

**NOAA CIOERT Cruise Report
South Atlantic MPAs and Oculina HAPC:
Characterization of Benthic Habitat and Biota**

**NOAA Ship *Pisces* Cruise 15-02
UNCW *Mohawk* ROV
June 18-29, 2015**

Funding: NOAA Coral Reef Conservation Program (CRCP)
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TABLE OF CONTENTS

Executive Summary	3
Acknowledgements	4
Deliverables and Data Management	4
CIOERT/NOAA Collaboration	4
Scientific Participants	5
Project Overview	5
Goals	6
Objectives	7
Methods	7
ROV Operations	7
ROV Video Camera	8
ROV Digital Still Camera	8
ROV Navigation	8
ROV Survey Protocol	8
Fish Analyses	8
Benthic Analyses	8
Protocol for Benthic Habitat Characterization	10
Statistical Analysis	11
Results	12
Study Areas	12
Cruise Summary	12
CTD Operations	19
SEADESC II Report: Characterization of Benthic Habitat and Benthic Macrobiota	19
Benthic Macrobiota and Habitat	19
<i>Oculina</i> HAPC	23
Benthic Biota and Habitat Relationships	24
Analysis of Fish Video Surveys	25
Snapper-Grouper Complex	27
Lionfish Populations	29
Future Work and Conclusions	30
Literature Cited	30
Appendix 1 - Species list of benthic biota and percent cover for each ROV dive	32
Appendix 2 - Species list of fish species and densities for each ROV dive	35
Appendix 3 - SEADESC II report for each ROV dive	40

EXECUTIVE SUMMARY

A 12 day research cruise was conducted June 18 to 29, 2015 by NOAA National Marine Fisheries on the NOAA Ship *Pisces* with the UNCW *Mohawk* ROV. Other collaborators involved include: the Cooperative Institute for Ocean Exploration, Research, and Technology (CIOERT) at Harbor Branch Oceanographic Institute, Florida Atlantic University (HBOI-FAU), University of North Carolina at Wilmington, College of Charleston, University of Miami, and Boston University.

The South Atlantic Fishery Management Council (SAFMC) established eight deepwater Marine Protected Areas (MPAs) along the outer continental shelf off the southeastern U.S in February 2009 and the *Oculina* Habitat Area of Particular Concern (OHPAC) in 1984. This cruise was the first cruise of a 3-year grant to document and characterize the benthic habitats, benthic biota, and fish populations within and adjacent to the protected areas within the jurisdiction of the SAFMC.

This 2015 Cruise Report provides detailed quantitative characterization of the benthic habitat, benthic macro-biota, and fish populations for each of the 22 ROV dives completed. Appendix 1 provides a species list and percent cover of benthic biota observed at each dive site. Appendix 2 provides a species list and densities of fish species observed at each dive site. Appendix 3 provides a SEADESC Level II Report for each dive site. The SEADESC Level II report includes:

- cruise and ROV dive metadata and objectives
- figures showing each ROV dive track on multibeam sonar maps
- ROV dive track data (start and end coordinates, time, and depth)
- CTD plots from shipboard casts and temperature profiles for each ROV dive
- images characterizing the habitat and biota for each dive site
- characterization of habitat, benthic biota, and fish populations for each dive site
- quantitative analyses of photo transects for each dive site of benthic habitat and biota
- quantitative analyses of video transects for each dive site of fish densities.

Twenty two ROV dives were conducted resulting in a total bottom time of 29 hours, covering 23.8 km, at depths from 46 to 166 m. A total of 2,020 *in situ* digital images were taken which included quantitative transect images, general habitat, and species documentation images. Nine shipboard CTD casts were made and a temperature/depth sensor recorded each ROV dive (Appendix 3). The multibeam sonar (ME-70) was not properly working during the cruise, so no multibeam data was collected this year.

The data from this cruise will be combined with previous cruise data collected 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 establish baseline information to be referenced and compared to future research cruises to identify the long-term health and status of these important ecosystems. These data will be made available to the SAFMC, NOAA Fisheries, NOAA DSC RTP, NOAA CRCP, NOAA Mesophotic Reef Ecosystem Program, and NOAA Marine Sanctuaries to assist management on these habitats and 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 #: NA14NMF4410149). We also acknowledge the NOAA Office of Ocean Exploration and Research (OER Grant #: NA14OAR4320260), 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). The crews of the NOAA Ship *Pisces* and the *Mohawk* ROV (owned by Flower Gardens Bank National Marine Sanctuary [FGBNMS], operated by Lance Horne and Jason White, UNCW Undersea Vehicle Program) are especially thanked for their support and efforts which made this cruise a success.

DELIVERABLES AND DATA MANAGEMENT

This Cruise Report and SEADESC Level II Report are the deliverables for this NOAA CRCP/SAFMC grant. To date, all data have been archived as required; these data include shipboard 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).

Table 1. NOAA Ship *Pisces* cruise (June 18-29, 2015) data archives (Principal Investigators- Stacey Harter, Andrew David, NOAA NMFS, Panama Lab; John Reed, HBOI-FAU).

Source	Description	Format
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 at Panama City (Andrew David, Stacey Harter, Heather Moe), NOAA CIOERT at HBOI-FAU (John Reed, Stephanie Farrington), and UNCW (Lance Horn, Jason White).

SCIENTIFIC PARTICIPANTS

Stacey Harter	Chief Scientist, Principal Investigator	NMFS/PC Lab
Andrew David	Co-Principal Investigator	NMFS/PC Lab
John Reed	Co-Principal Investigator	HBOI/FAU
Stephanie Farrington	Scientist, Data Manager	HBOI/FAU
LT Heather Moe	Scientist	NMFS/PC Lab
Lance Horn	Chief ROV Pilot	UNCW
Jason White	ROV Pilot	UNCW
Felicia Drummond	Scientist	NOAA Corps
Alex Nyberg	Scientist	University of Miami
Matthew Platt	Multibeam Sonar Specialist	College of Charleston
Marta Ribera	Multibeam Sonar Specialist	Boston University

PROJECT OVERVIEW

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

The *Oculina* Experimental Closed Area (OECA) was established in 1994 and closed the area to all bottom fishing in order to evaluate the effectiveness of the reserve for management and conservation of snapper grouper populations. The OECA is located within the *Oculina* Habitat Area of Particular Concern (OHAPC) which was established in 1984 when the significance and value of *Oculina varicosa* to important fishery species was recognized by the SAFMC. The OHAPC doubled in size when the Northern and Western Extensions were added with the implementation of Amendment 8 of the Fishery Management Plan in August 2015. As part of the OECA Evaluation Plan, a re-evaluation of the area is currently in progress. Data collected from the current grant will provide crucial data needed for this re-evaluation.

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, May 2010, July 2012, July 2013, and June 2014. 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.

GOALS

The primary goal of the cruise is to gather additional data on habitat and fish assemblages in the South Atlantic MPAs and OHAPC 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) multibeam or sidescan sonar mapping and groundtruthing, 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 and inside the OHAPC. 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

The primary objective of the cruise was to gather additional data on habitat and fish assemblages in six of the shelf-edge, South Atlantic Grouper/Tilefish Marine Protected Areas (MPAs) and provide data for the re-evaluation of the OECA. Data collected are part of a long-term sampling/monitoring program to document changes in these areas before and after fishing restrictions were implemented. Efficacy of this management tool will aid fishery managers in future use of area restrictions for the conservation of valuable habitat and fishery resources.

Specific objectives include:

- conduct ROV surveys of habitat and fish assemblages
- collect bathymetric data with the ME-70 multibeam mapping system on the ship to locate hard-bottom features and potential ROV dive sites (Note: this objective was not met as the ME-70 was not working during the cruise)
- conduct total water column Conductivity-Temperature-Depth (CTD) profiles.

METHODS

ROV Operations

The FGBNMS *Mohawk* ROV (operated by UNCW Undersea Vehicle Program) was used. ROV transect locations were selected by four methods:

- analysis of the limited multibeam bathymetric and acoustic backscatter maps produced within the preceding decade
- reef locations provided by colleagues
- sites found during previous years of this survey
- analysis of areas mapped on the current cruise.

The ROV was equipped with a high-definition digital video camera (using fiber optic cable) mounted on tilt bar, a fixed digital still camera, and a temperature/depth recorder. The ROV was not outfitted with a manipulator and no samples were collected.

ROV Video Camera

Video was recorded continuously throughout each dive from surface to surface with a high-definition video camera (Insite Pacific Mini Zeus CMOS color zoom camera with 2,000,000 effective pixels). The camera was typically angled down $\sim 30^\circ$ to view both near and far to the horizon for fish aggregations and habitat, and had 10-cm parallel lasers for scale. High-definition video was recorded to external hard drives and used as the primary data source for viewing by the science team and quantitative analysis of the fish populations. A second standard definition copy was also recorded to a hard drive as well as to DVD for backup and easy viewing on any computer's DVD drive. The standard definition format had an On-Screen Display (OSD) video overlay which recorded time, date, ROV heading, and ROV depth, and was used as the "pilot" view. A microphone was used for continuous audio annotations by the PIs describing events, habitat, and biota which were recorded onto the video recordings and transcribed into a Microsoft Access 2010 database.

ROV Digital Still Camera

Still images were taken to document habitat and benthic macrobiota with a Kongsberg OE14-408 (Canon G11) high-definition digital still camera (10 megapixels). For quantitative photo transects the camera was pointed 90° down from horizontal and used two 10-cm parallel lasers for scale. Still images were captured every 2 minutes throughout the dive at a height of 1.3 m to provide relatively consistent area for each image. 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.

ROV Navigation

The *Mohawk* ROV used an integrated navigation system consisting of Hypack Max 2014 software on a 64-bit, 3.4 GHz, rack-mounted computer running Windows 7. Additionally, data from an ORE Offshore 4410C Trackpoint II USBL Acoustic Tracking System, Northstar 951XD differential GPS, and Azimuth 1000 digital compass, along with the *Mohawk* ROV data fed to this computer. The Trackpoint II system communicates acoustically to an ORE Offshore 4377A transponder with depth telemetry on the ROV to provide slant range, bearing, and depth from the support vessel. This system allows the ROV to assign latitude and longitude while in operation. The integrated navigation system provides real time tracking and orientation of the ROV and the ship to the ROV pilot and the ship's bridge for navigation. Geo-referenced TIFF files obtained with multibeam sonar were entered into Hypack as background files to display target sites and features of interest to aid in ROV and ship navigation. Hypack can also export ROV position data in real time as a NMEA data string. Ship and ROV positions in addition to the ROV depth, heading and altimeter data, are logged and processed after each dive day and provided to the scientist in an Excel spreadsheet file. All data documentation (digital images, HD video, dive annotations, and specimen collections) are geo-referenced to ROV position by matching the time and date to the ROV navigation files.

ROV Survey Protocol

The primary objectives of each dive were to document benthic habitat, benthic macrobiota, 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. Video transects were used for analysis of fish populations. Video transects kept the ROV as close to the bottom as possible ($<1/2$ m) with a speed over ground of $\sim 1/4$ knot.
2. Digital still images perpendicular to the bottom were captured every 2 minutes throughout the dive during which the ROV hovered at a height of ~ 1.3 m off the bottom to provide similar field of view area for each image (~ 1.5 m²).
3. Still images captured from the photo transects were analyzed using CPCe[®] software to determine relative percent cover of benthic biota and habitat types. 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.
4. 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.
5. 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 habitat maps.

Fish Analyses

Each dive was divided into transects based on benthic habitat characterization (see Protocol for Benthic Habitat Characterization below) so that each transect consisted of only a single habitat type. All fish were identified for each transect down to the lowest taxonomic level and counted. Fish density (# individuals/1000 m²) was calculated as (# of individuals/ transect area) *1000. Transect length was calculated from the ROV tracking. Transect width was measured using the paired lasers.

Benthic Analyses

Percent cover of substrate type and benthic macrobiota 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 as hard corals (stony corals- Scleractinia) and other taxa

with solid calcareous skeletons (e.g., Styasteridae), as well as non-accreting taxa such as octocorals (Alcyonacea- “gorgonacea”) and black corals (Antipatharia) (Lumsden et al, 2007).

Protocol for Benthic Habitat Characterization

This protocol defines the habitat categories to characterize the benthic habitats for the shelf-edge reefs, the MPAs off southeastern U.S. within the jurisdiction of the South Atlantic Fishery Management Council. The data are results of the ROV video observations and multibeam sonar maps where available. The habitat categories are entered into the HBOI Microsoft Access at-Sea Database for each ROV dive site and used for Primer statistical 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. [*MPA Status*]: Dive site or transect is within a marine protected area (MPA) or is not protected (i.e., Outside of the MPA).
4. [*Depth*]: Depth range (m) of the dive.
5. [*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. Relief is defined 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.
6. [*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 the multibeam sonar maps collected 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.

7. [*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). The categories which are useful for characterizing deep coral habitat were modified to make them useful for the 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 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 North Florida MPA and Outside North Florida MPA). Then these data were square-root transformed to reduce the dominate influences of copious species to the similarity matrix. For the fish analysis, densities (#/ 1000 m²) of all species for each transect were analyzed. Density data were then averaged by location inside and outside each MPA and fourth-root transformed to reduce the effect of common species.

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.

RESULTS

Study Areas

The cruise was on the continental shelf edge of the South Atlantic Bight between the *Oculina* HAPC off Florida and the Northern South Carolina MPA. Five shelf-edge MPA sites and five adjacent non-protected sites were surveyed (Figs. 1-5).

Cruise Summary

A total of 22 ROV dives were attempted, 18 of which were completed. The remaining four dives were aborted early due to high winds and/or strong currents. Four dives were conducted within the OHAPC, including within the newly designated Northern and Western Extensions of the OHAPC. Due to the strong currents encountered within the OHAPC, the ship was unable to station keep, and the dives were generally unproductive as the ROV drifted to the north at speeds in excess of 1 kn, and was unable to stop or maneuver. Strong currents also precluded dives being conducted inside the OECA and on the barges which comprise the Charleston Deep Artificial Reef MPA as were planned. The 18 ROV dives resulted in a total bottom time of 29 hours, covering 23.8 km, and at depths ranging from 46 to 166 m (Tables 3 & 4, Figs. 1-5). A total of 2,020 *in situ* digital images were taken which included quantitative transect images, general habitat, and species documentation images. Nine shipboard CTD casts were made and a temperature/depth sensor recorded each ROV dive (Appendix 3). Complete species lists with percent cover of benthic macrobiota and densities of fish for each dive site are listed in Appendices 1 and 2, respectively. Each individual dive site is mapped and described in the SEADESC II report (Appendix 3).

South Atlantic MPA's
NOAA Ship Pisces Cruise 15-02
June 18-29, 2015
Oculina HAPC Sites
WGS_1984_UTM_Zone_17N

- ★ Mohawk ROV
- ★ CTD
- Bathymetry
- Oculina HAPC
- MPA
- Deep Coral HAPC

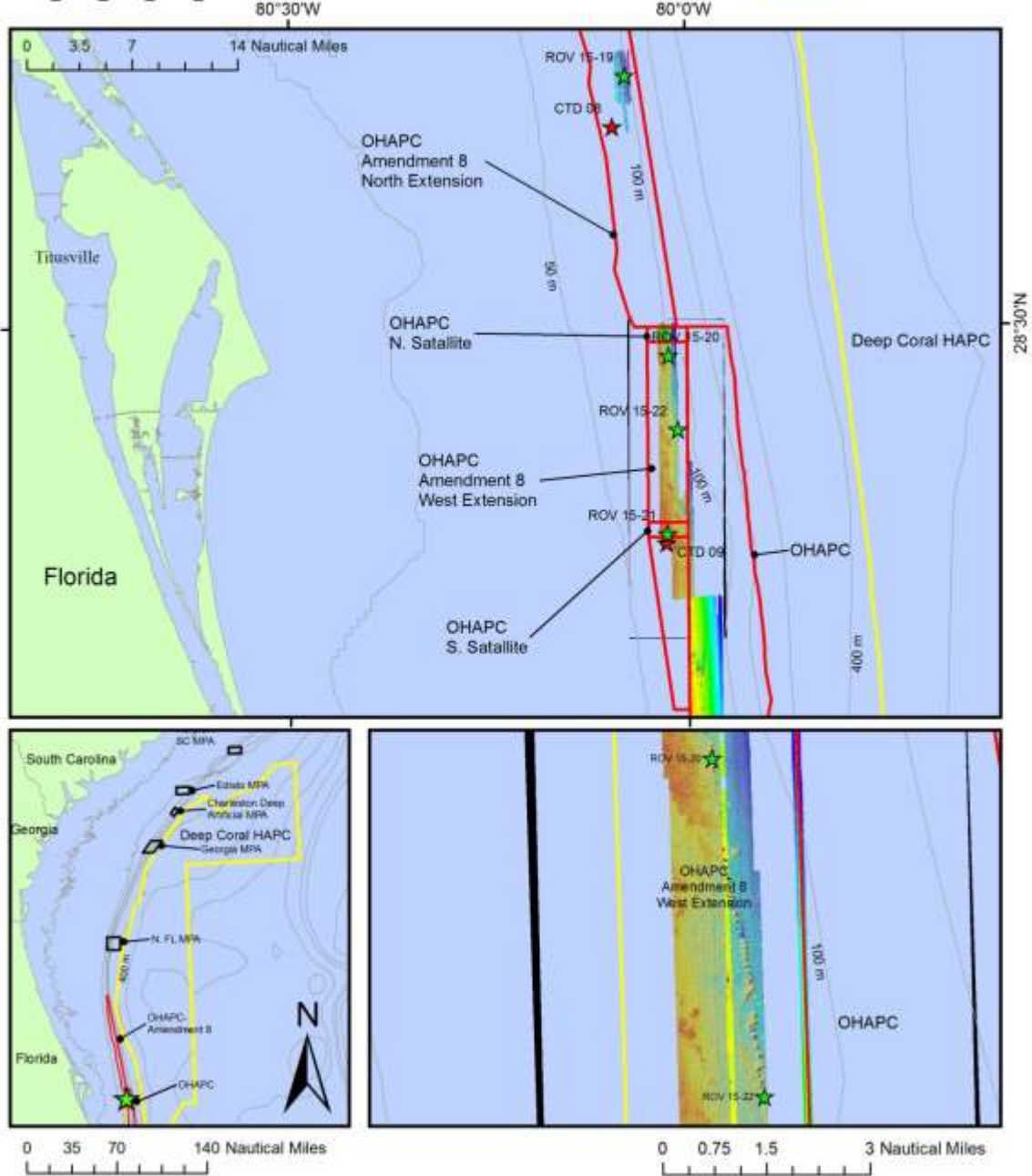


Figure 1. Locations of shelf-edge MPA sites and ROV dive sites in the *Oculina* HAPC and newly designated Northern and Western Extensions of the OHAPC during 2015 NOAA Ship *Pisces* cruise, June 18 to 29, 2015.

