HR	RLF
Transect 2	167.5 m, in scour, fine gray sand, ripples, some rubble/cobble. 80 m wide				
	Iceberg Scour- Valley	Off Reef	LRu	LR	S
Transect 3	North Rim of Iceberg Scour, 160-157 m eroded rugged				
	Iceberg Scour- Rim	On Reef	HRu	MR	RLF
Transect 4	166 m soft bottom North of North Rim of Scour,				
	Iceberg Scour- Valley	Off Reef	LRu	LR	S
Transect 5	North Rim				
	Iceberg Scour- Rim	On Reef	HRu	MR	RLF
Transect 6	165-167 m soft bottom in scour, some rock cobble				
	Iceberg Scour- Valley	Off Reef	LRu	LR	S
Transect 7	Base of S Rim 168 m, 35-60 ° rugged slope, 1-2 m ledges, top 160 m, 0.5-1 m boulders, rugged eroded				
	Iceberg Scour- Rim	On Reef	HRu	HR	RLF

Dive Site: South Carolina, Outside Northern S Carolina MPA, 0.9 nmi S of MPA, Iceberg Scour, 160 m; Dive 12-28

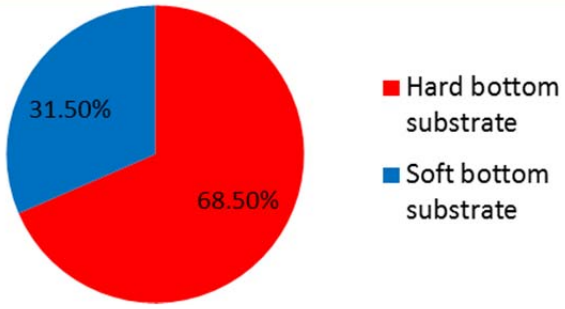


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-28. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-28 was predominately hard bottom (68.5%) consisting of eroded rock, ledges, 0.5-1 m boulders, and cobble.

Bare rock substrate without biota covered 55.21% of the bottom and bare soft bottom was 31.32% (Fig. 2, Table 2). Benthic macro-biota covered 13.45% of the bottom and consisted of 0.04% hard coral, 0.75% non-coral Cnidaria (Hydrozoa), 6.73% Porifera, 0.13% Alcyonacea ("gorgonacea"), and 5.8% other organisms (motile taxa).

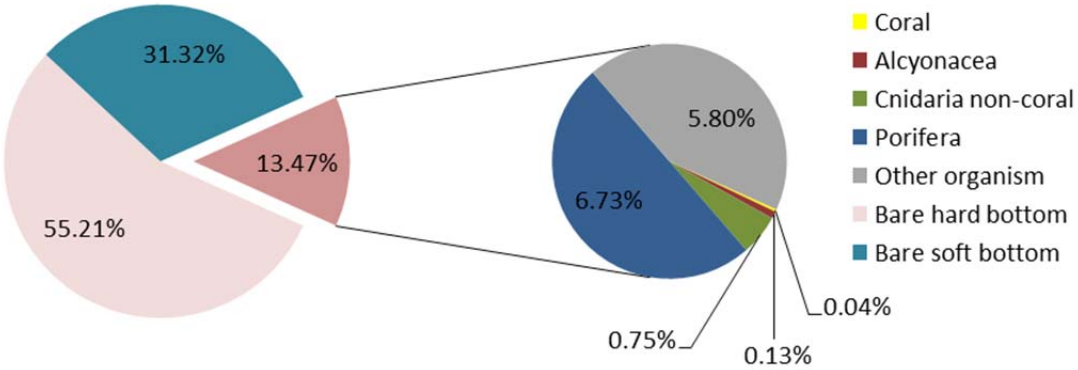


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-28. Corals include solitary coral. Non-scleractinian corals include Alcyonacea ("gorgonacea"). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-28.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**152**	**6.73%**
Porifera	**152**	**6.73%**
Astrophorida	7	0.31%
Corallistidae	9	0.40%
Demospongiae	31	1.37%
Diplastrella sp.	1	0.04%
Hexactinellida	5	0.22%
Leiodermatium sp.	88	3.90%

Dive Site: South Carolina, Outside Northern S Carolina MPA, 0.9 nmi S of MPA, Iceberg Scour, 160 m; Dive 12-28

Lithistida	3	0.13%
Oceanapia sp.	2	0.09%
Porifera	1	0.04%
Spirastrellidae	2	0.09%
Zyzzya sp.	3	0.13%
Cnidaria non-coral	**17**	**0.75%**
Cnidaria non-coral	**17**	**0.75%**
Hydroidolina	17	0.75%
Alcyonacea	**3**	**0.13%**
Alcyonacea	**3**	**0.13%**
Gorgonacea	3	0.13%
Coral	**1**	**0.04%**
Coral	**1**	**0.04%**
Scleractinia solitary	1	0.04%
Other organism	**131**	**5.80%**
Annelida	**89**	**3.94%**
Annelida	42	1.86%
Sabellidae	7	0.31%
Serpulidae	40	1.77%
Chordata	**12**	**0.53%**
Fish	12	0.53%
Echinodermata	**5**	**0.22%**
Echinoidea	4	0.18%
Ophiuroidea	1	0.04%
Other organism	**25**	**1.11%**
Other organism	25	1.11%
Hard bottom substrate	**1246**	**55.21%**
Hard bottom substrate	**1246**	**55.21%**
Bare rock- pavement boulder ledge	1242	55.03%
Bare rubble- rock	4	0.18%
Soft bottom substrate	**707**	**31.32%**
Soft bottom substrate	**707**	**31.32%**
Bare soft bottom substrate	707	31.32%
Grand Total	**2257**	**100.00%**

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The edges and rim of the scour were mostly bare rock substrate (67.2% cover) whereas the floor of the scour was predominately soft sediment (78.1%). Figure 4 shows the rocky edges (Scour-rim) had ~16% cover of biota, primarily Porifera (8.0%), hydroids (1.0%), and motile species (7.2%).

Dive Site: South Carolina, Outside Northern S Carolina MPA, 0.9 nmi S of MPA, Iceberg Scour, 160 m; Dive 12-28

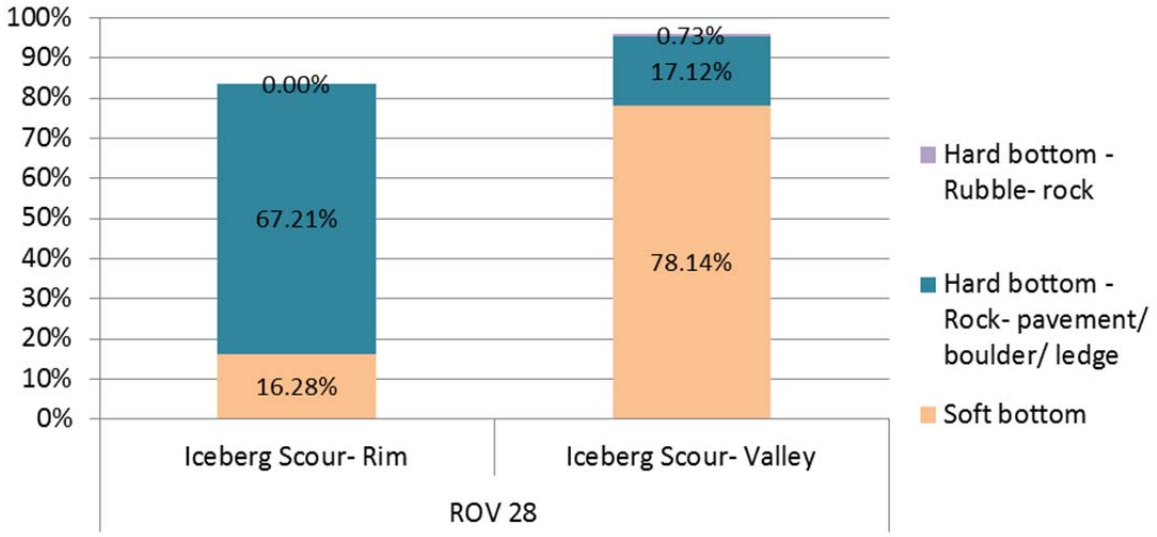


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-28.

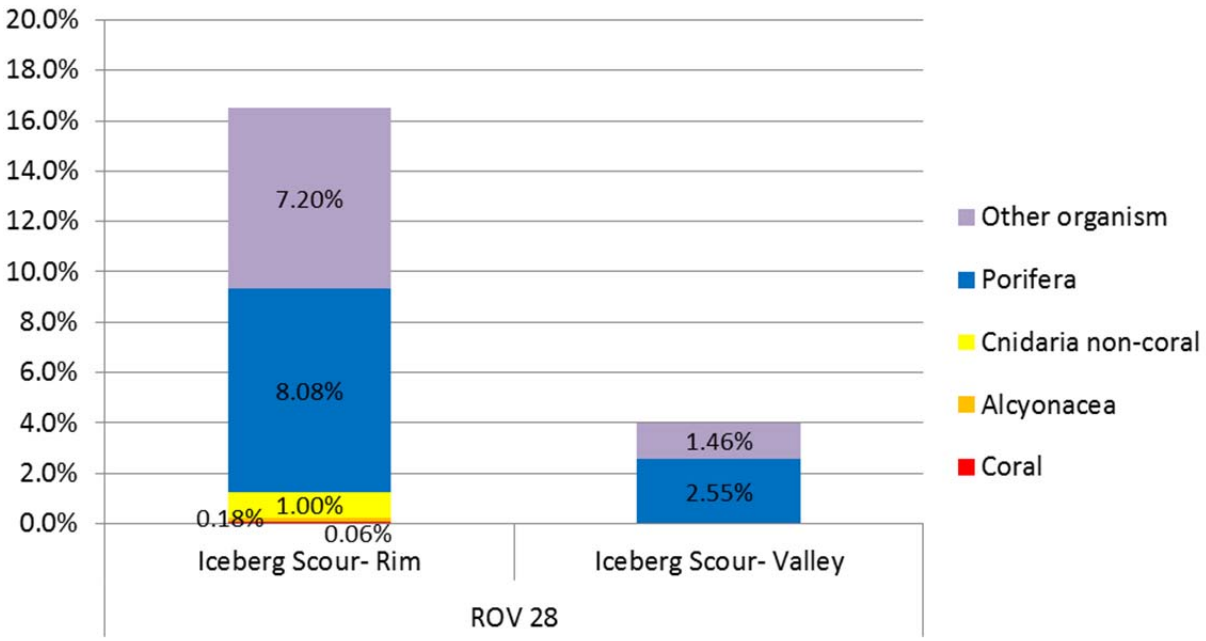


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-28.

Dive Site: South Carolina, Outside Northern S Carolina MPA, 0.9 nmi S of MPA, Iceberg Scour, 160 m; Dive 12-28

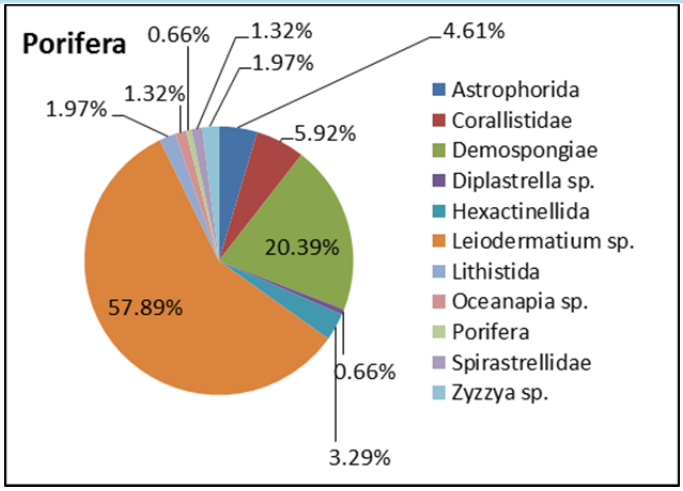


Figure 5. Diversity sponges at dive site ROV 12-28; CPCe analysis showing percent of total for each taxa category. Porifera included Demospongiae and glass sponges, Hexactinellida.

Only one solitary hard coral was counted at the dive site. Non-scleractinian coral included one species of Alcyonacea; no Antipatharia were present. Sponges were clearly the dominant and most diverse sessile fauna and included *Lieodermatium* sp. (57.8% of the total Porifera), Corallistidae (5.9%), other Lithistida (1.9%), *Zyzzya* sp. (1.9%), *Oceanapia* sp. (1.3%), and the glass sponges *Farrea* sp. and unidentified hexactinellids.

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 19 taxa of fish were identified from dive ROV 28 for a total density of 611.3 individuals/km (Table 3). These were dominated by anthiids (556.7/km), snowy grouper (14), and amberjack (13.3). Managed species included amberjack, snowy grouper, and slimehead (2.2/km).

Table 3. Density of fish for all transects at dive site ROV 12-28 (number individuals/km).

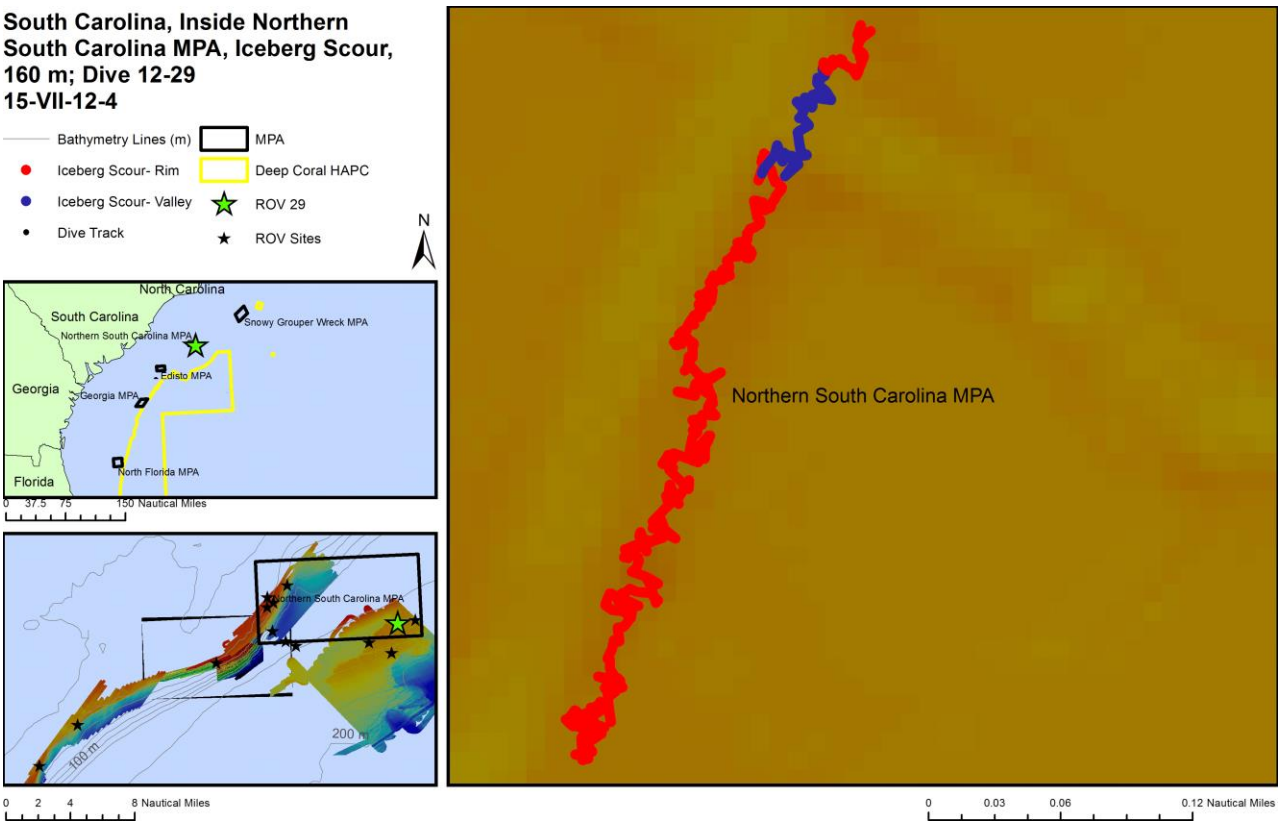
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Anthias nicholsi	yellowfin bass	2	4.5	0.4
Anthias woodsi	swallowtail bass	1	4.5	0.2
Anthiinae	anthiid	2505	4.5	556.7
Antigonia sp.	boarfish	16	4.5	3.6
Caulolatilus microps	blueline tilefish	2	4.5	0.4
Decodon puellaris	red hogfish	14	4.5	3.1
Epinephelus niveatus	snowy grouper	63	4.5	14.0
Epinephelus sp.	grouper	1	4.5	0.2
Gephyroberyx darwinii	Darwin's slimehead	10	4.5	2.2
Holocentridae	soldierfish	6	4.5	1.3
Laemonema sp.	mora cod	12	4.5	2.7
Ostichthys trachypoma	bigeye soldierfish	5	4.5	1.1
Pareques iwamotoi	blackbar drum	7	4.5	1.6

Dive Site: South Carolina, Outside Northern S Carolina MPA, 0.9 nmi S of MPA, Iceberg Scour, 160 m; Dive 12-28

Plectranthias garrupellus	apricot bass	3	4.5	0.7
Priacanthus arenatus	bigeye	8	4.5	1.8
Prognathodes guyanensis	french butterflyfish	1	4.5	0.2
Scorpaenidae	scorpionfish	33	4.5	7.3
Seriola sp.	amberjack	60	4.5	13.3
Serranus notospilus	saddle bass	2	4.5	0.4
Total		2751		611.3

Dive Site: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 160 m; Dive 12-29

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andrew W. David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	OE_Block2 (Unknown)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/15/2012
Specimens:	
Digital Photos:	184
DVD:	2
Hard Drive:	1

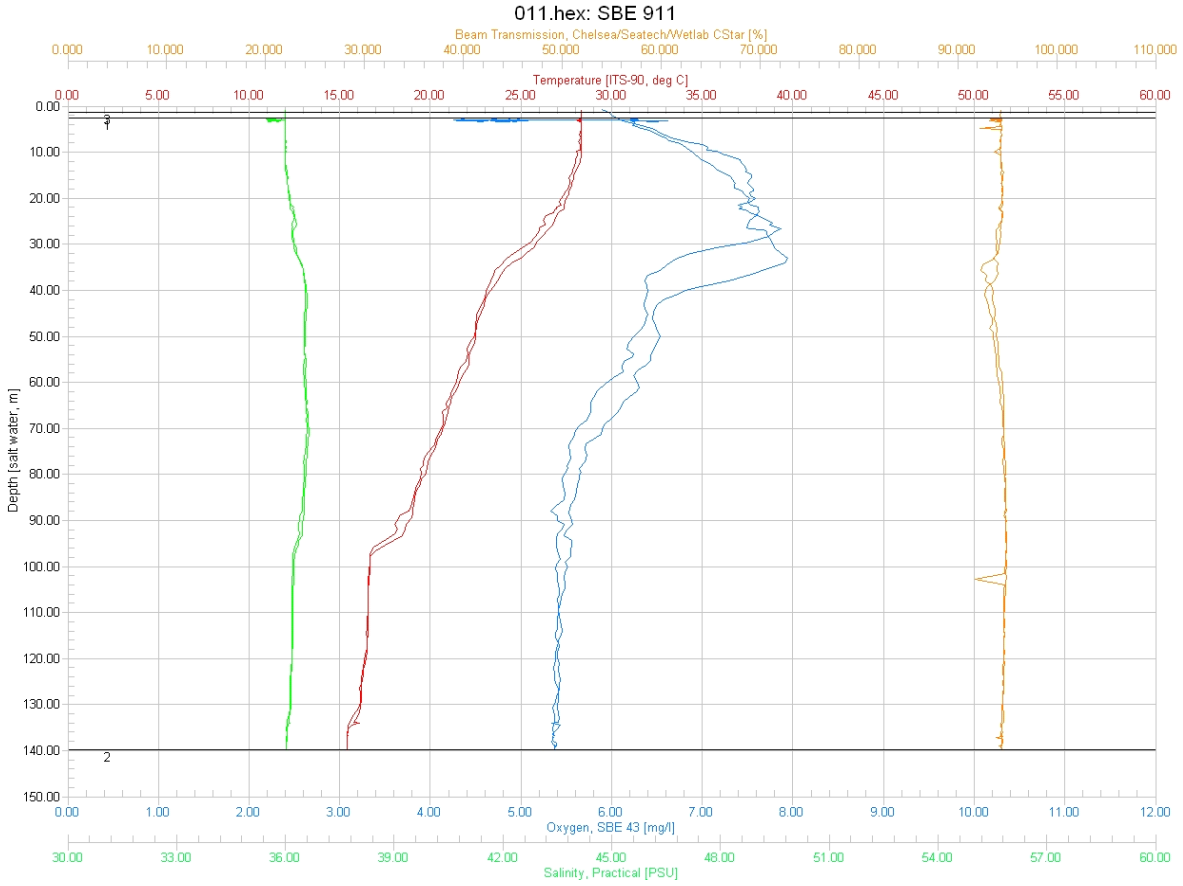
Dive Site: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 160 m; Dive 12-29

Dive Data:

Minimum Bottom Depth (m):	158	**Total Transect Length (km):**	2.653
Maximum Bottom Depth (m):	163	**Surface Current (kn):**	0.4
On Bottom (Time- GMT):	12:37	**On Bottom (Lat/Long):**	32.81°N; -78.12°W
Off Bottom (Time- GMT):	14:22	**Off Bottom (Lat/Long):**	32.82°N; -78.11°W
Physical (bottom); Temp (°C):	13.60	**Salinity:** 36.00 **Visibility (ft):** 30	**Current (kn):** 0.2

Physical Environment:

Distance from Dive Site(km): 11.97



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (140 m): temperature- 15.5, salinity- 36, and dissolved oxygen- 5.4. Surface temperature was 28.4 and there was a thermocline near 30-40 and 92-98 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 32 m. Visibility was estimated at 30 ft from the ROV video.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 160 m; Dive 12-29

Dive Imagery:

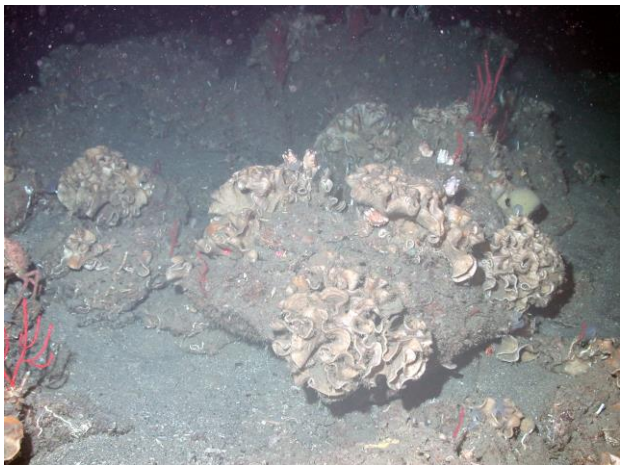


Figure 1: -161.3 m
1 m relief scattered boulders covered in *Leiodermatium* demosponges.

Figure 2: -159.3 m
Snowy grouper on sediment veneered hardbottom.

Figure 3: -157.6 m
Perotrochus quoyanus, slit shell.

Figure 4: -160.1 m
Slit shell (*Perotrochus quoyanus*) and red gorgonians on scattered boulders.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 160 m; Dive 12-29

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 29, Site #- 15-VII-12-4. Target Site – South Carolina, Northern S.C. MPA; 175 m. ROV survey inside MPA and ground truth multibeam sonar of the site. Conduct video/photo transect along N-S oriented iceberg scour of multibeam.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.4 kn from S; bottom 0.2 kn.

Site Description/Habitat/Biota:
Transect starts on flat pavement and sediment with 10-20 cm cobble, 30 boulders and ledges. Scattered patches of rock piles, 1 m relief (158 m top- 160 m base), with dense Leiodermatium sponges, orange gorgonians, and holothurian (sea weenies). Transect continues along east rim of N-S oriented ice berg scar; top 160 m, valley in scar 163 m sediment. The rim is rugged rock, boulder, cobble, and ledges.

Dominant Benthic Biota: Gorgonacea- *Scleracis*? (orange fan); Hydroida; Demospongiae- *Desmacella*, *Leiodermatium* (abundant), Lithistida, Corallistidae (common), Pachastrellidae, *Spongosorites*?; Hexactinellida; Arthropoda- hermit crab, Majidae, *Parthenope*; Echinoidea- Cidaroidea; Holothuroidea- *Holothuria lentiginosa*, *Paracolochirus mysticus*; Asteroidea- *Narcissia trigonaria*; Mollusca- *Tonna*?, *Perotrochus quoyanus* (common), *Scaphella*; Annelida- Serpulidae.
Fish: anthiids (common), apricot bass, Gephyroberyx, bigeye, bigeye soldierfish, blackbar drum, blueline tilefish, boarfish, bulleye, flounder, longspine snipefish, porgy, red hogfish, rough backed batfish, saddle bass, scorpion fish, short bigeye, snowy grouper, wrasse bass, yellowfin bass.

Location: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 160 m; Dive 12-29

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-29 conducted a survey of an apparent ice-berg scar from last glacial period (~20,000 years B.P.) which is clearly visible in the multibeam map at the SE corner of the MPA. Dive transects were divided into two habitat zones: Iceberg Scour- Rim and Iceberg Scour- Valley. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). The transect paralleled along the east edge of the linear scour. The rim of the scour was high relief, rugged, eroded rock and boulders, from 158 m at the top edge to 163 m at the inside base of the scour which was mostly soft sediment.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-29. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 29	South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 160 m; Dive 12-29				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	East Rim of iceberg scar, 158-160 m on top, 163 m at base in scour, 5-30 cm cobble rock outcrops, 1-2 m boulders rugged, eroded				
	Iceberg Scour- Rim	On Reef	HRu	HR	RLF
Transect 2	In scour 163 m sand, some pavement				
	Iceberg Scour- Valley	Off Reef	LRu	LR	S
Transect 3	East Rim of iceberg scar, 158 m top, 163 m base inside, Low relief boulders <.5m not as rugged				
	Iceberg Scour- Rim	On Reef	HRu	HR	RLF

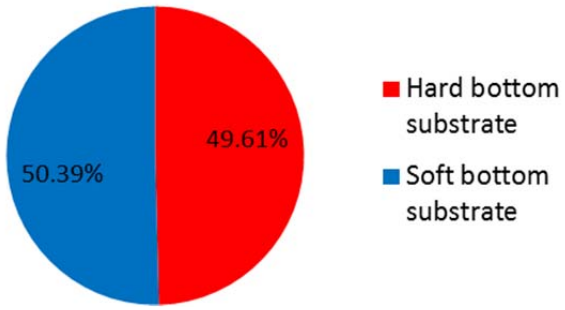


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-29. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site

Location: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 160 m; Dive 12-29

12-29 was about equal cover of hard bottom and soft bottom substrates. Hard bottom was predominately rugged, eroded rock, boulders, pavement and cobble.

Bare rock substrate without biota covered 37.15% of the bottom and bare soft bottom was 49.92% (Fig. 2, Table 2). Benthic macro-biota covered 12.93% of the bottom and consisted of 0.31% non-coral Cnidaria (Hydrozoa), 6.35% Porifera, 2.04% Alcyonacea ("gorgonacea"), and 4.2% motile species.

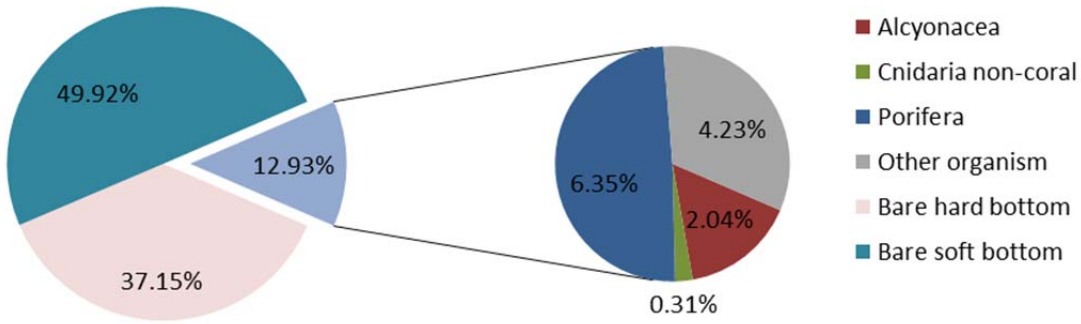


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-29. Non-scleractinian corals include Alcyonacea ("gorgonacea"). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-29.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**81**	**6.35%**
Porifera	**81**	**6.35%**
Corallistidae	8	0.63%
Demospongiae	18	1.41%
Leiodermatium sp.	55	4.31%
Cnidaria non-coral	**4**	**0.31%**
Cnidaria non-coral	**4**	**0.31%**
Hydroidolina	4	0.31%
Alcyonacea	**26**	**2.04%**
Alcyonacea	**26**	**2.04%**
Gorgonacea	26	2.04%
Other organism	**54**	**4.23%**
Annelida	**39**	**3.06%**
Annelida	13	1.02%
Serpulidae	26	2.04%
Arthropoda	**3**	**0.24%**
Decapoda	2	0.16%
Paguridae	1	0.08%
Echinodermata	**2**	**0.16%**
Paracolochirus mysticus	2	0.16%

Location: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 160 m; Dive 12-29

Human debris	**1**	**0.08%**
Fishing gear/line/long line	1	0.08%
Mollusca	**1**	**0.08%**
Mollusca	1	0.08%
Other organism	**8**	**0.63%**
Other organism	8	0.63%
Hard bottom substrate	**474**	**37.15%**
Hard bottom substrate	**474**	**37.15%**
Bare rock- pavement boulder ledge	457	35.82%
Bare rubble- rock	17	1.33%
Soft bottom substrate	**637**	**49.92%**
Soft bottom substrate	**637**	**49.92%**
Bare soft bottom substrate	637	49.92%
Grand Total	**1276**	**100.00%**

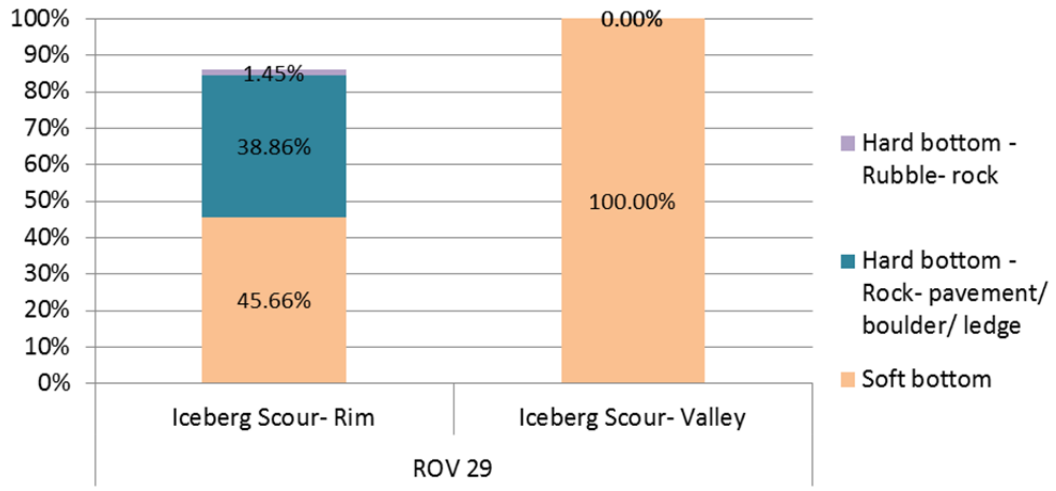


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-29.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The scour rim had 38.8% cover of bare rock substrate whereas the floor of the scour (valley) was entirely soft sand and mud. Figure 4 shows the that rim of the scour had 14% cover of biota which were dominated by Porifera (6.8% cover), Alcyonacea (2.2%), and motile species (4.5%). No macro-fauna were observed on the floor of the scour.

Location: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 160 m; Dive 12-29

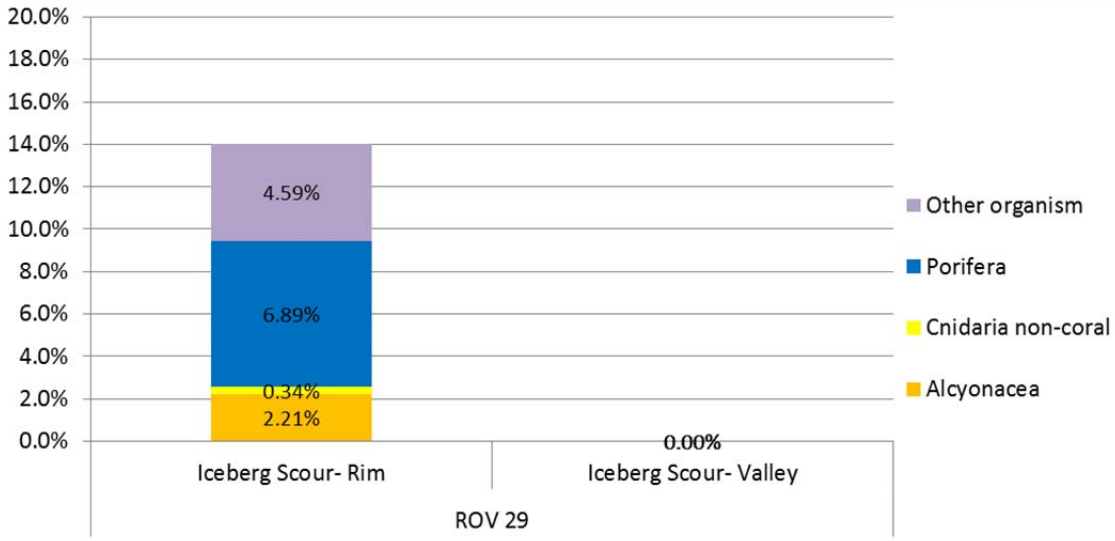


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-29.

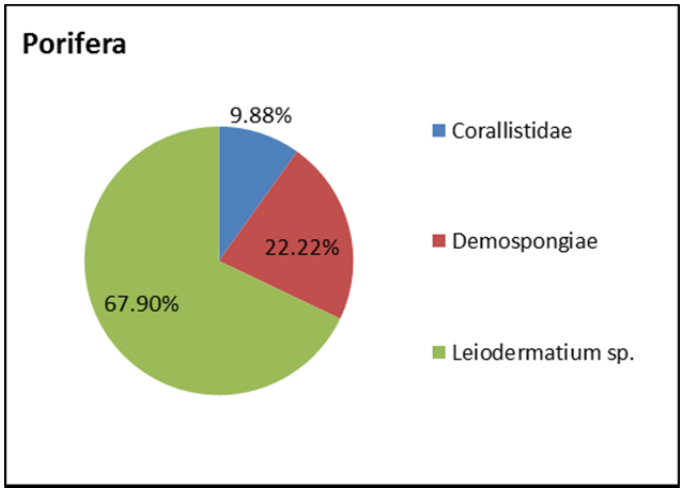


Figure 5. Diversity of sponges at dive site ROV 12-29; CPCe analysis showing percent of total for each taxa category. Porifera are Demospongiae.