South Atlantic MPA's
NOAA Ship Pisces Cruise 15-02
June 18-29, 2015
 North Florida Sites
 WGS_1984_UTM_Zone_17N

- ★ Mohawk ROV
- ★ CTD
- Bathymetry
- Oculina HAPC
- MPA
- Deep Coral HAPC

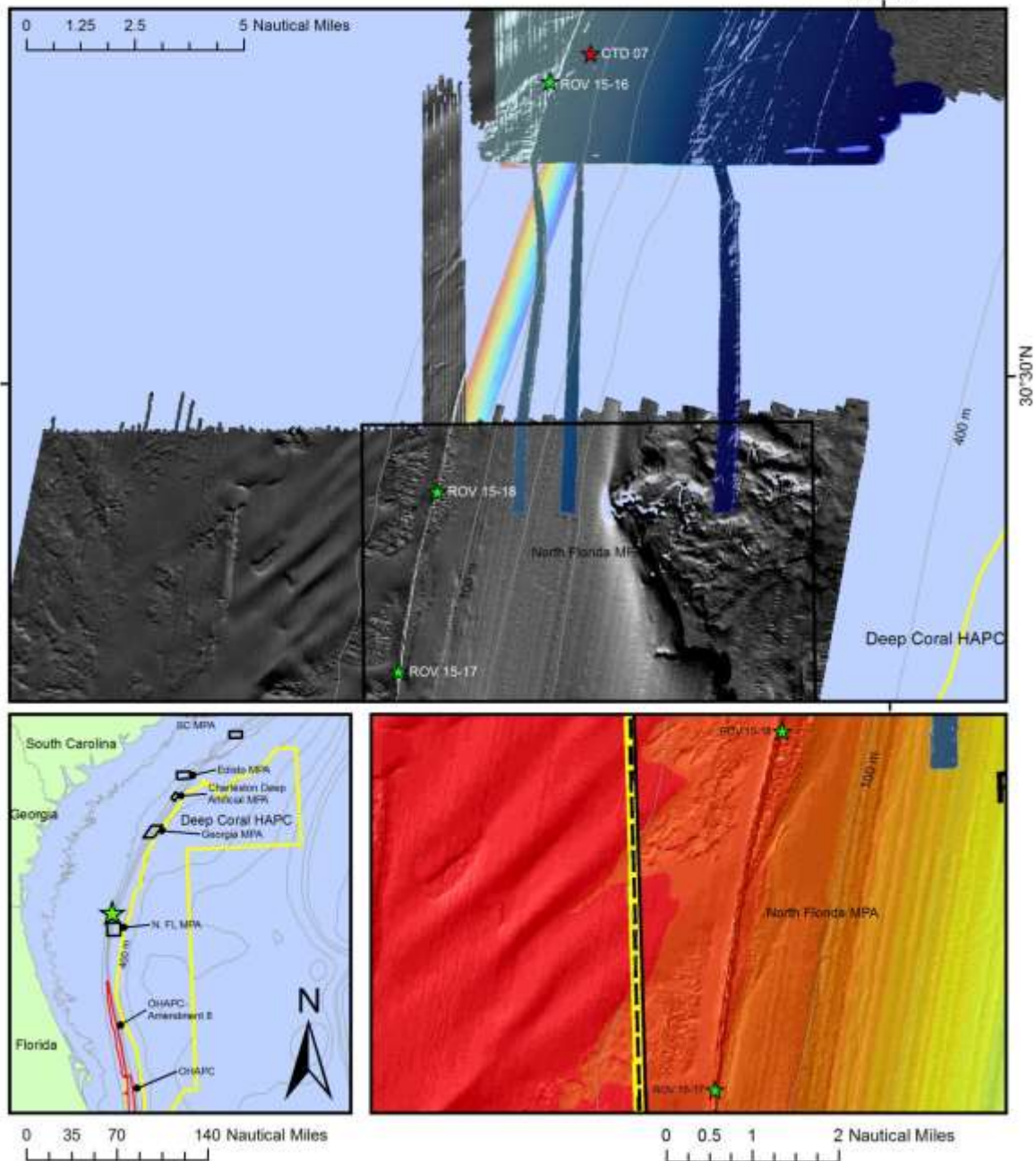


Figure 2. Locations of shelf-edge MPA sites and ROV dive sites off North Florida during 2015 NOAA Ship *Pisces* cruise, June 18 to 29, 2015.

South Atlantic MPA's
NOAA Ship Pisces Cruise 15-02
June 18-29, 2015
 Georgia Sites
 WGS_1984_UTM_Zone_17N

- ★ Mohawk ROV
- ★ CTD
- Bathymetry
- Oculina HAPC
- MPA
- Deep Coral HAPC

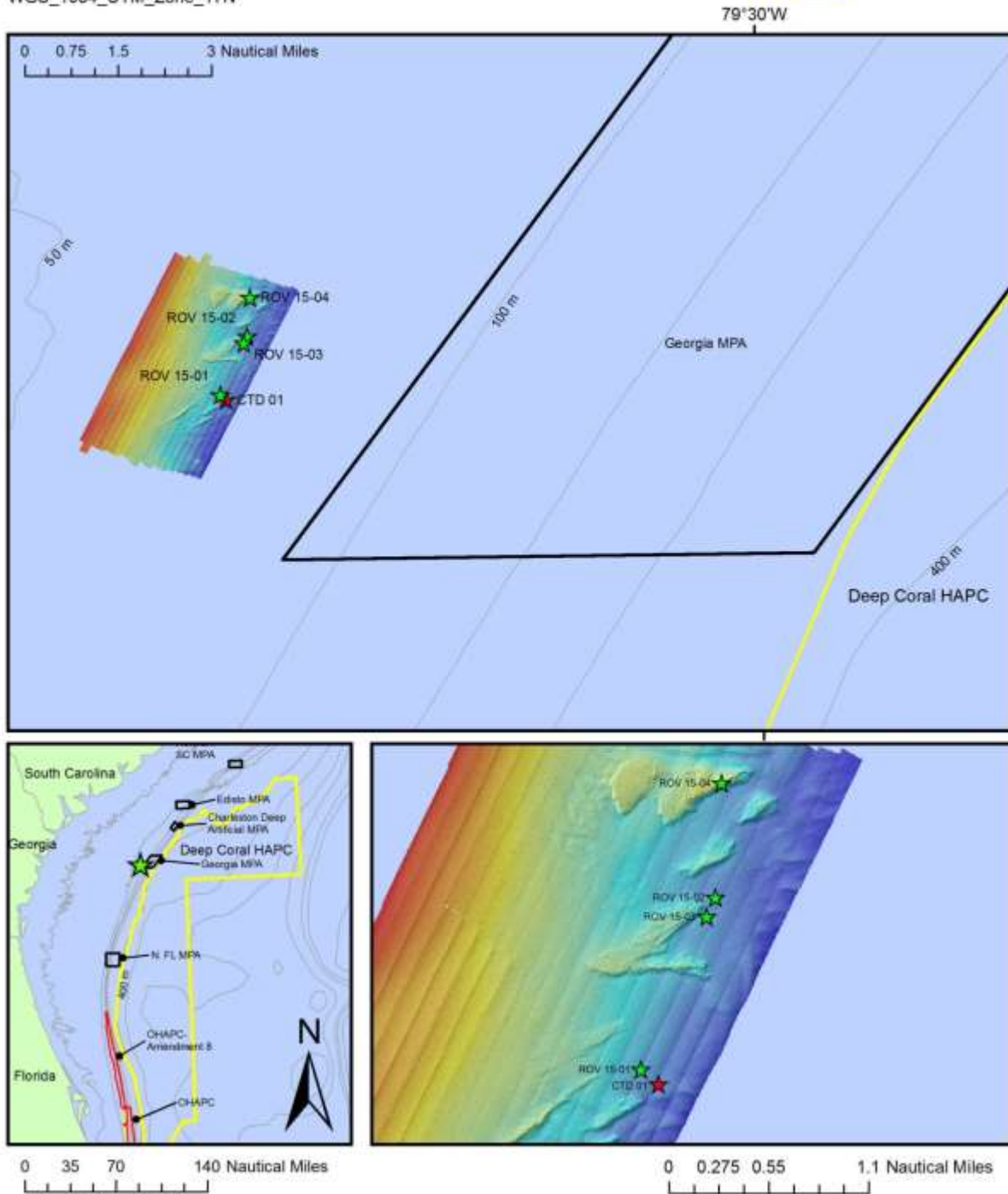


Figure 3. Locations of shelf-edge MPA sites and ROV dive sites off Georgia during 2015 NOAA Ship *Pisces* cruise, June 18 to 29, 2015.

South Atlantic MPA's
NOAA Ship Pisces Cruise 15-02
June 18-29, 2015
 South Carolina Sites
 WGS_1984_UTM_Zone_17N

- ★ Mohawk ROV
- ★ CTD
- Bathymetry
- Oculina HAPC
- MPA
- Deep Coral HAPC

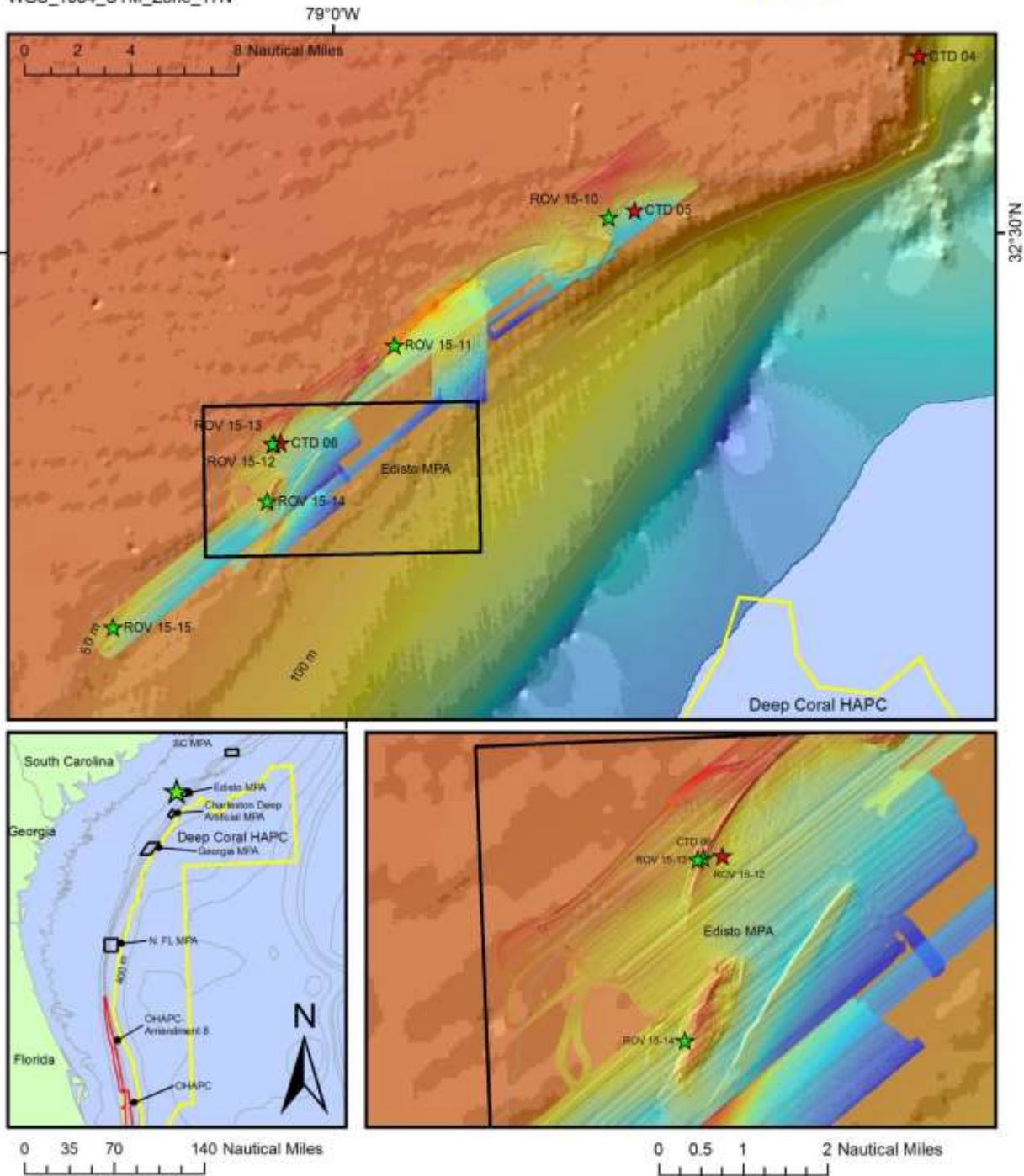


Figure 4. Locations of shelf-edge MPA sites and ROV dive sites off South Carolina during 2015 NOAA Ship *Pisces* cruise, June 18 to 29, 2015.

South Atlantic MPA's
NOAA Ship Pisces Cruise 15-02
June 18-29, 2015
 Northern South Carolina Sites
 WGS_1984_UTM_Zone_17N

- ★ Mohawk ROV
- ★ CTD
- Bathymetry
- Oculina HAPC
- MPA
- Deep Coral HAPC

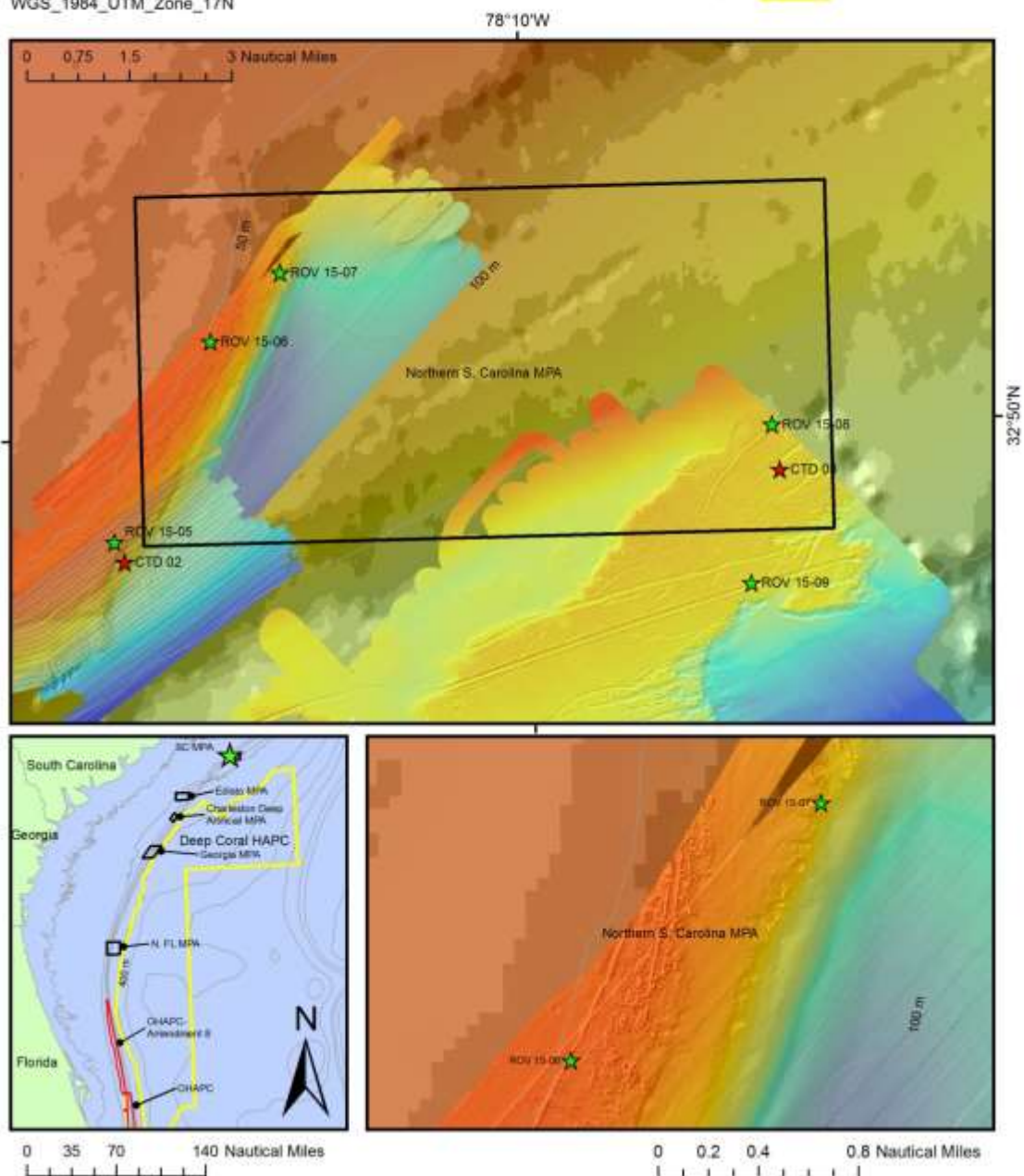


Figure 5. Locations of shelf-edge MPA sites and ROV dive sites off northern South Carolina during 2015 NOAA Ship *Pisces* cruise, June 18 to 29, 2015.

Table 3. ROV dive sites and CTD casts during NOAA Ship *Pisces* cruise, June 18 to 29, 2015. (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)
19-VI-15-1	CTD 01	31.61017	-79.6675				
19-VI-15-2	ROV 15-01	31.61175	-79.669317	31.60573	-79.674	70-73	1.41
19-VI-15-3	ROV 15-02	31.62718	-79.660583	31.62552	-79.660383	75-75	0.26
19-VI-15-4	ROV 15-03	31.62543	-79.661714	31.6217	-79.66885	70-72	1.07
19-VI-15-5	ROV 15-04	31.63645	-79.6607	31.63395	-79.66515	66-68	0.96
20-VI-15-1	CTD 02	32.80333	-78.284667				
20-VI-15-2	ROV 15-05	32.81043	-78.292317	32.80847	-78.283283	64-71	2.17
20-VI-15-3	ROV 15-06	32.85678	-78.258233	32.85352	-78.260833	49-50	1
20-VI-15-4	ROV 15-07	32.87323	-78.237483	32.87057	-78.2393	63-67	0.37
23-VI-15-1	CTD 03	32.82182	-78.094167				
23-VI-15-2	ROV 15-08	32.83285	-78.096033	32.82643	-78.10385	158-162	1.4
23-VI-15-3	ROV 15-09	32.79367	-78.103283	32.79112	-78.116817	162-166	1.38
23-VI-15-4	CTD 04	32.61198	-78.5672				
24-VI-15-1	CTD 05	32.51967	-78.779817				
24-VI-15-2	ROV 15-10	32.51512	-78.79885	32.51967	-78.793517	48-52	0.75
24-VI-15-3	ROV 15-11	32.43792	-78.958917	32.442	-78.953433	50-54	0.79
24-VI-15-4	ROV 15-12	32.51967	-78.779817	32.37679	-79.046054	53-54	0.46
25-VI-15-2	ROV 15-13	32.37755	-79.049967	32.38512	-79.04355	46-51	1.35
25-VI-15-1	CTD 06	32.37812	-79.044433			-	
25-VI-15-3	ROV 15-14	32.34177	-79.05485	32.3524	-79.048183	48-55	1.45
25-VI-15-4	ROV 15-15	32.26433	-79.170317	32.26845	-79.01765	51-55	0.57
26-VI-15-1	CTD 07	30.6255	-80.1305				
26-VI-15-2	ROV 15-16	30.61493	-80.148567	30.61423	-80.146533	54-55	0.31
26-VI-15-3	ROV 15-17	30.38827	-80.217567	30.3919	-80.21655	55-65	1.25
26-VI-15-4	ROV 15-18	30.45753	-80.200067	30.46823	-80.1974	53-61	1.32
27-VI-15-1	CTD 08	28.72282	-80.092				
27-VI-15-2	ROV 15-19	28.77927	-80.07585	28.793	-80.077183	68-88	1.79
27-VI-15-3	ROV 15-20	28.46805	-80.023117	28.48405	-80.027517	69-85	1.99
28-VI-15-1	CTD 09	28.26	-80.027417				
28-VI-15-2	ROV 15-21	28.27018	-80.026233	28.28427	-80.026533	71-75	1.61
28-VI-15-3	ROV 15-22	28.38608	-80.01195	28.38808	-80.001155	69-76	0.13

Table 4. Summary of ROV dive sites by state and MPA.

Site	# of Dives	Depth Range (m)
Florida (Total Dives)	7	53-88
Inside <i>Oculina</i> HAPC	4	68-88
Inside North Florida MPA	2	53-65
Outside North Florida MPA	1	54-55
Georgia (Total Dives)	4	66-75
Outside Georgia MPA	4	66-75
South Carolina (Total Dives)	11	46-166
Inside Edisto MPA	3	46-55
Outside Edisto MPA	3	48-55
Inside Northern S. Carolina MPA	2	49-67
Outside Northern S. Carolina MPA	1	64-71
Inside Northern S. Carolina MPA (iceberg scar site)	1	158-162
Outside Northern S. Carolina MPA (iceberg scar site)	1	162-166
Total	22	46-166

CTD Operations

A total of 9 shipboard CTD casts were conducted and each ROV dive recorded temperature/depth profiles (Appendix 3). Fairly cold-water upwelling was encountered on all of the dives in the *Oculina* area where bottom temperatures were 11-12°C.

SEADESC II Report: Characterization of Benthic Habitat and Benthic Macrobiota

A 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, CTD plots, 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 macrobiota and substrate types, and 2) densities of fish populations.

Benthic Macrobiota and Habitat

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 also presented 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 actually may include different orders or classes.