No hard coral was present at the dive site. Non-scleractinian corals included unidentified gorgonacea and no Antipatharia were observed. The diversity of sponges was low, consisting of *Leiodermatium* sp. (67.9% of the total Porifera), Corallistidae (9.8%), and other unidentified demosponges (22.2%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 24 taxa of fish were identified from dive ROV 29 for a total density of 546.8 individuals/km (Table 3). These were dominated by

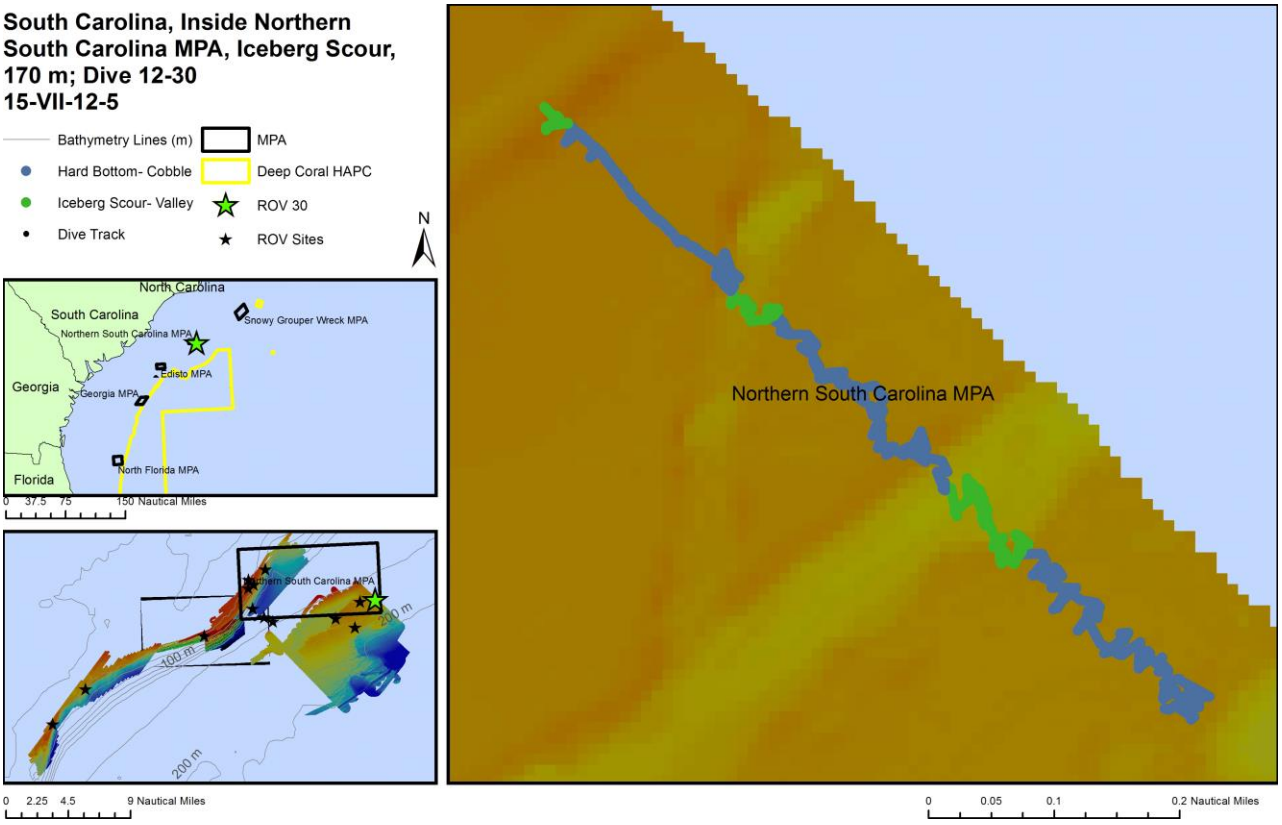
anthiids (327.5/km), boarfish (69.4), and yellowfin bass (37). Managed species included red porgy (17), snowy grouper (3.8), slimehead (6.4), and amberjack (0.4).

Table 3. Density of fish for all transects at dive site ROV 12-29 (number individuals/km).

Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Anthias nicholsii	yellowfin bass	98	2.65	37.0
Anthias woodsi	swallowtail bass	1	2.65	0.4
Anthiinae	anthiid	868	2.65	327.5
Antigonia sp.	boarfish	184	2.65	69.4
Caulolatilus microps	blueline tilefish	4	2.65	1.5
Cookeolus boops	bulleye	1	2.65	0.4
Decodon puellaris	red hogfish	22	2.65	8.3
Epinephelus niveatus	snowy grouper	10	2.65	3.8
Gephyroberyx darwinii	Darwin's slimehead	17	2.65	6.4
Hemanthias vivanus	red barbier	2	2.65	0.8
Holocentridae	soldierfish	1	2.65	0.4
Laemonema sp.	mora	21	2.65	7.9
Liopropoma eukrines	wrasse bass	1	2.65	0.4
Macroramphosus scolopax	longspine snipefish	11	2.65	4.2
Ostichthys trachypoma	bigeye soldierfish	6	2.65	2.3
Pagrus pagrus	red porgy	45	2.65	17.0
Pareques iwamotoi	blackbar drum	24	2.65	9.1
Plectranthias garrupellus	apricot bass	28	2.65	10.6
Priacanthus arenatus	bigeye	28	2.65	10.6
Pristigenys alta	short bigeye	4	2.65	1.5
Scorpaenidae	scorpionfish	60	2.65	22.6
Seriola sp.	amberjack	1	2.65	0.4
Serranus notospilus	saddle bass	11	2.65	4.2
Serranus phoebe	tattler	1	2.65	0.4
Total		1449		546.8

Dive Site: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 170 m; Dive 12-30

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andrew W. David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	OE_Block2 (Unknown)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/15/2012
Specimens:	
Digital Photos:	101
DVD:	2
Hard Drive:	1

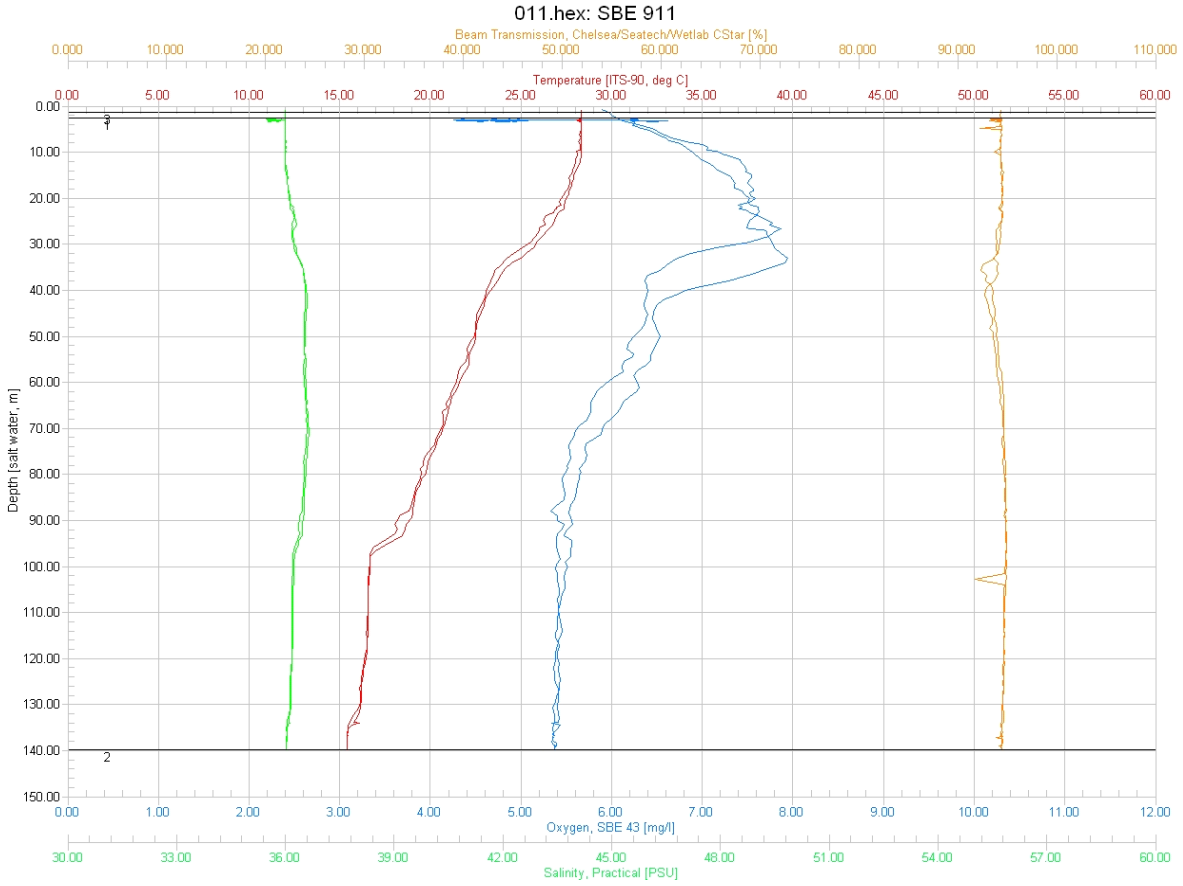
Dive Site: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 170 m; Dive 12-30

Dive Data:

Minimum Bottom Depth (m):	160	**Total Transect Length (km):**	4.231
Maximum Bottom Depth (m):	170	**Surface Current (kn):**	0.2
On Bottom (Time- GMT):	15:04	**On Bottom (Lat/Long):**	32.82°N; -78.09°W
Off Bottom (Time- GMT):	16:38	**Off Bottom (Lat/Long):**	32.83°N; -78.1°W
Physical (bottom); Temp (°C):	14.90	**Salinity:** 36.00 **Visibility (ft):** 30	**Current (kn):** 0.25

Physical Environment:

Distance from Dive Site(km): 14.04



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (140 m): temperature- 15.5, salinity- 36, and dissolved oxygen- 5.4. Surface temperature was 28.6 and there was a thermocline near 30-40 and 92-98 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 32 m. Visibility was estimated at 30 ft from the ROV video.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 170 m; Dive 12-30

Dive Imagery:

Figure 1: -164 m
Holothuroidea, *Paracolochirus mysticus*, on rock boulder.

Figure 2: -164.2 m
Edge of iceberg scar, cidaroid urchin on rock boulders encrusted with tube worms.

Figure 3: -163.8 m
sand diver lizardfish (*Synodus intermedius*) on sediment.

Figure 4: -170.5 m
Hermit crab inspecting a shell on soft bottom at base of iceberg scar.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 170 m; Dive 12-30

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 30, Site #- 15-VII-12-5. Target Site – South Carolina, Northern S.C. MPA; 175 m. ROV survey inside MPA and ground truth multibeam sonar of the site. Conduct video/photo transect perpendicular to three ice berg scars in multibeam.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.2 kn from S; bottom 0.25 kn.

Site Description/Habitat/Biota:
Transect starts at 164 m on flat sediment, with 10-30 cm cobble and small boulders. Transect crosses first ice berg scar; top rim is 165-168 m, sparse cobble and small boulders, then slopes to the sediment covered valley at 170 m. Top of west rim is 163 m, also with sparse 10-30 cm cobble and boulders. Crossing second ice berg scar is 161-163 m along top rims to166 m in the valley; cobble and boulders to 30-50 cm. Flat sand and cobble is between the scars. The third and last scar has 10-50 cm relief along the top rim at 161 m, and slopes to 164 m in the valley which is flat sediment.

Dominant Benthic Biota: Gorgonacea (orange fans common); Actiniaria- Cerianthidae; Demospongiae- *Leiodermatium* (common); Annelida- Serpulidae; Arthropoda- hermit crab, Majidae, *Parthenope*; Asteroidea- 6 arm star; Echinoidea- Cidaroidea; Holothuroidea- *Holothuria lentiginosa*, *Paracolochirus mysticus*; Mollusca- *Murex*, *Perotrochus quoyanus*, squid; *Tonna*?.
Fish: anthiids, blackbar drum, blueline tilefish, boarfish, flounder, giant anthiid- longtail bass?, lizardfish, longspine snipefish, red hogfish, red porgy, scorpion fish, short bigeye, Gephyroberyx, snowy grouper.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 170 m; Dive 12-30

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-30 conducted a survey perpendicular to and crossing three ice-berg scars which are apparent in the multibeam sonar at the SE corner of the MPA. Dive transects were divided into two habitat zones: Hard Bottom-Cobble and Iceberg Scour- Valley. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). Between the scars was low relief hard bottom with rock cobble and rubble. The top rim of the scour marks was about 160 m deep and the sediment groove in the scour was 170 m.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-30. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 30	South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 170 m; Dive 12-30				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	163-165 m rock pvmt, sed veneer, 10-30% cover, 10-40 cm cobble boulders				
	Hard Bottom- Cobble	On Reef	LRu	LR	PF
Transect 2	Iceberg scour 170 m base 163 top rim. Sparse cobble top edge, base soft bottom w some cobble, barren				
	Iceberg Scour- Valley	Off Reef	HRu	HR	SRB
Transect 3	163 m west rim of scour. No ledges, pvmt, 30-50% cover 10-30 cm cobble				
	Hard Bottom- Cobble	On Reef	LRu	LR	RLF
Transect 4	Iceberg Scour 2, 166 m, sand in scour				
	Iceberg Scour- Valley	Off Reef	LRu	LR	S
Transect 5	161 m West Rim of scar 2, 100% cover 10-50 cm boulders, 162 m pvmt, cobble, patches of 1-2 m diam bigeye excavations, 161 m east rim of 3rd scour				
	Hard Bottom- Cobble	On Reef	LRu	LR	PF
Transect 6	Iceberg Scour 3, 164 m				
	Iceberg Scour- Valley	Off Reef	LRu	LR	S

Dive Site: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 170 m; Dive 12-30

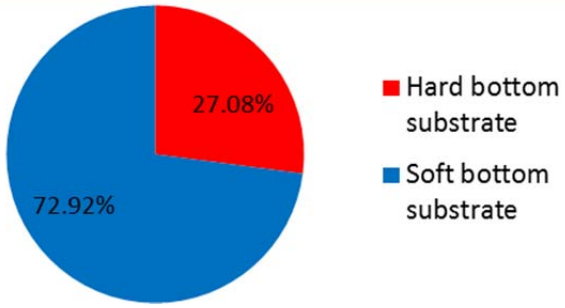


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-30. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-30 was predominately soft bottom (72.92%); the hard bottom substrate consisted mostly of rock pavement, cobble and boulders, and eroded rock along the scour rims.

Bare rock substrate without biota covered 23.72% of the bottom and bare soft bottom was 72.76% (Fig. 2, Table 2). Benthic macro-biota covered 3.51% of the bottom and consisted of 0.1% non-coral Cnidaria (Hydrozoa), 0.21% Porifera, 0.31% Alcyonacea ("gorgonacea"), and 2.8% other motile species.

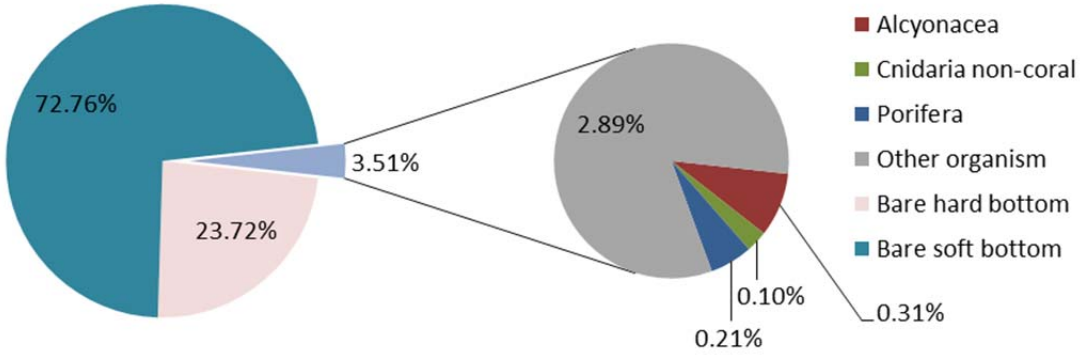


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-30. Non-scleractinian corals include Alcyonacea ("gorgonacea"). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-30.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**4**	**0.21%**
Porifera	**4**	**0.21%**
Demospongiae	3	0.16%
Leiodermatium sp.	1	0.05%
Cnidaria non-coral	**2**	**0.10%**
Cnidaria non-coral	**2**	**0.10%**
Hydroidolina	2	0.10%

Dive Site: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 170 m; Dive 12-30

Alcyonacea	**6**	**0.31%**
Alcyonacea	**6**	**0.31%**
Gorgonacea	6	0.31%
Other organism	**56**	**2.89%**
Annelida	**33**	**1.71%**
Annelida	1	0.05%
Sabellidae	4	0.21%
Serpulidae	28	1.45%
Arthropoda	**2**	**0.10%**
Majidae	2	0.10%
Chordata	**9**	**0.47%**
Fish	9	0.47%
Echinodermata	**6**	**0.31%**
Echinoidea	2	0.10%
Paracolochirus mysticus	4	0.21%
Mollusca	**1**	**0.05%**
Gastropoda	1	0.05%
Natural detritus	**2**	**0.10%**
Natural detritus	2	0.10%
Other organism	**3**	**0.16%**
Other organism	3	0.16%
Hard bottom substrate	**459**	**23.72%**
Hard bottom substrate	**459**	**23.72%**
Bare rock- pavement boulder ledge	448	23.15%
Bare rubble- rock	11	0.57%
Soft bottom substrate	**1408**	**72.76%**
Soft bottom substrate	**1408**	**72.76%**
Bare soft bottom substrate	1408	72.76%
Grand Total	**1935**	**100.00%**

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The flat hard bottom (Cobble zone) between the scour marks had 26.3% cover of bare rock pavement and 69% cover of sediment, which was possibly a thin veneer of sediment over pavement. Inside of the scours (valley zone) was mostly soft muddy sand (93% cover). Figure 4 shows the low cover of biota on the hard bottom (cobble zone) between the scour marks. Sponge cover was 0.2%, Alcyonacea 0.3%, and hydroids 0.1%. Motile species dominated at 3.3% cover and included serpulid worms, majid crabs, echinoids, holothurians, and gastropods.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 170 m; Dive 12-30

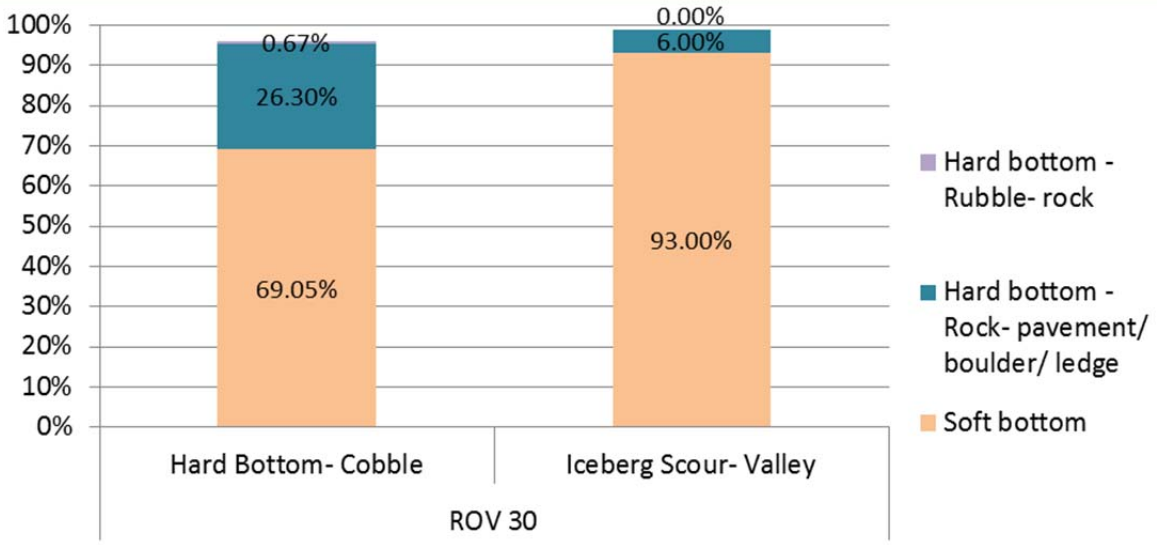


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-30.

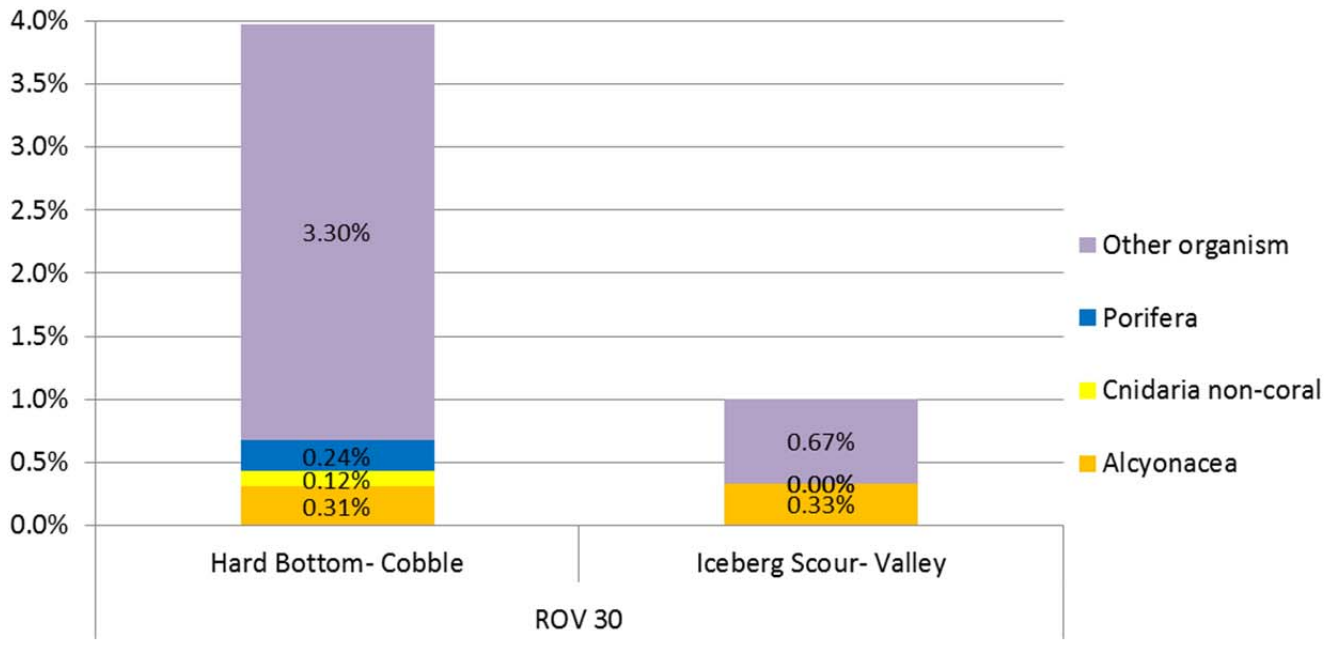


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-30.

Dive Site: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 170 m; Dive 12-30

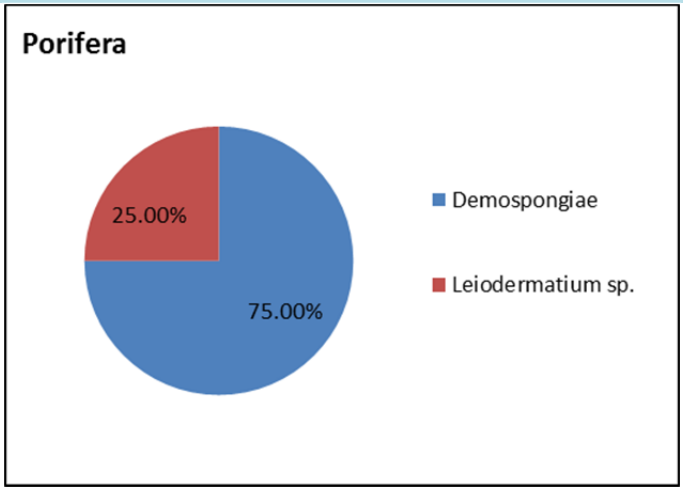


Figure 5. Diversity of sponges at dive site ROV 12-30; CPCe analysis showing percent of total for each taxa category.

Overall, the diversity of benthic fauna was very low. No hard coral was present at the dive site. Non-scleractinian coral only consisted of one species of gorgonacea. No Antipatharia were present. Twenty-five percent of the total Porifera were *Leiodermatium* sp.; 75% were unidentified Demospongiae (Figure 5).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 20 taxa of fish were identified from dive ROV 30 for a total density of 130.3 individuals/km (Table 3). These were dominated by boarfish (39.2), anthiids (21), and scorpionfish (16.8). Managed species included red porgy (7.1/km), snowy grouper (1.7), and slimehead (0.5).

Table 3. Density of fish for all transects at dive site ROV 12-30 (number individuals/km).

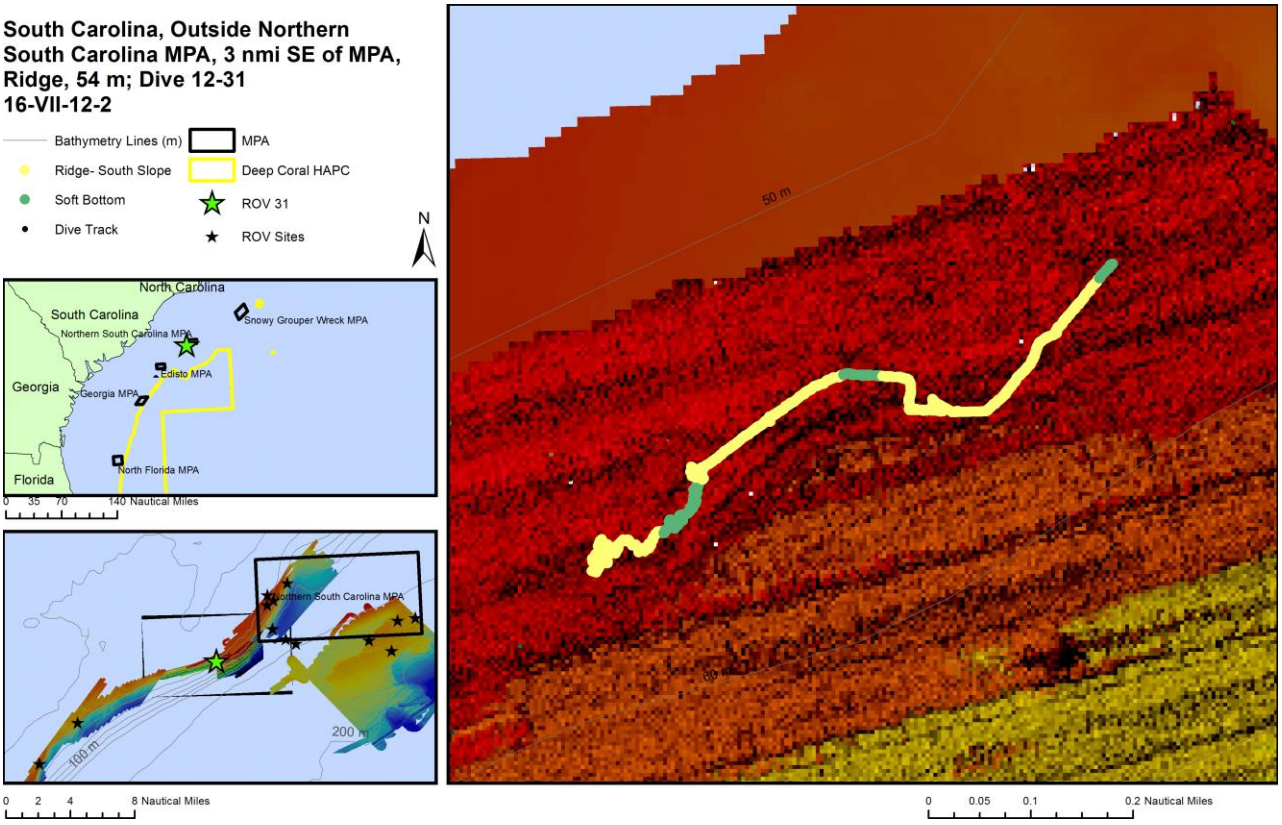
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Anthias nicholsi	yellowfin bass	21	4.23	5.0
Anthias woodsi	swallowtail bass	2	4.23	0.5
Anthiinae	anthiids	89	4.23	21.0
Antigonia sp.	boarfish	166	4.23	39.2
Caulolatilus microps	blueline tilefish	9	4.23	2.1
Cookeolus boops	bulleye	1	4.23	0.2
Decodon puellaris	red hogfish	38	4.23	9.0
Epinephelus niveatus	snowy grouper	7	4.23	1.7
Gephyroberyx darwinii	Darwin's slimehead	2	4.23	0.5
Hemanthias vivanus	red barbier	1	4.23	0.2
Laemonema sp.	mora	5	4.23	1.2
Liopropoma eukrines	wrasse bass	1	4.23	0.2
Macroramphosus scolopax	longspine snipefish	13	4.23	3.1
Ostichthys trachypoma	bigeye soldierfish	2	4.23	0.5

Dive Site: South Carolina, Inside Northern South Carolina MPA, Iceberg Scour, 170 m; Dive 12-30

Pagrus pagrus	red porgy	30	4.23	7.1
Pareques iwamotoi	blackbar drum	11	4.23	2.6
Plectranthias garrupellus	apricot bass	7	4.23	1.7
Pristigenys alta	short bigeye	34	4.23	8.0
Scorpaenidae	scorpionfish	71	4.23	16.8
Serranus notospilus	saddle bass	41	4.23	9.7
Total		551		130.3

Dive Site: South Carolina, Outside Northern South Carolina MPA, 3 nmi SW of MPA, Ridge, 54 m; Dive 12-31

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andrew W. David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	SC_MPA_1ab (SC_MPA_1)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/16/2012
Specimens:	
Digital Photos:	122
DVD:	2
Hard Drive:	1

Dive Site: South Carolina, Outside Northern South Carolina MPA, 3 nmi SW of MPA, Ridge, 54 m; Dive 12-31

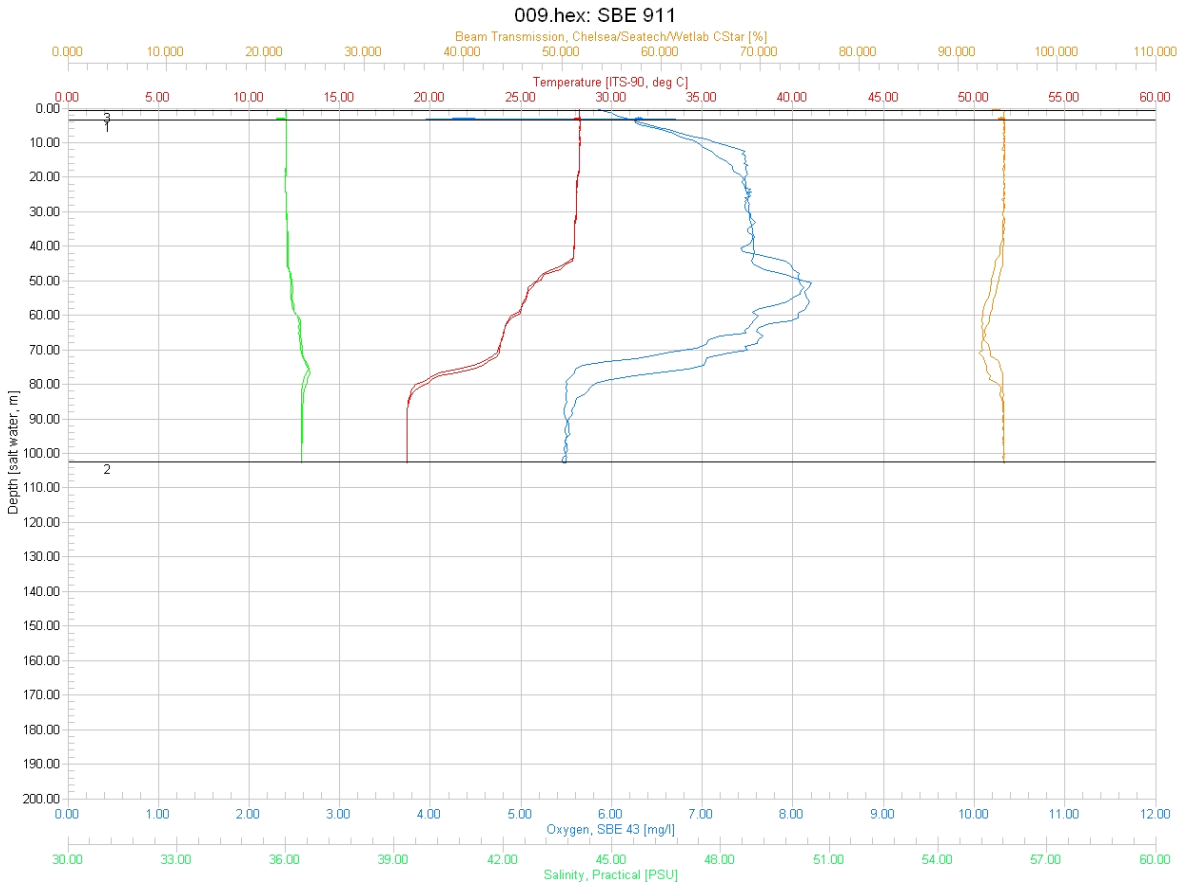
Dive Data:

Minimum Bottom Depth (m):	48	**Total Transect Length (km):**	2.839
Maximum Bottom Depth (m):	55	**Surface Current (kn):**	0.4
On Bottom (Time- GMT):	8:00	**On Bottom (Lat/Long):**	32.79°N; -78.33°W
Off Bottom (Time- GMT):	9:49	**Off Bottom (Lat/Long):**	32.79°N; -78.32°W

Physical (bottom); Temp (°C): 22.70 **Salinity:** 36.20 **Visibility (ft):** 50 **Current (kn):** 0.25

Physical Environment:

Distance from Dive Site(km): 7.44



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (101 m): temperature- 18, salinity- 36.2, and dissolved oxygen- 5.2. Surface temperature was 28.33 and there was a thermocline near 42-50 and 70-80 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 50 m. Visibility was estimated at 50 ft from the ROV video.

Dive Site: South Carolina, Outside Northern South Carolina MPA, 3 nmi SW of MPA, Ridge, 54 m; Dive 12-31

Dive Imagery:

Figure 1: -50.8 m
Bottle brush Antipatharia on *Dictyota* algal dominated low-relief hardbottom.

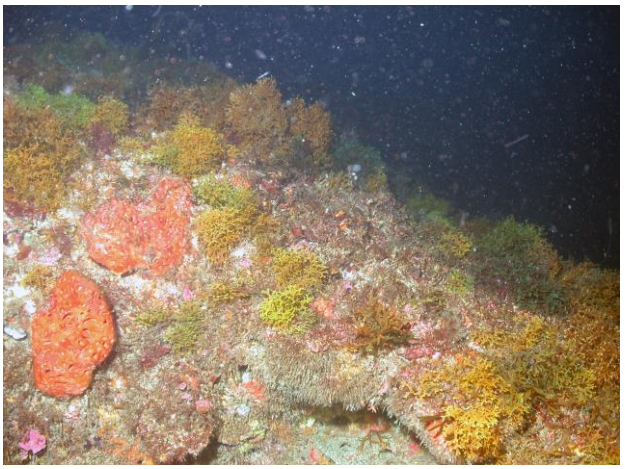


Figure 2: -50.8 m
Agelas sponges on *Dictyota* algal dominated hardbottom.

Figure 3: -50.6 m
Condylactis gigantea anemone on hardbottom.

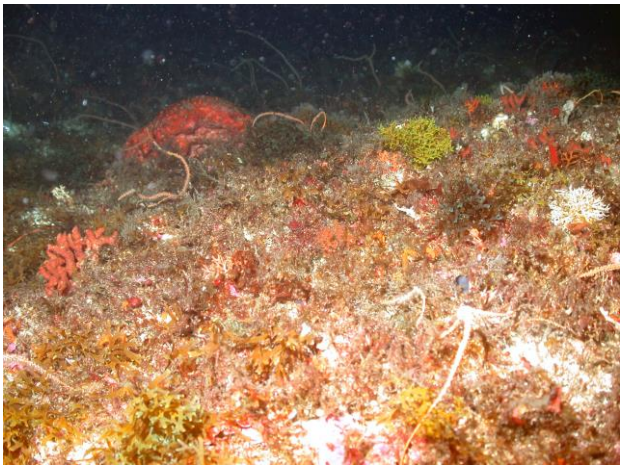


Figure 4: -51.8 m
Dense biota on hardbottom.

Dive Site: South Carolina, Outside Northern South Carolina MPA, 3 nmi SW of MPA, Ridge, 54 m; Dive 12-31

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 31, Site #- 16-VII-12-2. Target Site – outside of South Carolina, Northern S.C. MPA; 55 m. ROV survey outside MPA; ground truth new Pisces multibeam. Conduct video/photo transect on E-W oriented ridge.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.4 kn; bottom 0.25 kn.

Site Description/Habitat/Biota:
Transect along E-W oriented ridge of multibeam. Ridge is mostly smooth rock, 30-45o slope on south slope, few ledges, low rugosity; top 49 m, base 52 m. Nearly 100% cover of algae, dense Dictyota, along with green and red algae, large Agelas sponges, hydroids, and black coral. Off ridge is mostly patchy rock cobble and low relief rock knolls of 1/2 to 1 m relief, 5-10 m diameter, covered with similar biota, at depth of 52-54 m. Few large reef fish present.

Dominant Benthic Biota: Gorgonacea- Diodogorgia?, *Ellisella* (whips, tan), *Ellisella barbadensis* (orange), *Swiftia* (uncommon), *Telesto*; Alcyonacea- Nephtheidae; Hydroida; Antipatharia- *Stichopathes*, several spp (bottle brush, bushy white); Actiniaria- *Condylactis gigantea*; Demospongiae- *Agelas* (10-30 cm orange, thick plates), *Aplysina* (cluster thick tubes), *Aplysina* (creeping, branching), *Callyspongia vaginalis*, *Niphates*?, Spirastrellidae (orange/red encrusting); *Ircinia campana*; Asteroidea- *Narcissia trigonaria*; Ascidiacea- Eudistoma; Phaeophyta- *Dictyota* (dense, 4 color morphs), *Sargassum* (attached); Rhodophyta (several spp.), Chlorophyta (several spp.).
Fish: scamp (4), greater amberjack, blue angelfish, blue goby, Calamus porgy, creole fish, doctor fish, french angelfish, hogfish, rock beauty, reef butterfly, sand tile burrow, soapfish, spanish hogfish, spotfin butterfly, squirrelfish, surgeonfish, tomtate, lionfish (common, 30).

Location: South Carolina, Outside Northern South Carolina MPA, 3 nmi SW of MPA, Ridge, 54 m; Dive 12-31

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-31 conducted a survey 3 nmi SW of the MPA along the south slope of an E-W oriented ridge which is barely evident in the poorly defined multibeam sonar map. Dive transects were divided into two habitat zones: Ridge- South Slope and Soft Bottom. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). The ridge was smooth rock, ~10 m wide, and 3 m tall; the south slope dropped off from 49 m at the top to 52-55 m and was of moderate to high relief but low rugosity, with few low ledges and small 1-m tall rock knolls along the base; 48-55 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-31. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 31	South Carolina, Outside Northern South Carolina MPA, 3 nmi SW of MPA, Ridge, 54 m; Dive 12-31				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	Between 49-52 m N-S Ridge, 10 m wide, smooth slope. Ledges < 0.5 m. smooth ridge 3 m tall >35o slope no ledges				
	Ridge- South Slope	On Reef	LRu	MR	RLF
Transect 2	52 m off ridge, yellow MB zone, soft bot, some pvmt and rubble				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 3	50-52 m base, 49 m top of ridge, smooth round slope, orange in MB.				
	Ridge- South Slope	On Reef	LRu	MR	RLF
Transect 4	52 m yellow in MB,				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 5	55 m rock knolls (1 m relief), then; 58-51 m 1-2 m smooth rock ridges no ledges				
	Ridge- South Slope	On Reef	LRu	HR	RLF
Transect 6	52 m off ridge				
	Soft Bottom	Off Reef	LRu	LR	S

Location: South Carolina, Outside Northern South Carolina MPA, 3 nmi SW of MPA, Ridge, 54 m; Dive 12-31

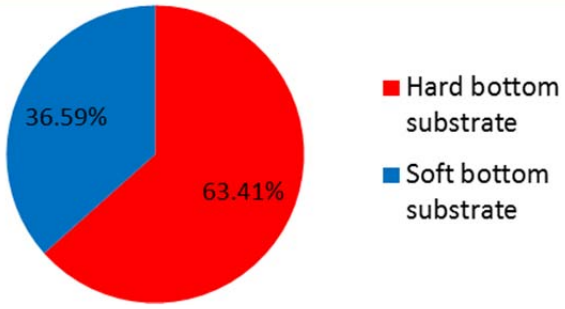


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-31. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-31 was predominately hard bottom (63.41%) consisting of rock pavement, low ledges and rubble.

Bare rock substrate without biota covered 11.25% of the bottom and bare soft bottom was 28.16% (Fig. 2, Table 2). Benthic macro-biota covered 60.59% of the bottom and consisted of 0.49% non-coral Cnidaria (Hydrozoa), 2.77% Porifera, 0.46% Antipatharia, 1.63% Alcyonacea ("gorgonacea" and soft coral), and 32.08% algae which included Phaeophyta (20.3%), fleshy Rhodophyta (4.8%), cyanobacteria (4.7%), and crustose coralline algae (1.1%).

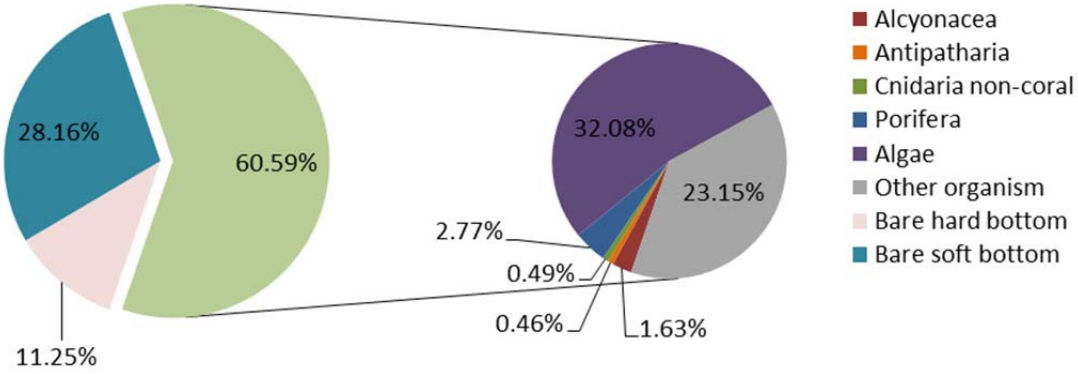


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-31. Non-scleractinian corals include Alcyonacea ("gorgonacea" and soft coral) and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-31.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**73**	**2.77%**
Porifera	**73**	**2.77%**
Agelas sp.	54	2.05%
Callyspongia vaginalis	4	0.15%
Demospongiae	7	0.27%
Demospongiae- ze tan starlet	3	0.11%

Location: South Carolina, Outside Northern South Carolina MPA, 3 nmi SW of MPA, Ridge, 54 m; Dive 12-31

Ircinia strobilina	3	0.11%
Niphates sp.	2	0.08%
Cnidaria non-coral	**13**	**0.49%**
Cnidaria non-coral	**13**	**0.49%**
Hydroidolina	13	0.49%
Antipatharia	**12**	**0.46%**
Antipatharia	**12**	**0.46%**
Antipatharia	4	0.15%
Stichopathes lutkeni	1	0.04%
Tanacetipathes hirta	7	0.27%
Algae	**844**	**32.08%**
Algae	**844**	**32.08%**
Chlorophyta	25	0.95%
Corallinales/crustose coralline	30	1.14%
Cyanophyta	126	4.79%
Phaeophyta	536	20.37%
Rhodophyta	127	4.83%
Alcyonacea	**43**	**1.63%**
Alcyonacea	**43**	**1.63%**
Alcyonacea	3	0.11%
Ellisella sp.	6	0.23%
Gorgonacea	2	0.08%
Nephtheidae	6	0.23%
Telesto sp.	26	0.99%
Other organism	**609**	**23.15%**
Bryozoa	**141**	**5.36%**
Bryozoa	129	4.90%
Schizoporella sp.	12	0.46%
Chordata	**12**	**0.46%**
Ascidiacea	4	0.15%
Fish	8	0.30%
Echinodermata	**2**	**0.08%**
Narcissia trigonaria	2	0.08%
Mollusca	**1**	**0.04%**
Bivalvia	1	0.04%
Natural detritus	**3**	**0.11%**
Natural detritus	3	0.11%
Other organism	**450**	**17.10%**
Other organism	450	17.10%
Hard bottom substrate	**296**	**11.25%**
Hard bottom substrate	**296**	**11.25%**
Bare rock- pavement boulder ledge	184	6.99%

Location: South Carolina, Outside Northern South Carolina MPA, 3 nmi SW of MPA, Ridge, 54 m; Dive 12-31

Bare rubble- rock	112	4.26%
Soft bottom substrate	**741**	**28.16%**
Soft bottom substrate	**741**	**28.16%**
Bare soft bottom substrate	741	28.16%
Grand Total	**2631**	**100.00%**

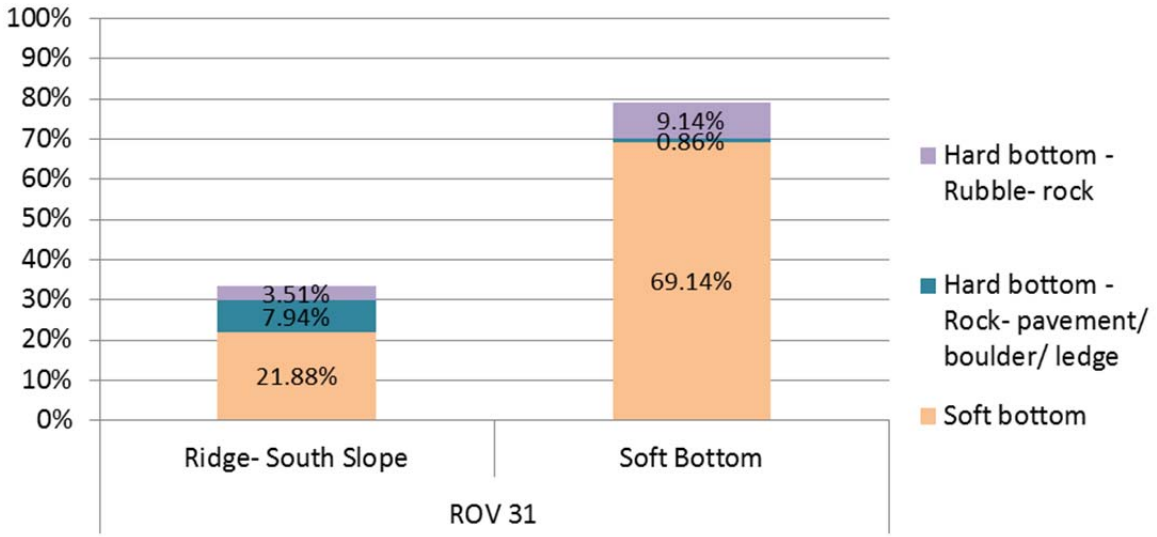


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-31.

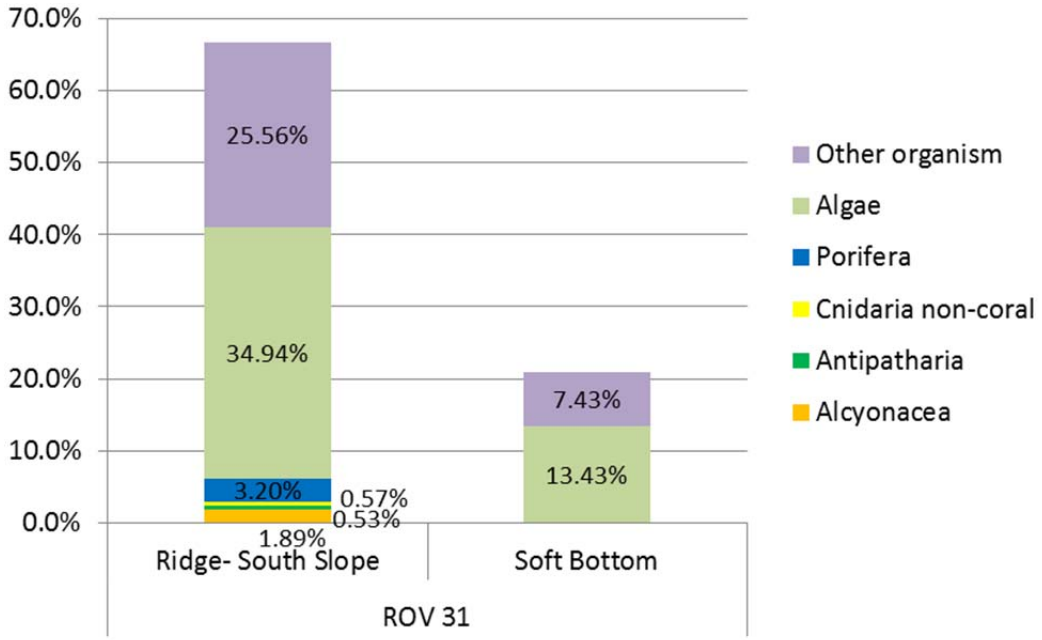


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-31.

Location: South Carolina, Outside Northern South Carolina MPA, 3 nmi SW of MPA, Ridge, 54 m; Dive 12-31

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The ridge south slope had 7.9% cover of bare rock and 21.8% bare sediment. Off reef was predominately soft substrate (69.1% cover). Figure 4 shows the ridge slope to have ~68% cover of biota which was dominated by algae (34.9% cover), Porifera (3.2%), Antipatharia (0.5%), and Alcyonacea (1..8%). Algae were found off reef on the sediment along with some motile species.

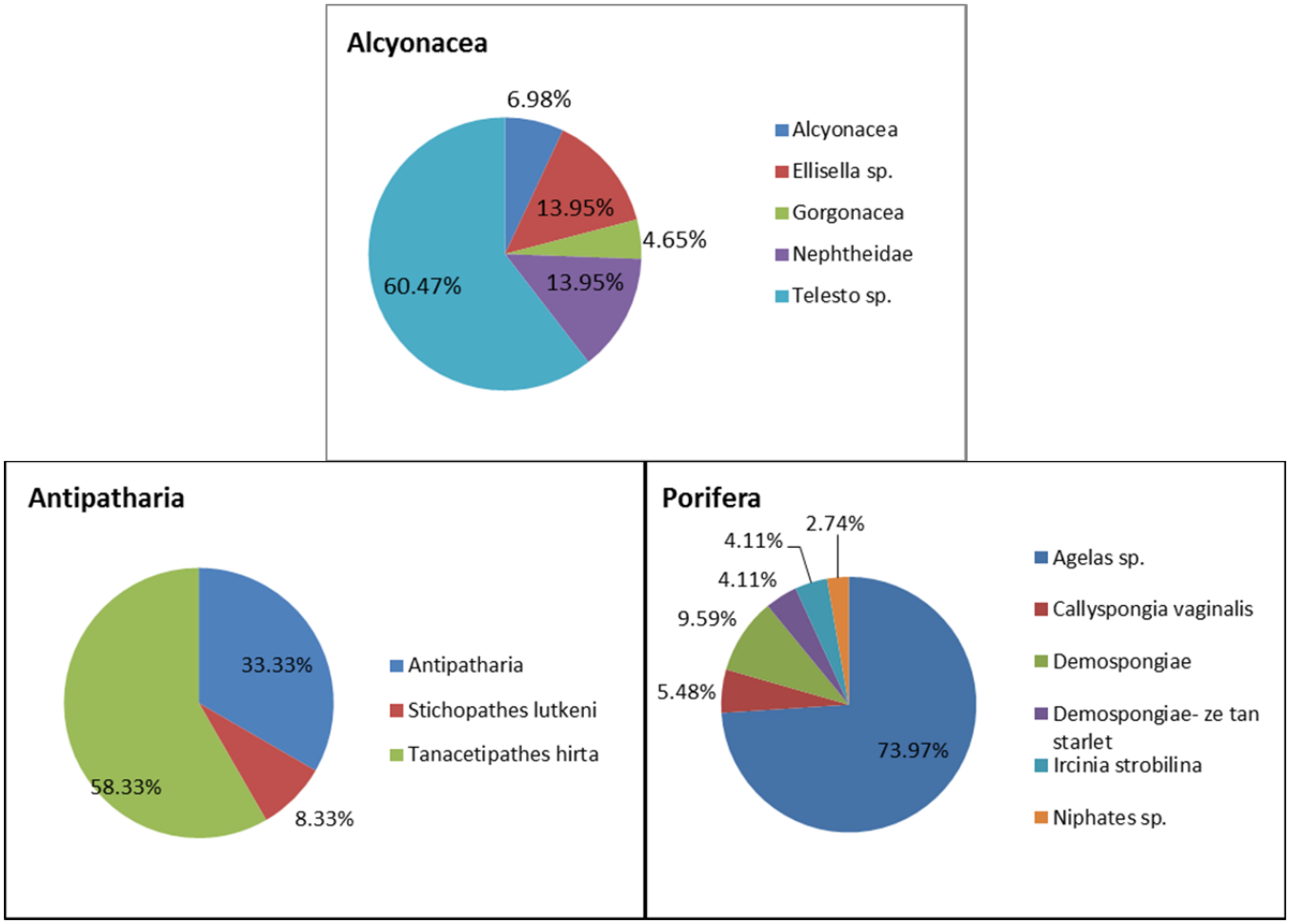


Figure 5. Diversity of corals and sponges at dive site ROV 12-31; CPCe analysis showing percent of total for each taxa category. Non-scleractinian corals include Alcyonacea ("gorgonacea" and soft corals) and Antipatharia (black coral); Porifera are Demospongiae.

No hard coral was present at the dive site. Non-scleractinian corals included Alcyonacea which were dominated by *Telesto* sp. (60.4% of the total Alcyonacea), *Ellisella* sp. (13.9%), and the soft corals Neptheidae (13.9%). Antipatharia were dominated by *Tanacetipathes hirta* (58.3% of the total Antipatharia), *Stichopathes lutkeni* (8.3%), and unidentified Antipatharia (33.3%). Sponges consisted of *Agelas* sp. (73.9% of the total Porifera), *Callyspongia vaginalis* (5.4%), tan starlet demosponge (4.1%), *Ircinia strobilina* (4.1%), and *Niphates* sp. (2.7%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (#

individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 39 taxa of fish were identified from dive ROV 31 for a total density of 298.6 individuals/km (Table 3). These were dominated by wrasse (65.8/km), sharpnose puffer (51.8), and reef butterflyfish (31.3). Managed species included scamp (1.1/km), hogfish (0.7), amberjack (0.7), graysby (0.4), and red grouper (0.4).

Table 3. Density of fish for all transects at dive site ROV 12-31 (number individuals/km).

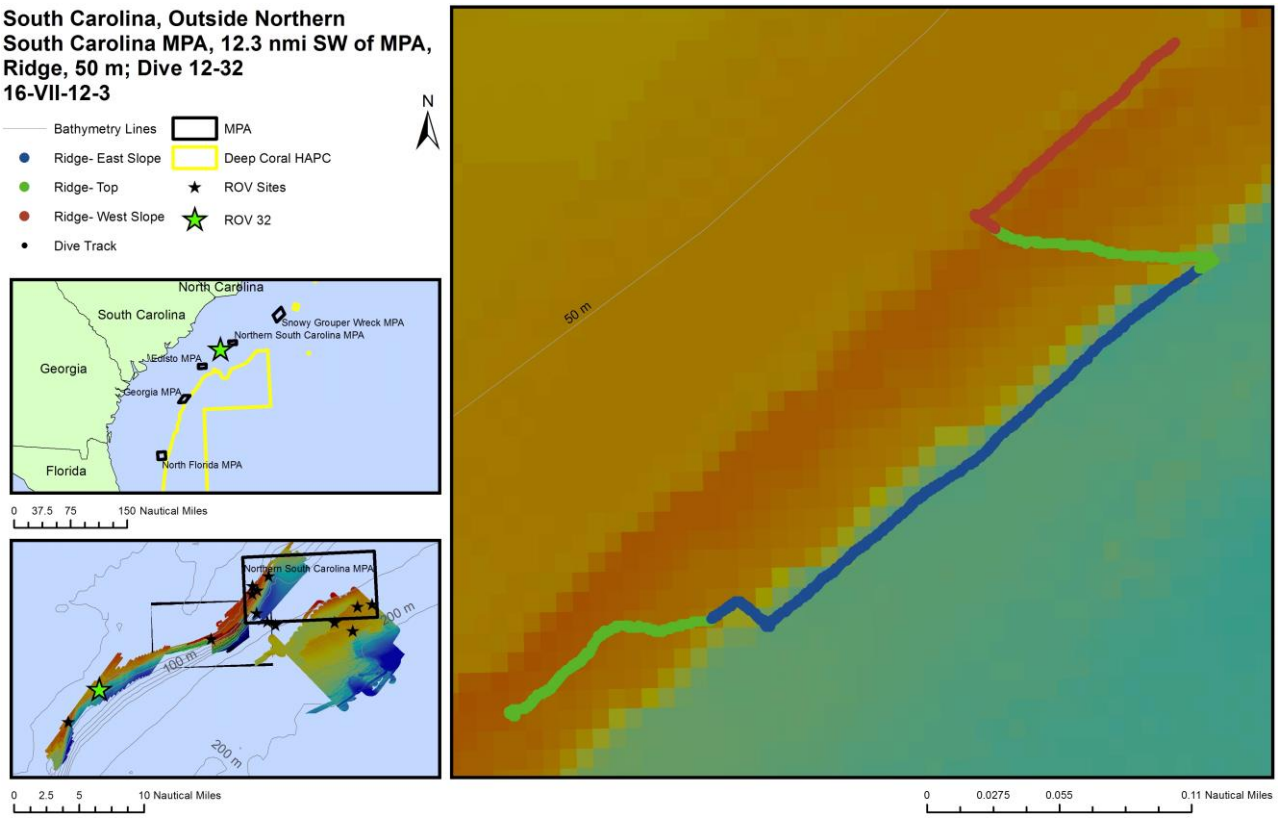
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus bahianus	ocean surgeonfish	5	2.84	1.8
Acanthurus sp.	doctorfish	6	2.84	2.1
Bodianus pulchellus	spotfin hogfish	37	2.84	13.0
Calamus sp.	porgy	11	2.84	3.9
Canthigaster rostrata	sharpnose puffer	147	2.84	51.8
Centropyge argi	cherubfish	3	2.84	1.1
Chaetodon ocellatus	spotfin butterflyfish	13	2.84	4.6
Chaetodon sedentarius	reef butterflyfish	89	2.84	31.3
Chromis enchrysurus	yellowtail reeffish	16	2.84	5.6
Chromis insolatus	sunshinefish	25	2.84	8.8
Chromis scotti	purple reeffish	10	2.84	3.5
Chromis sp.	damselfish	28	2.84	9.9
Epinephelus cruentatus	graysby	1	2.84	0.4
Epinephelus morio	red grouper	1	2.84	0.4
Equetus umbrosus	cubbyu	40	2.84	14.1
Haemulon aurolineatum	tomtate	70	2.84	24.6
Halichoeres garnoti	yellowhead wrasse	3	2.84	1.1
Halichoeres sp.	wrasse	187	2.84	65.8
Holacanthus bermudensis	blue angelfish	18	2.84	6.3
Holacanthus tricolor	rock beauty	6	2.84	2.1
Holocentridae	soldierfish	1	2.84	0.4
Holocentrus sp.	squirrelfish	12	2.84	4.2
Lachnolaimus maximus	hogfish	2	2.84	0.7
Lactophrys sp.	cowfish	1	2.84	0.4
Monacanthus sp.	filefish	1	2.84	0.4
Mycteroperca phenax	scamp	3	2.84	1.1
Myripristis jacobus	blackbar soldierfish	1	2.84	0.4
Paranthias furcifer	creole-fish	8	2.84	2.8
Pomacanthus paru	french angelfish	2	2.84	0.7
Pterois volitans	lionfish	34	2.84	12.0
Rypticus saponaceus	greater soapfish	4	2.84	1.4
Rypticus sp.	soapfish	4	2.84	1.4
Scorpaenidae	scorpionfish	1	2.84	0.4
Seriola rivoliana	almaco jack	2	2.84	0.7
Serranus annularis	orangeback bass	7	2.84	2.5
Serranus phoebe	tattler	8	2.84	2.8

Location: South Carolina, Outside Northern South Carolina MPA, 3 nmi SW of MPA, Ridge, 54 m; Dive 12-31

Sparisoma atomarium	greenblotch parrotfish	36	2.84	12.7
Sphoeroides spengleri	bandtail puffer	1	2.84	0.4
Stegastes partitus	bicolor damselfish	4	2.84	1.4
Total		848		298.6

Dive Site: South Carolina, Outside Northern South Carolina MPA, 12.3 nmi SW of MPA, Ridge, 50 m; Dive 12-32

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andrew W. David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	sc3_wgs84
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/16/2012
Specimens:	
Digital Photos:	82
DVD:	2
Hard Drive:	1

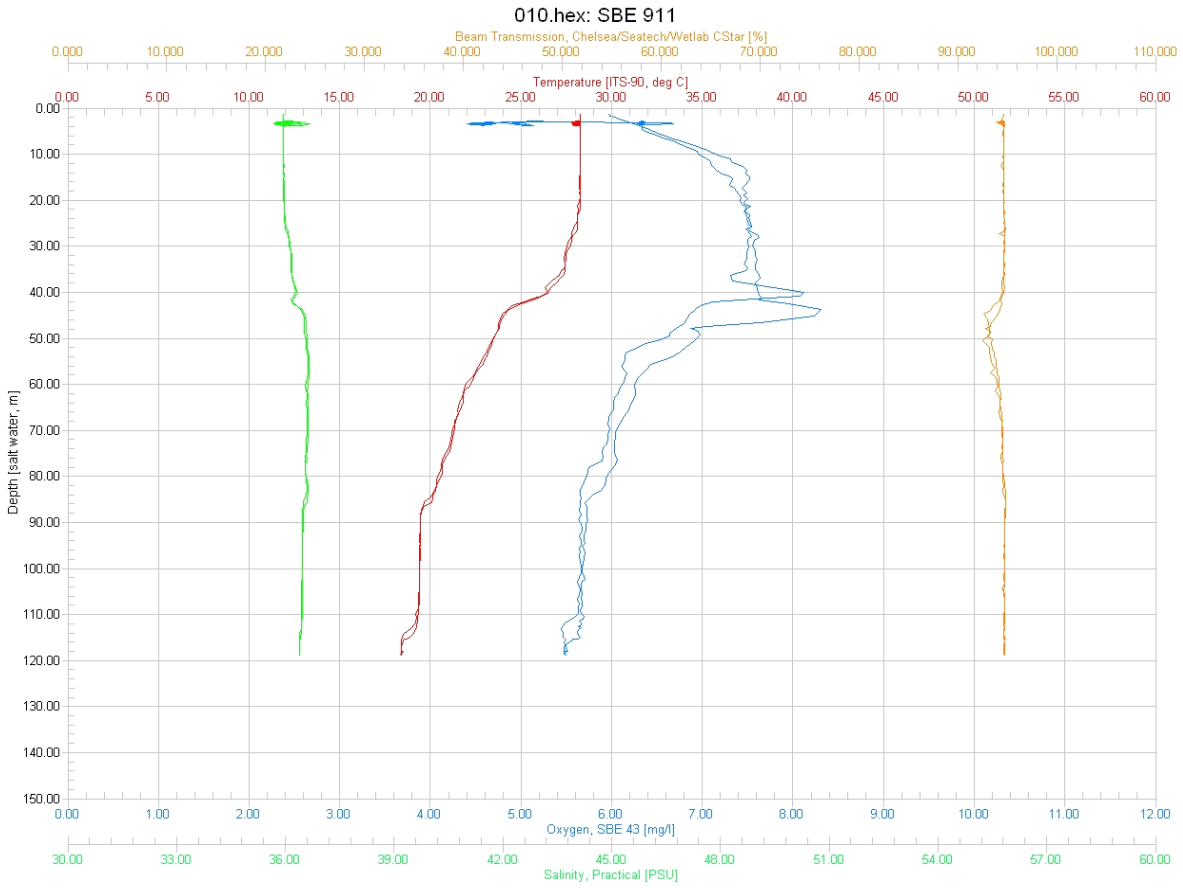
Dive Site: South Carolina, Outside Northern South Carolina MPA, 12.3 nmi SW of MPA, Ridge, 50 m; Dive 12-32

Dive Data:

Minimum Bottom Depth (m):	45	**Total Transect Length (km):**	1.550
Maximum Bottom Depth (m):	55	**Surface Current (kn):**	.5
On Bottom (Time- GMT):	11:36	**On Bottom (Lat/Long):**	32.73°N; -78.51°W
Off Bottom (Time- GMT):	13:10	**Off Bottom (Lat/Long):**	32.74°N; -78.5°W
Physical (bottom); Temp (°C):	22.22	**Salinity:** 36.00 **Visibility (ft):** 30	**Current (kn):** 0.5

Physical Environment:

Distance from Dive Site(km): 25.79



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (119 m): temperature- 18.5, salinity- 36.1, and dissolved oxygen- 5.4. Surface temperature was 28.41 and there was a thermocline near 40 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 48 m. Visibility was estimated at 30 ft from the ROV video.

Dive Site: South Carolina, Outside Northern South Carolina MPA, 12.3 nmi SW of MPA, Ridge, 50 m; Dive 12-32

Dive Imagery:

Figure 1: -45.3 m
Eudistoma tunicates, *Sargassum* and gorgonians on *Dictyota* algal dominated pavement.

Figure 2: -45.1 m
Nicella and purple plexaurid octocorals on algal dominated pavement.

Figure 3: -45.1 m
Algal dominated moderate relief rock.

Figure 4: -45.1 m
Callyspongia vaginalis tube sponge on algal dominated pavement.

Dive Site: South Carolina, Outside Northern South Carolina MPA, 12.3 nmi SW of MPA, Ridge, 50 m; Dive 12-32

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 32, Site #- 16-VII-12-3. Target Site – outside and southwest of South Carolina, Northern S.C. MPA; 50 m. ROV survey outside MPA; ground truth multibeam map. Conduct video/photo transect along NE-SW oriented ridge.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.5 kn; bottom 0.5. ROV navigation failed- all GPS positions logged from ship GPS position.

Site Description/Habitat/Biota:
Transect starts at WP 1 at depth of 45.5 m on flat pavement with 10-20 cm rock; exposed rock 100% covered with dense algae, mostly Dictyota, along with hydroids, sponges, and few gorgonians. Transect along ridge, moderate relief ledge with 2 m relief, 45-47 m. South escarpment of main ridge is 47 m at top, and 55 m at base. Upper slope is vertical rock 1-2 m relief; below this the lower slope which extends 15-20 m in width are ledges, very rugged and rugose, and a jumble of rock slabs and boulders. Huge schools of tomtate, and reef fish are common. The rock escarpment and boulders has little algae; mostly encrusting sponges and black coral. A transect to the NW crossed the ridge which is flat on top, ~100 m wide, to the north escarpment. Top of ridge, 46 m, is flat rock pavement, low relief rock, with dense brown algae, Dictyota, Sargassum (attached up to 1-2 m long), and hydroids; 50% cover of rock and algal. The north escarpment is 45 m at the top rim and slopes 10-20o to 47.5 m at the base in sand. The width of the drop-off is about 10 m width.

Dominant Benthic Biota: The flat pavement and ridge top is covered nearly completely with dense *Dictyota*, *Sargassum*, along with sponges, gorgonians, and black coral. Gorgonacea- Diodogorgia?, *Ellisella* (whip), Ellisellidae (branched), *Nicella* (30 cm purple); Hydroida; Antipatharia- *Stichopathes*, several spp; Demospongiae- *Aplysina* (thick cluster tubes), Axinellida, *Callyspongia vaginalis*, *Haliclona*?, Spirastrellidae, *Ircinia campana*; Ascidiacea- Didemnidae, *Eudistoma*; Chlorophyta- *Codium*, several spp.; Phaeophyta- *Dictyota*, *Sargassum*.
Fish: bank butterfly, blue angelfish, Calamus porgy, cowfish, creole fish, French angelfish, gag grouper (1), goatfish, hogfish, queen angelfish, reef butterflyfish, scamp (5), scorpion fish, short bigeye, shortnose puffer, spotted goatfish, tomtate (huge schools on south escarpment), tattler, vermilion snapper, lionfish (common, 37).