A total of 75 taxa of benthic biota were identified from the quantitative photo transects and were used for CPCe percent cover analyses. These included 26 taxa of Cnidaria which included the following corals: 3- Scleractinia hard corals (*Oculina varicosa*, Scleractinia unidentified colonial, and Scleractinia unidentified solitary); 10- Alcyonacea gorgonians [Octocorallia] (*Carijoa* sp., *Diodogorgia* sp., *Ellisella* sp., Ellisellidae, gorgonian unid, *Iciligorgia schrammi*, *Leptogorgia* sp., *Nicella* sp., *Swiftia exserta*, *Titanideum frauenfeldii*); and 6- Antipathidae (unidentified Antipatharia, *Antipathes atlantica*, *Antipathes furcata*, *Elatopathes abietina*, *Stichopathes lutkeni*, *Tanacetipathes tanacetum*). Alcyonian soft corals included Alcyonacea-Alcyoniina and *Nidalia occidentalis*. Non-coral Cnidaria included: Actiniaria, Cerianthidae, Corallimorpharia, Hydroidolina and Zoanthidae.

Porifera were most species rich with 23 taxa. There are many more species than that as most could only be identified to genus or higher level. The dominant sponges included numerous Demospongiae, including: *Agelas* sp., *Aiolochoira crassa*, *Aplysina* sp., *Callyspongia* sp., *Callyspongia vaginalis*, *Clathria* sp., *Corallistes* sp., *Erylus* sp., *Ircinia campana*, *Ircinia* sp., *Ircinia strobilina*, *Leiodermatium* sp., Lithistida, *Neofibularia* sp., Poecilosclerida, Spirastrellidae, *Spongisorites* sp., *Xestospongia* sp. and numerous unidentified species of Demospongiae (e.g., Demospongiae, Demospongiae- MPA03, Demospongiae- ze tan starlet). Only one species of Hexactinellida (glass sponge) was identified, *Farrea* sp. Other fauna included Annelida, Mollusca, Arthropoda, Bryozoa, Echinodermata, and Ascidiacea. Algae were dominant at many of the sites and included Phaeophyta (dominated by *Dictyota* spp.), Cyanobacteria, Chlorophyta, and Rhodophyta (primarily crustose coralline algae); but these were not identified to species level.

Table 6. Fish densities (#/1000 m²) from ROV video transects, and percent cover of benthic macrobiota and substrate from CPCe Point Count analysis of photographic transects listed by state and MPA status (i.e., inside MPA or no protection) during NOAA Ship *Pisces* cruise, June 18 to 29, 2015. Coral= Scleractinia hard coral, Octo= Octocorallia (gorgonacea), Anti= Antipatharia (black coral), Porifera (sponges).

State/Site	Count and ROV No.	Bare Hard bottom substrate	Fish- # spp.; Density	% Cover Biota	% Cover Coral	% Cover Octo.	% Cover Anti.	% Cover Porifera	% Cover Algae
Florida	5 (2 Fail)	42.98%	70; 209.53	10.31%	0.03%	0.12%	0.18%	1.41%	3.34%
North Florida MPA	# 17 & 18	29.64%	59; 620.59	16.16%	0.00%	0.16%	0.43%	2.91%	4.91%
Oculina HAPC	# 19-21	51.26%	36; 28.76	6.68%	0.05%	0.10%	0.02%	0.49%	2.37%

Georgia	3 (1 Fail)	13.80%	34; 86.39	3.46%	0.02%	0.91%	0.20%	0.52%	0.17%
Outside Georgia MPA	# 01, 03 & 04	13.80%	34; 86.39	3.46%	0.02%	0.91%	0.20%	0.52%	0.17%
South Carolina	10 (1 Fail)	32.70%	98; 1170.6	35.67%	0.06%	1.07%	0.43%	3.21%	26.97%
Edisto MPA	# 13 & 14	37.95%	68; 1154.16	50.90%	0.00%	1.62%	0.81%	5.26%	39.90%
Outside Edisto MPA	# 10-11 & 15	36.14%	68; 1767.71	46.38%	0.19%	0.96%	1.04%	5.30%	32.00%
Northern S. Carolina MPA	# 06 & 07	10.86%	52; 1980.79	52.66%	0.03%	0.53%	0.03%	0.30%	50.15%
Outside Northern S. Carolina MPA	# 05	18.45%	30; 154.73	15.88%	0.00%	2.81%	0.13%	0.88%	9.19%
Northern S. Carolina MPA (iceberg scar site)	# 08	36.49%	24; 276.15	6.47%	0.00%	1.03%	0.00%	1.78%	0.05%
Outside Northern S. Carolina MPA (iceberg scar site)	# 09	66.08%	20; 746.56	8.20%	0.00%	0.00%	0.00%	4.55%	0.00%
Grand Total	18 (4 Fail)	32.38%	113; 638.38	24.36%	0.05%	0.81%	0.33%	2.35%	16.93%

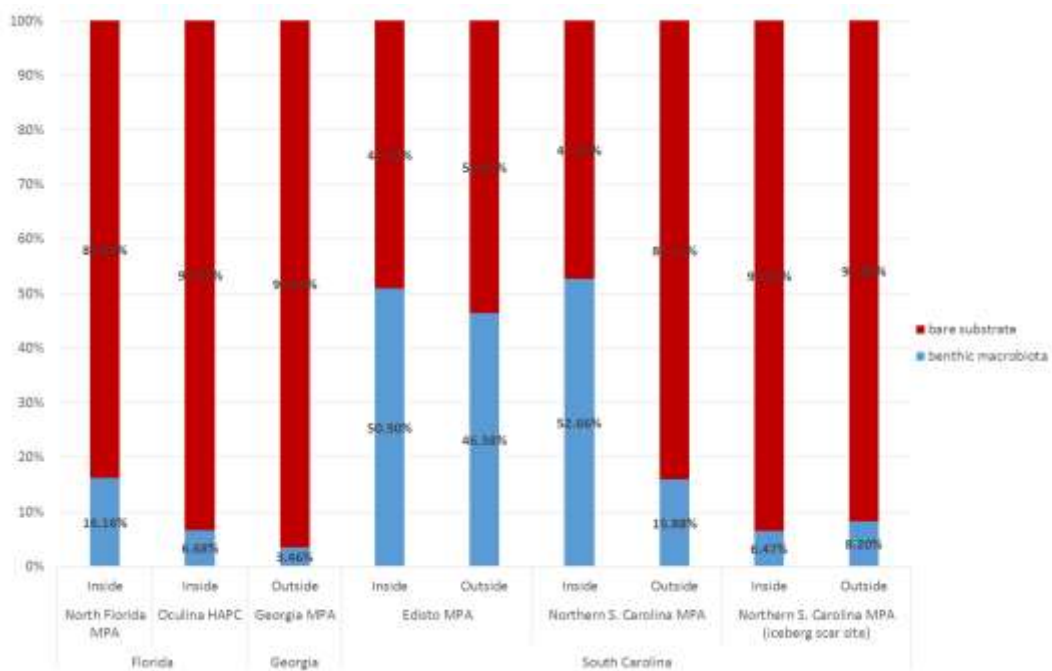


Figure 7. Percent cover of benthic macrobiota (blue) vs bare substrate (red) by MPA status and region from the 2015 NOAA Ship *Pisces* cruise.

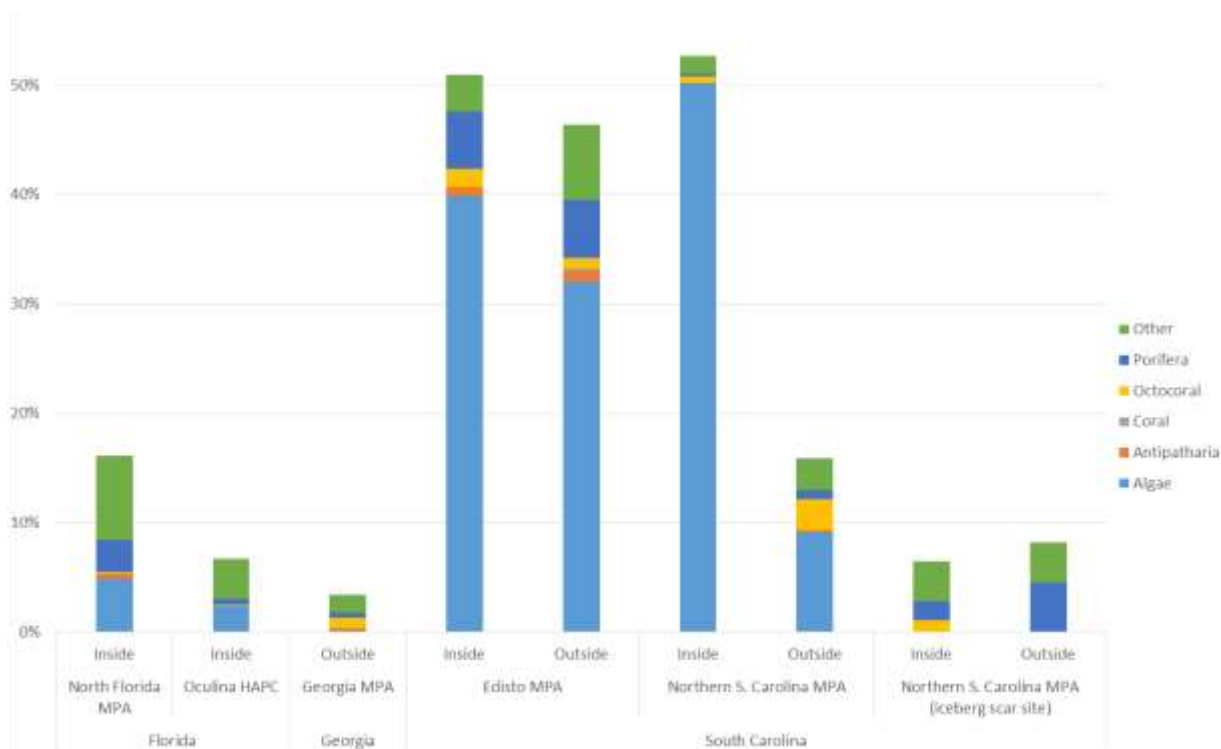


Figure 8. Percent cover of major benthic macrobiota taxa by MPA status and region from the 2015 NOAA Ship *Pisces* cruise.

CPCe Point Count analysis calculated the percent cover of bare substrate type and benthic macrobiota (Table 6, Fig. 7, Appendix 1). The range of biota cover ranged from 3.46% (Outside Georgia MPA) to 52.66% at the Northern S. Carolina MPA, and overall 24.36% for all sites. In general, the South Carolina sites, Edisto (inside and outside the MPA) and the Northern S.C. MPA had the highest cover of biota. There was little difference in cover inside vs outside of the Edisto sites and the Iceberg Scar site of the Northern S.C. MPA. However, there was considerable difference inside vs outside of the shallower Northern S.C. sites. Overall, algae were the dominant cover averaging 16.93% for all sites with a maximum cover of 50.15% at the Northern S. Carolina MPA site (Fig. 8). South Carolina sites had the greatest algal cover (26.97%) overall, but the deeper (158-166 m) Northern S. Carolina Iceberg Scar sites had virtually no algae. Porifera averaged 2.35% cover for all sites, and had maximum cover at the Edisto sites (5.28%) and the least cover at the Georgia sites (0.52%). Off hand, there is little obvious reason for the dense algae at the South Carolina sites (dominated by *Dictyota* spp.). Removing algae from the equation, the range of biota are much more similar among the sites. The low cover of biota was apparent at all three dives (15-01, -03, 04; Appendix 3) of the Georgia sites. Dives 15-01 and -03 were along ledges in the multibeam, and were described as hard bottom, pavement with low relief ledges (10-30 cm). But the biota was sparse and of low diversity. Dive 15-04 was on a ledge slightly north of the other two dives but had slightly more relief, more biota, and more fish including gag and scamp grouper.

Coral Cover

Based on CPCe Point Count, the percent cover of hard corals ranged from 0 to 0.41% and averaged overall at 0.05% for all sites (Appendix 1, Table 6, Fig. 8). Edisto sites had the greatest coral cover (average 0.12 %). Dive 15-10 (Outside Edisto MPA) had the greatest coral cover (Unidentified solitary scleractinian, 0.41%). *Oculina varicosa* had the highest density at the Outside Edisto MPA site (Dive 15-01; 0.07%) and inside the newly designated Northern Extension of the OHAPC (Dive 15-19; 0.05%).

Octocorals (gorgonians) consisted of 10 taxa; however, there are many more species than that as most could only be identified to genus or family level without a specimen in hand. Percent cover of gorgonians averaged 0.81% for all sites and was greatest at Dive 15-05 (2.81%; Outside Northern S.C. MPA), followed by 1.86% at Edisto MPA (Dive 15-14). Overall, *Diodogorgia* sp. was the most common species (0.31%), followed by unidentified gorgonians (0.16%), *Ellisella* sp. (0.12%), and *Nicella* sp. (0.10%). Antipatharian black corals were present at most sites, averaging 0.33% overall cover, with a maximum of 1.90% at the Outside Edisto MPA site (Dive 15-11). The Edisto sites had the greatest cover (0.95%).

Oculina HAPC

These sites are the only places on earth where the high-relief *Oculina* coral mounds have formed. Unfortunately bottom trawling has devastated most of the living coral habitat, but what remain are the coral rubble, rock outcrops and ledges at the base of the mounds, and scattered live colonies of *Oculina*. The mounds themselves are up to 15-20 m tall, and made entirely of coral that has built up over centuries. There is no reason that the coral should not regrow, if there remains a complete moratorium and enforcement on any bottom tending gear which could crush the coral. Ongoing poaching within the OECA also prevents the buildup of spawning aggregations of grouper which used to dominate these reefs.

Four dives were conducted within the OHAPC (15-19, -20, -21, -22), including within the newly designated Northern and Western Extensions of the OHAPC. These were added to the OHAPC boundaries in August 2015 with the implementation of Amendment 8 of the Fishery Management Act. Due to relatively strong currents (1-2 kn) encountered, the ship was unable to station keep over the ROV, and the dives were generally unproductive as the ROV drifted to the north at speeds in excess of 1 kn, and was unable to stop or maneuver for good quantitative photos or video, or to explore the mounds. Often the ROV was too far off the bottom for photographs. Also we encountered a strong cold-water upwelling event which is common on the *Oculina* reefs. This causes a dense nepheloid layer near the bottom which reduces visibility, thus obstructing good photos and videos.

Dive 15-19 was in the Northern Extension and transected 12 *Oculina* coral mounds (68-88 m depth). This series of 15-20 m tall coral mounds are nearly 100% coral rubble, with scattered healthy, live white colonies of *Oculina varicosa* (5-20 cm diameter), Antipatharia black corals (5-6 species), gorgonian octocorals (*Diodogorgia* sp.), soft corals (*Nidalia* sp.), cerianthid burrowing anemones, and hydroids. Between the mounds are exposed rock ledges which held most of the fish populations but we were unable to explore these areas due to the strong drift north. Fish observed included 27 species: Snowy grouper, apricot bass, bank butterflyfish, bank

seabass, batfish, boarfish, eel, greenband wrasse, moray eel, orangeback bass, red hogfish, reef butterflyfish, roughtongue bass, saddle bass, scorpionfish, sharpnose puffer, short bigeye, squirrelfish, tattler, toadfish, twospot cardinalfish, wrasse bass, and yellowtail reef fish. We also spotted 10 lionfish; this is the first record ever of lionfish on the *Oculina* banks. Although they are common to the north on the various other shelf-edge MPA sites, we had not seen them previously in the *Oculina* coral habitat.

Dive 15-20 was in the newly designated Western Extension of the HAPC. Nine coral mounds were transected (peaks 69-72 m; bases 80-82 m). This area is between the two Satellites regions of the OHAPC that was established in 2000, but had remained open to bottom trawling all this time since the 1970s. The surface current was 1.5 kn (not unusual for these sites), but the ship was unable to station keep, and the ROV drifted to fast and too high off the bottom for good video and photos. *Oculina* coral colonies (15-25 cm, live white) were observed on the coral rubble mounds. The valleys between the mounds consist of rock pavement and low ledges. Only 15 species of fish were counted compared to 27 on the Northern Extension which has had less fishing and trawling pressure over the years. However, small black sea bass were fairly common, which are making a comeback inside of the OHAPC. They were the dominant large sea bass species on the *Oculina* banks in the 1970s but had been virtually wiped out by the early 1990s.

Dive 15-21 was inside of the Satellite OHAPC. This dive also encountered a strong thermocline (28°C at surface, 12°C on bottom) and low visibility on the bottom. The entire transect was made at a speed of 1 kn and the ship was unable to maneuver either east or west or slow down. The speed was too fast to stop and view ledges of hard bottom and to identify fauna on rocks. The multibeam sonar showed extensive areas of hard bottom, flat topped rock mounds, and a series of moderate relief mounds up to 100 m in diameter. Several standing dead colonies of *Oculina varicosa* were observed, also a pile of trawl line and several long lines. It is clear that the enforcement of bottom tending gear is not well enforced. Twenty-four species of fish were counted including black sea bass, porgy, gag grouper, and vermillion snapper. A total of 16 lionfish were also counted, which is the first documentation of lionfish within the OHAPC.

Dive 15-22 was in newly designated Western Extension of the OHAPC. The multibeam sonar shows a series of high relief (15-20 m tall) coral mounds in this region. The entire dive was made at 1 kn and the ship was unable to slow down. The speed over ground was too fast to stop and view ledges of hard bottom and to identify fauna. Most of dive was at heights of 5-10 m altitude. No photo transects were conducted as the ROV was too high off bottom. The dive was aborted early.

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 macrobiota densities (Fig. 9). In general, there were 2 significant groups. Northern South Carolina Iceberg Scar sites were separated from all the other sites due to the much greater depths (158-166 m); these had much different fauna compared to the other shelf-edge reef sites that generally averaged 46-88 m depths. The remaining sites clustered together showing little difference

between the MPA status (inside vs outside) although the Florida sites (North Florida MPA and the *Oculina* HAPC) clustered separately from the Georgia and South Carolina sites. There is a larger break between inside Northern S.C. MPA and outside, showing them only having 20% similarity. These surveys appear to provide good baseline data for the MPA sites which only have been of protected status for less than a decade.

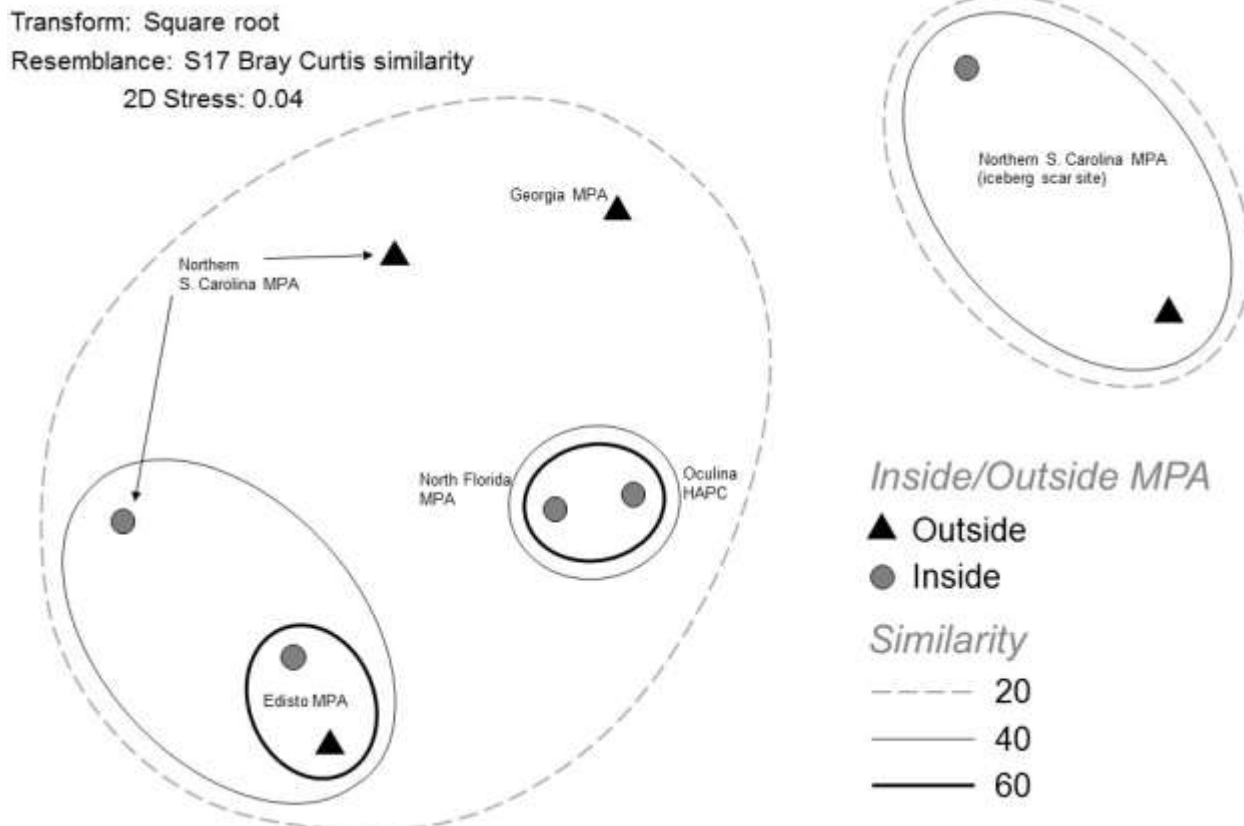


Figure 9. Multi-dimensional scaling (MDS) plot of ROV dives by protection status (i.e., MPA sites, non-MPA sites) based on Bray-Curtis similarity matrix calculated from square-root transformation of benthic macrobiota percent cover for the 2015 NOAA Ship *Pisces* cruise. Assemblage similarity at 20-60% are indicated.