Location: South Carolina, Outside Northern South Carolina MPA, 12.3 nmi SW of MPA, Ridge, 50 m; Dive 12-32

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-32 conducted a survey 12.3 nmi SW of the MPA along a SW to NE oriented ridge which is evident in the multibeam sonar map. Dive transects were divided into three habitat zones: Ridge- East Slope, Ridge- West Slope and Ridge- Top. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). The ridge top (45 m) was low relief, flat rock pavement with few ledges; the west slope was moderate relief but low rugosity; the east slope of the ridge was high relief, highly rugose, and very rugged drop-off of a jumble of rock slabs and boulders; 45- 55 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-32. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 32	South Carolina, Outside Northern South Carolina MPA, 12.3 nmi SW of MPA, Ridge, 50 m; Dive 12-32				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	45-47 m HD NE along Top of ridge, flat pvmt, 30 cm relief, few ledges < 0.5 m 100% cover				
	Ridge- Top	On Reef	LRu	LR	PF
Transect 2	Vertical wall, east slope of ridge, 47 m at top, 55 m at base, very rugose, jumble of rock slabs and boulders 3 m diam, 1-2 m relief.				
	Ridge- East Slope	On Reef	HRu	HR	RLF
Transect 3	XS across top of ridge, rock pavement				
	Ridge- Top	On Reef	LRu	MR	PF
Transect 4	West slope of ridge, 45 m top 47.5 m at bottom, 10 m wide slope, 2-45 m diam rock slabs, 1 m relief, sand at base				
	Ridge- West Slope	On Reef	HRu	MR	RLF

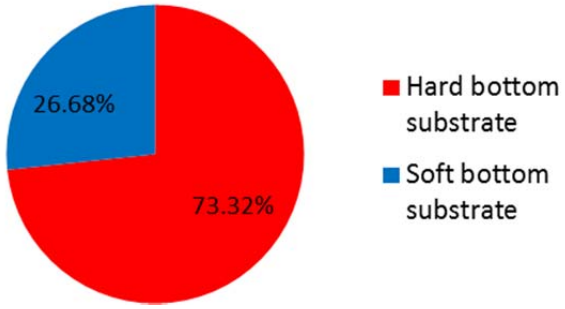


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-32. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Location: South Carolina, Outside Northern South Carolina MPA, 12.3 nmi SW of MPA, Ridge, 50 m; Dive 12-32

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-32 was predominately hard bottom (73.32%) consisting of rock pavement, rock slabs and boulders.

Bare rock substrate without biota covered 20.64% of the bottom and bare soft bottom was 20.71% (Fig. 2, Table 2). Benthic macro-biota covered 58.64% of the bottom and consisted of 5.16% non-coral Cnidaria (Hydrozoa), 4.65% Porifera, 0.36% Antipatharia, 1.16% Alcyonacea ("gorgonacea"), and 25.22% algae which consisted of Phaeophyta (8. 7%), fleshy Rhodophyta (8.1%), cyanobacteria (5.0%), and crustose coralline algae (3.2%).

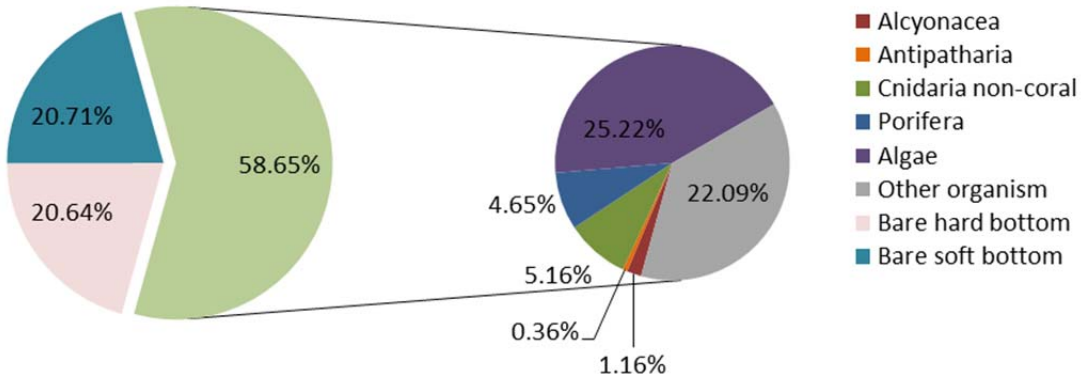


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-32. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-32.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**64**	**4.65%**
Porifera	**64**	**4.65%**
Astrophorida	1	0.07%
Axinellida	1	0.07%
Callyspongia vaginalis	6	0.44%
Demospongiae	34	2.47%
Demospongiae- ze tan starlet	1	0.07%
Ircinia sp.	1	0.07%
Ircinia strobilina	1	0.07%
Niphates sp.	2	0.15%
Scopalina sp.	3	0.22%
Spirastrellidae	14	1.02%
Cnidaria non-coral	**71**	**5.16%**
Cnidaria non-coral	**71**	**5.16%**
Hydroidolina	71	5.16%
Antipatharia	**5**	**0.36%**
Antipatharia	**5**	**0.36%**

Location: South Carolina, Outside Northern South Carolina MPA, 12.3 nmi SW of MPA, Ridge, 50 m; Dive 12-32

Antipatharia	5	0.36%
Algae	**347**	**25.22%**
Algae	**347**	**25.22%**
Corallinales/crustose coralline	44	3.20%
Cyanophyta	70	5.09%
Phaeophyta	121	8.79%
Rhodophyta	112	8.14%
Alcyonacea	**16**	**1.16%**
Alcyonacea	**16**	**1.16%**
Diodogorgia sp.	8	0.58%
Ellisellidae	3	0.22%
Gorgonacea	2	0.15%
Telesto sp.	3	0.22%
Other organism	**304**	**22.09%**
Annelida	**2**	**0.15%**
Serpulidae	2	0.15%
Bryozoa	**34**	**2.47%**
Bryozoa	33	2.40%
Schizoporella sp.	1	0.07%
Chordata	**28**	**2.03%**
Ascidiacea	17	1.24%
Didemnidae	1	0.07%
Fish	10	0.73%
Other organism	**240**	**17.44%**
Other organism	240	17.44%
Hard bottom substrate	**284**	**20.64%**
Hard bottom substrate	**284**	**20.64%**
Bare rock- pavement boulder ledge	261	18.97%
Bare rubble- rock	23	1.67%
Soft bottom substrate	**285**	**20.71%**
Soft bottom substrate	**285**	**20.71%**
Bare soft bottom substrate	285	20.71%
Grand Total	**1376**	**100.00%**

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The west slope of the ridge was predominately soft sediment (58.4% cover). The east slope of the ridge had 38.2% cover of bare rock substrate, and the ridge top had 9.6% bare rock cover. Figure 4 shows the ridge top to have the most biota (~82% cover) which was dominated by algae (39.2%), Porifera (5.1%), and Alcyonacea (1.9%). The south slope also had a high cover of biota (~50%).

Location: South Carolina, Outside Northern South Carolina MPA, 12.3 nmi SW of MPA, Ridge, 50 m; Dive 12-32

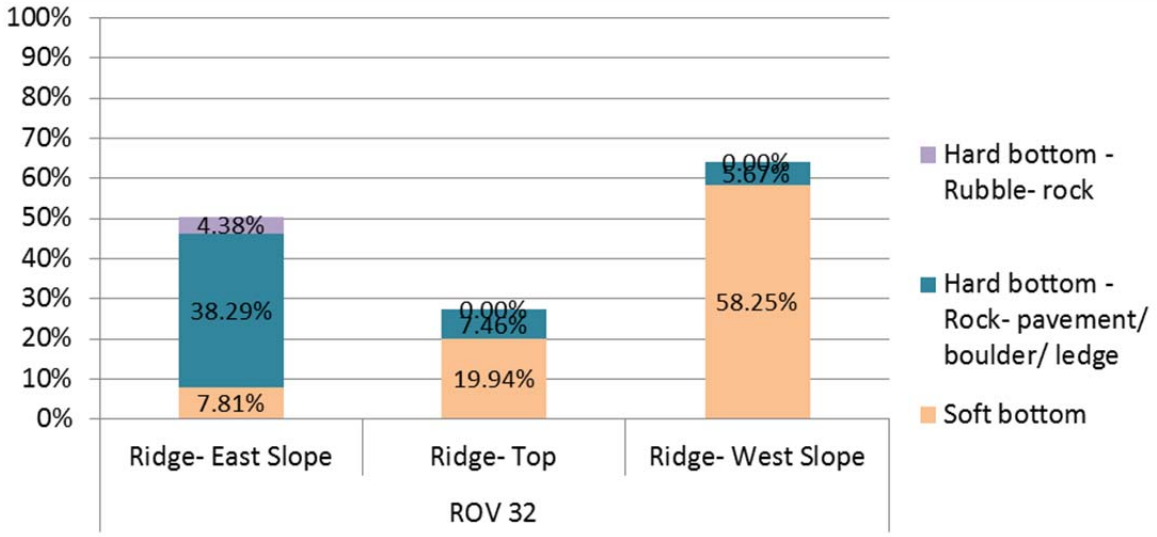


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-32.

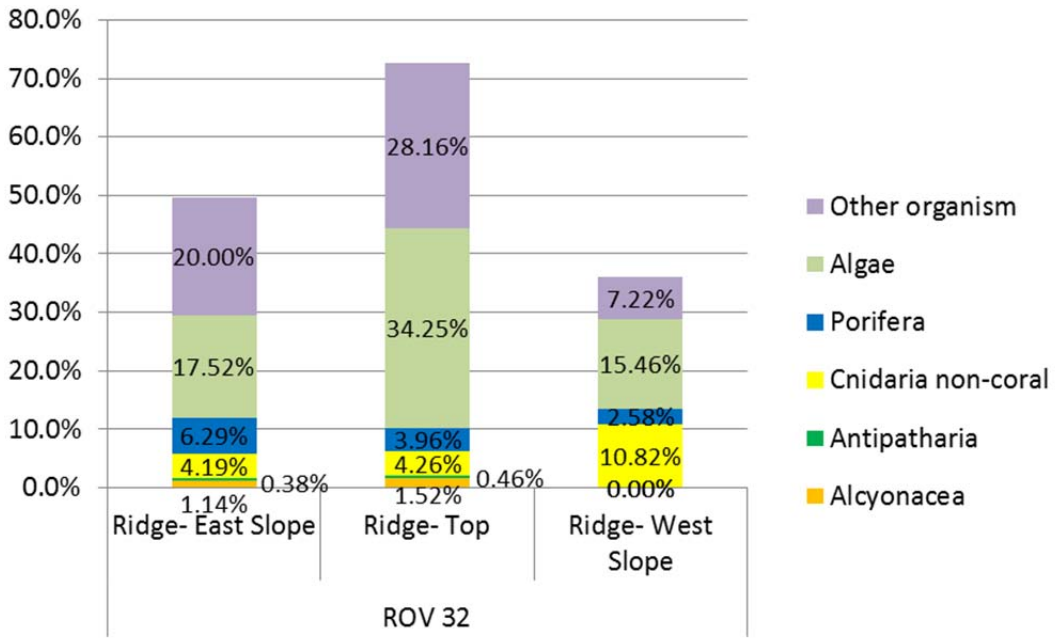


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-32.

Location: South Carolina, Outside Northern South Carolina MPA, 12.3 nmi SW of MPA, Ridge, 50 m; Dive 12-32

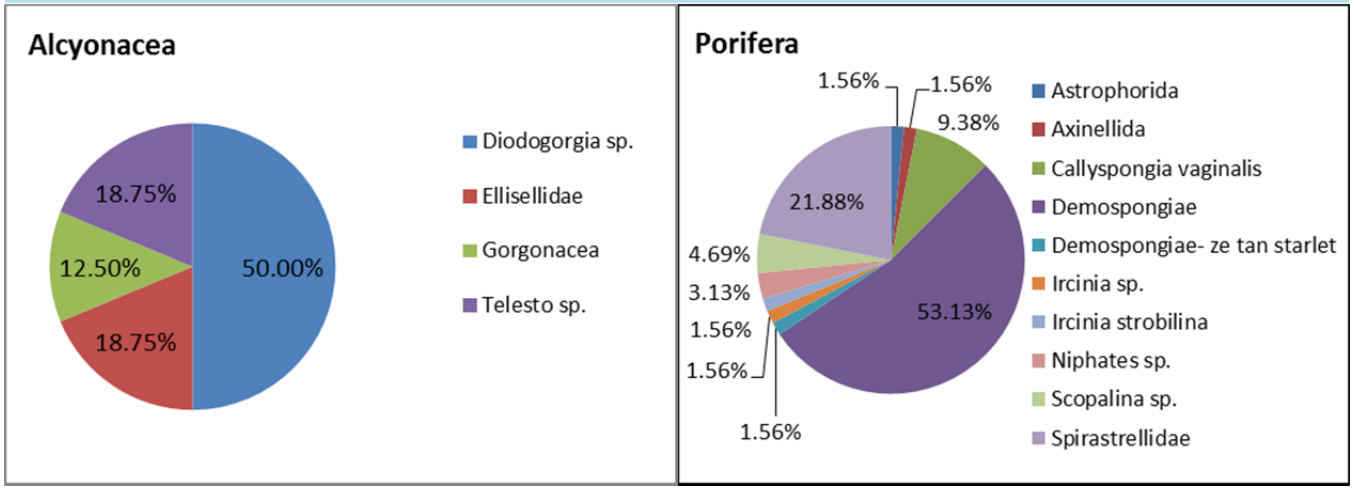


Figure 5. Diversity of corals and sponges at dive site ROV 12-32; CPCe analysis showing percent of total for each taxa category. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral); Porifera are Demospongiae.

No hard coral was present at the dive site. Non-scleractinian corals included one unidentified species of Antipatharia and 4 taxa of Alcyonacea: *Diodogorgia* sp. (50% of the total Alcyonacea), *Telesto* sp. (18.7%), Ellisellidae (18.7%), and other unidentified gorgonacea (12.5%). Sponges were relatively diverse with 10 taxa which were dominated by Spirastrellidae (21.8% of the total Porifera), *Callyspongia vaginalis* (9.3%), *Scopalina* sp. (4.6%), and *Niphates* sp. (3.1%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 43 taxa of fish were identified from dive ROV 32 for a total density of 3213.5 individuals/km (Table 3). These were dominated by tomtate (2300/km), sharpnose puffer (174.2), grunts (129). Managed species included scamp (16.8/km), red porgy (3.9), graysby (3.9), hogfish (5.8), amberjack (0.6), gag grouper (0.6), and vermilion snapper (127.7).

Table 3. Density of fish for all transects at dive site ROV 12-32 (number individuals/km).

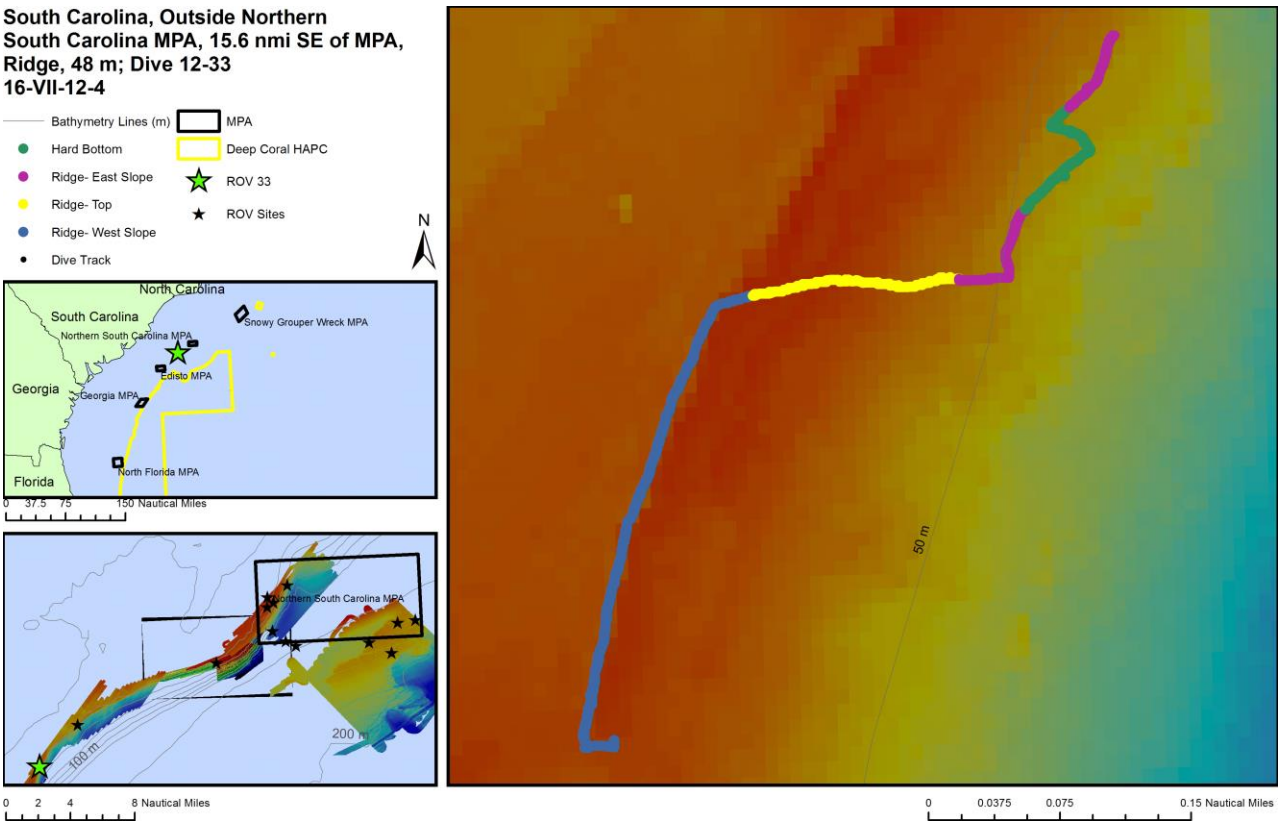
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus bahianus	ocean surgeonfish	2	1.55	1.3
Acanthurus sp.	doctorfish	3	1.55	1.9
Balistes capriscus	grey triggerfish	1	1.55	0.6
Bodianus pulchellus	spotfin hogfish	72	1.55	46.5
Calamus sp.	porgy	38	1.55	24.5
Canthigaster rostrata	sharpnose puffer	270	1.55	174.2
Chaetodon ocellatus	spotfin butterflyfish	7	1.55	4.5
Chaetodon sedentarius	reef butterflyfish	93	1.55	60.0
Chromis enchrysurus	yellowtail reeffish	56	1.55	36.1
Chromis insolatus	sunshinefish	15	1.55	9.7
Chromis scotti	purple reeffish	88	1.55	56.8

Location: South Carolina, Outside Northern South Carolina MPA, 12.3 nmi SW of MPA, Ridge, 50 m; Dive 12-32

Chromis sp.	damselfish	12	1.55	7.7
Epinephelus cruentatus	graysby	6	1.55	3.9
Equetus umbrosus	cubbyu	5	1.55	3.2
Haemulon aurolineatum	tomtate	3566	1.55	2300.6
Haemulon sp.	grunts	200	1.55	129.0
Halichoeres garnoti	yellowhead wrasse	1	1.55	0.6
Halichoeres sp.	wrasse	109	1.55	70.3
Holacanthus bermudensis	blue angelfish	46	1.55	29.7
Holocentridae	soldierfish/squirrelfish	1	1.55	0.6
Holocentrus sp.	squirrelfish	8	1.55	5.2
Lachnolaimus maximus	hogfish	9	1.55	5.8
Lactophrys sp.	cowfish	3	1.55	1.9
Mycteroperca microlepis	gag	1	1.55	0.6
Mycteroperca phenax	scamp	26	1.55	16.8
Myripristis jacobus	blackbar soldierfish	3	1.55	1.9
Pagrus pagrus	red porgy	6	1.55	3.9
Paranthias furcifer	creole-fish	5	1.55	3.2
Pomacanthus paru	french angelfish	5	1.55	3.2
Pristigenys alta	short bigeye	4	1.55	2.6
Prognathodes aya	bank butterflyfish	16	1.55	10.3
Pseudupeneus maculatus	spotted goatfish	2	1.55	1.3
Pterois volitans	lionfish	49	1.55	31.6
Rhomboplites aurorubens	vermilion snapper	198	1.55	127.7
Rypticus saponaceus	greater soapfish	1	1.55	0.6
Scorpaenidae	scorpionfish	2	1.55	1.3
Seriola rivoliana	almaco jack	1	1.55	0.6
Serranidae	grouper	1	1.55	0.6
Serranus annularis	orangeback bass	1	1.55	0.6
Serranus phoebe	tattler	23	1.55	14.8
Sparidae	porgy	5	1.55	3.2
Sparisoma atomarium	greenblotch parrotfish	17	1.55	11.0
Stegastes partitus	bicolor damselfish	4	1.55	2.6
Total		4981		3213.5

Dive Site: South Carolina, Outside Northern South Carolina MPA, 15.6 nmi SW of MPA, Ridge, 48 m; Dive 12-33

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	sc3_wgs84
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/16/2012
Specimens:	
Digital Photos:	110
DVD:	2
Hard Drive:	1

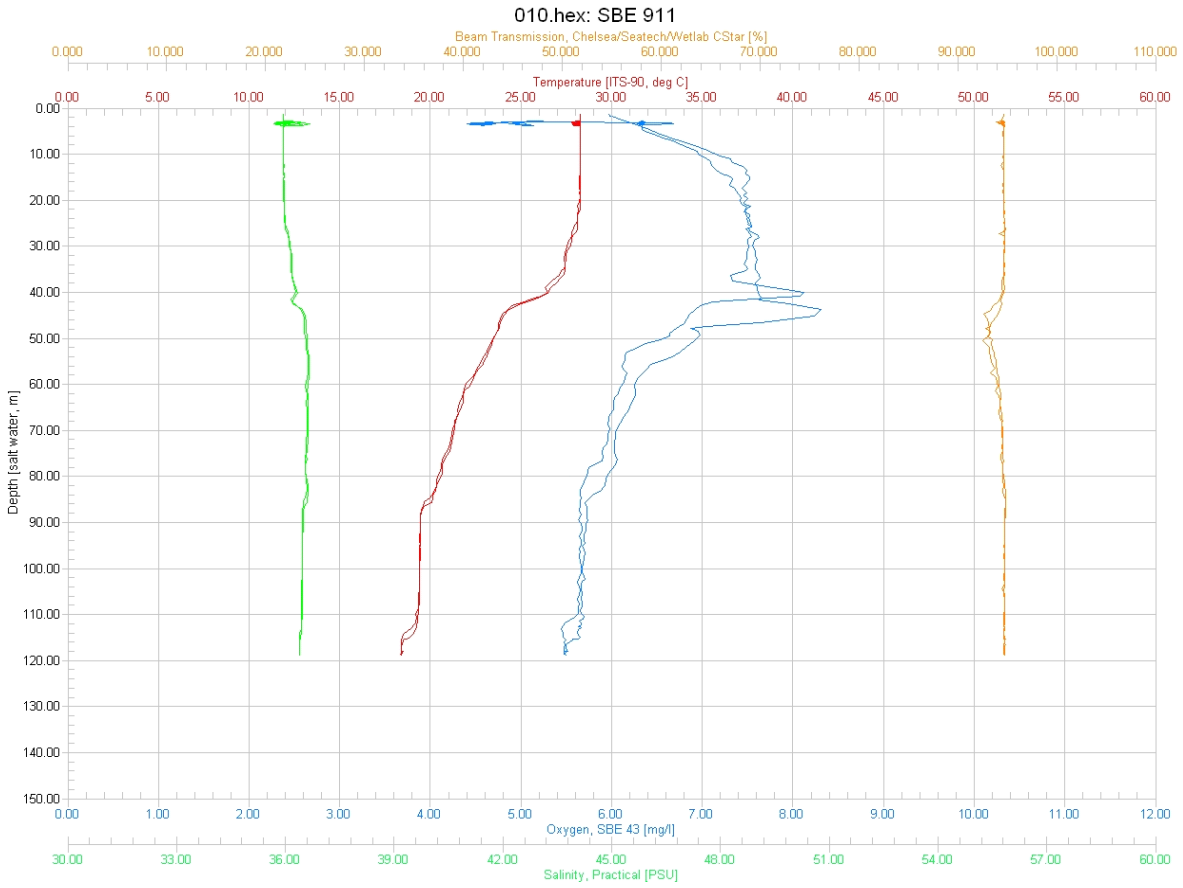
Dive Site: South Carolina, Outside Northern South Carolina MPA, 15.6 nmi SW of MPA, Ridge, 48 m; Dive 12-33

Dive Data:

Minimum Bottom Depth (m):	43	**Total Transect Length (km):**	1.589
Maximum Bottom Depth (m):	48	**Surface Current (kn):**	0.5
On Bottom (Time- GMT):	14:09	**On Bottom (Lat/Long):**	32.68°N; -78.56°W
Off Bottom (Time- GMT):	15:37	**Off Bottom (Lat/Long):**	32.68°N; -78.56°W
Physical (bottom); Temp (°C):	20.60	**Salinity:** 36.00 **Visibility (ft):** 50	**Current (kn):** 0.2

Physical Environment:

Distance from Dive Site(km): 31.77



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (119 m): temperature- 18.5, salinity- 36.1, and dissolved oxygen- 5.4. Surface temperature was 28.6 and there was a thermocline near 40 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 48 m. Visibility was estimated at 50 ft from the ROV video.

Dive Site: South Carolina, Outside Northern South Carolina MPA, 15.6 nmi SW of MPA, Ridge, 48 m; Dive 12-33

Dive Imagery:

Figure 1: -43.5 m
Scamp grouper and school of tomtate on high relief hardbottom.

Figure 2: -43.7 m
Agelas sponge and *Telesto* octocoral on moderate relief hardbottom.

Figure 3: -47.4 m
Hogfish on algal dominated high relief hardbottom.

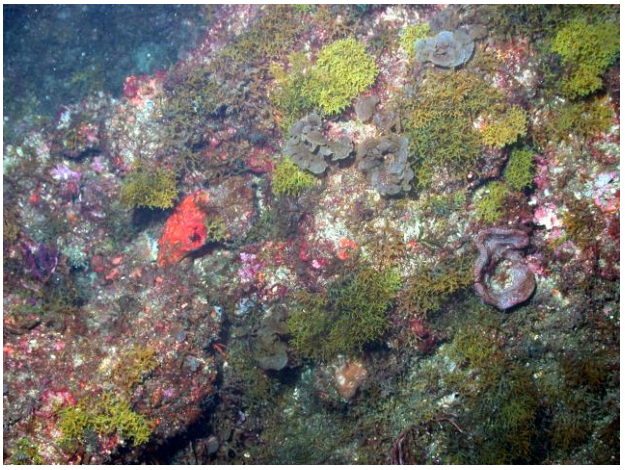


Figure 4: -42.4 m
Dense biota dominated by brown algae and demosponges on rock wall.

Dive Site: South Carolina, Outside Northern South Carolina MPA, 15.6 nmi SW of MPA, Ridge, 48 m; Dive 12-33

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 33, Site #- 16-VII-12-4. Target Site – outside and southwest of South Carolina, Northern S.C. MPA; 50 m. ROV survey outside MPA and ground truth new Pisces multibeam sonar of the site. Conduct video/photo transect along ridge.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.5 kn; bottom 0.2. ROV navigation failed- all navigation data is from ship's GPS.

Site Description/Habitat/Biota:
Transect starts along the west escarpment of the ridge, total relief 3 m, 42.5 to 45.8 m at base in sediment. Escarpment is very rugose, with an upper vertical wall 1-2 m, undercut ledge and 1-2 m boulders on lower slope which extends 10-20 m in width. The top of the ridge is flat, low relief pavement, 80-100% cover, and very dense fields of Padina brown algae. The east escarpment of the ridge is less rugged, has a 1 m ledge with 1/2 m rock slabs and boulders at the base which grades into sand at 47.5 m.

Dominant Benthic Biota: Gorgonacea- *Diodogorgia*?, *Ellisella* (whips), Ellisellidae (branched), *Nicella* (30 cm purple fan), *Telesto*, *Titanideum frauenfeldii*; Hydroida; Antipatharia- *Stichopathes*; Demospongiae- *Agelas* (red plates), *Aplysina* (cluster hollow tubes), *Callyspongia vaginalis*, tan cake sponge, *Ircinia campana*; Arthropoda- slipper lobster; Ascidiacea- Eudistoma; Phaeophyta- *Dictyota* (dense), *Padina* (dense), *Sargassum* (dense).
Fish: greater amberjack, blackbar soldierfish, blue angelfish, Calamus porgy, cornet fish, cubbyu, gray snapper, graysby, hogfish, porcupine fish, rock beauty, rock hind, scamp (few), Spanish hogfish, spotted goatfish, tattler, tomtate, triggerfish, trumpet fish, vermilion snapper, white grunt, wrasse bass, lionfish (common, 34).

Location: South Carolina, Outside Northern South Carolina MPA, 15.6 nmi SW of MPA, Ridge, 48 m; Dive 12-33

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-33 conducted a survey 15.6 nmi SW of the MPA along a N-S oriented ridge which is evident in the multibeam sonar map. Dive transects were divided into four habitat zones: Hard Bottom, Ridge- East Slope, Ridge- Top, and Ridge- West Slope. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). The ridge top was low relief rock pavement with rubble; the west slope was moderate relief with high rugosity rock slabs, boulders and ledges; the east slope was moderate relief and low rugosity; 42-48 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-33. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 33	South Carolina, Outside Northern South Carolina MPA, 15.6 nmi SW of MPA, Ridge, 48 m; Dive 12-33				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	Ridge West Slope, top 42.5 base 45.8, slope 20 m wide, 1 m boulders, pvmt, cobble, undercut ledge				
	Ridge- West Slope	On Reef	HRu	MR	RLF
Transect 2	Xs Across top of ridge, 42 m on the west side, 42 m on W 46 m on west. Pvmt, 100% rock cover, no ledges dense algae				
	Ridge- Top	On Reef	LRu	LR	PF
Transect 3	E slope of ridge, top of ridge, 45.5 m base 47.5 m wide zone of boulders at base, 1-2 m relief, undercut				
	Ridge- East Slope	On Reef	LRu	MR	RLF
Transect 4	Flat pvmt east of ridge base 48 m rock pvmt, 10-20 cm rubble/cobble				
	Hard Bottom	On Reef	LRu	LR	PF
Transect 5	47 m E Slope, 50 cm ledges pvmt				
	Ridge- East Slope	On Reef	LRu	LR	RLF

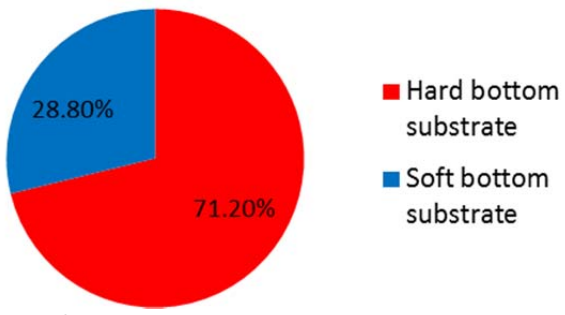


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-33. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Location: South Carolina, Outside Northern South Carolina MPA, 15.6 nmi SW of MPA, Ridge, 48 m; Dive 12-33

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-33 was predominately hard bottom (71.2%) consisting of rock pavement, boulders, ledges, rubble and cobble.

Bare rock substrate without biota covered 10.18% of the bottom and bare soft bottom was 25.84% (Fig. 2, Table 2). Benthic macro-biota covered 63.99% of the bottom and consisted of 1.63% non-coral Cnidaria (Hydrozoa), 3.06% Porifera, 1.24% Alcyonacea ("gorgonacea"), and 55.34% algae which was dominated by Phaeophyta (45.9% cover), fleshy Rhodophyta (2.4%), and cyanobacteria (5.9%).

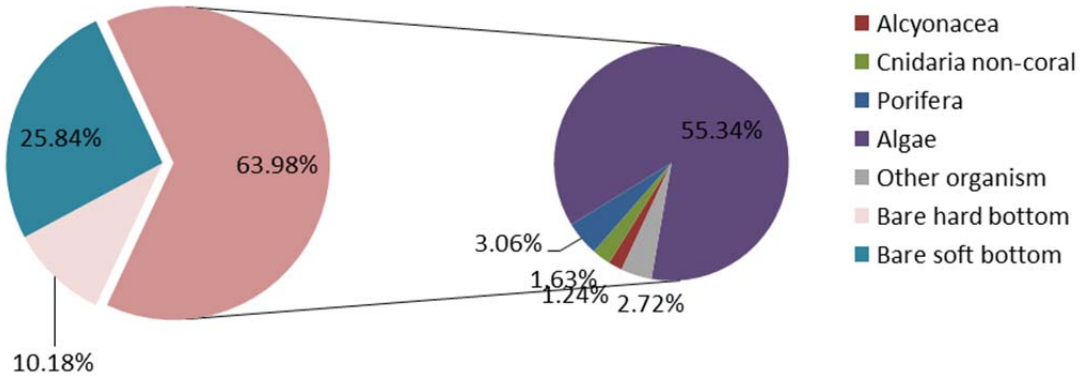


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-33. Non-scleractinian corals include Alcyonacea ("gorgonacea"). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-33.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**62**	**3.06%**
Porifera	**62**	**3.06%**
Agelas sp.	6	0.30%
Axinellida	9	0.44%
Demospongiae	16	0.79%
Ircinia campana	18	0.89%
Ircinia sp.	4	0.20%
Niphates sp.	1	0.05%
Spirastrellidae	8	0.40%
Cnidaria non-coral	**33**	**1.63%**
Cnidaria non-coral	**33**	**1.63%**
Hydroidolina	33	1.63%
Algae	**1120**	**55.34%**
Algae	**1120**	**55.34%**
Chlorophyta	7	0.35%
Corallinales/crustose coralline	14	0.69%
Cyanophyta	120	5.93%

Location: South Carolina, Outside Northern South Carolina MPA, 15.6 nmi SW of MPA, Ridge, 48 m; Dive 12-33

Phaeophyta	929	45.90%
Rhodophyta	50	2.47%
Alcyonacea	**25**	**1.24%**
Alcyonacea	**25**	**1.24%**
Diodogorgia sp.	16	0.79%
Ellisellidae	1	0.05%
Telesto sp.	8	0.40%
Other organism	**55**	**2.72%**
Annelida	**3**	**0.15%**
Filograna sp.	3	0.15%
Bryozoa	**17**	**0.84%**
Bryozoa	16	0.79%
Schizoporella sp.	1	0.05%
Chordata	**16**	**0.79%**
Ascidiacea	2	0.10%
Fish	14	0.69%
Other organism	**19**	**0.94%**
Other organism	19	0.94%
Hard bottom substrate	**206**	**10.18%**
Hard bottom substrate	**206**	**10.18%**
Bare rock- pavement boulder ledge	204	10.08%
Bare rubble- rock	2	0.10%
Soft bottom substrate	**523**	**25.84%**
Soft bottom substrate	**523**	**25.84%**
Bare soft bottom substrate	523	25.84%
Grand Total	**2024**	**100.00%**

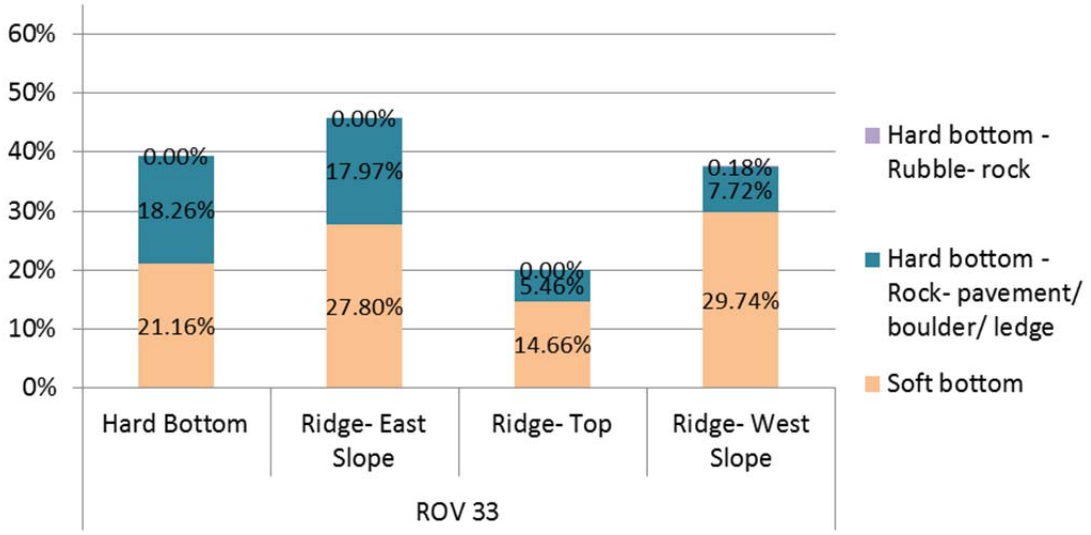


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-33.