Analysis of Fish Video Surveys

Appendix 2 lists all fish species identified from the quantitative video transects at each dive site and their densities (# individuals/ 1000 m²). A total of 113 species were observed including four target species: blueline tilefish, speckled hind, yellowedge grouper, and snowy grouper. Dives 2, 12, 16, and 22 were excluded from all analyses. These dives were aborted early due to high currents and/or wind.

Fish assemblages 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 10; PRIMER 6.0). Six statistically different groups resulted from the SIMPROF test ($p < 0.05$). Letters in the figure indicate statistically significant groups. Depth played a major role in the composition of fish species as all the deep dives conducted both inside

and outside the Northern South Carolina MPA (Iceberg Scar sites) formed a statistically significant group and, therefore, had a distinct assemblage of fish compared to the shallower dives. Fish assemblages inside and outside the OHAPC also formed a distinctive group with a different suite of species. This area had higher densities of bank sea bass, tattler, and black sea bass compared to the other regions according to SIMPER analyses. The sites indicated as Outside the OHAPC were within the proposed Northern and Western Extensions; however, these sites are now within the OHAPC with the implementation of Amendment 8 of the Fishery Management Plan (August 2015). For the remaining MPAs, fish assemblages were generally more similar by level of protection (inside vs. outside) than they were for geographic region. For instance, fish assemblages outside the Northern South Carolina MPA were more similar to those outside the Georgia MPA than they were to those inside the Northern South Carolina MPA. The only exception to this was Edisto where fish assemblages were very similar inside and outside the MPA.

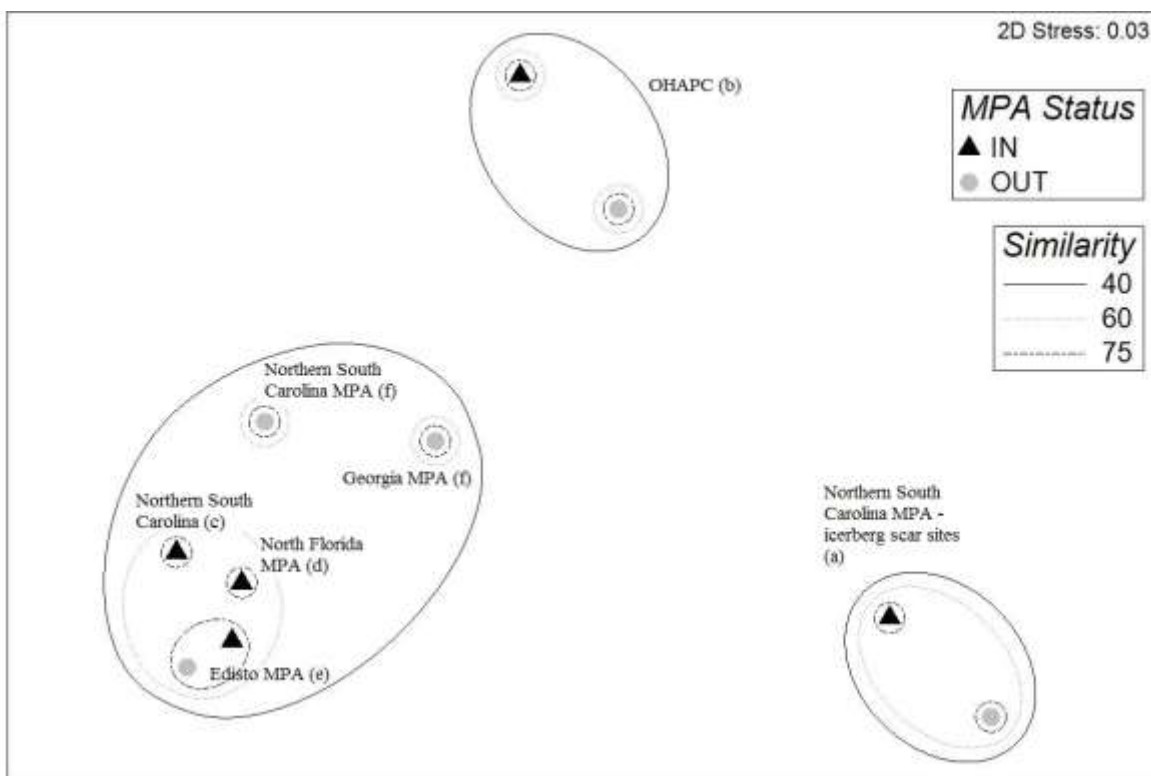


Figure 10. Multi-dimensional scaling (MDS) plot of ROV dive sites within and outside of the protected management areas (MPAs & OHAPC) based on Bray-Curtis similarity matrix calculated using fourth-root transformed data of fish species. Assemblage similarity at 40, 60, and 75% are indicated. Statistically different groups (SIMPROF, $p < 0.05$) are indicated by letters. Note that the sites indicated as outside the OHAPC are now part of the OHAPC.

Snapper-Grouper Complex

Densities of fish species in the snapper-grouper complex were compared inside and outside for each of the MPAs (Table 7). No dives were made inside the Georgia MPA or outside the North Florida MPA, so comparisons could not be made for those two areas. Even though Georgia is not displayed in Table 7, several red snapper were observed on the dives conducted outside the MPA. Most species had higher densities inside the Northern South Carolina MPA compared to outside including: speckled hind, scamp, red porgy, and vermilion snapper. Most species also had higher densities inside the Iceberg Scar sites (i.e., deep sites) of the Northern South Carolina MPA including: blueline tilefish, snowy grouper, and red porgy. For the Edisto MPA, densities were quite similar, but most species were more abundant outside compared to inside. A couple of large schools of gray snapper, however, were observed inside the MPA. For the OHAPC dives, species were mostly observed either inside or outside the protected area, but usually not both (noting that these sites are all now inside the OHAPC as of August 2015). Scamp were observed inside the OHAPC, but not outside. Snowy grouper were observed outside, but not inside. Black sea bass were observed both inside and outside but were more abundant outside. At this point, it is unknown whether these density differences are statistically significant. In this report the data is only based on differences of raw densities. Once the research cruises are completed for this grant in two years, results from all the cruises will be combined to conduct a comprehensive analysis to test for MPA effects over time on species' densities.

Several observations were made of juvenile fish. These include juvenile yellowmouth grouper outside the Edisto MPA and juvenile blackfin snapper inside the North Florida MPA. Reproductive behavior was also observed on some dives. Greyhead scamp (one of their color phases indicating spawning behavior) were observed outside the Georgia MPA, outside the Edisto MPA, and inside the North Florida MPA. Also, a yellowmouth grouper was observed displaying courtship behavior outside the Edisto MPA.

Table 7. Densities (# individuals/1000 m²) for species of the snapper-grouper complex inside and outside each MPA. MPA names are abbreviated (SC= Northern South Carolina MPA, ED= Edisto MPA, GA= Georgia MPA, FL= North Florida MPA, OHAPC= Oculina Habitat Area of Particular Concern). YES and NO indicate whether a species had a higher density inside the MPA or not. Species in bold are the target species.

Scientific Name	Inside SC	Outside SC	Higher Inside?	Inside SC Deep	Outside SC Deep	Higher Inside?	Inside ED	Outside ED	Higher Inside?	Inside OHAPC	Outside OHAPC	Higher Inside?
<i>Balistes caprisus</i>	0.46		YES				0.36	0.2	YES			
<i>Balistes</i> sp.							0.43		YES			
<i>Balistes vetula</i>	0.23		YES				0.07	0.1	NO			
<i>Calamus</i> sp.	8.19	1.48	YES				1.8	7.18	NO	0.12		YES
<i>Caranx bartholomaei</i>							0.79	1.23	NO			
<i>Caulolatilus microps</i>				1.56	0.49	YES						

<i>Centropristis striata</i>									1.16	2.45	NO
<i>Cephalopholis cruentata</i>	1.63		YES				1.01	3.9	NO		
<i>Epinephelus adscensionis</i>	0.46		YES								
<i>Epinephelus guttatus</i>	0.23		YES								
<i>Haemulon aurolineatum</i>	1312		YES				564.5	691.1	NO		
<i>Haemulon plumieri</i>	0.93		YES				0.07		YES		
<i>Haemulon</i> sp.							57.79	336.31	NO		
<i>Haemulon striatum</i>	351		YES				134	161.73	NO		
<i>Hyporthodus flavolimbatus</i>				0.24	NO						
<i>Hyporthodus niveatus</i>				11.3	1.72	YES				0.07	NO
<i>Lachnolaimus maximus</i>	0.7	2.96	NO				0.36	0.61	NO		
<i>Lutjanus analis</i>											
<i>Lutjanus buccanella</i>											
<i>Lutjanus campechanus</i>								0.1	NO		
<i>Lutjanus griseus</i>							8.01		YES		
<i>Lutjanus</i> sp.							0.28		YES	0.12	YES
<i>Mycteroperca interstitialis</i>	0.23		YES				0.07	0.61	NO		
<i>Mycteroperca microlepis</i>		0.37	NO				0.5	0.71	NO	0.51	YES
<i>Mycteroperca phenax</i>	2.81	0.74	YES	0.58		YES	5.63	6.88	NO		
<i>Mycteroperca</i> sp.											
<i>Pagrus pagrus</i>	5.38		YES	38.3	9.58	YES	0.36	11.19	NO		
<i>Rhomboplites aurorubens</i>	7.26		YES	0.39		YES	110.9	82.15	YES	0.12	YES
<i>Seriola dumerili</i>		0.37	NO	0.39		YES	0.72	0.41	YES	0.42	NO
<i>Seriola fasciata</i>								1.54	NO		
<i>Seriola rivoliana</i>	1.4	0.74	YES				1.51	6.88	NO		
<i>Seriola</i> sp.	0.46	0.74	NO	0.97	2.7	NO	1.8	2.46	NO		
Serranidae							0.07	0.3	NO		

Lionfish Populations

Lionfish continue to have a strong presence in and around the south Atlantic MPAs. Densities inside and outside each MPA are presented in Figure 11. In years past, lionfish densities have been highest off the two South Carolina MPAs. This year is no exception with the highest densities in and around the Edisto MPA. A one-way ANOVA demonstrated significantly different lionfish densities among MPAs ($P=0.00004$), and when they were compared for each MPA using ANOSIM, it was revealed that lionfish were significantly more abundant inside the Northern South Carolina compared to outside. Densities were lowest in and around the OHAPC; however, these were the first lionfish sightings in this region. A total of 16 lionfish were counted in the Satellite OHAPC (Dive 15-21), which is the first documentation of lionfish within the OHAPC. A one-way ANOVA was run to compare lionfish densities by level of protection (inside vs. outside with all MPAs combined) which was not significant ($P=0.47$, Fig. 12).

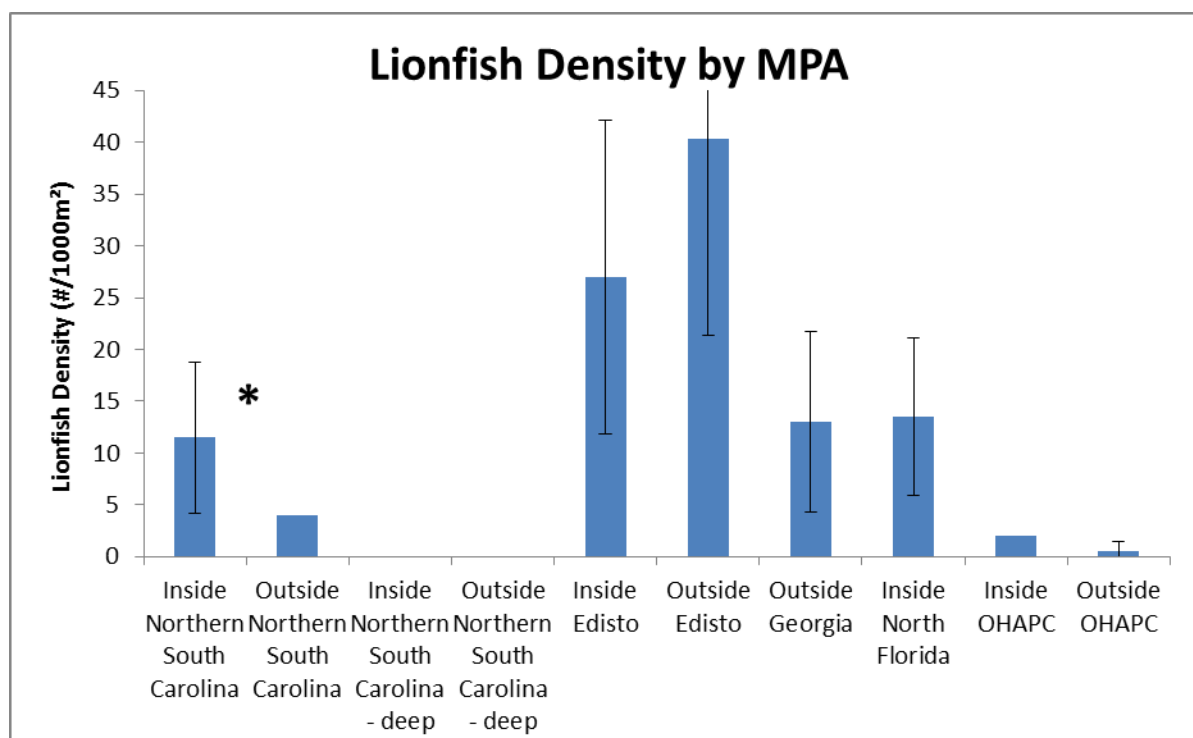


Figure 11. Density of lionfish (# individuals/1000 m²) from quantitative ROV video transects during 2015 NOAA Ship *Pisces* cruise at sites inside and outside each shelf-edge MPA.

“*” indicates a significant difference ($P < 0.05$).

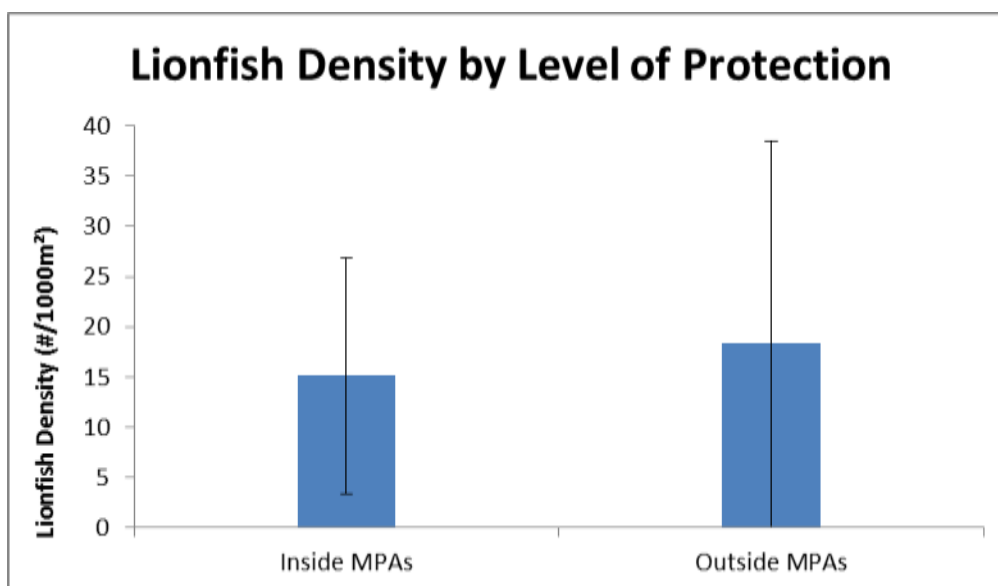


Figure 12. Lionfish densities (# individuals/1000 m²) based on quantitative ROV video transects summarized by all dives within and outside the shelf-edge MPA sites during 2015 NOAA Ship *Pisces* cruise.

FUTURE WORK AND CONCLUSIONS

This cruise and research has resulted in a rich set of new data discovering and characterizing deepwater MPA and OHAPC sites and fish populations off the southeastern United States within the jurisdiction of the South Atlantic Fishery Management Council. 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.

LITERATURE CITED

- Clarke K, Gorley R. 2006. PRIMER v6: User manual/tutorial. Plymouth UK: PRIMER-E. p.192.
- Clarke K, Warwick R. 2001. Changes in marine communities: an approach to statistical analysis and interpretation (2nd ed). Plymouth, UK: PRIMER-E.
- Kohler KE & Gill SM. 2006. Coral Point Count with Excel extensions (CPCe): A Visual Basic program for the determination of coral and substrate coverage using random point count methodology. *Computers and Geosciences* 32 (9): 1259-1269.

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.

Partyka ML, Ross SW, Quattrini AM, Sedberry GR, Birdsong TW, Potter J, Gottfried S. 2007. Southeastern United States Deep-Sea Corals (SEADESC) Initiative: A Collaboration to Characterize Areas of Habitat Forming Deep-Sea Corals. Silver Spring, MD. p. 176.

SAFMC. 1998. Comprehensive amendment addressing sustainable fishery act definitions and other required provision in fishery management plans of the South Atlantic region. In: NOAA-SAFMC, editor. Amendment 5. p. 311.

Vinick C., A. Riccobono, C.G. Messing, B.K. Walker, J.K. Reed, and S. Farrington. 2012. Siting study for a hydrokinetic energy project located offshore southeastern Florida: protocols for survey methodology for offshore marine hydrokinetic energy projects, www.osti.gov/servlets/purl/1035555/, U. S. Department of Energy, vii + 93 pp.

APPENDIX 1

Species List and Percent Cover of Benthic Macrobiota

Species list of the benthic macro-invertebrates and algae that were identified from quantitative photo transects for each ROV dive during the 2015 NOAA Ship *Pisces* cruise to the South Atlantic MPAs. Still images captured from the photo transects were analyzed using CPCe[®] software to determine relative percent cover of benthic biota and habitat types. (Best viewed in PDF format in order to zoom view)

Group/Major/Minor Categories	ROV 15-01	ROV 15-03	ROV 15-04	ROV 15-05	ROV 15-06	ROV 15-07	ROV 15-08	ROV 15-09	ROV 15-10	ROV 15-11	ROV 15-13	ROV 15-14	ROV 15-15	ROV 15-17	ROV 15-18	ROV 15-19	ROV 15-20	ROV 15-21	Grand Total
Biota	0.68%	2.51%	6.50%	15.88%	60.77%	20.98%	6.19%	8.04%	43.59%	62.29%	44.02%	58.54%	26.77%	10.16%	18.65%	9.44%	7.93%	1.12%	24.30%
Algae	0.30%	0.25%	0.00%	9.19%	59.66%	13.02%	0.05%	0.00%	29.02%	50.64%	33.31%	47.20%	8.65%	3.21%	5.62%	3.46%	3.28%	0.00%	16.93%
Chlorophyta	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	0.00%	0.00%	0.17%	0.14%	0.00%	0.00%	0.10%	0.00%	0.17%	0.00%	0.00%	0.00%	0.04%
Corallinales/crustose coralline	0.00%	0.00%	0.00%	0.81%	0.22%	1.16%	0.00%	0.00%	1.57%	2.37%	3.08%	6.44%	4.90%	0.94%	1.39%	1.05%	1.90%	0.00%	1.26%
Cyanophyta	0.00%	0.00%	0.00%	2.75%	0.11%	0.29%	0.00%	0.00%	0.00%	0.20%	0.00%	0.23%	0.00%	0.00%	0.28%	0.00%	0.00%	0.00%	0.23%
Phaeophyta	0.30%	0.25%	0.00%	4.94%	55.69%	10.85%	0.05%	0.00%	18.01%	43.26%	24.00%	37.97%	1.46%	0.94%	1.34%	0.05%	0.00%	0.00%	13.16%
Rhodophyta	0.00%	0.00%	0.00%	0.69%	3.56%	0.72%	0.00%	0.00%	9.27%	4.67%	6.23%	2.56%	2.19%	1.34%	2.45%	2.36%	1.37%	0.00%	2.24%
Porifera	0.00%	0.42%	1.03%	0.88%	0.30%	0.29%	1.78%	4.55%	4.14%	4.06%	5.04%	5.51%	9.27%	2.27%	3.17%	0.94%	0.21%	0.00%	2.35%
Agelas sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.00%	0.07%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
Aiolochroia crassa	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.17%	0.20%	0.00%	0.00%	0.10%	0.00%	0.06%	0.00%	0.00%	0.00%	0.03%
Aplysina sp.	0.00%	0.00%	0.00%	0.00%	0.04%	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%	0.01%
Callyspongia sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
Callyspongia vaginalis	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
Clathria 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%	0.13%	0.06%	0.00%	0.00%	0.00%	0.01%
Corallistes sp.	0.00%	0.00%	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%	0.00%	0.02%
Demospongiae	0.00%	0.17%	0.39%	0.63%	0.00%	0.14%	0.52%	1.39%	1.40%	1.96%	2.45%	2.17%	4.58%	1.34%	0.67%	0.58%	0.00%	0.00%	0.94%
Demospongiae- MPA03	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%	0.01%
Demospongiae- ze tan starlet	0.00%	0.00%	0.00%	0.00%	0.11%	0.00%	0.00%	0.00%	0.52%	0.07%	0.49%	0.23%	0.73%	0.00%	0.50%	0.05%	0.00%	0.00%	0.15%
Erylus sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.00%	0.00%	0.00%	0.10%	0.13%	0.00%	0.00%	0.00%	0.00%	0.01%
Farrea sp.	0.00%	0.00%	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%	0.00%	0.02%
Hexactinellida	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
Ircinia campana	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.07%	0.56%	0.62%	0.00%	0.00%	0.67%	0.00%	0.00%	0.00%	0.11%
Ircinia sp.	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	0.00%	0.11%	0.47%	0.74%	0.28%	1.48%	1.46%	0.27%	0.17%	0.05%	0.00%	0.00%	0.25%
Ircinia strobilina	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%
Leiodermatium sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.89%	2.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.25%
Lithistida	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.19%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%
Neofibularia 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%	0.11%	0.00%	0.00%	0.00%	0.01%
Poecilosclerida	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.17%	0.00%	0.00%	0.00%	0.01%
Spirastrellidae	0.00%	0.17%	0.64%	0.25%	0.07%	0.14%	0.00%	0.00%	1.34%	0.81%	1.12%	0.62%	2.19%	0.40%	0.78%	0.26%	0.21%	0.00%	0.46%
Spongisorites sp.	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%	0.00%	0.00%	0.00%	0.00%
Xestospongia sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	0.16%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
Coral	0.00%	0.00%	0.06%	0.00%	0.00%	0.14%	0.00%	0.00%	0.41%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.10%	0.00%	0.00%	0.05%
Oculina varicosa	0.00%	0.00%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.01%
Scleractinia colonial	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%	0.05%	0.00%	0.00%	0.01%
Scleractinia solitary	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.41%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%
Alcyonacea- gorgonian	0.15%	0.92%	1.54%	2.81%	0.26%	1.59%	1.03%	0.00%	1.05%	1.02%	1.40%	1.86%	0.73%	0.13%	0.17%	0.21%	0.00%	0.00%	0.81%
Carijoa sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.52%	0.14%	0.00%	0.00%	0.00%	0.00%	0.06%	0.00%	0.00%	0.00%	0.05%
Diodogorgia sp.	0.00%	0.92%	1.22%	0.56%	0.00%	0.72%	0.00%	0.00%	0.00%	0.47%	0.77%	0.70%	0.52%	0.00%	0.06%	0.21%	0.00%	0.00%	0.31%
Ellisella sp.	0.00%	0.00%	0.00%	0.13%	0.26%	0.29%	0.00%	0.00%	0.00%	0.00%	0.42%	1.01%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.12%
Ellisellidae	0.00%	0.00%	0.00%	0.06%	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%	0.01%
gorgonian unid	0.15%	0.00%	0.32%	1.56%	0.00%	0.43%	0.09%	0.00%	0.06%	0.07%	0.07%	0.00%	0.10%	0.00%	0.06%	0.00%	0.00%	0.00%	0.16%
Iciligorgia schrammi	0.00%	0.00%	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%
Leptogorgia sp.	0.00%	0.00%	0.00%	0.06%	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%	0.01%
Nicella sp.	0.00%	0.00%	0.00%	0.31%	0.00%	0.00%	0.94%	0.00%	0.00%	0.00%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.10%
Titanideum frauenfeldii	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%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
Swiftia exserta	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.47%	0.34%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%
Alcyonacea- Alcyoniina	0.00%	0.00%	0.06%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.68%	0.11%	0.00%	0.06%
Alcyonacea- Alcyoniina	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%
Nidalia occidentalis	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.68%	0.11%	0.00%	0.06%
Antipatharia	0.00%	0.00%	0.51%	0.13%	0.00%	0.14%	0.00%	0.00%	0.52%	1.90%	0.63%	1.01%	0.63%	0.80%	0.28%	0.05%	0.00%	0.00%	0.33%
Antipatharia	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.54%	0.28%	0.16%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%
Antipathes atlantica	0.00%	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.23%	1.15%	0.14%	0.54%	0.10%	0.00%	0.00%	0.05%	0.00%	0.00%	0.13%
Antipathes furcata	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	0.08%	0.31%	0.27%	0.00%	0.00%	0.00%	0.00%	0.03%
Elatopathes abietina	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.17%	0.07%	0.07%	0.23%	0.10%	0.13%	0.06%	0.00%	0.00%	0.00%	0.04%
Stichopathes lutkeni	0.00%	0.00%	0.51%	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.07%	0.07%	0.00%	0.00%	0.40%	0.22%	0.00%	0.00%	0.00%	0.07%
Tanacetipathes tanacetum	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.00%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
Cnidaria non-coral	0.00%	0.33%	2.51%	1.38%	0.11%	2.60%	0.94%	0.17%	6.41%	3.66%	3.29%	2.02%	5.83%	2.94%	8.07%	3.67%	4.12%	1.12%	2.61%
Actinaria	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%	0.11%	0.00%	0.01%
Cerianthidae	0.00%	0.00%	0.00%	0.00%	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%	0.01%
Corallimorpharia	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%
Hydroidolina	0.00%	0.33%	2.51%	1.31%	0.11%	2.60%	0.94%	0.17%	6.41%	3.66%	3.22%	2.02%	5.83%	2.94%	8.07%	3.52%	3.81%	1.12%	2.58%
Zoanthidae	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.21%	0.00%	0.01%
Annelida	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%	1.50%	2.88%	0.12%	0.07%	0.00%	0.00%	0.21%	0.00%	0.95%	0.05%	0.00%	0.00%	0.41%

Group/Major/Minor Categories	ROV 15-01	ROV 15-03	ROV 15-04	ROV 15-05	ROV 15-06	ROV 15-07	ROV 15-08	ROV 15-09	ROV 15-10	ROV 15-11	ROV 15-13	ROV 15-14	ROV 15-15	ROV 15-17	ROV 15-18	ROV 15-19	ROV 15-20	ROV 15-21	Grand Total
Filograna sp.	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.07%	0.00%	0.00%	0.10%	0.00%	0.95%	0.00%	0.00%	0.00%	0.08%
Sabellidae	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.50%	2.88%	0.06%	0.00%	0.00%	0.00%	0.10%	0.00%	0.00%	0.05%	0.00%	0.00%	0.33%
Mollusca	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.09%	0.00%	0.00%	0.14%	0.00%	0.00%	0.31%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%
Bivalvia	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%	0.31%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%
Mollusca	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%	0.01%
Arthropoda	0.00%	0.00%	0.06%	0.00%	0.00%	0.14%	0.05%	0.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%
Decapoda	0.00%	0.00%	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%	0.00%	0.01%
Majidae	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%
Scyllaridae	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%
Stenorhynchus seticornis	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%
Bryozoa	0.00%	0.00%	0.06%	1.38%	0.07%	0.58%	0.00%	0.00%	0.06%	0.07%	0.00%	0.08%	0.00%	0.80%	0.11%	0.00%	0.00%	0.00%	0.15%
Bryozoa	0.00%	0.00%	0.06%	1.25%	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%	0.08%
Schizoporella sp.	0.00%	0.00%	0.00%	0.13%	0.04%	0.58%	0.00%	0.00%	0.06%	0.07%	0.00%	0.08%	0.00%	0.80%	0.11%	0.00%	0.00%	0.00%	0.07%
Echinodermata	0.00%	0.00%	0.06%	0.00%	0.00%	0.00%	0.05%	0.11%	0.93%	0.00%	0.00%	0.00%	0.21%	0.00%	0.00%	0.10%	0.21%	0.00%	0.10%
Arbacia punctulata	0.00%	0.00%	0.00%	0.00%	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%
Cidaroida	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.21%	0.00%	0.01%
Davidaster discoideus	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.87%	0.00%	0.00%	0.00%	0.21%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%
Echinoidea	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%
Goniaster tessellatus	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%
Paracoloichirus mysticus	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%
Stylocidaris sp.	0.00%	0.00%	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%	0.00%	0.01%
Chordata	0.08%	0.33%	0.26%	0.06%	0.37%	2.46%	0.70%	0.22%	0.93%	0.68%	0.14%	0.85%	0.94%	0.00%	0.22%	0.16%	0.00%	0.00%	0.42%
Asciacea	0.00%	0.00%	0.00%	0.06%	0.04%	2.03%	0.00%	0.00%	0.06%	0.07%	0.00%	0.00%	0.21%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%
Didemnidae	0.00%	0.00%	0.26%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.41%	0.07%	0.54%	0.21%	0.00%	0.11%	0.10%	0.00%	0.00%	0.09%
Fish	0.08%	0.33%	0.00%	0.00%	0.33%	0.43%	0.70%	0.22%	0.87%	0.20%	0.07%	0.31%	0.52%	0.00%	0.11%	0.05%	0.00%	0.00%	0.25%
Natural detritus	0.15%	0.25%	0.19%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.21%	0.00%	0.00%	0.00%	0.06%	0.00%	0.00%	0.00%	0.05%
Bare Hard bottom substrate	6.74%	20.99%	14.28%	18.45%	5.04%	33.57%	36.49%	66.08%	37.06%	26.34%	44.23%	30.98%	49.58%	23.93%	32.02%	75.71%	65.54%	3.12%	32.38%
Bare Hard bottom substrate	6.74%	20.99%	14.28%	18.45%	5.04%	33.57%	36.49%	66.08%	37.06%	26.34%	44.23%	30.98%	49.58%	23.93%	32.02%	75.71%	65.54%	3.12%	32.38%
Bare rock- pavement boulder ledge	3.10%	20.23%	14.08%	14.38%	4.93%	24.31%	35.98%	59.42%	36.48%	25.46%	40.66%	30.36%	46.77%	18.85%	28.79%	10.44%	10.25%	2.48%	23.69%
Bare rubble- 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%	0.10%	0.13%	0.00%	64.85%	43.76%	0.24%	6.24%
Bare rubble- rock	3.63%	0.75%	0.19%	4.07%	0.11%	9.26%	0.52%	6.65%	0.58%	0.88%	3.57%	0.62%	2.71%	4.95%	3.23%	0.26%	9.41%	0.40%	2.36%
Bare 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%	0.16%	2.11%	0.00%	0.09%
Bare Soft bottom substrate	92.58%	76.51%	79.16%	65.67%	34.19%	45.44%	57.04%	25.72%	19.29%	11.37%	11.76%	10.48%	23.65%	65.91%	49.33%	14.80%	26.53%	95.44%	43.26%
Human debris	0.00%	0.00%	0.06%	0.00%	0.00%	0.00%	0.28%	0.17%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.32%	0.06%
Human debris	0.00%	0.00%	0.06%	0.00%	0.00%	0.00%	0.28%	0.17%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.32%	0.06%
Fishing gear/line/long line	0.00%	0.00%	0.06%	0.00%	0.00%	0.00%	0.28%	0.00%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.32%	0.05%
Human debris- other	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.17%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.02%
Grand 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%

APPENDIX 2

Species List and Density of Fish Populations

Species list all of fish that were identified and counted from the quantitative video transects for each ROV dive during the 2015 NOAA Ship *Pisces* cruise to the South Atlantic MPAs. Fish density (# individuals/1000 m²) was calculated as (# of individuals/ transect area) *1000. Transect length was calculated from the ROV tracking. Transect width was measured using the paired lasers.

Class/Family/Scientific Name	Common Name	ROV 15-01	ROV 15-03	ROV 15-04	ROV 15-05	ROV 15-06	ROV 15-07	ROV 15-08	ROV 15-09	ROV 15-10	ROV 15-11	ROV 15-13	ROV 15-14	ROV 15-15	ROV 15-17	ROV 15-18	ROV 15-19	ROV 15-20	ROV 15-21
Actinopterygii																			
Acanthuridae																			
Acanthurus sp.	doctorfish				0.37	5.01				2.54	1.38	3.22	0.35	0.9	0.26				
Apogonidae																			
Apogon pseudomaculatus	twospot cardinalfish		1.04	0.18						0.25	0.55		0.11		0.26	0.33	0.11		
Apogon sp.	cardinalfish		1.3							3.81		0.37	3.5						
Aulostomidae																			
Aulostomus maculatus	trumpetfish									1.01	3.6	0.37		0.45	0.26				
Balistidae																			
Balistes capricus	gray triggerfish			0.18		0.66					0.55	0.56	0.23		0.26	5.53			
Balistes sp.	triggerfish												0.7		0.26	0.16			
Balistes vetula	queen triggerfish						0.78				0.27		0.11			0.33			
Batrachoididae																			
Opsanus sp.	toadfish	0.22														0.16	0.11		0.12
Bothidae																			
Bothidae	flounder																		0.25
Caproidae																			
Antigonia capros	deepbody boarfish							24.39	11.06								0.23		
Carangidae																			
Caranx bartholomaei	yellow jack										3.33		1.28						
Seriola dumerili	greater amberjack	3.66		0.18	0.37			0.39				0.37	0.93	1.81		0.5	0.7		
Seriola fasciata	lesser amberjack													6.79					
Seriola rivoliana	almaco jack	0.91		0.72	0.74	2				5.85	8.6	1.7	1.4	5.89	0.8	0.16			
Seriola sp.	amberjack	1.37	0.26	0.9	0.74	0.66		0.97	2.7	2.54	1.38	0.94	2.33	4.07		0.16			
Chaetodontidae																			
Chaetodon ocellatus	spotfin butterflyfish	0.45	0.52	3.44	1.48	4.67	0.78			5.34	4.44	5.11	0.81	0.45	0.53	2.68		0.17	
Chaetodon sedentarius	reef butterflyfish	0.91	3.9	5.79	8.53	13.36	11.75			20.87	29.97	31.27	10.5	33.98	30.47	28.03	2.1	0.52	0.51
Chaetodon sp.	butterflyfish									0.5	0.83	1.32				0.33	0.11		
Chaetodontidae	butterflyfish										1.11	1.51	0.23	0.45	0.26		0.11		
Prognathodes aculeatus	longsnout butterflyfish									1.01	0.55	0.18	0.11	0.45		0.16			
Prognathodes aya	bank butterflyfish	2.52	1.82	3.25	2.96	0.66	2.35			4.32	4.16	2.27	0.7	9.06	2.96	1.67	7.95	1.4	0.12
Prognathodes guyanensis	french butterflyfish							0.97											
Prognathodes sp.	butterflyfish							0.58	0.24										
Dactylopteridae																			
Dactylopterus volitans	flying gurnard															0.67			
Diodontidae																			
Diodon hystrix	porcupinefish					0.33							0.18						
Diodon sp.	spiny puffer									0.25			0.37						
Fistulariidae																			
Fistularia petimba	red cornetfish												0.11						
Fistularia sp.	cornetfish					0.33				1.01	0.27	0.37	0.23	0.45					
Fistularia tabacaria	bluespotted cornetfish					1.67				1.27	1.94	1.13	0.23	0.9		0.16			
Haemulidae																			
Haemulon aurolineatum	tomtate	0.22				1871.03				371.69	1054.67	1019.71	284.23	666.06	162.08	94.34			
Haemulon plumieri	white grunt					1.33							0.18						
Haemulon sp.	grunt									814.66	20.81	47.38	64.19						
Haemulon striatum	striped grunt					501.16				19.09	402.44	7.58	211.85	22.65		32.73			
Holocentridae																			
Holocentridae	soldierfish									1.78	0.55								
Holocentridae	squirrelfish			0.54	2.59	3.34				3.81	23.59	5.11	10.38	7.24	9.97	13.76	0.23		
Holocentrus sp.	squirrelfish													1.35					
Myripristis jacobus	blackbar soldierfish					0.33				18.07	6.66	3.79	1.16	2.26	17.79	10.57			
Ostichthys trachypoma	bigeye soldierfish							1.75											
Plectrypops retrospinis	cardinal soldierfish										0.27								