Location: South Carolina, Outside Northern South Carolina MPA, 15.6 nmi SW of MPA, Ridge, 48 m; Dive 12-33

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. All four zones had between 20% and ~45% cover of bare substrates. The hard bottom zone and east slope zone had the most bare rock substrate (18.2% and 18.9%, respectively). Figure 4 shows the ridge top had the greatest cover of biota (80%) and consisting primarily of algae (72.7% cover), with sparse hydroids (3.4%), and Porifera (0.8%). Algae dominated all the habitat zones.

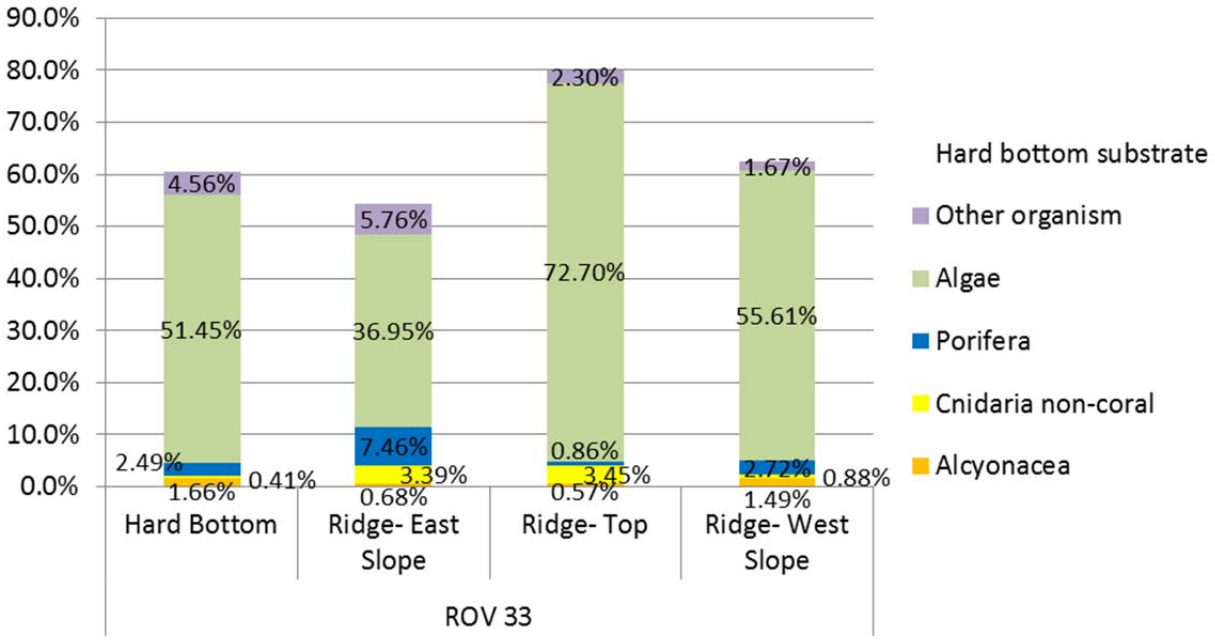


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-33.

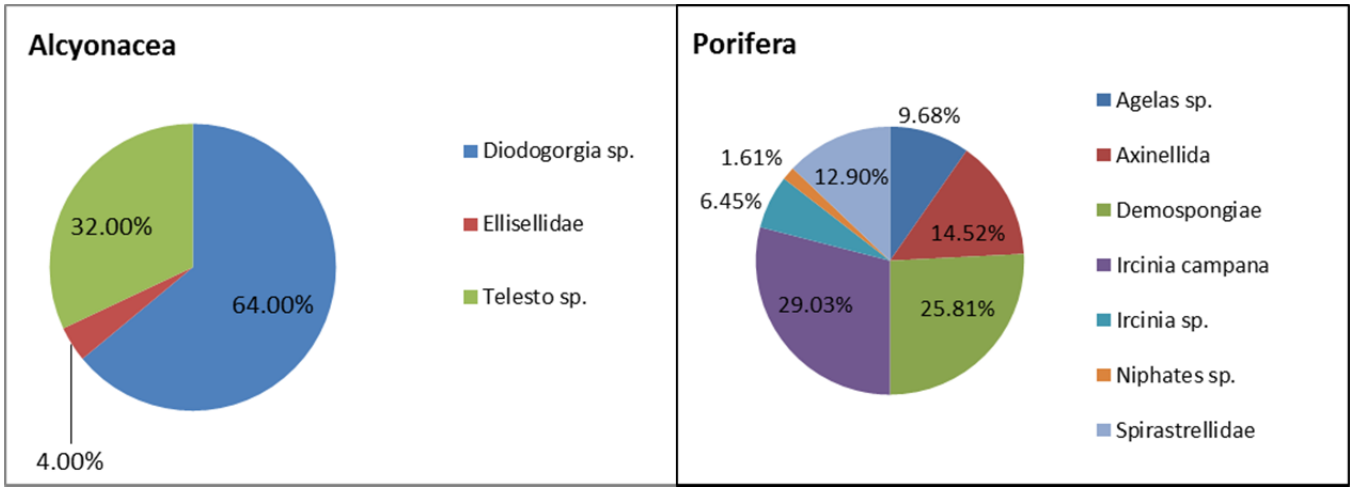


Figure 5. Diversity of corals and sponges at dive site ROV 12-33; CPCe analysis showing percent of total for each taxa category. Non-scleractinian corals include Alcyonacea ("gorgonacea"); Porifera are Demospongiae.

No hard coral was present at the dive site. No black coral were present. Non-scleractinian corals included just 3 taxa of Alcyonacea: *Diodogorgia* sp. (64.0% of the total Alcyonacea), *Telesto* sp. (32.0%), and Ellisellidae (4.0%). Porifera were relatively diverse with 7 taxa, dominated by *Ircinia campana* (29% of the total Porifera), Axinellida (14.5%), Spirastrellidae (12.9%), *Agelas* sp. (9.6%), and *Ircinia* sp. (6.4%).

Location: South Carolina, Outside Northern South Carolina MPA, 15.6 nmi SW of MPA, Ridge, 48 m; Dive 12-33

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 53 taxa of fish were identified from dive ROV 33 for a total density of 8767.9 individuals/km (Table 3). These were dominated by tomtate (7499/km), striped grunt (424.5), and vermilion snapper (166.7). Managed species included vermilions, scamp (8.8/km), hogfish (3.8), graysby (3.8), amberjack (1.3), gag grouper (1.9), rock hind (1.3), red grouper (0.6), and red porgy (0.6).

Table 3. Density of fish for all transects at dive site ROV 12-33 (number individuals/km).

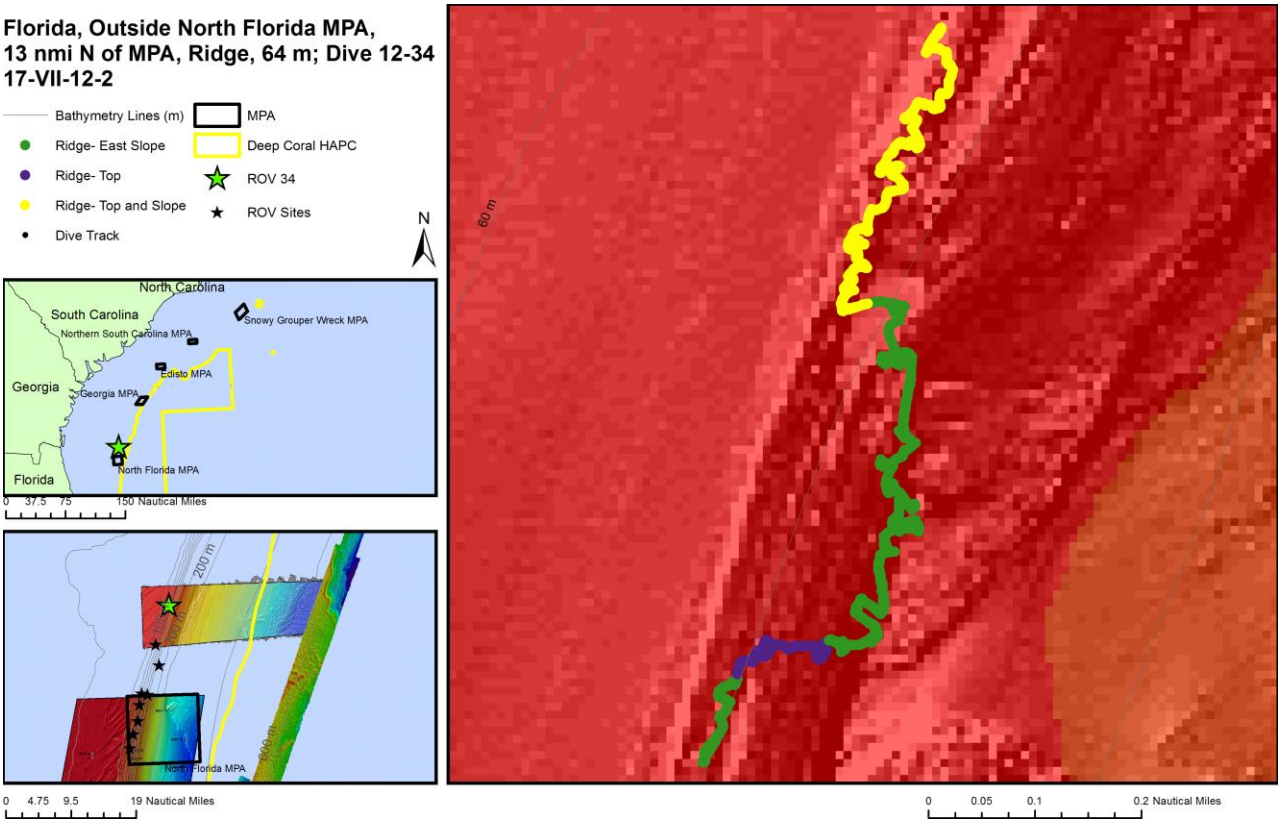
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus bahianus	ocean surgeonfish	3	1.59	1.9
Acanthurus sp.	doctorfish	9	1.59	5.7
Aulostomus maculatus	trumpetfish	3	1.59	1.9
Balistes capriscus	grey triggerfish	8	1.59	5.0
Balistes sp.	triggerfish	1	1.59	0.6
Bodianus pulchellus	spotfin hogfish	61	1.59	38.4
Bodianus rufus	spanish hogfish	2	1.59	1.3
Calamus sp.	porgy	23	1.59	14.5
Canthigaster rostrata	sharpnose puffer	112	1.59	70.4
Chaetodon ocellatus	spotfin butterflyfish	11	1.59	6.9
Chaetodon sedentarius	reef butterflyfish	71	1.59	44.7
Chromis enchrysurus	yellowtail reeffish	18	1.59	11.3
Chromis insolatus	sunshinefish	13	1.59	8.2
Chromis scotti	purple reeffish	132	1.59	83.0
Chromis sp.	damselfish	5	1.59	3.1
Diodon sp.	puffer	1	1.59	0.6
Epinephelus adscensionis	rock hind	2	1.59	1.3
Epinephelus cruentatus	graysby	6	1.59	3.8
Epinephelus morio	red grouper	1	1.59	0.6
Equetus umbrosus	cubbyu	156	1.59	98.1
Fistularia tabacaria	bluespotted cornetfish	2	1.59	1.3
Haemulon aurolineatum	tomtate	11924	1.59	7499.4
Haemulon plumieri	white grunt	4	1.59	2.5
Haemulon striatum	striped grunt	675	1.59	424.5
Halichoeres garnoti	yellowhead wrasse	15	1.59	9.4
Halichoeres sp.	wrasse	125	1.59	78.6
Holacanthus bermudensis	blue angelfish	43	1.59	27.0
Holacanthus tricolor	rock beauty	9	1.59	5.7
Holocentrus sp.	squirrelfish	69	1.59	43.4
Lachnolaimus maximus	hogfish	6	1.59	3.8
Lactophrys polygonia	honeycomb cowfish	1	1.59	0.6

Location: South Carolina, Outside Northern South Carolina MPA, 15.6 nmi SW of MPA, Ridge, 48 m; Dive 12-33

Lactophrys sp.	cowfish	2	1.59	1.3
Liopropoma eukrines	wrasse bass	3	1.59	1.9
Lutjanus griseus	grey snapper	13	1.59	8.2
Mulloidichthys martinicus	yellow goatfish	3	1.59	1.9
Mycteroperca sp.	grouper	1	1.59	0.6
Mycteroperca microlepis	gag grouper	3	1.59	1.9
Mycteroperca phenax	scamp	14	1.59	8.8
Myripristis jacobus	blackbar soldierfish	26	1.59	16.4
Pagrus pagrus	red porgy	1	1.59	0.6
Paranthias furcifer	creole-fish	3	1.59	1.9
Pomacanthus paru	french angelfish	1	1.59	0.6
Priacanthus arenatus	bigeye	1	1.59	0.6
Pristigenys alta	short bigeye	1	1.59	0.6
Prognathodes aya	bank butterflyfish	2	1.59	1.3
Pseudupeneus maculatus	spotted goatfish	10	1.59	6.3
Pterois volitans	lionfish	46	1.59	28.9
Rhomboplites aurorubens	vermilion snapper	265	1.59	166.7
Rypticus sp.	soapfish	1	1.59	0.6
Seriola sp.	amberjack	2	1.59	1.3
Serranus phoebe	tattler	9	1.59	5.7
Sparisoma atomarium	greenblotch parrotfish	8	1.59	5.0
Stegastes partitus	bicolor damselfish	15	1.59	9.4
Total		13941		8767.9

Dive Site: Florida, Outside North Florida MPA, 13 nmi N of MPA, Ridge, 64 m; Dive 12-34

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	ShadedCC (Navy Data)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/17/2012
Specimens:	2
Digital Photos:	162
DVD:	2
Hard Drive:	1

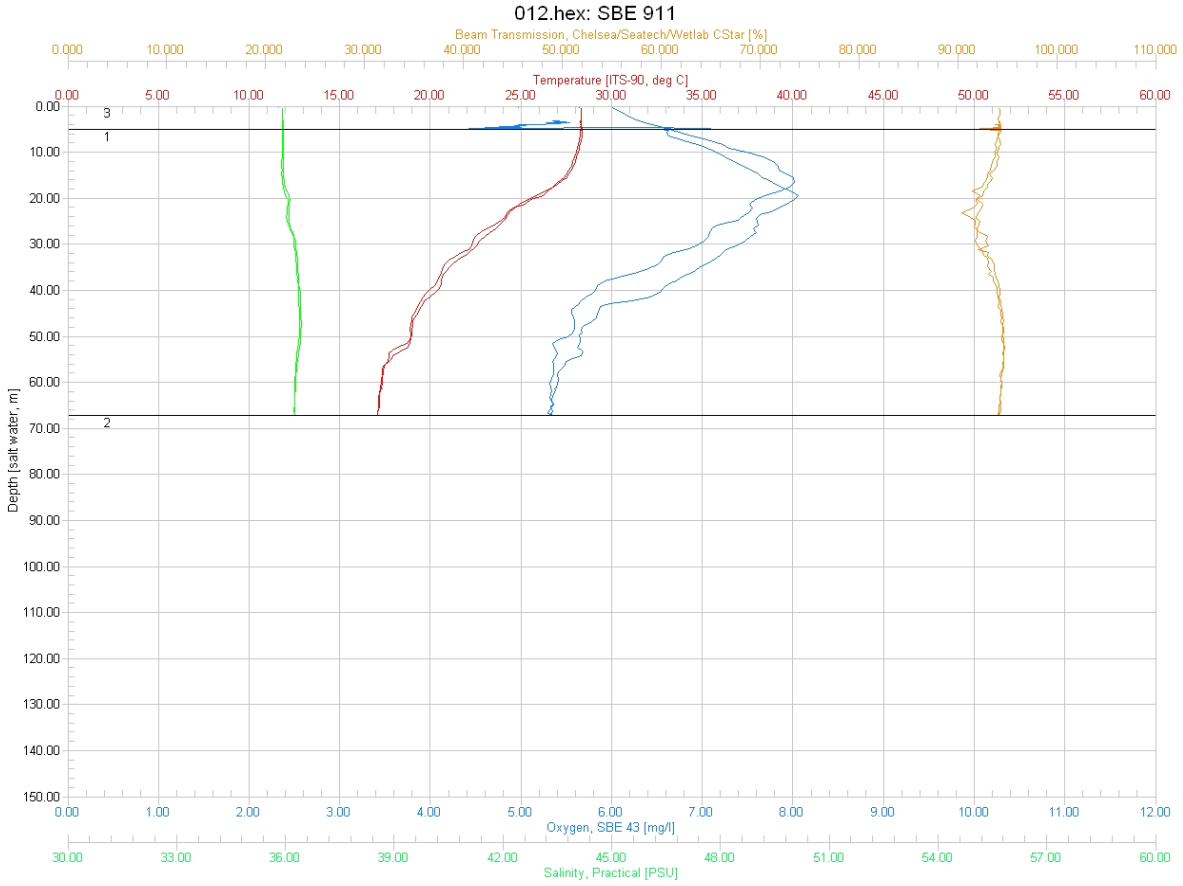
Dive Site: Florida, Outside North Florida MPA, 13 nmi N of MPA, Ridge, 64 m; Dive 12-34

Dive Data:

Minimum Bottom Depth (m):	51	**Total Transect Length (km):**	4.154
Maximum Bottom Depth (m):	64	**Surface Current (kn):**	.5
On Bottom (Time- GMT):	11:39	**On Bottom (Lat/Long):**	30.7°N; -80.11°W
Off Bottom (Time- GMT):	13:43	**Off Bottom (Lat/Long):**	30.72°N; -80.1°W
Physical (bottom); Temp (°C):	16.30	**Salinity:** 36.00 **Visibility (ft):** 50	**Current (kn):** 0.2

Physical Environment:

Distance from Dive Site(km): 56.50



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (68 m): temperature- 17, salinity- 36, and dissolved oxygen- 5.2. Surface temperature was 27.6 and there was a thermocline near 20-50 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 20 m. Visibility was estimated at 50-100 ft from the ROV video.

Dive Site: Florida, Outside North Florida MPA, 13 nmi N of MPA, Ridge, 64 m; Dive 12-34

Dive Imagery:

Figure 1: -58.9 m
Speckled hind on low relief hardbottom.

Figure 2: -55.5 m
Warsaw grouper and *Stichopathes* black whip coral on low relief hardbottom.

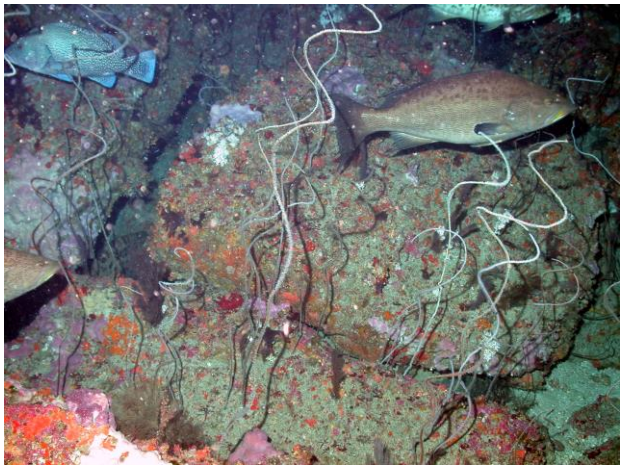


Figure 3: -60.1 m
Speckled hind and scamp grouper with *Stichopathes* black coral on rock boulder habitat.

Figure 4: -49.9 m
Nicella octocoral, greater amberjack and *Filograna* tube worms on low relief hardbottom.

Dive Site: Florida, Outside North Florida MPA, 13 nmi N of MPA, Ridge, 64 m; Dive 12-34

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 34, Site #- 17-VII-12-2. Target Site – ~10 nmi north of North Florida MPA; 70 m. ROV survey outside MPA and ground truth Navy multibeam sonar map of the site. Conduct video/photo transect along N-S oriented ridge of sonar map; multibeam is 15 m resolution.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.5 kn; bottom 0.2.

Site Description/Habitat/Biota:
Ridge on multibeam is extensive N-S oriented. Transect NE across ridge top, ~100 m wide: depth 52 m, rock pavement with sediment, 10-30 cm relief rock and scattered low relief ledges. Dominant fauna- various demosponges, hydroids, gorgonians and black coral. Few fish except on ledges. Eastern escarpment of ridge: transect to the north along the face of the east escarpment- top of edge 56 m, base in sand 60-64 m. Escarpment is 10-20o slope of fractured rock slabs with 30-50 cm relief, jumbled rock slabs and boulders which extend 15-20 m or more from the top edge. Rock slope dominated by back coral, encrusting sponges, Ircinia vase sponges, and gorgonians. Dense schools of tomtate, vermilion snapper, along with gag grouper, numerous scamp grouper, 6 speckled hind, and 3 warsaw grouper. East of the escarpment is flat sand with some low relief rock pavement patches. Transect along western escarpment of ridge: 10o slope of fractured rock slabs, 30-50 cm relief, but not as rugose as the east slope; top edge 49 m, base 52 m.

Dominant Benthic Biota: Gorgonacea- *Diodogorgia*, *Ellisella barbadensis*, *Nicella*; Demospongiae- *Aplysina*, *Callyspongia vaginalis*, *Cinachyra*, Spirastrellidae, *Ircinia campana*; Antipathidae- Antipathes, *Stichopathes*; Hydroida; Zoanthidea; Annelida- *Filograna*; Arthropoda- *Panulirus argus*; Bryozoa- Horn bryozoa (*Schizoporella*?); Ascidiacea- Didemnidae; Chlorophyta; Phaeophyta- *Sargassum*; Rhodophyta.
Fish: scamp grouper (common on east slope), Warsaw grouper (east slope), gag grouper (east slope), speckled hind (4), amberjack, bank butterflyfish, bicolor damselfish, black bar drum, black fin snapper, blue angelfish, Calamus porgy, cowfish, creole fish, cubbyu, hogfish, jackknife, purple reef fish, queen trigger, reef butterflyfish, shortnose puffer, spotfin butterflyfish, squirrelfish, surgeonfish, tattler, tomtate, triggerfish, vermilion snapper, wrasse bass, yellowtail reeffish; lionfish (16).

Dive Site: Florida, Outside North Florida MPA, 13 nmi N of MPA, Ridge, 64 m; Dive 12-34

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-34 conducted a survey 13 nmi north of the MPA along a N-S oriented double ridge which is evident in the multibeam sonar map. Dive transects were divided into three habitat zones: Ridge- East Slope, Ridge-Top, and Ridge- Top and Slope. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). The dive site was a double ridge system of moderate to high relief. The ridge top was low relief rock pavement. The east slopes of both the east and west ridges were rugose 10-20^{o} slopes of fractured rock slabs and boulders; 49-63 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-34. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 34	Florida, Outside North Florida MPA, 13 nmi N of MPA, Ridge, 64 m; Dive 12-34				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	West Ridge - N-S double ridge, xs along E slope of Western ridge, 49.5 m at top, 52.5 m base, rock pvmt 0.5 m boulders				
	Ridge- East Slope	On Reef	LRu	MR	RLF
Transect 2	Xs across top of 100 m wide East Ridge, pvmt, 51 m				
	Ridge- Top	On Reef	LRu	LR	PF
Transect 3	East Slope/base of East Ridge from 56-62.5 m, 10-20o slope, 15 m wide, fractured rock slabs, rugose				
	Ridge- East Slope	On Reef	HRu	HR	RLF
Transect 4	Western Ridge- top and slope of West Ridge, 49 m pvmt on top, E slope 52-55 m 10-20o slope, 20 m wide, rock slab boulders				
	Ridge- Top and Slope	On Reef	HRu	HR	RLF

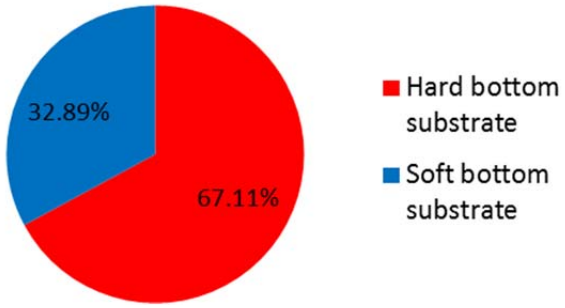


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-34. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on

biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-34 was predominately hard bottom (67.11%) consisting of rock pavement, rock slabs and boulders.

Bare rock substrate without biota covered 25.04% of the bottom and bare soft bottom was 30.13% (Fig. 2, Table 2). Benthic macro-biota covered 44.84% of the bottom and consisted of 12.28% non-coral Cnidaria (Hydrozoa), 7.77% Porifera, 2.1% Antipatharia, 0.76% Alcyonacea ("gorgonacea"), and 15.93% algae which were dominated by fleshy Rhodophyta (5%), crustose coralline algae (4.7%), and cyanobacteria (5.2%).

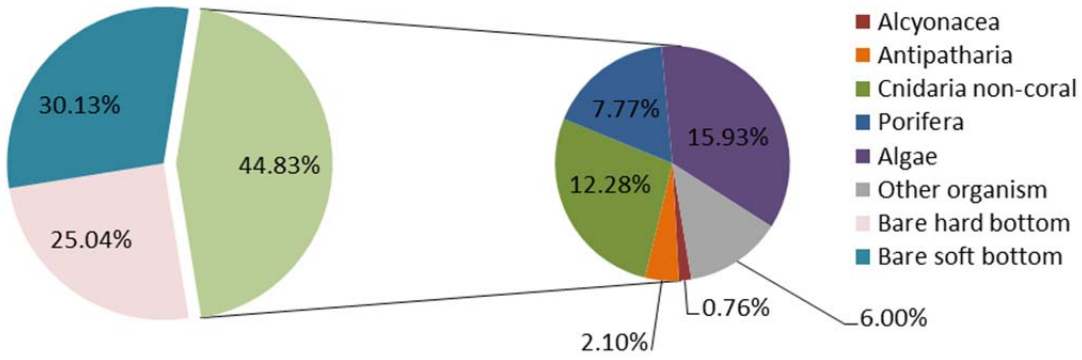


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-34. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida and Zoanthidea.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-34.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**215**	**7.77%**
Porifera	**215**	**7.77%**
Axinellida	2	0.07%
Cinachyra sp./Cinachyrella sp.	7	0.25%
Demospongiae	61	2.20%
Demospongiae- ze tan starlet	2	0.07%
Dictyoceratida	6	0.22%
Ircinia campana	11	0.40%
Ircinia sp.	49	1.77%
Porifera	1	0.04%
Spirastrellidae	76	2.75%
Cnidaria non-coral	**340**	**12.28%**
Cnidaria non-coral	**340**	**12.28%**
Hydroidolina	337	12.17%
Zoanthidea	3	0.11%
Antipatharia	**58**	**2.10%**
Antipatharia	**58**	**2.10%**
Antipatharia	8	0.29%

Dive Site: Florida, Outside North Florida MPA, 13 nmi N of MPA, Ridge, 64 m; Dive 12-34

Antipathes sp. A	12	0.43%
Stichopathes lutkeni	14	0.51%
Tanacetipathes hirta	24	0.87%
Algae	**441**	**15.93%**
Algae	**441**	**15.93%**
Chlorophyta	6	0.22%
Corallinales/crustose coralline	132	4.77%
Cyanophyta	146	5.27%
Phaeophyta	18	0.65%
Rhodophyta	139	5.02%
Alcyonacea	**21**	**0.76%**
Alcyonacea	**21**	**0.76%**
Diodogorgia sp.	8	0.29%
Ellisellidae	1	0.04%
Gorgonacea	3	0.11%
Muricea sp.	3	0.11%
Telesto sp.	6	0.22%
Other organism	**166**	**6.00%**
Annelida	**68**	**2.46%**
Annelida	1	0.04%
Filograna sp.	67	2.42%
Bryozoa	**15**	**0.54%**
Schizoporella sp.	15	0.54%
Chordata	**62**	**2.24%**
Ascidiacea	8	0.29%
Didemnidae	37	1.34%
Fish	17	0.61%
Other organism	**21**	**0.76%**
Other organism	21	0.76%
Hard bottom substrate	**693**	**25.04%**
Hard bottom substrate	**693**	**25.04%**
Bare rock- pavement boulder ledge	641	23.16%
Bare rubble- rock	52	1.88%
Soft bottom substrate	**834**	**30.13%**
Soft bottom substrate	**834**	**30.13%**
Bare soft bottom substrate	834	30.13%
Grand Total	**2768**	**100.00%**

Dive Site: Florida, Outside North Florida MPA, 13 nmi N of MPA, Ridge, 64 m; Dive 12-34

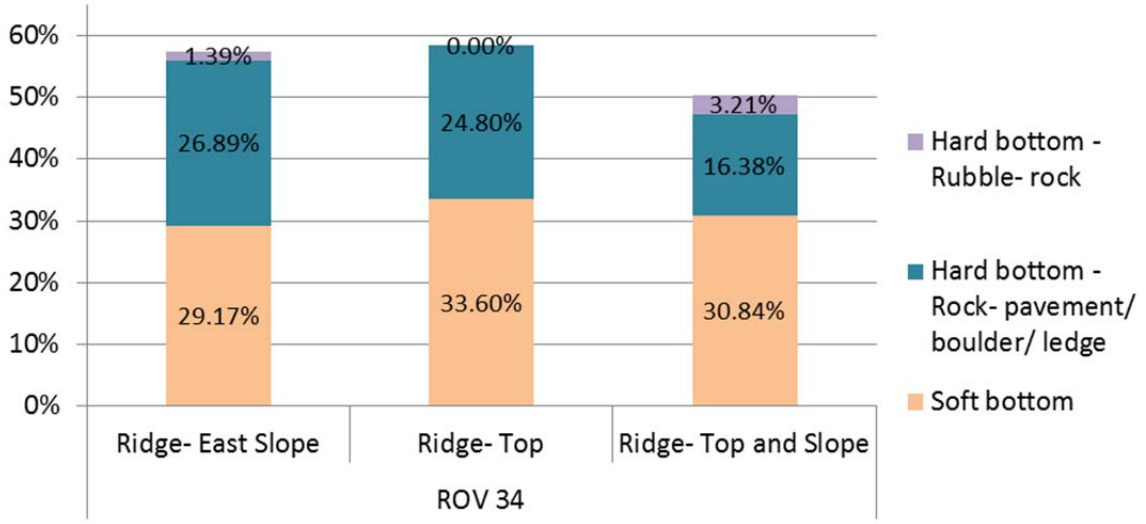


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-34.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. All habitat zones had 50-~60% cover of bare substrate. Figure 4 shows the east slope and ridge top to have similar cover of biota (~40-50% cover) which was dominated by algae (11.8-22.9%), Porifera (6.7-8.4%), hydroids (11.9-13.6%), and Antipatharia (0.6-3.0%).

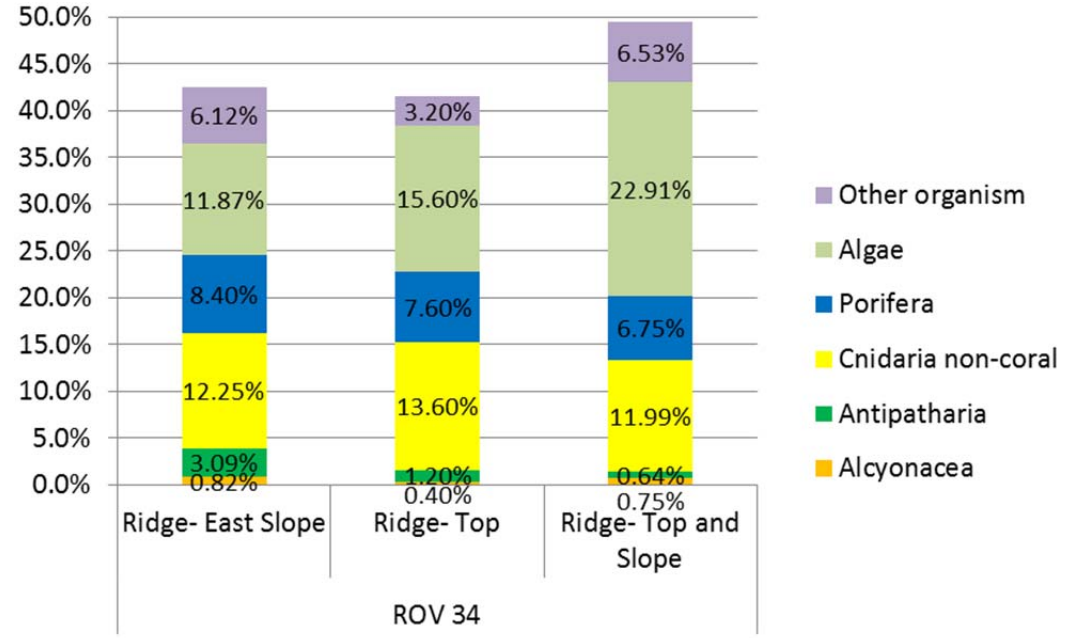


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-34.