Class/Family/Scientific Name	Common Name	ROV 15-01	ROV 15-03	ROV 15-04	ROV 15-05	ROV 15-06	ROV 15-07	ROV 15-08	ROV 15-09	ROV 15-10	ROV 15-11	ROV 15-13	ROV 15-14	ROV 15-15	ROV 15-17	ROV 15-18	ROV 15-19	ROV 15-20	ROV 15-21
Kyphosidae																			
Kyphosus sp.	chub					0.66													
Labridae																			
Bodianus pulchellus	spotfin hogfish				2.59	22.38	0.78			56.77	38.57	30.32	8.52	28.54	16.45	19.8			
Bodianus rufus	spanish hogfish					1.67				2.54	1.38	0.18	0.93			0.16			
Clepticus parrai	creole wrasse											0.75	28.94						
Decodon puellaris	red hogfish							7.41	2.7								0.7	0.35	0.51
Halichoeres bathyphilus	greenband wrasse	0.22	0.52	0.36			7.83	0.19				0.18			0.8		0.35	0.7	2.84
Halichoeres garnoti	yellowhead wrasse					28.4	0.78			8.4	10.82	6.06	1.75		5.39	6.37			
Halichoeres sp.	wrasse	8.48	3.38	3.44	32.65	37.75	54.85	0.39		45.57	5.55	5.68	2.68	7.24	28.85	19.97	1.17	0.87	2.32
Labridae	wrasse							0.58											
Lachnolaimus maximus	hogfish				2.96	0.33	1.56				1.11	0.75	0.11	0.9	0.26	0.33			
Thalassoma bifasciatum	bluehead wrasse															0.16			
Lutjanidae																			
Lutjanus analis	mutton snapper															0.16			
Lutjanus buccanella	blackfin snapper														0.26				
Lutjanus campechanus	red snapper	0.91	0.52	1.99										0.45					
Lutjanus griseus	gray snapper											4.16	10.38		0.26				
Lutjanus sp.	snapper												0.46			0.5		0.12	
Rhomboplites aurorubens	vermillion snapper	0.22				10.35		0.39		70.01	84.65	290.94		99.68	137	83.93		0.12	
Malacanthidae																			
Caulolatilus microps	blueline tilefish							1.56	0.49										
Malacanthus plumieri	sand tilefish														0.26	0.16			
Monacanthidae																			
Cantherhines pullus	orangespotted filefish										0.55		0.11						
Monacanthidae	filefish													0.45					
Stephanolepis hispidus	planehead filefish										0.55	0.18		0.9					
Moridae																			
Laemonema sp.	mora cod							1.36	3.19										
Mullidae																			
Mulloidichthys martinicus	yellow goatfish									16.29	3.33	0.94	9.22	0.9					
Pseudupeneus maculatus	spotted goatfish					8.35				1.78	3.88	3.03	3.26	2.71					
Muraenidae																			
Gymnothorax miliaris	goldentail moray															0.16			
Gymnothorax sp.	moray eel															0.16			
Muraena retifera	reticulate moray	0.45	0.26	0.18					0.24										
Muraena robusta	stout moray														0.26				
Muraenidae	moray eel	0.22		0.18	0.37			0.19	1.22			0.18			0.26	0.16	0.11		
Ogcocephalidae																			
Ogcocephalus corniger	longnose batfish																0.11		
Ogcocephalus sp.	batfish																	0.35	
Ostraciidae																			
Lactophrys polygona	honeycomb cowfish										0.27								
Lactophrys quadricornis	scrawled cowfish									0.25	0.27								
Lactophrys sp.	cowfish				0.37	0.33				1.27	0.55	1.51	0.35	0.45		0.16			
Phycidae																			
Urophycis sp.	hake									0.5									
Pomacanthidae																			
Centropyge argi	cherubfish				3.33	0.66					0.27	0.18	3.38	0.45					
Holacanthus bermudensis	blue angelfish	0.91	1.56	5.97	1.85	6.01	5.48			21.63	16.65	24.45	4.2	30.81	11.05	10.07		0.12	
Holacanthus tricolor	rock beauty				0.37	2				1.01	0.27	0.75	1.98		1.88	0.33			
Pomacanthus arcuatus	gray angelfish									0.25	0.55	0.37	0.11						
Pomacanthus paru	french angelfish									0.5		0.37				0.16			
Pomacanthus sp.	angelfish											0.18		0.45		0.67			
Pomacentridae																			
Chromis cyaneus	blue chromis					0.66					1.94								
Chromis enchrysurus	yellowtail reeffish	1.37	12.49	11.58	15.95	3.34	15.67			8.14	1.94	17.81	3.26	16.76	86.56	63.28	3.51	0.52	0.25
Chromis insolatus	sunshinefish				8.53	40.42	5.48			16.54	43.57	9.47	25.21	6.34	18.33	26.35			
Chromis scotti	purple reeffish			0.36	2.22	16.7				68.99	78.54	100.64	19.14	43.95	28.04	19.64			
Chromis sp.	damselfish		0.18	2.22	10.35	0.78				100.81	3.33	14.59	18.79	3.17	15.1	18.8			
Stegastes partitus	bicolor damselfish					0.33				4.58	1.94	3.22	1.16	2.26	0.8	1.51			

Class/Family/Scientific Name	Common Name	ROV 15-01	ROV 15-03	ROV 15-04	ROV 15-05	ROV 15-06	ROV 15-07	ROV 15-08	ROV 15-09	ROV 15-10	ROV 15-11	ROV 15-13	ROV 15-14	ROV 15-15	ROV 15-17	ROV 15-18	ROV 15-19	ROV 15-20	ROV 15-21
Priacanthidae																			
Priacanthus arenatus	bigeye			0.18				1.56	0.73	8.91	0.83	3.41	0.11	0.45	0.8				
Pristigenys alta	short bigeye	3.2	7.28	5.43	2.59		10.18	1.17		14.51	3.05	3.79		6.79	0.53		3.62		0.38
Scaridae																			
Scaridae	parrotfish									0.5									
Sparisoma atomarium	greenblotch parrotfish											1.13	1.28	0.9	0.53	0.16			
Sparisoma aurofrenatum	redband parrotfish											0.37	0.11						
Sparisoma sp.	parrotfish									0.55	0.18	1.05		1.61					
Sciaenidae																			
Equetus lanceolatus	jackknife-fish					1.33													
Pareques iwamotoi	blackbar drum	0.22	0.26	12.67				5.46	0.98										
Pareques umbrosus	cubbyu	4.58	20.03	1.81		61.47				5.34	13.04	2.84	3.38	2.71	8.62	10.91			2.58
Scorpaenidae																			
Pterois volitans	lionfish	22	10.66	7.78	4.08	16.37	7.05			59.82	28.86	37.14	17.5	34.43	17.52	10.74	1.17		2.58
Scorpaena plumieri	spotted scorpionfish									1.52	0.83		0.35						
Scorpaenidae	scorpionfish			0.18	0.37			13.85	9.09	0.5		0.37	0.23	0.45			2.45	1.4	
Serranidae																			
Anthias nicholsi	yellowfin bass							2.53	218.04										
Anthiinae	anthiid		0.54			0.33		117.87	393.8				2.33						
Centropristis ocyurus	bank sea bass	1.14								1.27		0.37		1.35	0.26	0.16	3.04	2.1	2.97
Centropristis sp.	sea bass													0.45				0.17	0.77
Centropristis striata	black sea bass																	6.13	1.16
Cephalopholis cruentata	graysby					2.33				4.83	4.71	1.13	0.93	0.9	0.26	0.16			
Epinephelus adscensionis	rock hind					0.66													
Epinephelus guttatus	red hind					0.33													
Hemanthias vivanus	red barbler		0.52					7.41	47.44										
Hyporthodus flavolimbatus	yellowedge grouper								0.24										
Hyporthodus niveatus	snowy grouper							11.31	1.72								0.11		
Liopropoma eukrines	wrasse bass	1.83	1.04	1.99	1.85	0.66	2.35	0.19		4.32	2.22	1.13	0.23	1.81	2.96	2.01	0.93	0.17	
Mycteroperca interstitialis	yellowmouth grouper					0.33				0.25	0.83	0.18		0.9					
Mycteroperca microlepis	gag grouper	0.22		0.18	0.37					0.5	0.55	0.75	0.35	1.35	0.8	0.33			0.51
Mycteroperca phenax	scamp	6.64	3.38	4.88	0.74	3.34	1.56	0.58		5.6	8.32	5.11	5.95	6.79	2.15	3.02			
Mycteroperca sp.	grouper															0.16			
Paranthias furcifer	creole-fish				0.37										5.66				
Plectranthias garrupellus	apricot bass							10.14	24.58								0.11		
Pronotogrammus martinicensis	rougtongue bass				2.22			12.68	1.47								1.05	0.35	
Rypticus maculatus	whitespotted soapfish									0.76									
Rypticus saponaceus	greater soapfish					1.33				0.76			0.23						
Rypticus sp.	soapfish													0.45			0.11		
Serranidae	grouper									0.5			0.11	0.45					
Serranus annularis	orangeback bass		0.26	0.18	2.59	1.33	8.62			0.76	1.94	0.56	0.11	2.26	3.23	2.51	0.46		
Serranus baldwini	lantern bass													0.45	0.8	1			
Serranus chionaraia	snow bass						0.78												
Serranus notospilus	saddle bass		0.26					6.04	0.73								0.11		0.25
Serranus phoebe	tattler	4.35	1.3	2.71	20.4	4	25.86			0.25	0.55	0.37		0.45	4.58	4.36	8.66	4.03	0.77
Serranus sp.	sea bass									0.25				0.9					
Serranus tigrinus	harlequin bass					0.33									0.26	0.33			
Sparidae																			
Calamus sp.	porgy			1.48	9.35	5.48				9.41	4.99	3.6	0.7	6.79	0.26				0.12
Diplodus holbrookii	spottail pinfish										13.04	0.18							
Pagrus pagrus	red porgy	11.23	3.12	1.08		3.67	9.4	38.25	9.58	7.12	14.98	0.94		12.23	1.34	1.17			
Sparidae	porgy			0.74															
Sphyrnidae																			
Sphyrna barracuda	barracuda				0.33					0.25			0.23	3.62					
Synodontidae																			
Synodus intermedius	sand diver					0.33	1.56		0.24						0.26				
Synodus sp.	lizardfish									0.25	0.27					0.16			0.12
Tetraodontidae																			
Canthigaster sp.	puffer	1.37	4.42	13.03	20.4	27.39	23.51			37.42	59.39	37.9	6.88	40.77	28.04	24.67			0.12
Sphoeroides spengleri	bandtail puffer	0.22	1.04	1.62						1.52	0.83	0.56							
Trachichthyidae																			
Gephyroberyx darwinii	Darwin's slimehead							1.56	13.02										
Triglidae																			
Triglidae	searobin																		0.12

Class/Family/Scientific Name	Common Name	ROV 15-01	ROV 15-03	ROV 15-04	ROV 15-05	ROV 15-06	ROV 15-07	ROV 15-08	ROV 15-09	ROV 15-10	ROV 15-11	ROV 15-13	ROV 15-14	ROV 15-15	ROV 15-17	ROV 15-18	ROV 15-19	ROV 15-20	ROV 15-21
Elasmobranchii																			
Carcharhinidae																			
Carcharhinidae	shark											0.18	0.11	0.45					
Carcharhinus falciformis	silky shark									0.27									
Carcharhinus sp.	shark												0.11						
Dasyatidae																			
Dasyatis centroura	rougthead stingray														0.26				
Dasyatis sp.	stingray								0.5				0.11						

APPENDIX 3

SEADESC II REPORT

Characterizations and Quantitative Analyses of Habitat, Benthic Biota, and Fish Populations

Provides the following data for each dive site during the 2015 NOAA Ship *Pisces* cruise to the South Atlantic MPAs:

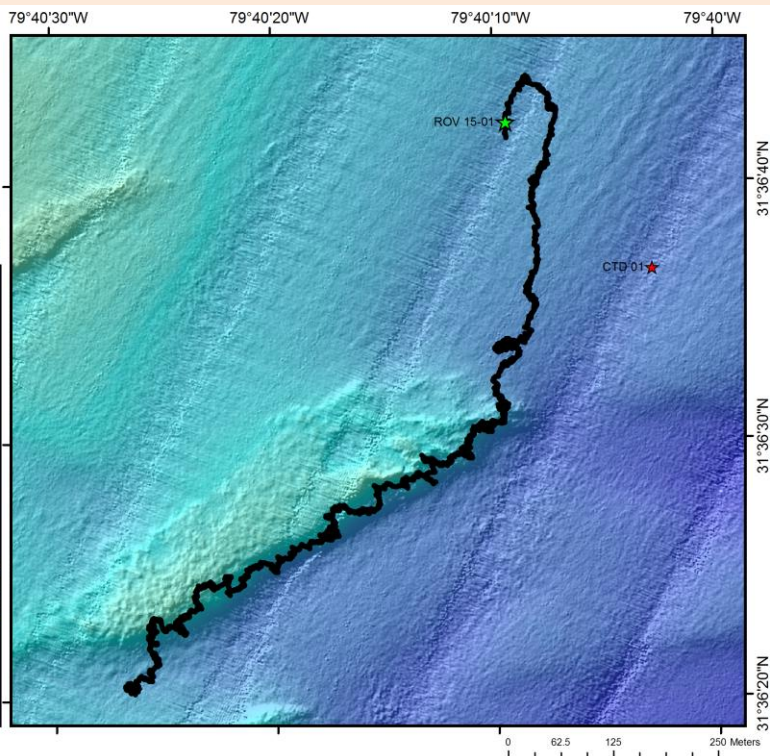
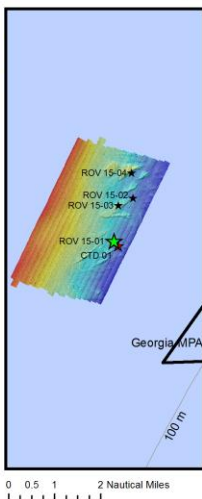
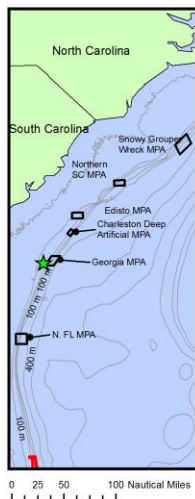
- cruise and ROV dive metadata and objectives
- figures showing each ROV dive track and habitat zones overlaid on multibeam sonar maps
- ROV dive track data (start and end coordinates, time, and depth)
- CTD plots from shipboard casts and temperature profiles for each ROV dive
- images characterizing the habitat and biota for each dive site
- characterization of habitat, benthic biota, and fish populations for each dive site
- quantitative analyses of photo transects for each dive site including CPCe 4.1[®] Coral Point Count analysis of percent cover of benthic biota and substrate types
- quantitative analyses of video transects for each dive site of fish densities by species

Dive Site: ROV 15-01; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 165

General Location and Dive Track:

ROV 15-01 West of Georgia MPA 19-VI-15-2

- ★ ROV
- ★ CTD
- ★ ROV 15-01
- ROV Track



Site Overview:

Project: 2015 MPA Cruise

Vessel: NOAA Ship *Pisces* Cruise 15-02

Principal Investigator: Stacy Harter

PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444

Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington

Ship Position System DGPS

Data Management: Access Database

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/19/2015

ROV: Mohawk ROV

ROV Navigation: Trackpoint II

ROV Sensors: Temperature (°C), Depth (m)

Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs

Digital Photos: 75

Distance (km): 1.41

Sonar Data: NancyFoster_14_08_MPA_GA_Grid

DVD: 2

Hard Drive: 1

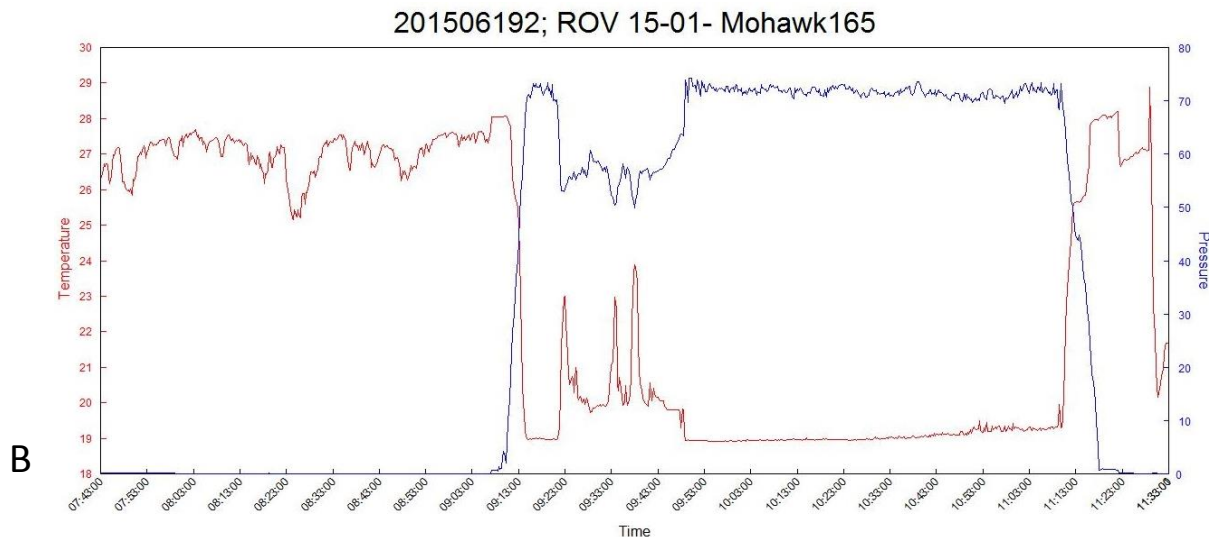
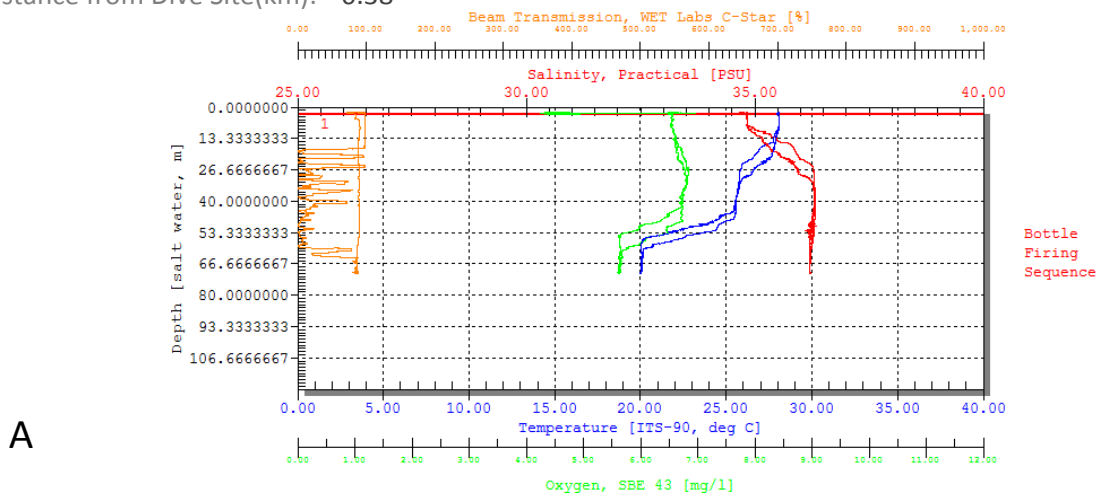
Dive Site: ROV 15-01; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 165

Dive Data:

Minimum Bottom Depth (m):	70	Total Transect Length (km):	1.410
Maximum Bottom Depth (m):	73	Surface Current (kn):	0.25
On Bottom (Time- GMT):	9:16	On Bottom (Lat/Long):	31.61°N; -79.67°W
Off Bottom (Time- GMT):	11:11	Off Bottom (Lat/Long):	31.61°N; -79.67°W
Physical (bottom); Temp (°C):	18.99	Salinity:	Visibility (ft): 30
		Current (kn):	0.25

Physical Environment:

Distance from Dive Site(km): 0.38



A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 70.6 m, Temperature: 20-28.1 °C , Salinity: 34.7-36.3 (PSU), Sound Velocity: 1523.9-1541.6 (m/s), Oxygen Saturation: 4.5-5.1 (ml/l; plot is mg/l), Density: 1022.1-1026 (Kg/m³), Nitrogen Saturation: 8.4-9.4 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-01; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 165

Dive Imagery:



Figure 1: 31°36.4073'N, 79°40.3898'W; -71.5 m
Lionfish take refuge near an outcrop



Figure 2: 31°36.3869'N, 79°40.4074'W; -71.8 m
Toadfish (*Opsanus* sp.) under an outcrop covered in *Diodogorgia* gorgonians



Figure 3: 31°36.3703'N, 79°40.4299'W; -72.8 m
Lionfish around an outcrop



Figure 4: 31°36.4083'N, 79°40.3855'W; -71.6 m
Stenorhynchus arrow crabs near a low relief ledge

Dive Site: ROV 15-01; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 165

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site # 19-VI-15-2; ROV 15-01, Mohawk UNCW Dive 165. Target Site: Georgia, west of Georgia MPA, NE-SW ridges, depth 70-73 m. MB map- Nancy Foster 14-08_MPA_GA_Grid.

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected.

Site Description/Habitat:

Depth range: 73-75 m.

MB map shows two NE-SW oriented ridges, ~700 m long, at depth of 70 m on top to 73 m at base of east slope. Transect planned along east edge and slope from north end to south.

9:17- On bottom, 75 m depth, 400 m north of reef on flat sand bottom. Coarse grey sand. Off bottom to transect to reef.

9:53- at NE end of reef, on east slope; 73 m. 10-30% cover hard bottom, pavement with sediment veneer, rubble. Head southwest along slope. Slope less than 5 dg. Areas of 10-30 cm ledges. Mostly covered with hydroids, thin encrusting demosponges.

10:21- half way along ridge on east slope; 73.5 m. Patchy pavement, 30-50% cover, some 30 cm relief rock. 8 Spp. of demosponges, Clathriidae; scamp and porgy common.

10:56- near WP 3, south end of first reef ridge; 73 m. Same habitat. Head toward second ridge; in valley of MB, 73 m, sand.

Dominant Macrobiota:

Coral- *Phyllangia americana*

Octocorals- *Diodogorgia*, *Titanideum frauenfeldii*

Other Cnidaria- Hydroida, Corallimorpharia

Porifera- red and yellow encrusting demosponges, Clathriidae

Decapoda- *Stenorhynchus seticornis*

Asteroidea- *Goniaster tessellatus*

Fish:

Lionfish (common), bank butterfly (*Prognathodes aya*), wrasse bass, short bigeye, few red snapper, scamp (common), red porgy (common), tattler, cubbyu, eels

Dive Site: ROV 15-01; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 165

CPCe Percent Cover Analysis:

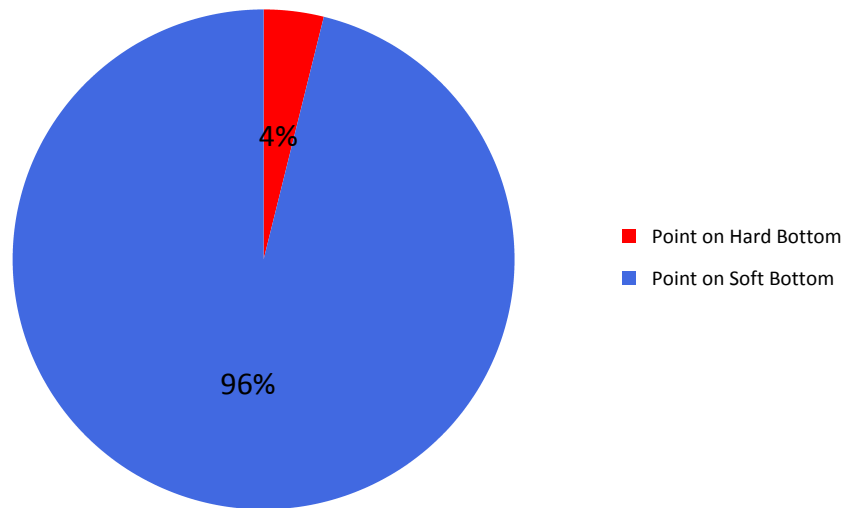
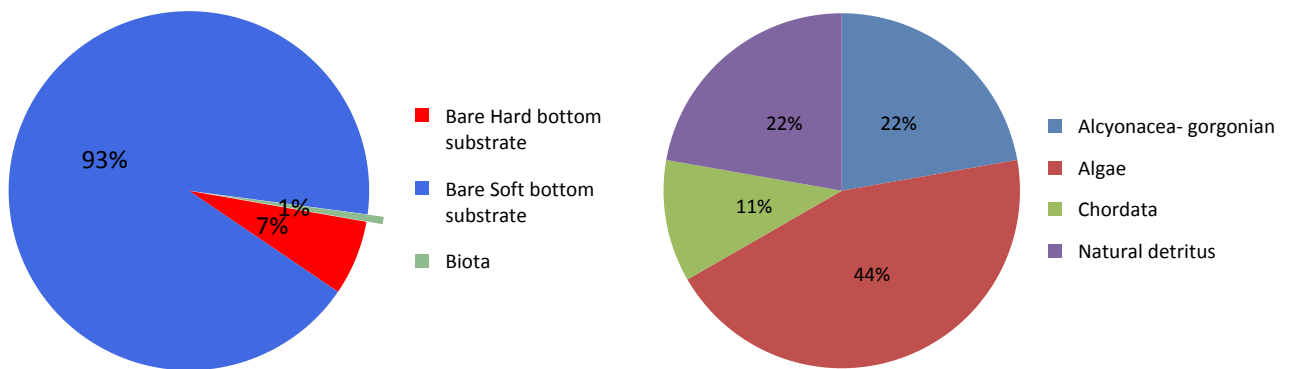


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-01. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-01.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Dive Site: ROV 15-01; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 165

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-01.

Benthic Macro-biota and Substrate Type	ROV 15-01	
	Point Count	% Cover
Biota	9	0.68%
Algae	4	0.30%
Phaeophyta	4	0.30%
Alcyonacea- gorgonian	2	0.15%
gorgonian unid	2	0.15%
Chordata	1	0.08%
Fish	1	0.08%
Natural detritus	2	0.15%
Natural detritus	2	0.15%
Bare hard bottom substrate	89	6.74%
Bare Hard bottom	89	6.74%
Bare rock- pavement boulder ledge	41	3.10%
Bare rubble- rock	48	3.63%
Bare soft bottom substrate	1223	92.58%
Grand Total	1321	100.00%

Dive Site: ROV 15-01; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 165

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 15-01.

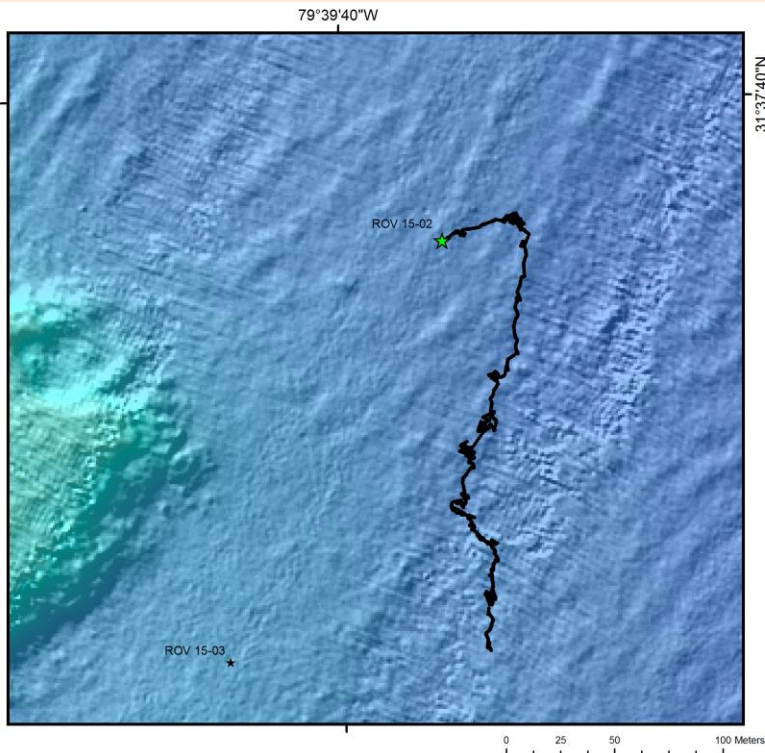
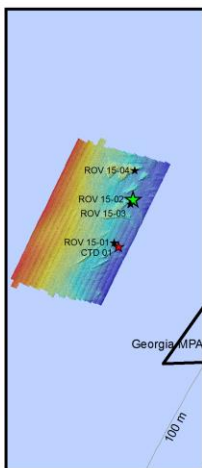
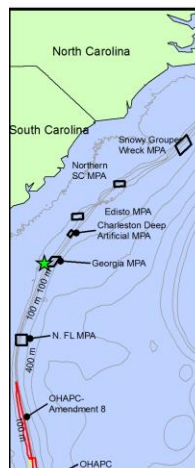
Class/Scientific Name	Common Name	ROV 15-01
Actinopterygii		
<i>Canthigaster</i> sp.	puffer	1.37
<i>Centropristis ocyurus</i>	bank sea bass	1.14
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	0.45
<i>Chaetodon sedentarius</i>	reef butterflyfish	0.91
<i>Chromis enchrysurus</i>	yellowtail reeffish	1.37
<i>Haemulon aurolineatum</i>	tomtate	0.22
<i>Halichoeres bathyphilus</i>	greenband wrasse	0.22
<i>Halichoeres</i> sp.	wrasse	8.48
<i>Holacanthus bermudensis</i>	blue angelfish	0.91
<i>Liopropoma eukrines</i>	wrasse bass	1.83
<i>Lutjanus campechanus</i>	red snapper	0.91
<i>Muraena retifera</i>	reticulate moray	0.45
<i>Muraenidae</i>	moray eel	0.22
<i>Mycteroperca microlepis</i>	gag grouper	0.22
<i>Mycteroperca phenax</i>	scamp	6.64
<i>Opsanus</i> sp.	toadfish	0.22
<i>Pagrus pagrus</i>	red porgy	11.23
<i>Pareques iwamotoi</i>	blackbar drum	0.22
<i>Pareques umbrosus</i>	cubbyu	4.58
<i>Pristigenys alta</i>	short bigeye	3.2
<i>Prognathodes aya</i>	bank butterflyfish	2.52
<i>Pterois volitans</i>	lionfish	22
<i>Rhomboplites aurorubens</i>	vermillion snapper	0.22
<i>Seriola dumerili</i>	greater amberjack	3.66
<i>Seriola rivoliana</i>	almaco jack	0.91
<i>Seriola</i> sp.	amberjack	1.37
<i>Serranus phoebe</i>	tattler	4.35
<i>Sphoeroides spengleri</i>	bandtail puffer	0.22

Dive Site: ROV 15-02; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 166

General Location and Dive Track:

ROV 15-02 West of Georgia MPA 19-VI-15-3

- ★ ROV
- ROV Track
- ★ CTD
- ★ ROV 15-02



Site Overview:

Project: 2015 MPA Cruise
Vessel: NOAA Ship *Pisces* Cruise 15-02
Principal Investigator: Stacy Harter
PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444
Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington
Ship Position System DGPS
Data Management: Access Database
Report Analyst: John Reed, Stephanie Farrington
Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/19/2015
ROV: Mohawk ROV
ROV Navigation: Trackpoint II
ROV Sensors: Temperature (°C), Depth (m)
Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs
Digital Photos: 16
Distance (km): 0.26
Sonar Data: NancyFoster_14_08_MPA_GA_Grid
DVD: 1
Hard Drive: 1

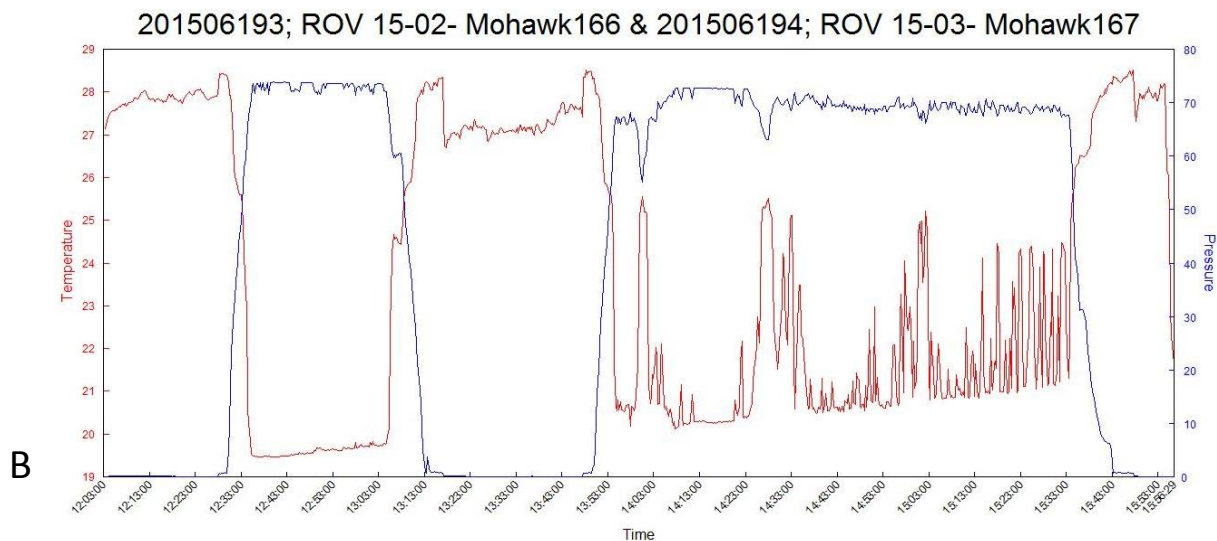
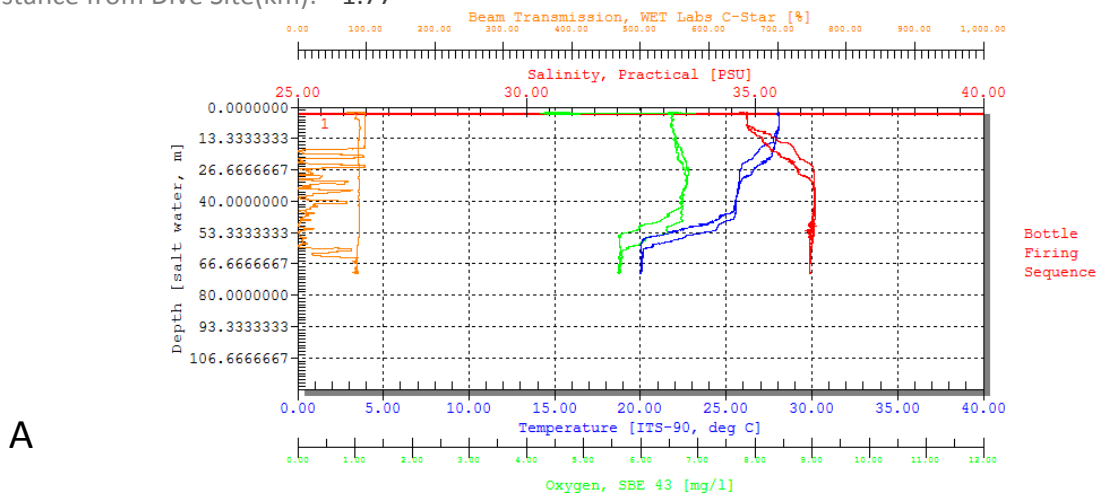
Dive Site: ROV 15-02; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 166

Dive Data:

Minimum Bottom Depth (m):	75	Total Transect Length (km):	0.260
Maximum Bottom Depth (m):	75	Surface Current (kn):	1.25
On Bottom (Time- GMT):	12:38	On Bottom (Lat/Long):	31.63°N; -79.66°W
Off Bottom (Time- GMT):	13:06	Off Bottom (Lat/Long):	31.63°N; -79.66°W
Physical (bottom); Temp (°C):	19.48	Salinity:	Visibility (ft): 15
		Current (kn):	0.25

Physical Environment:

Distance from Dive Site(km): 1.77



A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 70.6 m, Temperature: 20-28.1 °C , Salinity: 34.7-36.3 (PSU), Sound Velocity: 1523.9-1541.6 (m/s), Oxygen Saturation: 4.5-5.1 (ml/l; plot is mg/l), Density: 1022.1-1026 (Kg/m³), Nitrogen Saturation: 8.4-9.4 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-02; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 166

Dive Imagery:



Figure 1: 31°37.5968'N, 79°39.6238'W; -73.9 m
Human debris on sediment



Figure 2: 31°37.5839'N, 79°39.6268'W; -73.8 m
An eel coming out of hole on barren soft bottom



Figure 3: 31°37.5965'N, 79°39.6252'W; -74 m
Tattler near human debris



Figure 4: 31°37.5794'N, 79°39.6339'W; -73.8 m
Hydroid on rubble

Dive Site: ROV 15-02; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 166

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 19-VI-15-3, ROV 15-02, Mohawk UNCW Dive 166. Target Site: Georgia, west of Georgia MPA, NE-SW ridge, depth 70-72 m. MB map- Nancy Foster 14-08_MPA_GA_Grid.

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Dive ended early; unable to get to reef, unable to station keep. Seas 2', wind 10 kn, surface current 1.25 kn.

Site Description/Habitat

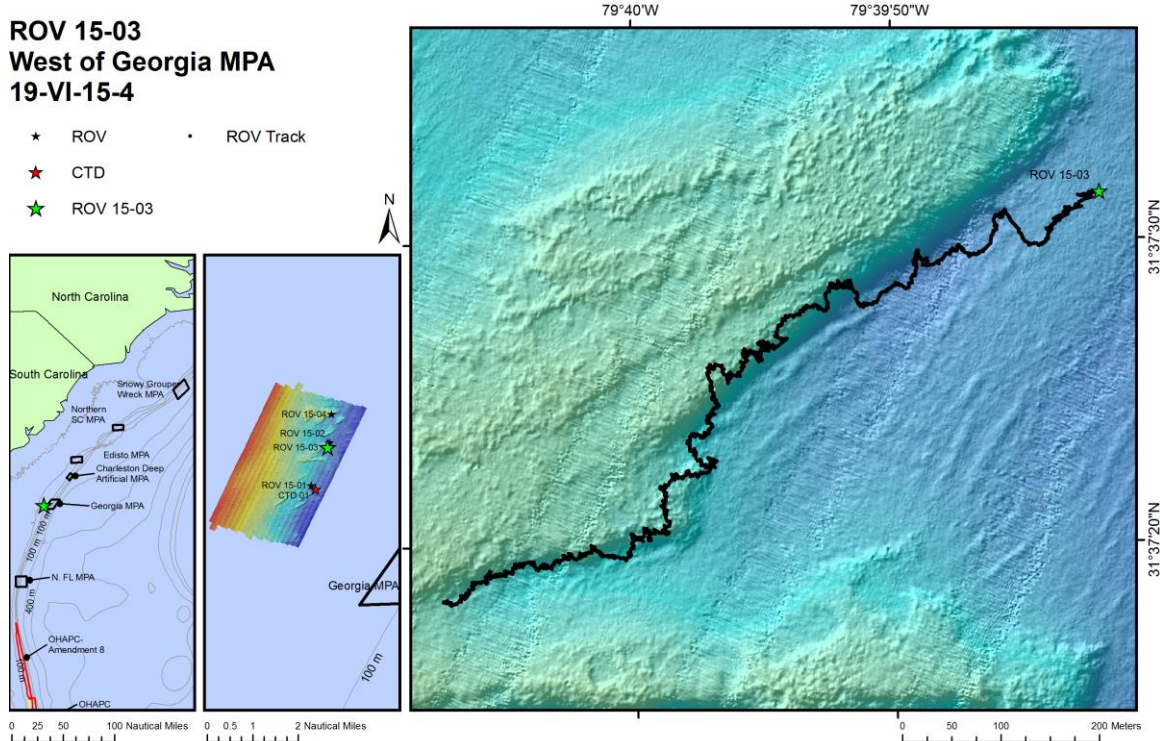
Depth range: 75 m.

12:39- on bottom- 75 m, 229 m NE of reef on flat sand bottom.

13:06- end dive, unable to get to reef.