Dive Site: Florida, Outside North Florida MPA, 13 nmi N of MPA, Ridge, 64 m; Dive 12-34

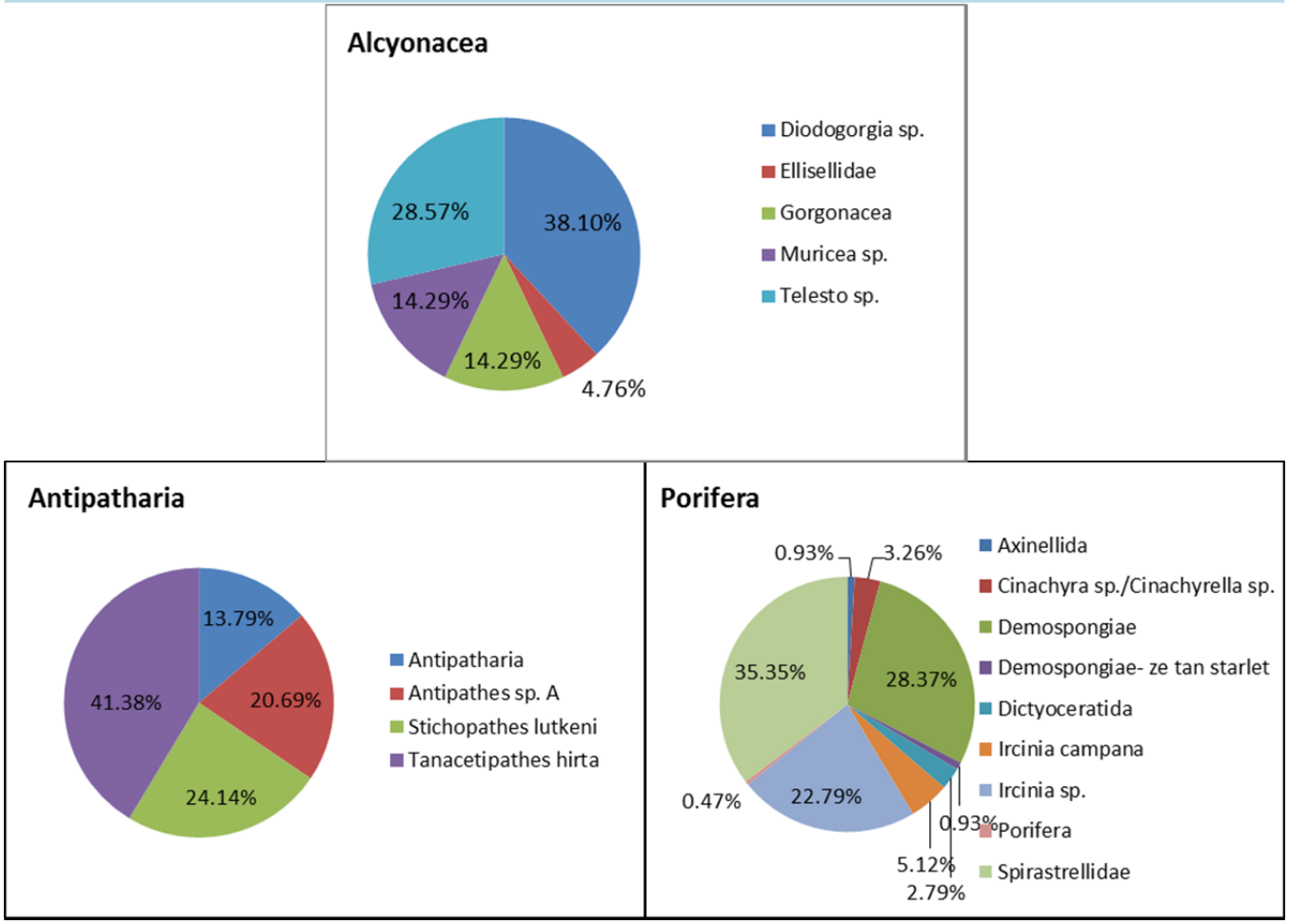


Figure 5. Diversity of corals and sponges at dive site ROV 12-34; CPCe analysis showing percent of total for each taxa category. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral); Porifera are Demospongiae.

No hard coral was present at the dive site. Non-scleractinian corals were 5 taxa of Alcyonacea and 4 Antipatharia. All Alcyonacea were gorgonians which were dominated by *Diodogorgia* sp. (38.1% of the total Alcyonacea), *Telesto* sp. (28.5%), *Muricea* sp. (14.2%), and Ellisellidae (4.7%). Antipatharia were dominated by *Tanacetipathes hirta* (41.3% of the total Antipatharia), *Stichopathes lutkeni* (24.1%), and *Antipathes* sp. A (20.6%). Porifera were relatively diverse with 9 taxa and dominated by *Ircinia* sp. (22.7% of the total Porifera), *Ircinia campana* (5.1%), Spirastrellidae (33.9%), and *Cinachyra* sp. (3.2%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 53 taxa of fish were identified from dive ROV 34 for a total density of 1365.8 individuals/km (Table 3). These were dominated by tomtate (777.1/km), vermilion snapper (309.6), and wrasse (50.1). Managed species included vermilions, amberjack (43.2/km), scamp (10.6), speckled hind (1.9), warsaw grouper (0.5), red grouper (0.2), gag grouper (0.7), hogfish (0.2), and red porgy (1.7).

Dive Site: Florida, Outside North Florida MPA, 13 nmi N of MPA, Ridge, 64 m; Dive 12-34

Table 3. Density of fish for all transects at dive site ROV 12-34 (number individuals/km).

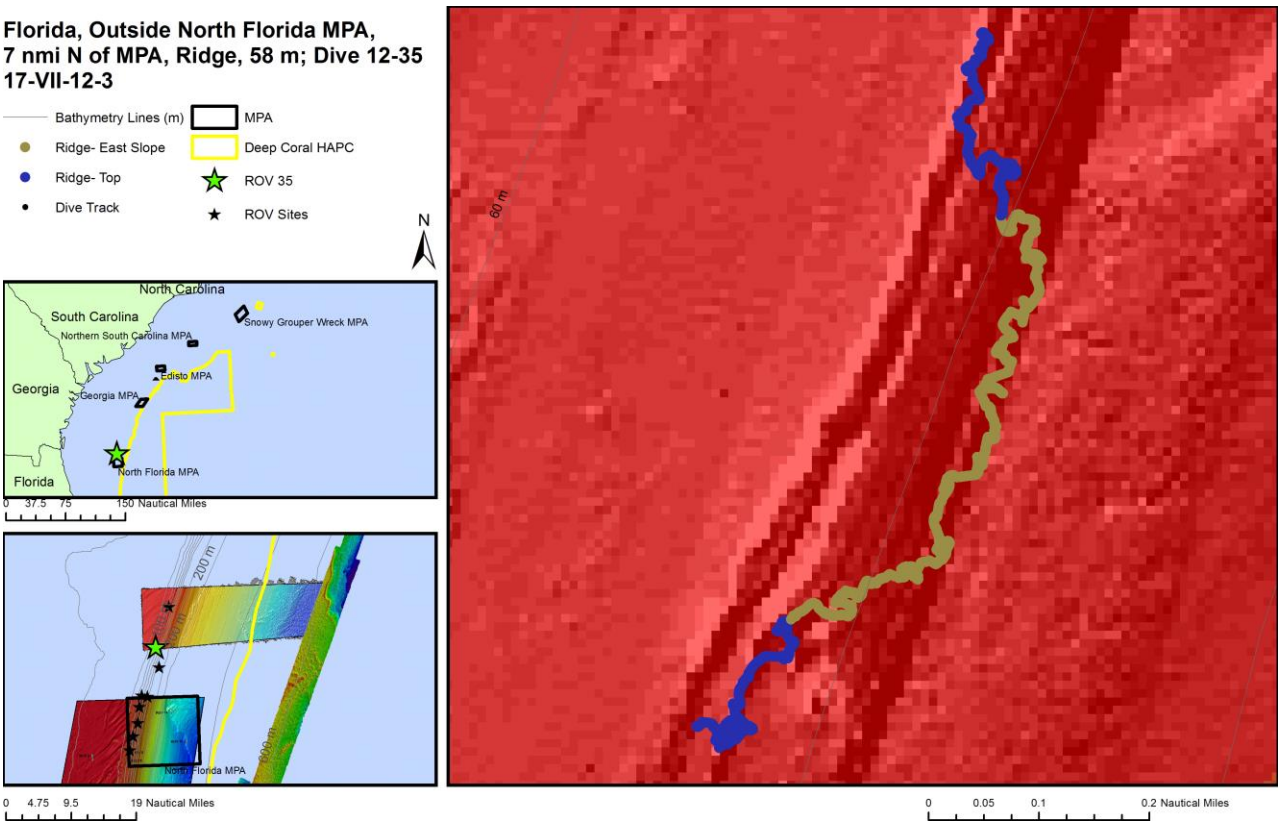
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus bahianus	ocean surgeonfish	2	4.15	0.5
Acanthurus sp.	doctorfish	1	4.15	0.2
Balistes capriscus	grey triggerfish	9	4.15	2.2
Balistes vetula	queen triggerfish	1	4.15	0.2
Bodianus puchellus	spotfin hogfish	27	4.15	6.5
Calamus sp	porgy	5	4.15	1.2
Canthigaster rostrata	sharpnose puffer	102	4.15	24.6
Centropristis ocyurus	bank sea bass	5	4.15	1.2
Chaetodon aculeatus	longsnout butterflyfish	1	4.15	0.2
Chaetodon ocellatus	spotfin butterflyfish	19	4.15	4.6
Chaetodon sedentarius	reef butterflyfish	118	4.15	28.4
Chromis enchrysurus	yellowtail reeffish	66	4.15	15.9
Chromis insolatus	sunshinefish	2	4.15	0.5
Chromis scotti	purple reeffish	10	4.15	2.4
Chromis sp.	damselfish	5	4.15	1.2
Diodon sp.	puffer	1	4.15	0.2
Epinephelus drummondhayi	speckled hind	8	4.15	1.9
Epinephelus morio	red grouper	1	4.15	0.2
Epinephelus nigritis	warsaw grouper	2	4.15	0.5
Equetus lanceolatus	jack-knife fish	1	4.15	0.2
Equetus umbrosus	cubbyu	28	4.15	6.7
Haemulon aurolineatum	tomtate	3225	4.15	777.1
Halichoeres bathyphilus	greenband wrasse	11	4.15	2.7
Halichoeres sp.	wrasse	208	4.15	50.1
Holacanthus bermudensis	blue angelfish	76	4.15	18.3
Holocentrus sp.	squirrelfish	42	4.15	10.1
Lachnolaimus maximus	hogfish	1	4.15	0.2
Lactophrys polygonia	honeycomb cowfish	2	4.15	0.5
Lactophrys quadricornis	scrawled cowfish	1	4.15	0.2
Lactophrys sp.	cowfish	2	4.15	0.5
Liopropoma eukrines	wrasse bass	7	4.15	1.7
Lutjanus buccanella	blackfin snapper	3	4.15	0.7
Lutjanus griseus	grey snapper	1	4.15	0.2
Mycteroperca microlepis	gag grouper	3	4.15	0.7
Mycteroperca phenax	scamp	44	4.15	10.6
Myripristis jacobus	blackbar soldierfish	34	4.15	8.2
Opsanus sp.	toadfish	1	4.15	0.2
Pagrus pagrus	red porgy	7	4.15	1.7
Paranthias furcifer	creole-fish	7	4.15	1.7

Dive Site: Florida, Outside North Florida MPA, 13 nmi N of MPA, Ridge, 64 m; Dive 12-34

Pareques iwamotoi	blackbar drum	2	4.15	0.5
Pomacanthus paru	french angelfish	1	4.15	0.2
Priacanthus arenatus	bigeye	2	4.15	0.5
Prognathodes aya	bank butterflyfish	2	4.15	0.5
Pterois volitans	lionfish	18	4.15	4.3
Rhomboplites aurorubens	vermilion snapper	1285	4.15	309.6
Rypticus sp.	soapfish	1	4.15	0.2
Seriola dumerili	greater amberjack	138	4.15	33.3
Seriola rivoliana	almaco jack	10	4.15	2.4
Seriola sp.	amberjack	31	4.15	7.5
Serranus annularis	orangeback bass	3	4.15	0.7
Serranus phoebe	tattler	69	4.15	16.6
Sparidae	porgy	5	4.15	1.2
Stegastes partitus	bicolor damselfish	12	4.15	2.9
Total		5668		1365.8

Dive Site: Florida, Outside North Florida MPA, 7 nmi N of MPA, Ridge, 58 m; Dive 12-35

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	ShadedCC (Navy Data)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/17/2012
Specimens:	
Digital Photos:	121
DVD:	2
Hard Drive:	1

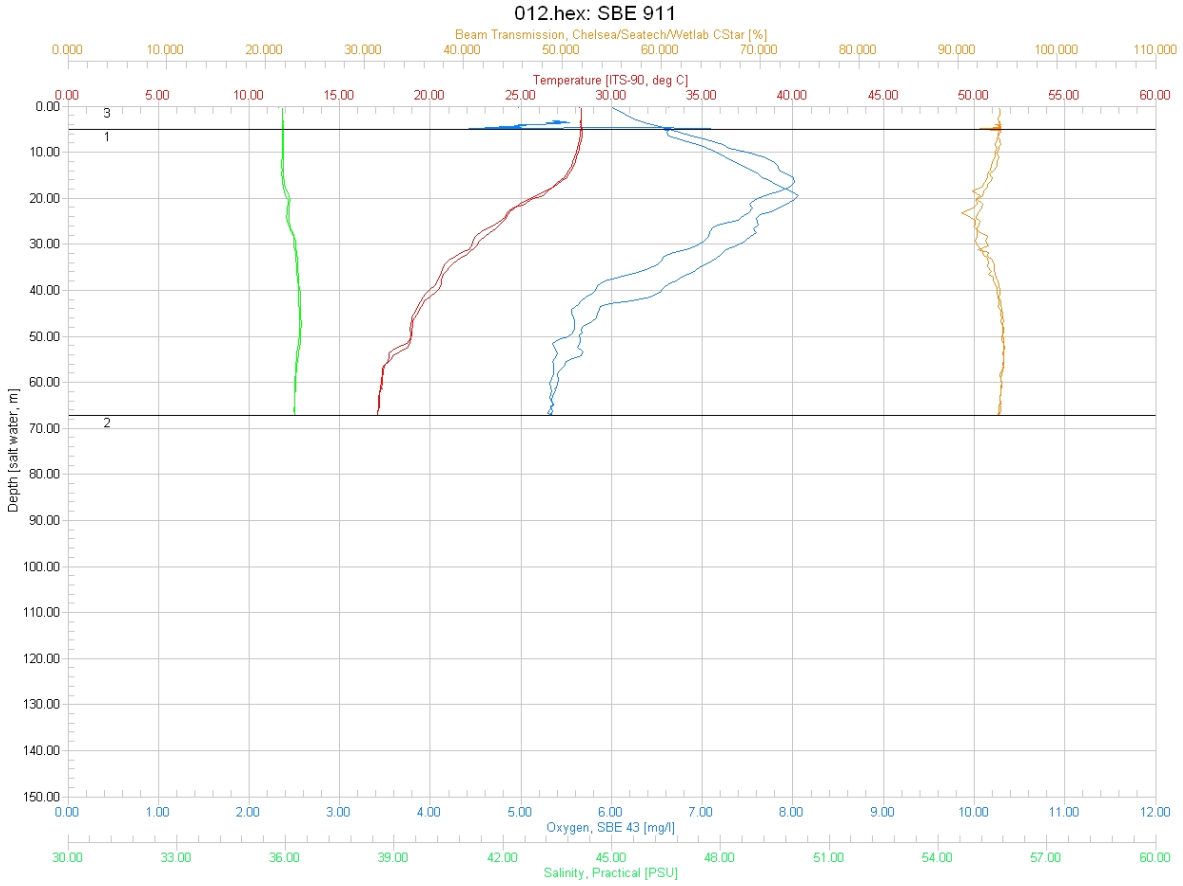
Dive Site: Florida, Outside North Florida MPA, 7 nmi N of MPA, Ridge, 58 m; Dive 12-35

Dive Data:

Minimum Bottom Depth (m):	50	**Total Transect Length (km):**	3.742
Maximum Bottom Depth (m):	59	**Surface Current (kn):**	.75
On Bottom (Time- GMT):	14:50	**On Bottom (Lat/Long):**	30.61°N; -80.15°W
Off Bottom (Time- GMT):	16:27	**Off Bottom (Lat/Long):**	30.62°N; -80.14°W
Physical (bottom); Temp (°C):	19.37	**Salinity:** 36.00 **Visibility (ft):** 50	**Current (kn):** 0.5

Physical Environment:

Distance from Dive Site(km): 67.90



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (68 m): temperature- 17, salinity- 36, and dissolved oxygen- 5.2. Surface temperature was 27.7 and there was a thermocline near 20-50 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 20 m. Visibility was estimated at 50 ft from the ROV video.

Dive Site: Florida, Outside North Florida MPA, 7 nmi N of MPA, Ridge, 58 m; Dive 12-35

Dive Imagery:

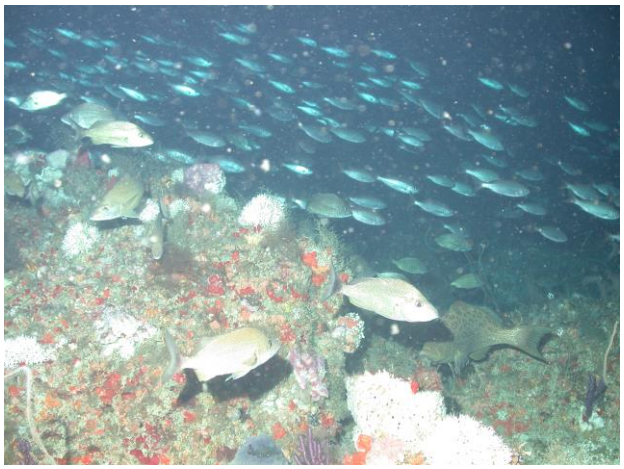


Figure 1: -57.8 m

School of tomtate and vermillion snapper with grouper and *Filograna* worm colonies on moderate relief boulders.

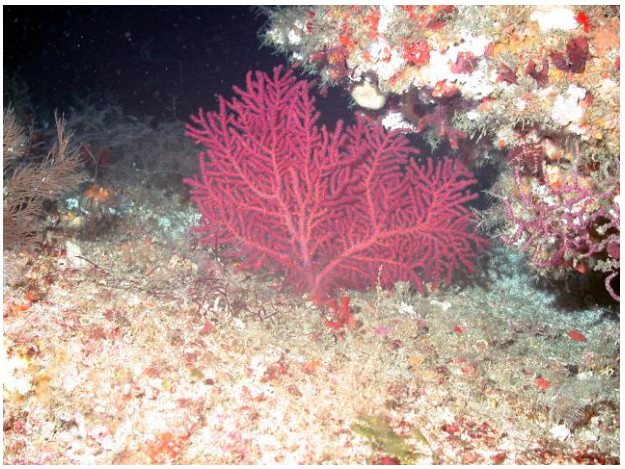


Figure 2: -55.1 m

Nicella gorgonian on low relief boulders.

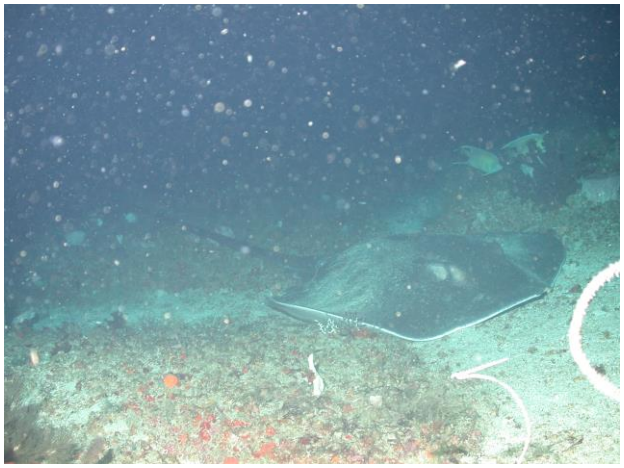


Figure 3: -56.4 m

Southern stingray on low relief pavement.

Figure 4: -51.4 m

Human debris, bottle brush Antipatharia and blue angelfish.

Dive Site: Florida, Outside North Florida MPA, 7 nmi N of MPA, Ridge, 58 m; Dive 12-35

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 35, Site #- 17-VII-12-3. Target Site – ~10 nmi north of North Florida MPA; 50 m. ROV survey outside MPA and ground truth Navy multibeam sonar of the site. Conduct video/photo transect along N-S oriented ridge of sonar map; sonar resolution is 15 m.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.75 kn; bottom 0.5.

Site Description/Habitat/Biota:
West escarpment of N-S oriented ridge: low relief slope ~15 m wide and 30-45o, 51m on top to 55 m in sand at the base, with rock slabs and few ledges of 10-30 cm relief; dominated by black corals, purple gorgonians, encrusting sponges, hydroids, and Filograna worm clusters. East slope of the ridge: Fractured rock slabs and low relief boulders on 10o slope, with 30-50 cm ledges; 55 m at top to 59 m on sand and rubble at base. Mostly encrusting sponges, didemnid ascidians, and Filograna worms. Transect NW across the ridge: 54 m, rock pavement and sediment, with scattered 30-50 cm ledges.

Dominant Benthic Biota: Gorgonacea- *Diodogorgia*, *Nicella*; Antipathidae- *Stichopathes*, Hydroida; Demospongiae- *Agelas*, *Aplysina*, *Cinachyra*, *Ircinia* sp., *Ircinia campana*, *Neofibularia*, Spirastrellidae; Arthropoda- *Panulirus argus*; Annelida- *Filograna*; Bryozoan- horn Bryozoan (*Schizoporella*?); Ascidiacea-Didemnidae; Cyanophyta; Rhodophyta.
Fish: amberjack, bank butterflyfish, Calamus porgy, cowfish, creole fish, cubbyu, purple reeffish, reef butterflyfish, rock beauty, sand tilefish, scamp grouper, snake eel, speckled hind, spotfin butterflyfish, spotfin hogfish, squirrelfish, stingray, tattler, tomtate, vermilion snapper, wrasse bass, yellowtail reeffish, sand tilefish burrow, lionfish (6).

Location: Florida, Outside North Florida MPA, 7 nmi N of MPA, Ridge, 58 m; Dive 12-35

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-35 conducted a survey 7 nmi north of the MPA along a N-S oriented ridge which is evident in the multibeam sonar map. Dive transects were divided into three habitat zones: Ridge- East Slope, Ridge- Top, and Ridge- West Slope. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This site was a moderate to high relief ridge with rugged east and west slopes of 4-m relief, fractured rock slabs and ledges; 49-59 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-35. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 35	Florida, Outside North Florida MPA, 7 nmi N of MPA, Ridge, 58 m; Dive 12-35				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	Xs along top ridge, 54 m narrow ridge low relief rock, slabs, pvmt, few ledges, 1-30 cm relief				
	Ridge- Top	On Reef	LRu	LR	RLF
Transect 2	Xs down E slope, 53 m top, 58 m at base, pvmt, Low relief rock				
	Ridge- East Slope	On Reef	LRu	HR	RLF
Transect 3	Xs along base of E slope, 58-59 m, fractured square rock slabs, pvmt, 2 m ledge				
	Ridge- East Slope	On Reef	LRu	MR	RLF
Transect 4	55 m xs up east slope from 59 m to 55 m at top, pvmt low relief				
	Ridge- East Slope	On Reef	LRu	LR	PF
Transect 5	Xs along top ridge, 52 m pvmt, flat 20-30 cm relief				
	Ridge- Top	On Reef	LRu	LR	PF
Transect 6	Xs down west slope of ridge, 51 m top, 55 m at base, quick transition into sand, 30o rock slabs				
	Ridge- West Slope	On Reef	HRu	HR	RLF

Location: Florida, Outside North Florida MPA, 7 nmi N of MPA, Ridge, 58 m; Dive 12-35

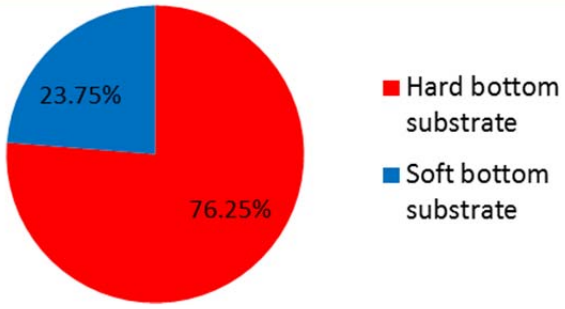


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-35. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-35 was predominately hard bottom (76.25%) consisting of rock pavement, rock slabs, and ledges.

Bare rock substrate without biota covered 32.73% of the bottom and bare soft bottom was 22.08% (Fig. 2, Table 2). Benthic macro-biota covered 45.19% of the bottom and consisted of 11.74% non-coral Cnidaria (Hydrozoa), 8.77% Porifera, 2.83% Antipatharia, 2.29% Alcyonacea ("gorgonacea"), and 13.94% algae which was dominated by cyanobacteria (6.1% cover), fleshy Rhodophyta (4.5%), and crustose coralline algae (2.7%).

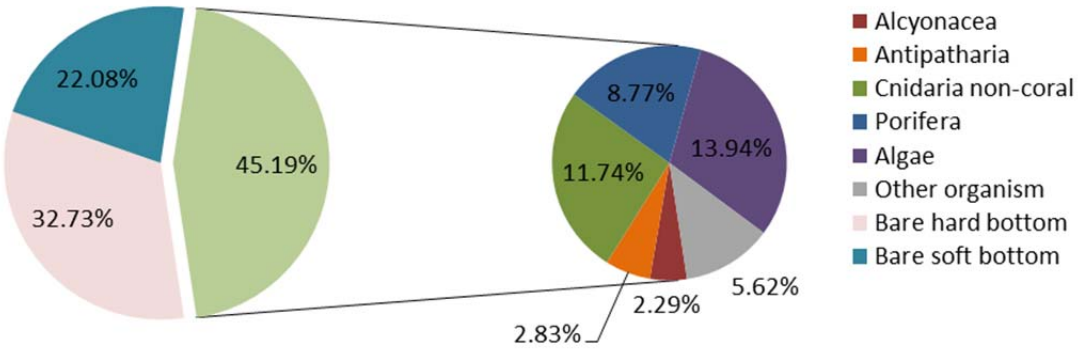


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-35. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-35.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**195**	**8.77%**
Porifera	**195**	**8.77%**
Aiolochroia crassa	5	0.22%
Axinellida	2	0.09%
Demospongiae	66	2.97%
Demospongiae- ze tan starlet	3	0.13%
Geodia sp.	1	0.04%

Location: Florida, Outside North Florida MPA, 7 nmi N of MPA, Ridge, 58 m; Dive 12-35

Ircinia campana	43	1.93%
Ircinia sp.	18	0.81%
Scopalina sp.	2	0.09%
Spirastrellidae	55	2.47%
Cnidaria non-coral	**261**	**11.74%**
Cnidaria non-coral	**261**	**11.74%**
Hydroidolina	261	11.74%
Antipatharia	**63**	**2.83%**
Antipatharia	**63**	**2.83%**
Antipatharia	10	0.45%
Antipathes sp. A	31	1.39%
Stichopathes lutkeni	10	0.45%
Tanacetipathes hirta	12	0.54%
Algae	**310**	**13.94%**
Algae	**310**	**13.94%**
Chlorophyta	4	0.18%
Corallinales/crustose coralline	62	2.79%
Cyanophyta	136	6.12%
Phaeophyta	8	0.36%
Rhodophyta	100	4.50%
Alcyonacea	**51**	**2.29%**
Alcyonacea	**51**	**2.29%**
Diodogorgia sp.	3	0.13%
Gorgonacea	2	0.09%
Muricea sp.	9	0.40%
Telesto sp.	37	1.66%
Other organism	**125**	**5.62%**
Annelida	**38**	**1.71%**
Filograna sp.	36	1.62%
Serpulidae	2	0.09%
Arthropoda	**3**	**0.13%**
Panulirus argus	3	0.13%
Bryozoa	**16**	**0.72%**
Bryozoa	7	0.31%
Schizoporella sp.	9	0.40%
Chordata	**51**	**2.29%**
Ascidiacea	6	0.27%
Didemnidae	29	1.30%
Fish	16	0.72%
Other organism	**17**	**0.76%**
Other organism	17	0.76%
Hard bottom substrate	**728**	**32.73%**

Location: Florida, Outside North Florida MPA, 7 nmi N of MPA, Ridge, 58 m; Dive 12-35

Hard bottom substrate	**728**	**32.73%**
Bare rock- pavement boulder ledge	649	29.18%
Bare rubble- rock	79	3.55%
Soft bottom substrate	**491**	**22.08%**
Soft bottom substrate	**491**	**22.08%**
Bare soft bottom substrate	491	22.08%
Grand Total	**2224**	**100.00%**

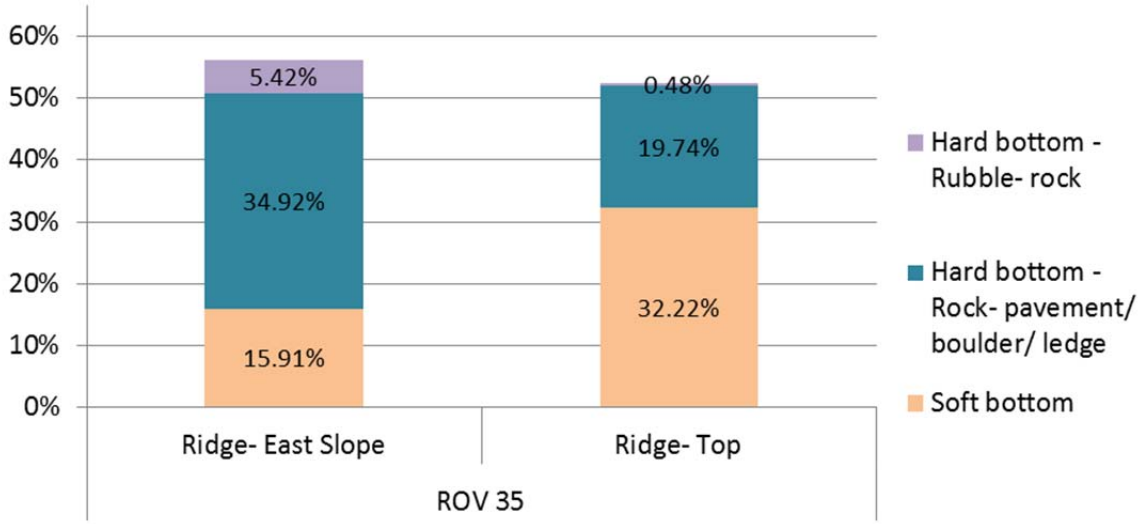


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-35.

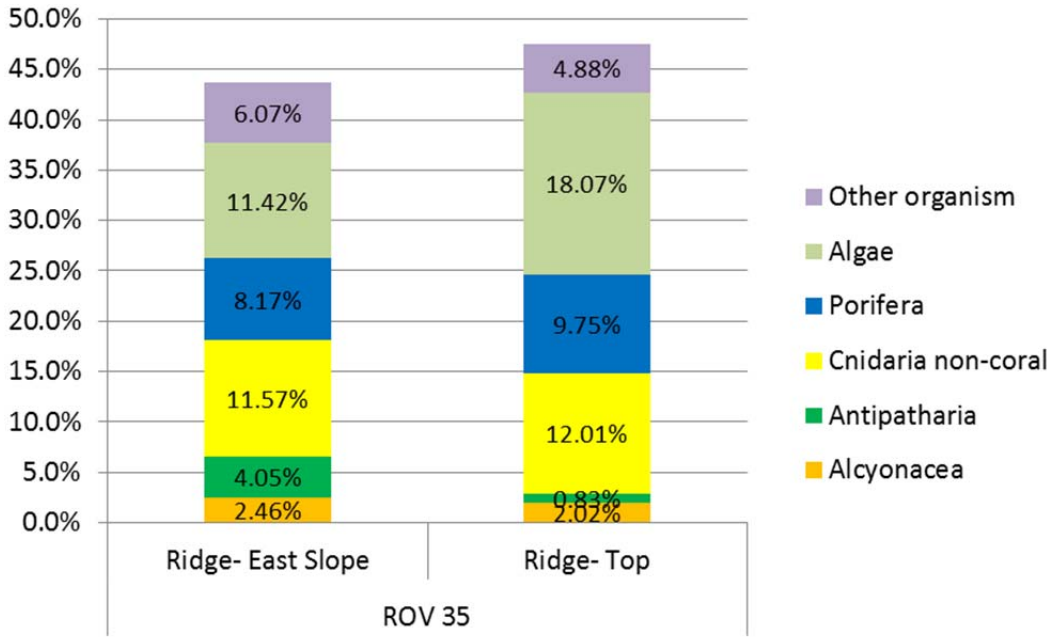


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-35.

Location: Florida, Outside North Florida MPA, 7 nmi N of MPA, Ridge, 58 m; Dive 12-35

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The ridge slope and top had similar cover of bare substrate (~50-55%). The east slope had 34.9% cover of bare rock. Figure 4 shows the ridge top and east slope had similar cover and assemblages of macro-biota: algae (11.4-18.0% cover), Porifera (8.1-9.7%), hydroids (11.5-12.0%), Antipatharia (4.0-0.8%), and Alcyonacea (2.4-2.0%).

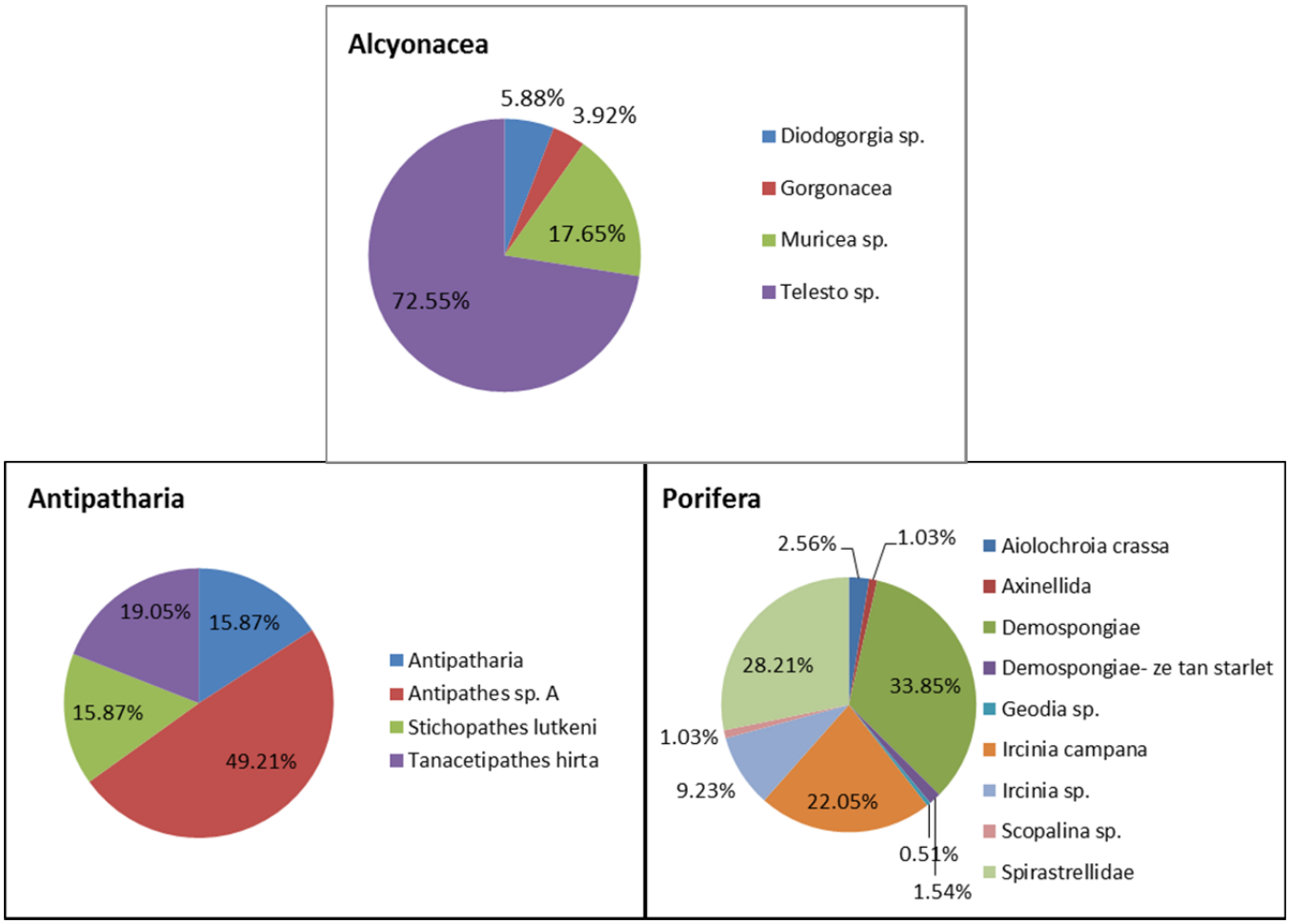


Figure 5. Diversity of corals and sponges at dive site ROV 12-35; CPCe analysis showing percent of total for each taxa category. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral); Porifera are Demospongiae.

No hard coral was present at the dive site. Non-scleractinian corals included 4 taxa of Alcyonacea and 4 Antipatharia. The Alcyonacea were dominated by *Telesto* sp. (72.5% of the total Alcyonacea), *Muricea* sp. (17.6%), and *Diodogorgia* sp. (5.8%). The Antipatharia were dominated by *Antipathes* sp. A (49.2% of the total Antipatharia), *Tanacetipathes hirta* (19.0% of the total Antipatharia), and *Stichopathes lutkeni* (15.8%). Sponges were diverse with 9 taxa, consisting of *Ircinia campana* (22.0% of the total Porifera), Spirastrellidae (28.2%), *Ircinia* sp. (9.2%), and *Aiolochroia crassa* (2.5%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 41 taxa of fish were

Location: Florida, Outside North Florida MPA, 7 nmi N of MPA, Ridge, 58 m; Dive 12-35

identified from dive ROV 35 for a total density of 794.1 individuals/km (Table 3). These were dominated by vermilion snapper (402.1/km), tomtate (169), and wrasse (36.9). Managed species included vermilion snapper, red porgy (2.7/km), amberjack (2.4), scamp (1.3), and speckled hind (0.3).

Table 3. Density of fish for all transects at dive site ROV 12-35 (number individuals/km).

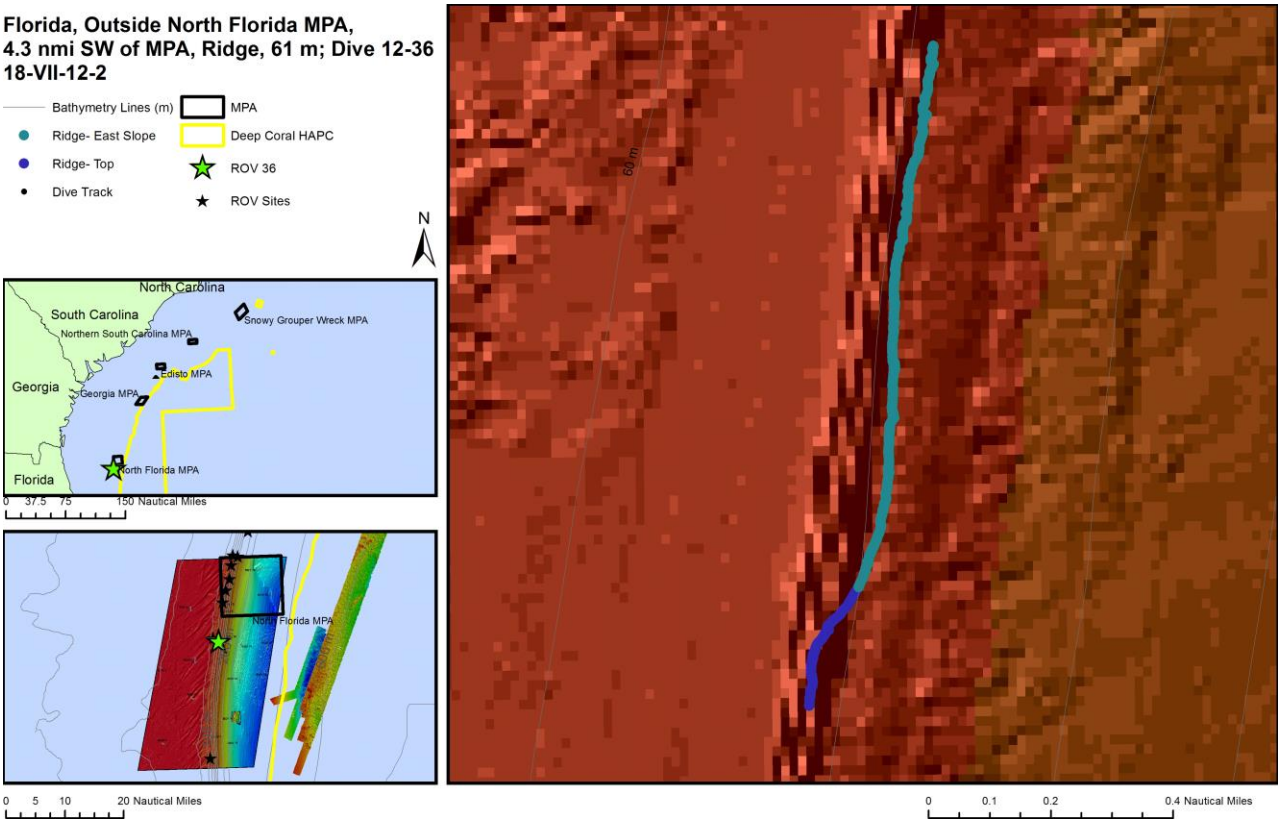
Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Acanthurus sp.	doctorfish	2	3.74	0.5
Balistes capriscus	grey triggerfish	5	3.74	1.3
Bodianus pulchellus	spotfin hogfish	65	3.74	17.4
Calamus sp.	porgy	13	3.74	3.5
Canthigaster rostrata	sharpnose puffer	51	3.74	13.6
Centropristis ocyurus	bank sea bass	4	3.74	1.1
Chaetodon ocellatus	spotfin butterflyfish	14	3.74	3.7
Chaetodon sedentarius	reef butterflyfish	115	3.74	30.7
Chromis enchrysurus	yellowtail reeffish	93	3.74	24.9
Chromis insolatus	sunshinefish	1	3.74	0.3
Chromis scotti	purple reeffish	10	3.74	2.7
Chromis sp.	damselfish	8	3.74	2.1
Epinephelus drummondhayi	speckled hind	1	3.74	0.3
Equetus umbrosus	cubbyu	34	3.74	9.1
Haemulon aurolineatum	tomtate	632	3.74	169.0
Haemulon striatum	striped grunt	2	3.74	0.5
Halichoeres garnoti	yellowhead wrasse	1	3.74	0.3
Halichoeres sp.	wrasse	138	3.74	36.9
Holacanthus bermudensis	blue angelfish	57	3.74	15.2
Holacanthus tricolor	rock beauty	2	3.74	0.5
Holocentridae	soldierfish	3	3.74	0.8
Holocentrus sp.	squirrelfish	63	3.74	16.8
Lactophrys polygonia	honeycomb cowfish	1	3.74	0.3
Lactophrys sp.	cowfish	7	3.74	1.9
Liopropoma eukrines	wrasse bass	4	3.74	1.1
Malacanthas plumieri	sand tilefish	3	3.74	0.8
Mycteroperca phenax	scamp	5	3.74	1.3
Myrichthys acuminatus	sharptail snake eel	1	3.74	0.3
Myripristis ocyurus	blackbar soldierfish	7	3.74	1.9
Pagrus pagrus	red porgy	10	3.74	2.7
Paranthias furcifer	creole-fish	4	3.74	1.1
Priacanthus arenatus	bigeye	11	3.74	2.9
Prognathodes aya	bank butterflyfish	7	3.74	1.9
Pterois volitans	lionfish	10	3.74	2.7
Rhomboplites aurorubens	vermilion snapper	1504	3.74	402.1
Seriola dumerili	greater amberjack	5	3.74	1.3

Location: Florida, Outside North Florida MPA, 7 nmi N of MPA, Ridge, 58 m; Dive 12-35

Seriola rivoliana	almaco jack	1	3.74	0.3
Seriola sp.	amberjack	3	3.74	0.8
Serranus annularis	orangeback bass	3	3.74	0.8
Serranus phoebe	tattler	59	3.74	15.8
Stegastes partitus	bicolor damselfish	11	3.74	2.9
Total		2970		794.1

Dive Site: Florida, Outside North Florida MPA, 4.3 nmi SW of MPA, Ridge, 61 m; Dive 12-36

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	USWTR Bathy with ROV (Navy)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/18/2012
Specimens:	
Digital Photos:	18
DVD:	1
Hard Drive:	1

Dive Site: Florida, Outside North Florida MPA, 4.3 nmi SW of MPA, Ridge, 61 m; Dive 12-36

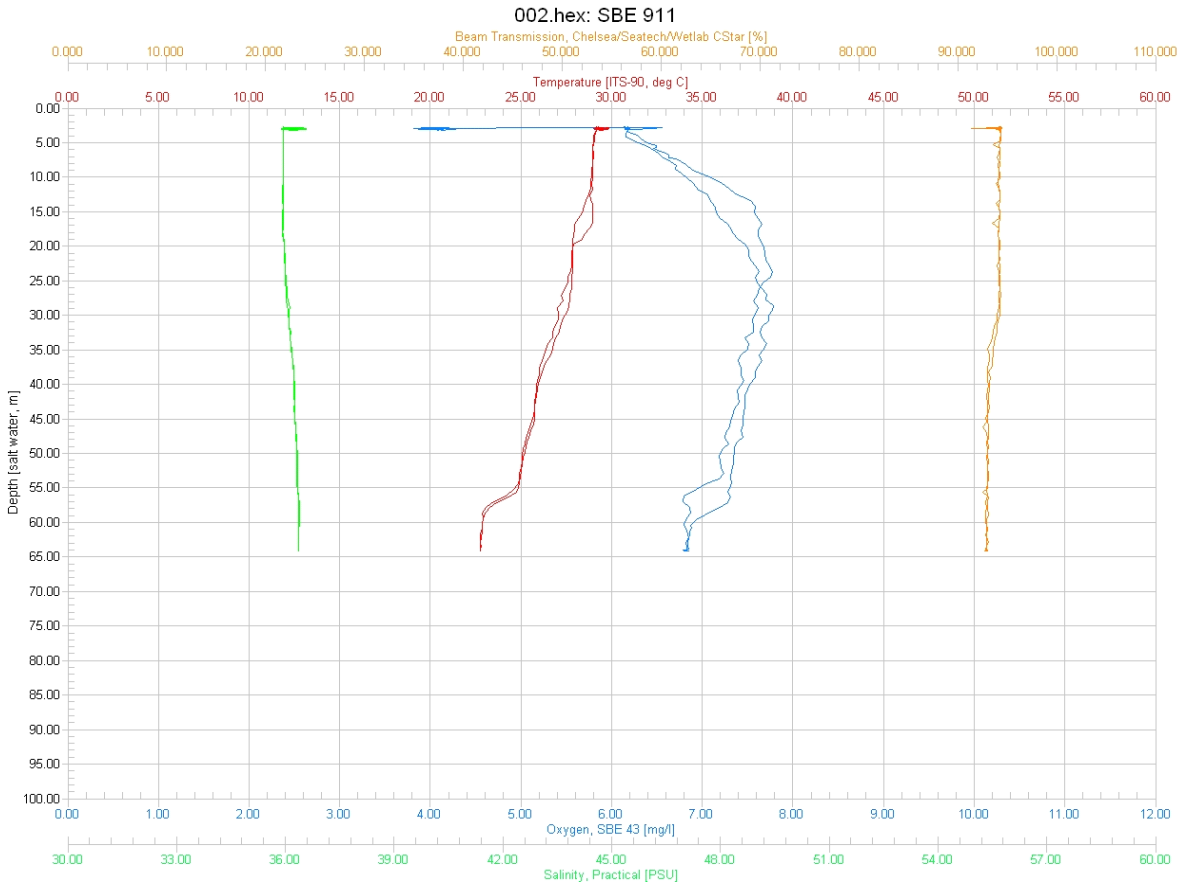
Dive Data:

Minimum Bottom Depth (m):	54	**Total Transect Length (km):**	2.273
Maximum Bottom Depth (m):	61	**Surface Current (kn):**	3.0
On Bottom (Time- GMT):	10:40	**On Bottom (Lat/Long):**	30.23°N; -80.25°W
Off Bottom (Time- GMT):	11:15	**Off Bottom (Lat/Long):**	30.24°N; -80.25°W

Physical (bottom); Temp (°C): 17.70 **Salinity:** 36.10 **Visibility (ft):** 30 **Current (kn):** 2

Physical Environment:

Distance from Dive Site(km): 20.05



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (64 m): temperature- 22, salinity- 36.2, and dissolved oxygen- 6.8. Surface temperature was 28.06 and there was a thermocline near 55 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 25 m. Visibility was estimated at 30 ft from the ROV video.

Dive Site: Florida, Outside North Florida MPA, 4.3 nmi SW of MPA, Ridge, 61 m; Dive 12-36

Dive Imagery:

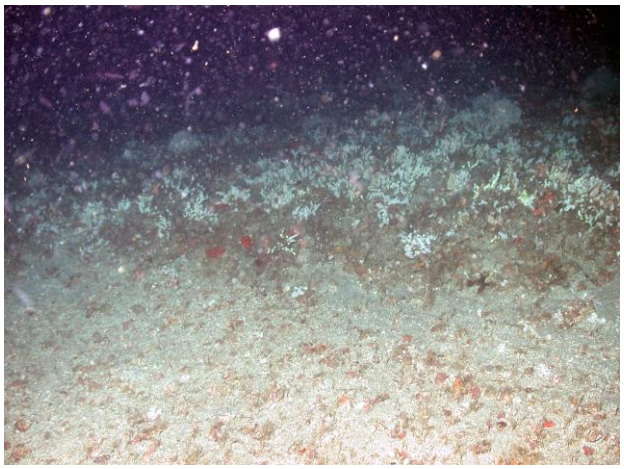


Figure 1: -60.3 m
Didemnidae tunicates on low relief pavement.

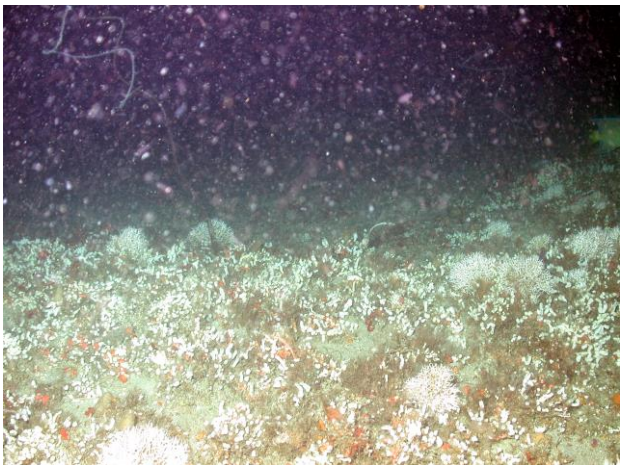


Figure 2: -59.9 m
Didemnidae tunicates, *Filograna* polychaete colonies, and *Stichopathes* black coral on low relief pavement.

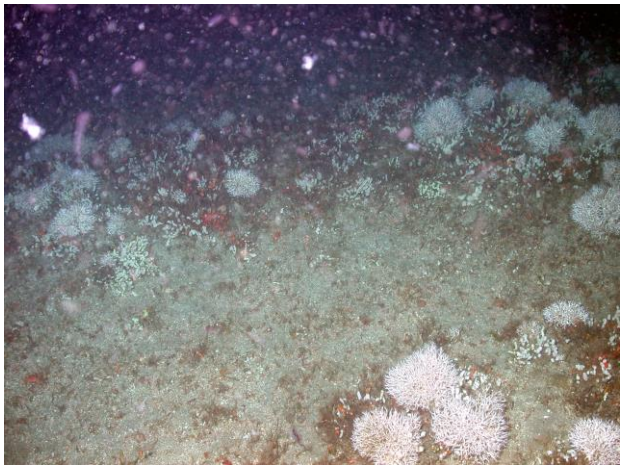


Figure 3: -60.1 m
Didemnidae tunicates and *Filograna* worm colonies on low relief pavement.

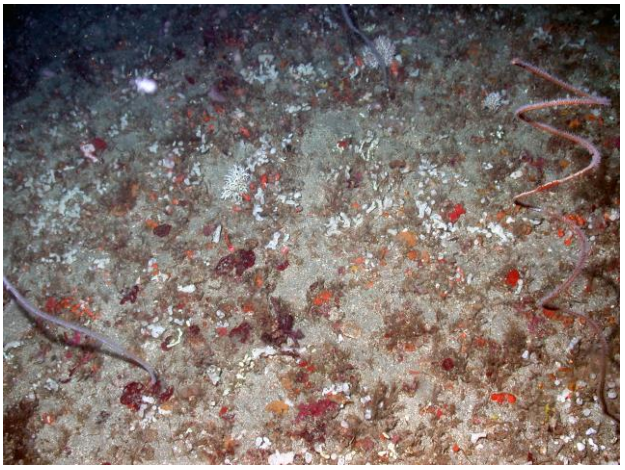


Figure 4: -59.5 m
Didemnidae tunicates, *Filograna* polychaete colonies, and *Stichopathes* black coral on low relief pavement.

Dive Site: Florida, Outside North Florida MPA, 4.3 nmi SW of MPA, Ridge, 61 m; Dive 12-36

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 36, Site #- 18-VII-12-2. Target Site – outside and south of North Florida MPA; 55 m. ROV survey outside MPA and ground truth Navy multibeam sonar of the site. Conduct video/photo transect along west slope of ridge of multibeam sonar map.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 0.3.0 kn; bottom 2.0. Unable to station keep, drifting 1-2 kn to the north, often pulled off bottom; only on bottom few short periods.

Site Description/Habitat/Biota:
Transect along east and west slope of N-S oriented ridge of multibeam; depth range 55-61 m. West slope: 55 m, sand with 30-50% cover of flat rock slabs, 30 cm relief; slope appeared as 10o jumble of rock slabs, which corresponded to black line of multibeam. East slope: 61 m, series of linear, low relief, smooth rock knolls, <30 cm, separated by rock pavement and sediment. Cover is very sparse and very few fish.

Dominant Benthic Biota: Antipatharia- *Stichopathes*; Hydroida; Demospongiae- *Ircinia campana*, encrusting spp; Annelida- *Filograna* (dense 10 cm colonies); Ascidiacea- Didemnidae (dense 2 cm nubs).
Fish: reef butterfly, spotfin hogfish, tattler.

Location: Florida, Outside North Florida MPA, 4.3 nmi SW of MPA, Ridge, 61 m; Dive 12-36

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-36 conducted a survey 4.3 nmi SW of the MPA. A transect was attempted along a S-N oriented ridge which is evident in the multibeam sonar map. However, 3 kn surface currents and 2 kn bottom currents prevented any detailed survey; the ROV was unable to station keep and was on and off bottom throughout the dive. The dive transects were divided into two habitat zones: Ridge- East Slope and Ridge- Top; however, no photos were able to be taken on the ridge top and therefore only the east slope was analyzed herein. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This dive site was primarily low relief pavement with low ledges and rock knolls; 54-61 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-36. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 36	Florida, Outside North Florida MPA, 4.3 nmi SW of MPA, Ridge, 61 m; Dive 12-36				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	Top of ridge, 54 m flat, rock slabs 0.5 m relief, 30-50% cover				
	Ridge- Top	On Reef	LRu	LR	PF
Transect 2	Xs along east slope and base, ROV mostly off bottom, 61 m at base, Low relief knolls and ledges, mostly pvmt				
	Ridge- East Slope	On Reef	LRu	LR	PF

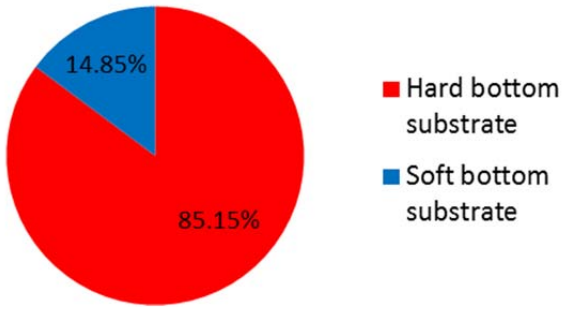


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-36. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-36 was predominately hard bottom (85.15%) consisting of rock pavement, rock slabs, ledges and low relief rock knolls.

Location: Florida, Outside North Florida MPA, 4.3 nmi SW of MPA, Ridge, 61 m; Dive 12-36

Bare rock substrate without biota covered 50.83% of the bottom and bare soft bottom was 14.72% (Fig. 2, Table 2). Benthic macro-biota covered 34.45% of the bottom and consisted of 5% non-coral Cnidaria (Hydrozoa), 2.5% Porifera, 1.39% Antipatharia, and 1.67% algae.

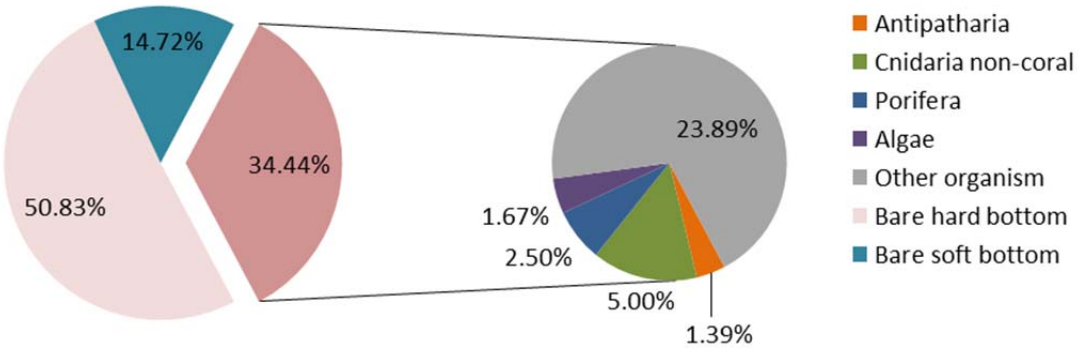


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-36. Non-scleractinian corals include Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-36.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**9**	**2.50%**
Porifera	**9**	**2.50%**
Demospongiae	4	1.11%
Ircinia sp.	1	0.28%
Spirastrellidae	4	1.11%
Cnidaria non-coral	**18**	**5.00%**
Cnidaria non-coral	**18**	**5.00%**
Hydroidolina	18	5.00%
Antipatharia	**5**	**1.39%**
Antipatharia	**5**	**1.39%**
Stichopathes lutkeni	5	1.39%
Algae	**6**	**1.67%**
Algae	**6**	**1.67%**
Corallinales/crustose coralline	5	1.39%
Rhodophyta	1	0.28%
Other organism	**86**	**23.89%**
Annelida	**19**	**5.28%**
Annelida	5	1.39%
Filograna sp.	14	3.89%
Chordata	**63**	**17.50%**
Didemnidae	63	17.50%
Other organism	**4**	**1.11%**
Other organism	4	1.11%

Location: Florida, Outside North Florida MPA, 4.3 nmi SW of MPA, Ridge, 61 m; Dive 12-36

Hard bottom substrate	**183**	**50.83%**
Hard bottom substrate	**183**	**50.83%**
Bare rock- pavement boulder ledge	181	50.28%
Bare rubble- rock	2	0.56%
Soft bottom substrate	**53**	**14.72%**
Soft bottom substrate	**53**	**14.72%**
Bare soft bottom substrate	53	14.72%
Grand Total	**360**	**100.00%**

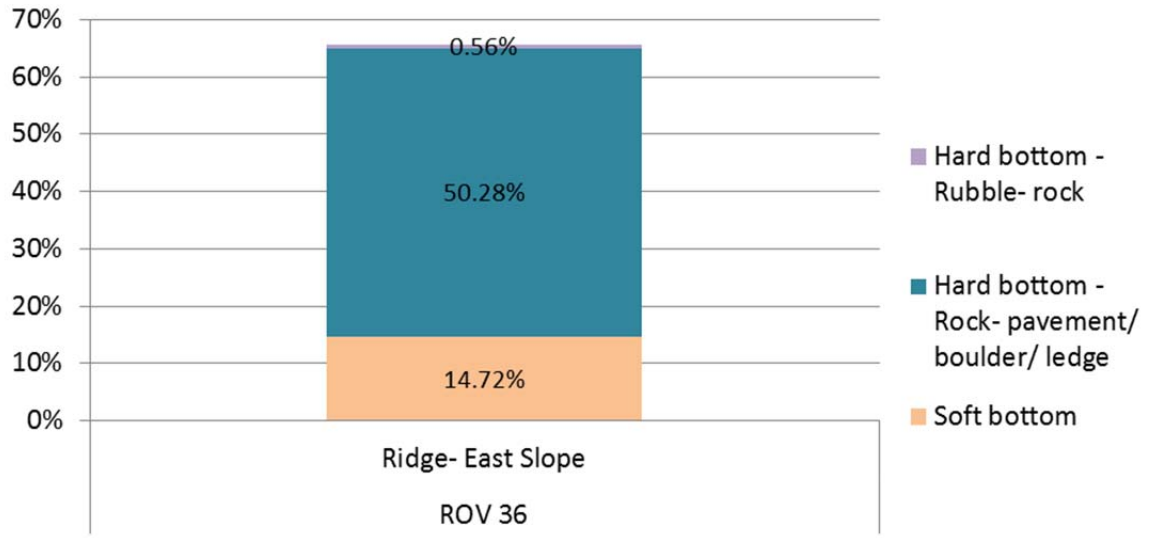


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-36.

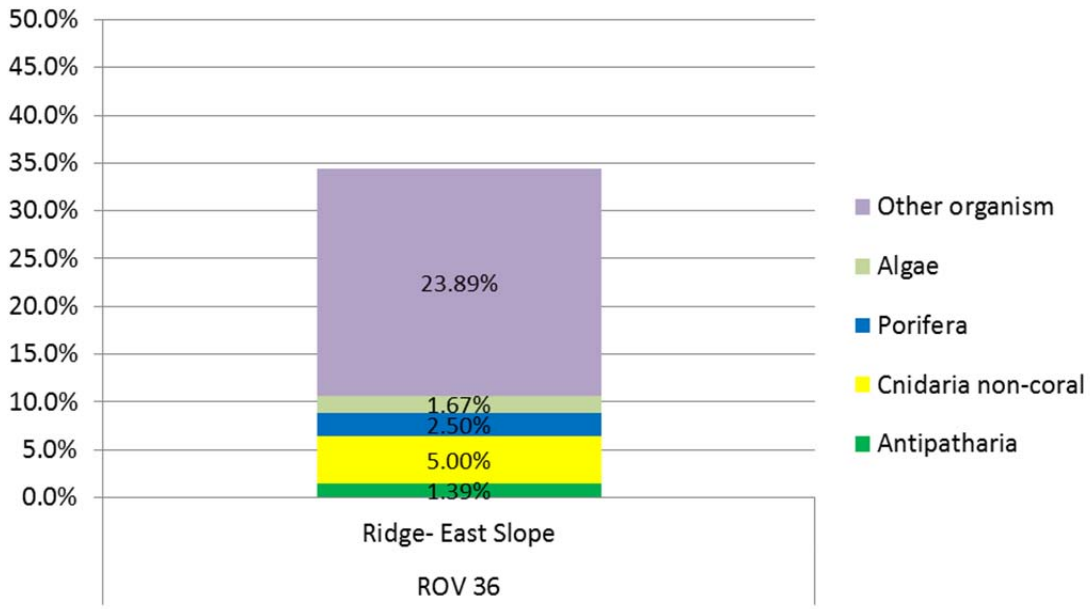


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-36.

Location: Florida, Outside North Florida MPA, 4.3 nmi SW of MPA, Ridge, 61 m; Dive 12-36

Figure 3 shows the percent cover of bare substrate type for just the ridge east slope since no useable images were taken on the ridge top. 50.2% of the bottom on the slope was bare rock, 14.7% was bare sediment. Figure 4 shows the slope to have 34.4% cover of biota and dominated by algae (23.8%), hydroids (5.%), sponges (2.5%), and Antipatharia (1.3%). Other biota (23.8%) included mostly Didemnidae tunicates (17.5%) and *Filograna* sp. polychaete tubes.

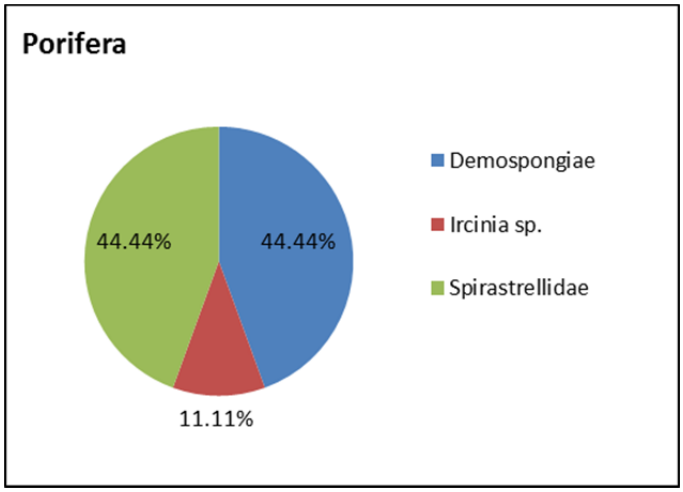


Figure 5. Diversity of sponges at dive site ROV 12-36; CPCe analysis showing percent of total for each taxa category.

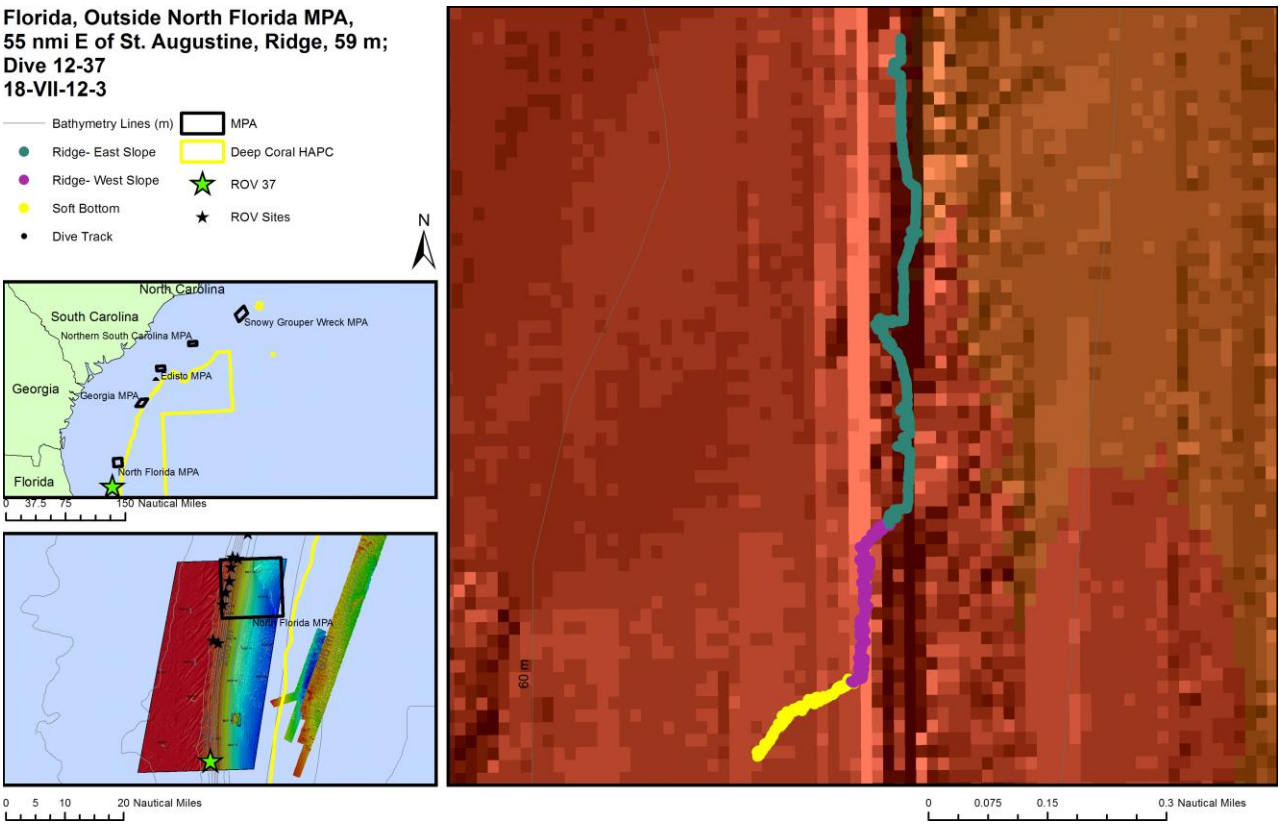
This site which only had a few photo images to analyze had very low diversity. No hard coral was present at the dive site. The only non-scleractinian coral was the antipatharian *Stichopathes lutkeni*. Sponges also had low diversity and were dominated by Spirastrellidae (44.4% of the total Porifera), *Ircinia* sp. (11.1%), and other unidentified demosponges (44.4%).

Fish Data Analysis:

Dive 36 had very strong currents and was spent mostly too far off bottom to identify fish, so the fish were not analyzed.

Dive Site: Florida, Outside North Florida MPA, 55 nmi E of St. Augustine, Ridge, 59 m; Dive 12-37

General Location and Dive Track:



Site Overview:

Project:	South Atlantic MPA
Principal Investator:	Stacy Harter
PI Contact Info:	3500 Delwood Beach Rd., Panama City, FL 32444
Website:	http://teacheratsea.wordpress.com/category/marsha-skoczek/
Scientific Observers:	Andy David, John Reed, Stacy Harter, Stephanie Farrington
Data Management:	Access Database, Excel Spreadsheet
ROV Navigation Data:	Trackpoint II
Ship Position System:	DGPS
Report Analyst:	John Reed, Stephanie Farrington
Date Compiled:	8/7/2013

Dive Overview:

Vessel:	NOAA Ship *Pisces*
Sonar Data:	USWTR Bathy with ROV (Navy)
Purpose:	ROV surveys to compare inside and outside shelf-edge MPA sites
ROV:	UNCW Super Phantom
ROV Sensors:	Temperature (°C), Conductivity
Date of Dive:	7/18/2012
Specimens:	
Digital Photos:	176
DVD:	2
Hard Drive:	1

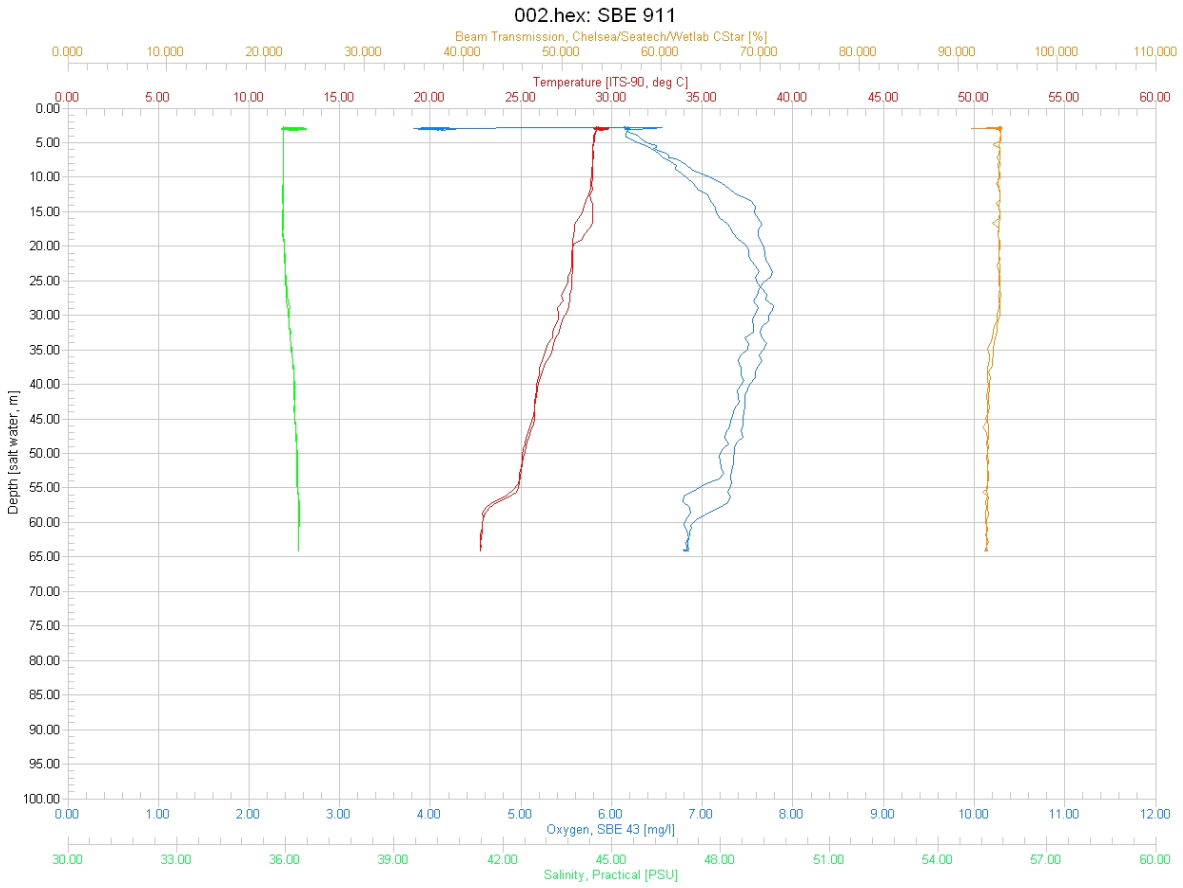
Dive Site: Florida, Outside North Florida MPA, 55 nmi E of St. Augustine, Ridge, 59 m; Dive 12-37

Dive Data:

Minimum Bottom Depth (m):	54	**Total Transect Length (km):**	4.066
Maximum Bottom Depth (m):	66	**Surface Current (kn):**	1.25
On Bottom (Time- GMT):	14:14	**On Bottom (Lat/Long):**	29.9°N; -80.29°W
Off Bottom (Time- GMT):	16:20	**Off Bottom (Lat/Long):**	29.91°N; -80.29°W
Physical (bottom); Temp (°C):	15.40	**Salinity:** 36.10 **Visibility (ft):** 30	**Current (kn):** 0.1

Physical Environment:

Distance from Dive Site(km): 57.31



All CTD data were collected with shipboard CTD which recorded depth (m), temperature (°C), salinity (PSU), oxygen concentration (mg/l), and beam transmission (%). These data were used both to support multibeam surveys (sound velocity) and to characterize hydrographic conditions at the dive sites.

The following values were recorded at the maximum depth of this CTD cast (64 m): temperature- 22, salinity- 36.2, and dissolved oxygen- 6.8. Surface temperature was 27.7 and there was a thermocline near 55 m depth; salinity remained fairly consistant, dissolved oxygen peaked at 25 m. Visibility was estimated at 30 ft from the ROV video.

Dive Site: Florida, Outside North Florida MPA, 55 nmi E of St. Augustine, Ridge, 59 m; Dive 12-37

Dive Imagery:

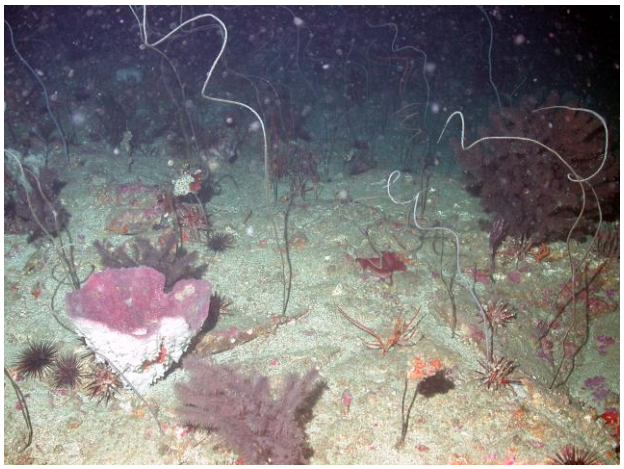


Figure 1: -54.3 m

St Augustine ridge- *Ircinia campana* sponge, *Stichopathes* black whip coral, bush antipatharians, and *Eucidaris* urchins on rock pavement.

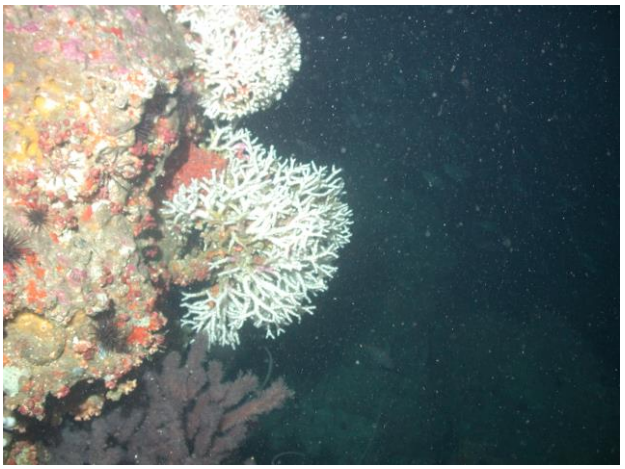


Figure 2: -57.6 m

St Augustine ridge- *Oculina varicosa* coral and bush antipatharian on rock escarpment.

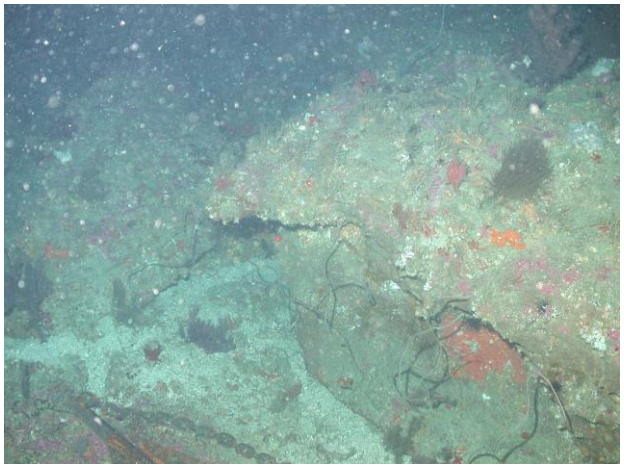


Figure 3: -57.2 m

St Augustine ridge- lost anchor with chain on high relief hardbottom.

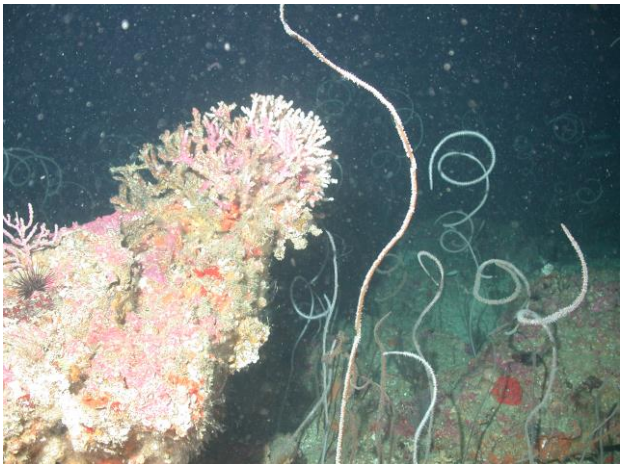


Figure 4: -58.5 m

St Augustine ridge- *Oculina varicosa* coral and *Stichopathes* black coral on high relief rocky escarpment.

Dive Site: Florida, Outside North Florida MPA, 55 nmi E of St. Augustine, Ridge, 59 m; Dive 12-37

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:
ROV Dive 37, Site #- 18-VII-12-3. Target Site – 55 nmi east of St. Augustine, 60-m reef line, outside MPA; 60 m. ROV survey outside MPA and ground truth Navy multibeam sonar and NOAA Bathymetric chart of the site. Conduct video/photo survey of NOAA Bathymetric Chart which shows high relief features, possibly Oculina coral, and Navy multibeam sonar map (15 m resolution) which shows a linear N-S ridge. A. David's ROV dive in 2007 on the same ridge a few miles north reported a 10-m tall N-S ridge.

ROV Setup/Dive Events:
Video time ESDT. Dive Notes depth recorded as total depth (ROV altitude + ROV depth in meters). COG is ROV heading. Events, habitat and fauna are recorded by Reed and Farrington directly into Access database. Fish data recorded by David and Harter in separate Excel spreadsheet to be added to Access database. Quantitative photos taken 90° down; lasers 10 cm; non-transect photos forward. Surface current 1.25 kn; bottom 0 kn.

Site Description/Habitat/Biota:
Transect up west slope of N-S oriented ridge, along top, and along the east escarpment. Feature proves to be a N-S linear rock ridge, 56 m at west base, 54-56 m on top, and 65 m at east base. Appears to be the same continuous ridge system that continues north through the North Florida MPA site. At this site it is not individual Oculina coral mounds, although individual 10-30 cm live white Oculina varicosa coral colonies were common on the vertical rock surfaces along the east escarpment at depths of 58-61. The same ridge system continues south but become individual Oculina coral mounds off of Daytona and continuing south to Fort Pierce. West base, 56 m: sand and shell hash, with several knocked down 30 cm gorgonian colonies. West slope of ridge: 56 to 54 m, 20o slope, jumbled 1-2 m rock slabs, 30-50 cm relief, with black coral, numerous black sea urchins (Arbacia or Centrostephanus), sponges, and 15-30 cm gorgonians. Fairly dense fauna on slope and upper edge of ridge; some scamp. Ridge top; 55-56 m, ~50 m wide, flat pavement consisting of fractured rock slabs, and some ledges, 10-30 cm relief; fairly barren compared to edge zones, black coral, gorgonians, and sponges still common. East edge and escarpment: 30o slope from 56 to 65 m, extending 10-20 m to the base which grades into sand at 64-66 m. Upper slope near vertical rock with 1-2 m relief of rugged rock and the lower slope is a jumble of 1-2 m rock slabs, 1/2-1 m relief.

Dominant Benthic Biota: Antipathidae (3-4 spp.), gorgonacea, demosponges, sea urchins, and *Oculina varicosa* are dominant. Scleractinia- *Oculina varicosa*, (live white, 10-20 cm colonies, 13+ colonies); Antipathidae (4 spp)- *Stichopathes*, 30-40 cm bushy brown, white fans, Australian pine; Gorgonacea- *Diodogorgia*? (10-15 cm purple), *Swiftia exserta* (30-40 cm red); Hydroida; Demospongiae- *Cinachyra*?, *Neofibularia*, Spirastrellidae, *Ircinia campana*, other spp; Asteroidea; Echinoidea- *Arbacia* or Centrostephanus, *Eucidaris tribuloides*; Ascidiacea- Didemnidae; Algae- crustose coralline algae; Rhodophyta. Fish: greater amberjack, bank butterflyfish, bank seabass, blackbar drum, blue angelfish, cowfish, cubbyu, hogfish, red porgy, reef butterflyfish, scamp grouper, sharpnose puffer, short bigeye, spotfin hogfish, squirrelfish, tattler, tomtate (numerous), vermilion snapper (numerous), yellowtail reeffish, lionfish (8).

Location: Florida, Outside North Florida MPA, 55 nmi E of St. Augustine, Ridge, 59 m; Dive 12-37

Percent Cover of Benthic Macro-Biota and Substrate:

ROV dive 12-37 conducted a survey 25 nmi south of the North Florida MPA and 55 nmi east of St. Augustine. The dive followed a S-N oriented ridge that is evident the multibeam sonar map. Dive transects were divided into three habitat zones: Ridge- East Slope, Ridge- West Slope and Soft Bottom. Table 1 describes the habitat characteristics of each transect based on habitat zone, relief, rugosity, and SEADESC habitat categories (see Methods for definitions). This dive site was primarily a moderate and high relief ridge, with steep east and west slopes of high rugosity, consisting of boulders, ledges, and fractured rock slabs; 53-65 m depth range.

Table 1. Habitat categories used to characterize the benthic habitats for each transect of ROV dive 12-37. Rugosity: LRu= low rugosity, HRu= high rugosity. Relief: LR= low relief (0- <1.0 m), MR= moderate relief (1-3 m), HR= high relief (>3 m). SEADESC Habitat Code: S= soft bottom, R= rubble, RLF= rock and/or ledges, PF= rock pavement, A= artificial substrate (see Methods for details).

Dive Number	Location				
ROV 37	Florida, Outside North Florida MPA, 55 nmi E of St. Augustine, Ridge, 59 m; Dive 12-37				
Transect #	**Habitat Zone**	**On/Off Reef**	**Rugosity**	**Relief**	**SEADESC Code**
Transect 1	56 m starting 150 m from reef flat sand, shell hash				
	Soft Bottom	Off Reef	LRu	LR	S
Transect 2	55 m base of west slope, 20o slope, jumble of boulder / rock slabs 1-2 m diam, 1 m relief				
	Ridge- West Slope	On Reef	HRu	MR	RLF
Transect 3	Xs along e slope and base, 55 m top, 65 m at base, 30-45o slope, rock slabs, stair step ledges ~ 20 m wide, rugose,, upper 3 m steep rock, lower slope boulders, top or ridge flat 10-30 cm relief				
	Ridge- East Slope	On Reef	HRu	HR	RLF

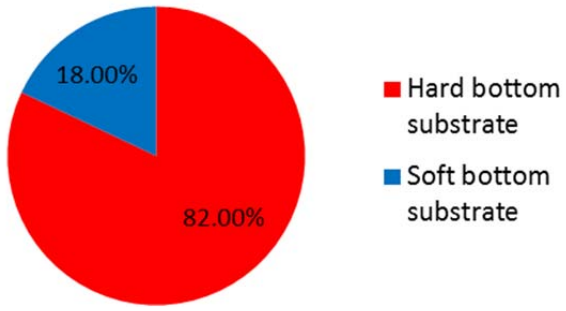


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 12-37. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

Point count (CPCe©) was used to determine percent cover of substrate and benthic biota (see Methods for details). Figure 1 shows the percent cover of hard bottom and soft bottom substrate, in which CPCe points on biota were scored as the underlying substrate type. Soft bottom is defined as unconsolidated mud or sand. Site 12-37 was predominately hard bottom (82%) consisting of 1-2 m rock slabs, boulders, ledges and rock pavement.

Location: Florida, Outside North Florida MPA, 55 nmi E of St. Augustine, Ridge, 59 m; Dive 12-37

Bare rock substrate without biota covered 55.49% of the bottom and bare soft bottom was 17.82% (Fig. 2, Table 2). Benthic macro-biota covered 26.71% of the bottom and consisted of 0.66% hard coral, 1.52% non-coral Cnidaria (Hydrozoa), 4.94% Porifera, 8.7% Antipatharia, 0.73% Alcyonacea ("gorgonacea"), and 6.98% algae of which 6.7% was crustose coralline algae.

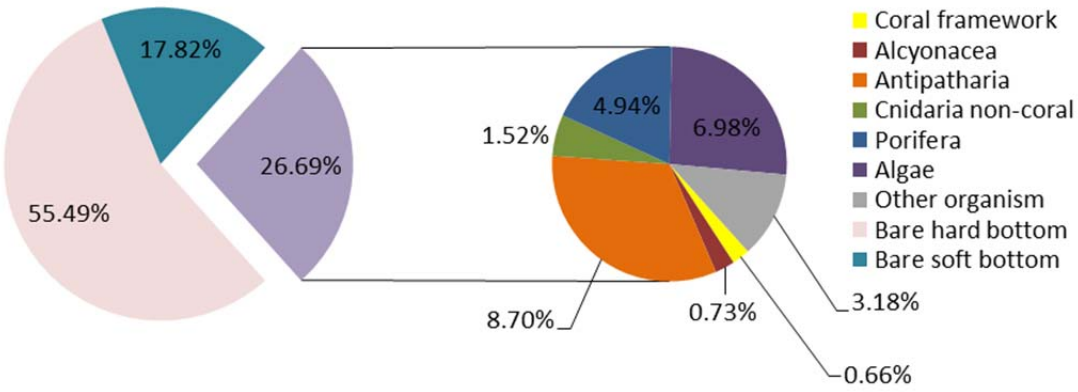


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 12-37. Corals include framework scleractinian coral and solitary coral. Non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral). Cnidaria non-coral are primarily Hydroida.

Table 2. Percent cover of benthic macro-biota and substrate types at dive site ROV 12-37.

Benthic macro-biota and substrate types	Point Count	% Cover
Porifera	**143**	**4.94%**
Porifera	**143**	**4.94%**
Chondrosia sp.	3	0.10%
Demospongiae	37	1.28%
Ircinia campana	8	0.28%
Ircinia sp.	33	1.14%
Spirastrellidae	62	2.14%
Cnidaria non-coral	**44**	**1.52%**
Cnidaria non-coral	**44**	**1.52%**
Hydroidolina	44	1.52%
Antipatharia	**252**	**8.70%**
Antipatharia	**252**	**8.70%**
Antipatharia	4	0.14%
Antipathes sp. A	7	0.24%
Stichopathes lutkeni	144	4.97%
Tanacetipathes hirta	97	3.35%
Algae	**202**	**6.98%**
Algae	**202**	**6.98%**
Corallinales/crustose coralline	195	6.73%
Rhodophyta	7	0.24%
Alcyonacea	**21**	**0.73%**

Location: Florida, Outside North Florida MPA, 55 nmi E of St. Augustine, Ridge, 59 m; Dive 12-37

Alcyonacea	**21**	**0.73%**
Bebryce sp.	2	0.07%
Diodogorgia sp.	3	0.10%
Ellisellidae	2	0.07%
Gorgonacea	6	0.21%
Muricea sp.	6	0.21%
Telesto sp.	2	0.07%
Coral	**19**	**0.66%**
Coral	**19**	**0.66%**
Oculina varicosa	17	0.59%
Phyllangia americana	1	0.03%
Scleractinia solitary	1	0.03%
Other organism	**92**	**3.18%**
Annelida	**7**	**0.24%**
Filograna sp.	5	0.17%
Serpulidae	2	0.07%
Arthropoda	**1**	**0.03%**
Stenorhynchus seticornis	1	0.03%
Bryozoa	**3**	**0.10%**
Schizoporella sp.	3	0.10%
Chordata	**14**	**0.48%**
Ascidiacea	1	0.03%
Didemnidae	4	0.14%
Fish	9	0.31%
Echinodermata	**52**	**1.80%**
Arbacia punctulata	37	1.28%
Centrostephanus longispinus	4	0.14%
Eucidaris tribuloides	11	0.38%
Human debris	**1**	**0.03%**
Fishing gear/line/long line	1	0.03%
Other organism	**14**	**0.48%**
Other organism	14	0.48%
Hard bottom substrate	**1607**	**55.49%**
Hard bottom substrate	**1607**	**55.49%**
Bare rock- pavement boulder ledge	1601	55.28%
Bare rubble- rock	6	0.21%
Soft bottom substrate	**516**	**17.82%**
Soft bottom substrate	**516**	**17.82%**
Bare soft bottom substrate	516	17.82%
Grand Total	**2896**	**100.00%**

Location: Florida, Outside North Florida MPA, 55 nmi E of St. Augustine, Ridge, 59 m; Dive 12-37

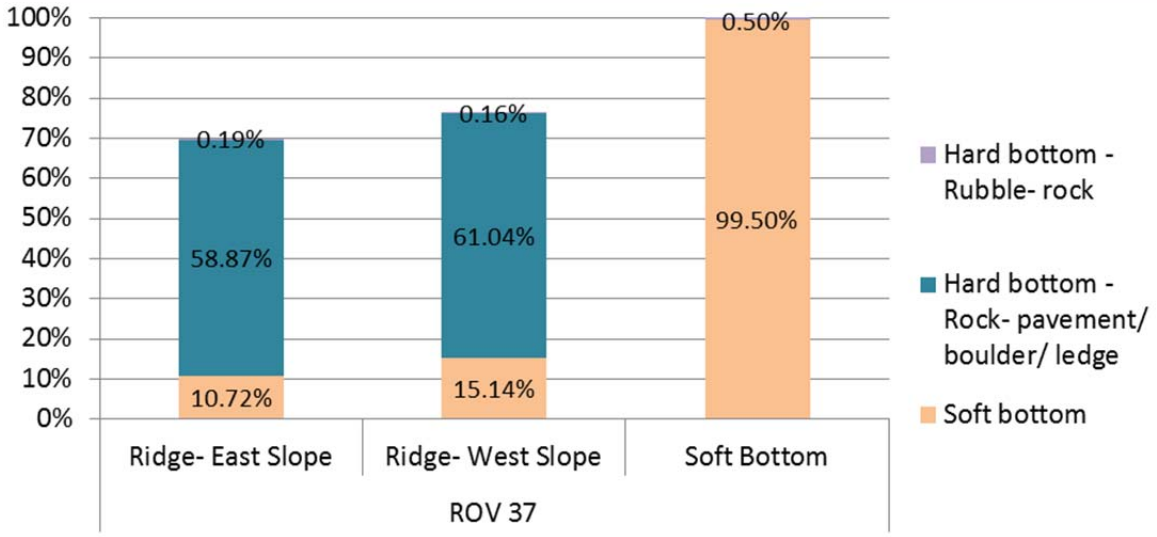


Figure 3. Percent cover of bare substrate types for each habitat zone at dive site ROV 12-37.

Figure 3 shows the percent cover of bare substrate type for each habitat zone of the dive site. The east and west slopes of the ridge were very similar in the amount of exposed bare hard bottom (58.8 and 61.0%, respectively). Off ridge was barren flat sediment (99.9% sand). The east slope had more biota (30% cover, Fig. 4). Both slopes had similar biota and were dominated by algae (8.8 and 3.1%, respectively), Porifera (5.3%), Antipatharia (8.8-9.5%), and scleractinian coral (0.4-0.7%).

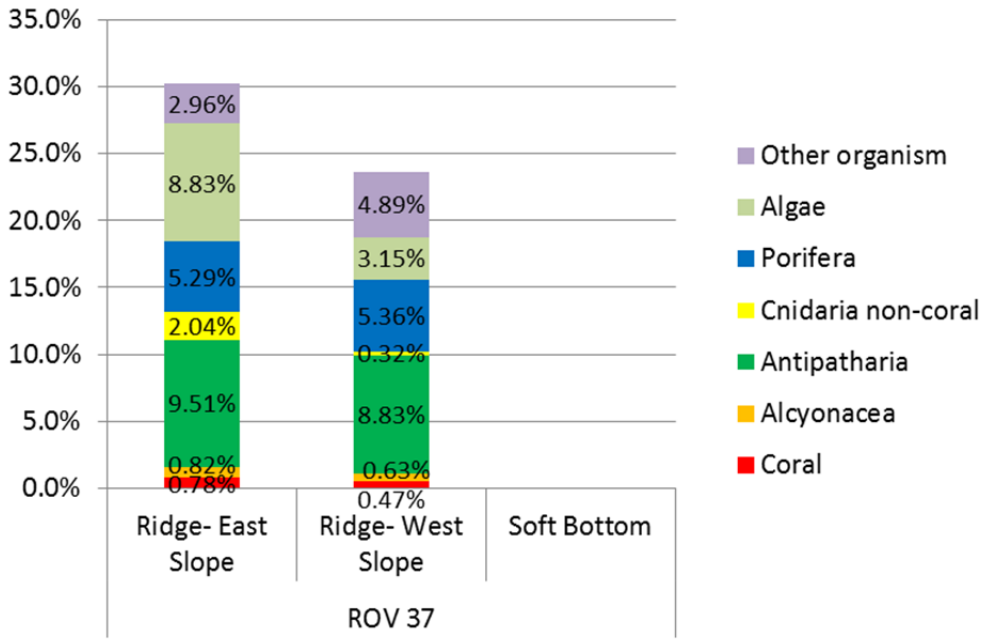


Figure 4. Percent cover of benthic macro-biota for each habitat zone at dive site ROV 12-37.

Location: Florida, Outside North Florida MPA, 55 nmi E of St. Augustine, Ridge, 59 m; Dive 12-37

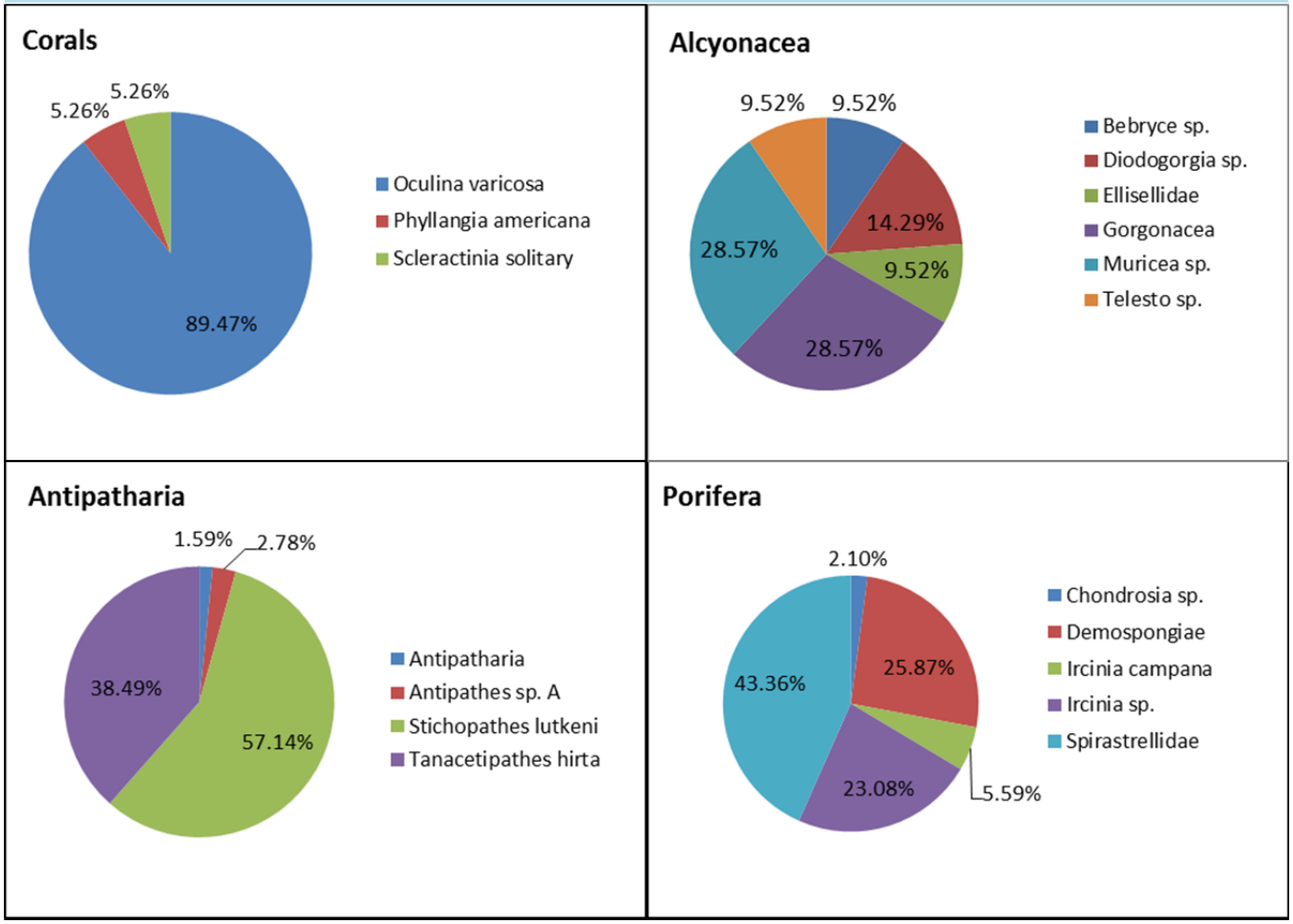


Figure 5. Diversity of corals and sponges at dive site ROV 12-37; CPCe analysis showing percent of total for each taxa category. Corals include framework scleractinian coral and solitary coral; non-scleractinian corals include Alcyonacea ("gorgonacea") and Antipatharia (black coral); Porifera are Demospongiae.

This site had the most framework scleractinian coral of all sites of the cruise except for the deepwater shipwreck (ROV 12-19). Framework coral consisted of *Oculina varicosa* (89.4% of the total scleractinian corals); solitary coral included *Phyllangia americana*. Non-scleractinian corals were relatively diverse with 6 taxa of Alcyonacea and 4 Antipatharia. The Alcyonacea were dominated by *Muricea* sp. (28.5% of the total gorgonacea), *Diodogorgia* sp. (14.2%), Ellisellidae (9.5%), *Bebryce* sp. (9.5%), and *Telesto* sp. (9.5%). Antipatharia were dominated by *Stichopathes lutkeni* (57.1% of the total Antipatharia), *Tanacetipathes hirta* (38.4%), and *Antipathes* sp. A (2.7%). Sponges had 5 taxa, dominated by Spirastrellidae (43.3% of the total Porifera), *Ircinia* sp. (23%), *Ircinia campana* (5.5%), and *Chondrosia* sp. (2.1%).

Fish Data Analysis:

Video transects were used to analyze the fish populations and densities. All fish were identified for each ROV dive to species level and counted. The total distance (km) of each dive was used to calculate the density (# individuals/km) of each fish species. The average field of view was about 5-10 m. A total of 36 taxa of fish were identified from dive ROV 37 for a total density of 1840.5 individuals/km (Table 3). These were dominated by vermilion snapper (1185.7/km), tomtate (463.9), and yellowtail reeffish (72). Managed species included vermilion snapper, scamp (4.2/km), amberjack (1.2), hogfish (1.2), and red porgy (1.0).

Location: Florida, Outside North Florida MPA, 55 nmi E of St. Augustine, Ridge, 59 m; Dive 12-37

Table 3. Density of fish for all transects at dive site ROV 12-37 (number individuals/km).

Species Name	Common Name	#	Transect Length (km)	Density (#/km)
Bodianus pulchellus	spotfin hogfish	62	4.07	15.2
Calamus sp.	porgy	2	4.07	0.5
Canthigaster rostrata	sharpnose puffer	23	4.07	5.7
Centropristis ocyurus	bank sea bass	10	4.07	2.5
Chaetodon ocellatus	spotfin butterflyfish	27	4.07	6.6
Chaetodon sedentarius	reef butterflyfish	64	4.07	15.7
Chromis enchrysurus	yellowtail reeffish	293	4.07	72.0
Chromis scotti	purple reeffish	25	4.07	6.1
Equetus lanceolatus	jack-knife fish	1	4.07	0.2
Equetus umbrosus	cubbyu	9	4.07	2.2
Haemulon album	margate	1	4.07	0.2
Haemulon aurolineatum	tomtate	1888	4.07	463.9
Halichoeres bathyphilus	greenband wrasse	3	4.07	0.7
Halichoeres garnoti	yellowhead wrasse	1	4.07	0.2
Halichoeres sp.	wrasse	67	4.07	16.5
Holacanthus bermudensis	blue angelfish	42	4.07	10.3
Holocentridae	soldierfish/squirrelfish	1	4.07	0.2
Holocentus sp.	squirrelfish	37	4.07	9.1
Lachnolaimus maximus	hogfish	5	4.07	1.2
Lactophrys quadricornis	scrawled cowfish	2	4.07	0.5
Lactophrys sp.	cowfish	2	4.07	0.5
Liopropoma eukrines	wrasse bass	1	4.07	0.2
Lutjanidae	snapper	1	4.07	0.2
Muraenidae	moray eel	1	4.07	0.2
Mycteroperca phenax	scamp	17	4.07	4.2
Pagrus pagrus	red porgy	4	4.07	1.0
Pareques iwamotoi	blackbar drum	4	4.07	1.0
Priacanthus arenatus	bigeye	11	4.07	2.7
Prognathodes aya	bank butterflyfish	18	4.07	4.4
Pterois volitans	lionfish	15	4.07	3.7
Rhomboplites aurorubens	vermilion snapper	4826	4.07	1185.7
Seriola dumerili	greater amberjack	4	4.07	1.0
Seriola sp.	amberjack	1	4.07	0.2
Serranus phoebe	tattler	16	4.07	3.9
Sparidae	porgy	4	4.07	1.0
Sphoeroides spengleri	bandtail puffer	3	4.07	0.7
Total		7491		1840.5