Dive Site: ROV 15-03; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 167

General Location and Dive Track:



Site Overview:

Project: 2015 MPA Cruise
Vessel: NOAA Ship *Pisces* Cruise 15-02
Principal Investigator: Stacy Harter
PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444
Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington
Ship Position System DGPS
Data Management: Access Database
Report Analyst: John Reed, Stephanie Farrington
Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/19/2015
ROV: Mohawk ROV
ROV Navigation: Trackpoint II
ROV Sensors: Temperature (°C), Depth (m)
Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs
Digital Photos: 82
Distance (km): 1.07
Sonar Data: NancyFoster_14_08_MPA_GA_Grid
DVD: 2
Hard Drive: 1

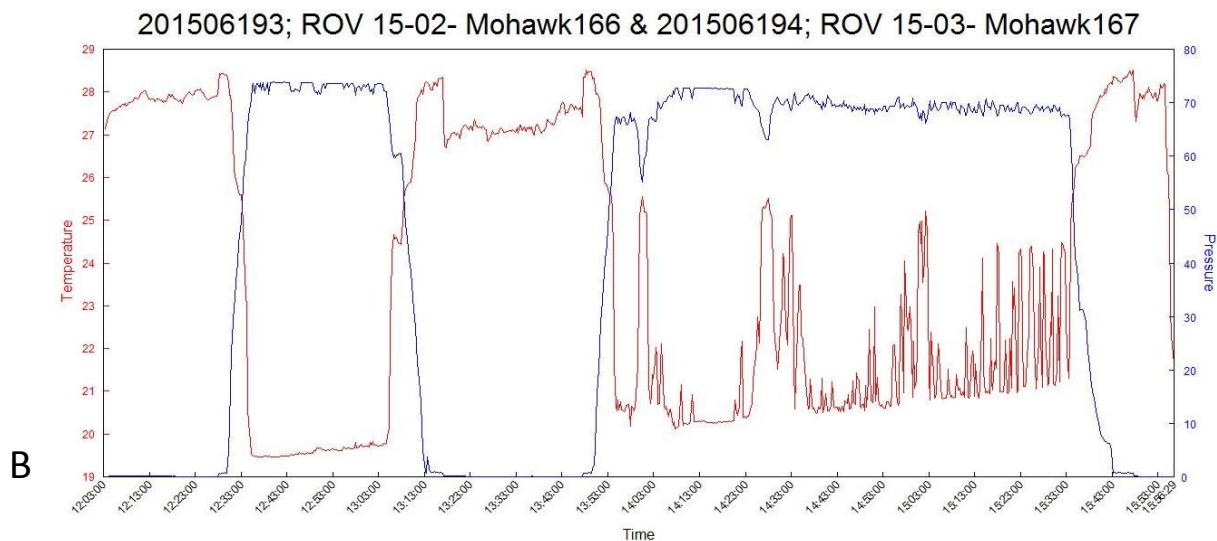
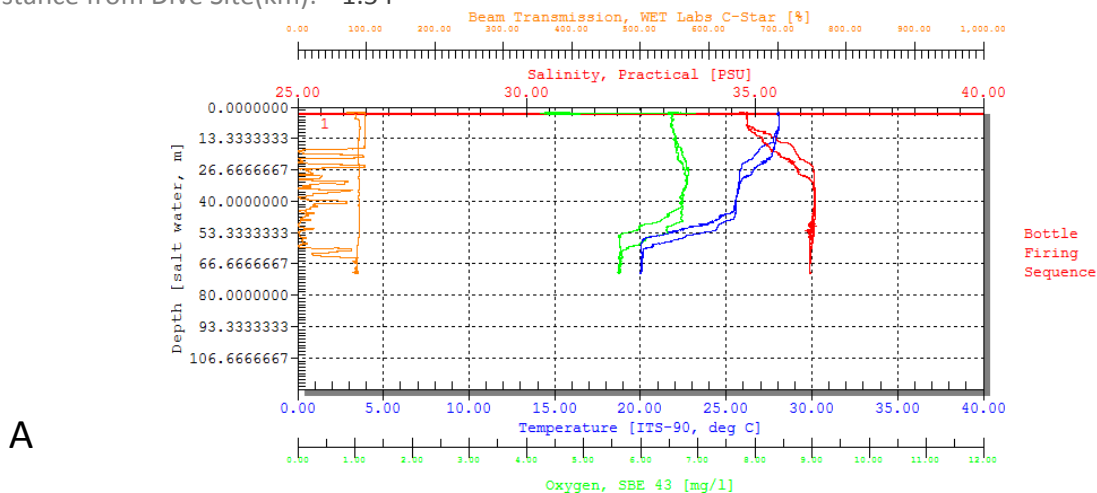
Dive Site: ROV 15-03; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 167

Dive Data:

Minimum Bottom Depth (m):	70	Total Transect Length (km):	1.070
Maximum Bottom Depth (m):	72	Surface Current (kn):	0.8
On Bottom (Time- GMT):	13:56	On Bottom (Lat/Long):	31.63°N; -79.66°W
Off Bottom (Time- GMT):	15:33	Off Bottom (Lat/Long):	31.62°N; -79.67°W
Physical (bottom); Temp (°C):	20.55	Salinity:	Visibility (ft): 15 Current (kn):

Physical Environment:

Distance from Dive Site(km): 1.54



A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 70.6 m, Temperature: 20-28.1 °C , Salinity: 34.7-36.3 (PSU), Sound Velocity: 1523.9-1541.6 (m/s), Oxygen Saturation: 4.5-5.1 (ml/l; plot is mg/l), Density: 1022.1-1026 (Kg/m³), Nitrogen Saturation: 8.4-9.4 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-03; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 167

Dive Imagery:



Figure 1: 31°37.4746'N, 79°39.8653'W; -70.8 m
Lionfish, *Diodogorgia* gorgonians and *Stichopathes* black coral on pavement



Figure 2: 31°37.4198'N, 79°39.953'W; -69.6 m
Cubbyu and lionfish with an artillery shell under a ledge



Figure 3: 31°37.3275'N, 79°40.0377'W; -69.5 m
Blue angelfish and bank butterflyfish on a low relief outcrop



Figure 4: 31°37.3648'N, 79°39.9862'W; -70.3 m
Reticulate moray eel under a rock

Dive Site: ROV 15-03; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 167

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 19-VI-15-4, ROV 15-03, Mohawk UNCW Dive 167. Target Site: Georgia, west of Georgia MPA, NE-SW ridge, depth 70-72 m. Same site as previous dive. MB map- Nancy Foster 14-08_MPA_GA_Grid.

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Dive ended early; unable to get to reef, unable to station keep. Seas 2', wind 10 kn, surface current 1.25 kn.

Site Description/Habitat:

Depth range: 70-72 m.

MB map shows NE-SW oriented ridge, flat plateau on top. Transect along east edge and slope.

13:56- on bottom, 70 m, east of reef. 100% soft bottom, 200 m W of WP at NE end.

14:05- at NE end of reef, 71.5 m; top of east slope; pavement with sediment veneer. *Diodogorgia*, *Didemnidae*, *Stichopathes* dominant. *Virgularia presbytes* in coarse sand and shell hash.

73 m- base of slope, sediment, off reef. Trouble station keeping.

14:35- on east slope, 72 m. On and off bottom, trouble station keeping. On reef- pavement, sediment veneer, some 10-20 cm ledges, >5 dg slope. Head SW along ridge and slope. Lionfish and scamp common. 70% hard bottom, pavement, few ½ m diameter boulders, with <30 cm relief.

69.5 m- ½ m ledges on slope.

WP 2- 71 m, east slope, pavement with shell hash. Change heading to S to WP 3. Habitat the same.

WP 3- 70.3 m; same; head SW to WP 4 along slope.

WP 4- 70 m, top of ridge slope. End dive.

Dominant Macrobiota:

Octocorals- *Diodogorgia*, *Titanideum frauenfeldii*, *Bebryce*

Antipatharia- *Stichopathes lutkeni*

Other Cnidaria- Hydroida, Corallimorpharia, *Virgularia presbytes*

Porifera- red and yellow encrusting demosponges, *Spongosorites*

Asteroidea- *Narcissia trigonaria*

Chordata- *Didemnidae*

Fish:

Lionfish, scamp, red snapper, cubbyu

Dive Site: ROV 15-03; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 167

CPCe Percent Cover Analysis:

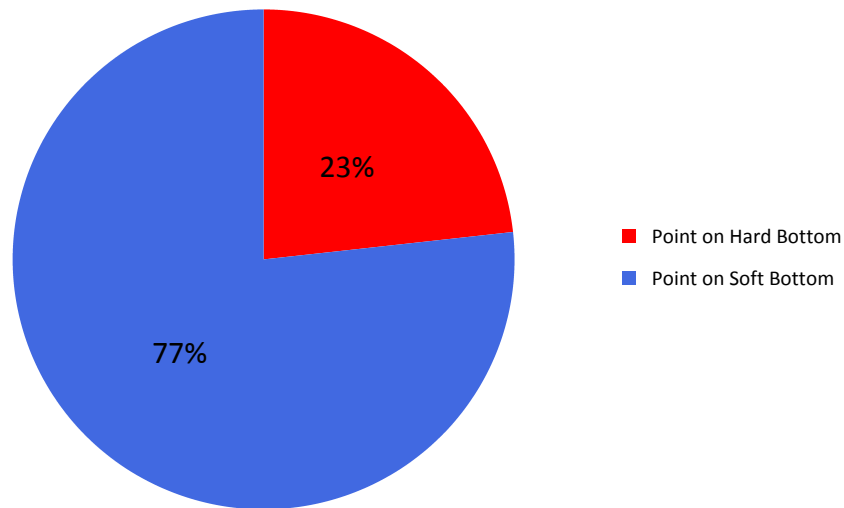


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-03. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

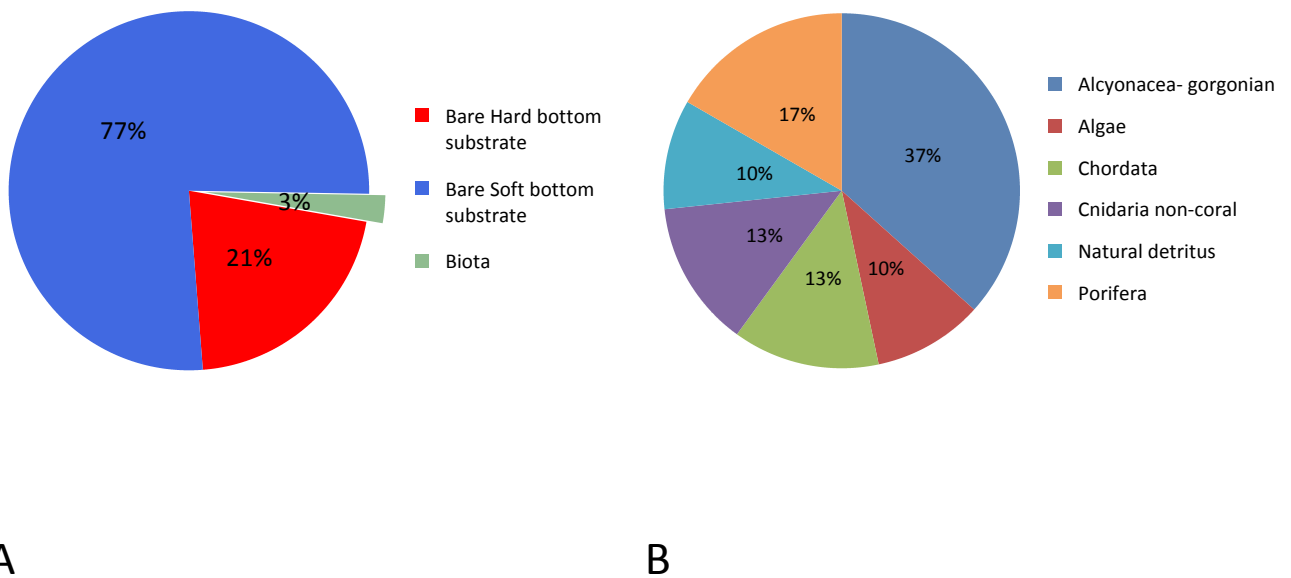


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-03. A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Dive Site: ROV 15-03; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 167

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-03.

Benthic Macro-biota and Substrate Type	ROV 15-03	
	Point Count	% Cover
Biota	30	2.51%
Algae	3	0.25%
Phaeophyta	3	0.25%
Porifera	5	0.42%
Demospongiae	2	0.17%
Spirastrellidae	2	0.17%
Spongosorites sp.	1	0.08%
Alcyonacea- gorgonian	11	0.92%
Diodogorgia sp.	11	0.92%
Cnidaria non-coral	4	0.33%
Hydroidolina	4	0.33%
Chordata	4	0.33%
Fish	4	0.33%
Natural detritus	3	0.25%
Natural detritus	3	0.25%
Bare hard bottom substrate	251	20.99%
Bare Hard bottom	251	20.99%
Bare rock- pavement boulder ledge	242	20.23%
Bare rubble- rock	9	0.75%
Bare soft bottom substrate	915	76.51%
Grand Total	1196	100.00%

Dive Site: ROV 15-03; Georgia, West of Georgia MPA, 73 m depth, NE/SW Ridges, UNCW 167

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 15-03.

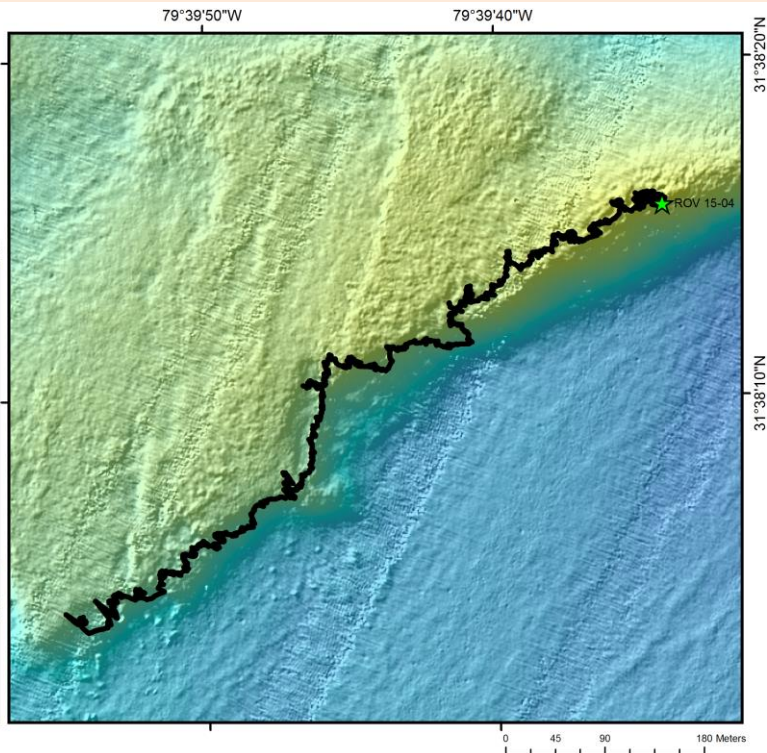
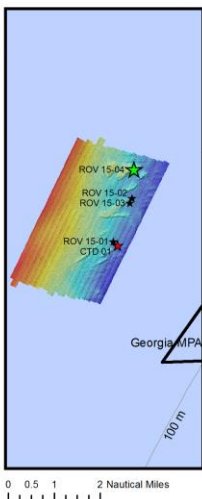
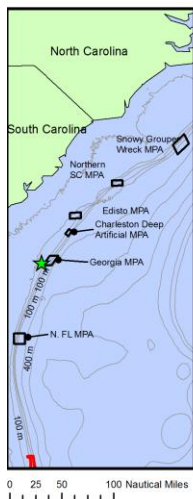
Class/Scientific Name	Common Name	ROV 15-03
Actinopterygii		
<i>Apogon pseudomaculatus</i>	twospot cardinalfish	1.04
<i>Apogon</i> sp.	cardinalfish	1.3
<i>Canthigaster</i> sp.	puffer	4.42
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	0.52
<i>Chaetodon sedentarius</i>	reef butterflyfish	3.9
<i>Chromis enchrysurus</i>	yellowtail reeffish	12.49
<i>Halichoeres bathyphilus</i>	greenband wrasse	0.52
<i>Halichoeres</i> sp.	wrasse	3.38
<i>Hemanthias vivanus</i>	red barbier	0.52
<i>Holacanthus bermudensis</i>	blue angelfish	1.56
<i>Liopropoma eukrines</i>	wrasse bass	1.04
<i>Lutjanus campechanus</i>	red snapper	0.52
<i>Muraena retifera</i>	reticulate moray	0.26
<i>Mycteroperca phenax</i>	scamp	3.38
<i>Pagrus pagrus</i>	red porgy	3.12
<i>Pareques iwamotoi</i>	blackbar drum	0.26
<i>Pareques umbrosus</i>	cubbyu	20.03
<i>Pristigenys alta</i>	short bigeye	7.28
<i>Prognathodes aya</i>	bank butterflyfish	1.82
<i>Pterois volitans</i>	lionfish	10.66
<i>Seriola</i> sp.	amberjack	0.26
<i>Serranus annularis</i>	orangeback bass	0.26
<i>Serranus notospilus</i>	saddle bass	0.26
<i>Serranus phoebe</i>	tattler	1.3
<i>Sphoeroides spengleri</i>	bandtail puffer	1.04

Dive Site: ROV 15-04; Georgia, West of Georgia MPA, 70 m depth, NE/SW Ridge (repeat ROV 14-04), UNCW 168

General Location and Dive Track:

ROV 15-04 West of Georgia MPA 19-VI-15-5

- ★ ROV
- ROV Track
- ★ CTD
- ★ ROV 15-04



Site Overview:

Project: 2015 MPA Cruise

Vessel: NOAA Ship *Pisces* Cruise 15-02

Principal Investigator: Stacy Harter

PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444

Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington

Ship Position System DGPS

Data Management: Access Database

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/19/2015

ROV: Mohawk ROV

ROV Navigation: Trackpoint II

ROV Sensors: Temperature (°C), Depth (m)

Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs

Digital Photos: 91

Distance (km): 0.96

Sonar Data: NancyFoster_14_08_MPA_GA_Grid

DVD: 2

Hard Drive: 1

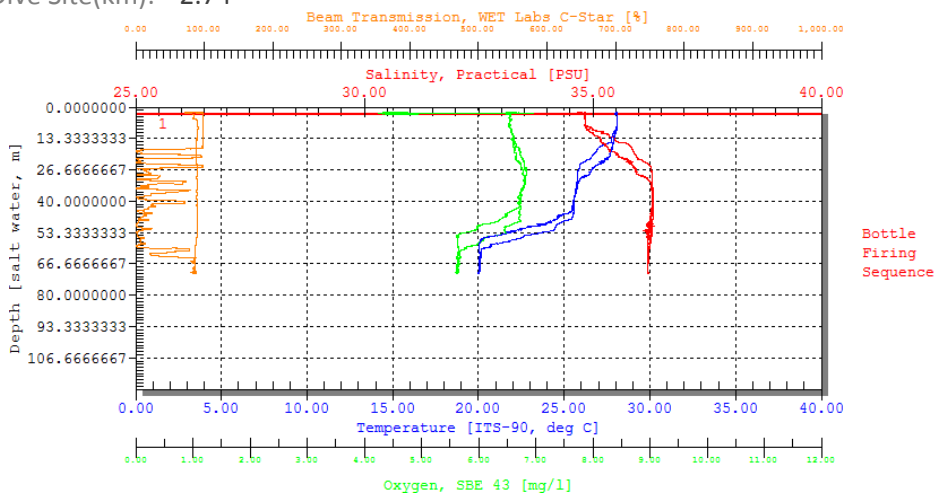
Dive Site: ROV 15-04; Georgia, West of Georgia MPA, 70 m depth, NE/SW Ridge (repeat ROV 14-04), UNCW 168

Dive Data:

Minimum Bottom Depth (m):	66	Total Transect Length (km):	0.960
Maximum Bottom Depth (m):	68	Surface Current (kn):	1
On Bottom (Time- GMT):	16:23	On Bottom (Lat/Long):	31.64°N; -79.66°W
Off Bottom (Time- GMT):	17:39	Off Bottom (Lat/Long):	31.63°N; -79.67°W
Physical (bottom); Temp (°C):	20.67	Salinity:	Visibility (ft): Current (kn):

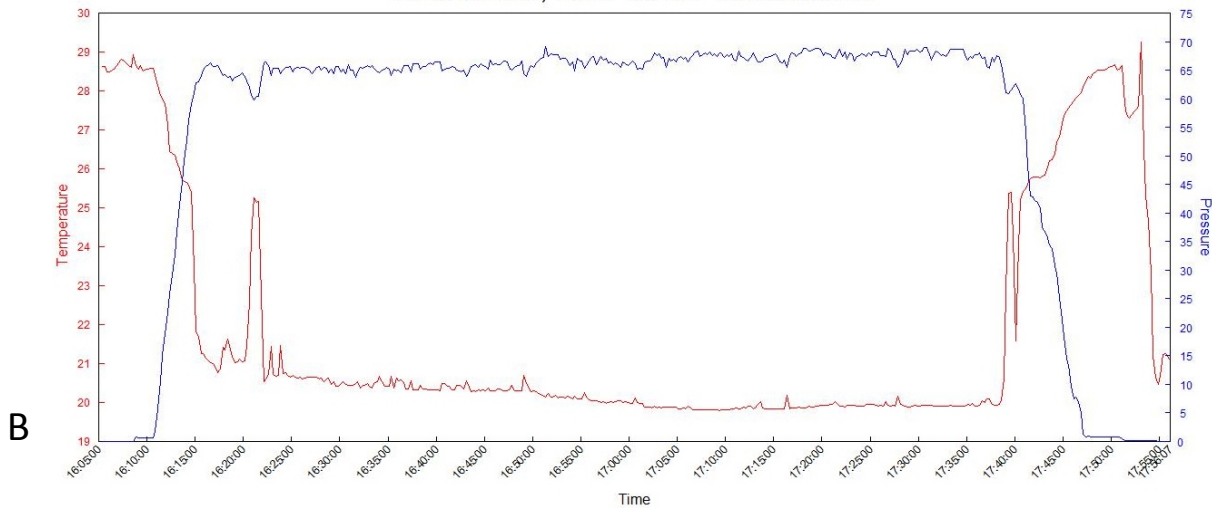
Physical Environment:

Distance from Dive Site(km): 2.74



A

201506195; ROV 15-04- Mohawk168



B

A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 70.6 m, Temperature: 20-28.1 °C , Salinity: 34.7-36.3 (PSU), Sound Velocity: 1523.9-1541.6 (m/s), Oxygen Saturation: 4.5-5.1 (ml/l; plot is mg/l), Density: 1022.1-1026 (Kg/m³), Nitrogen Saturation: 8.4-9.4 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-04; Georgia, West of Georgia MPA, 70 m depth, NE/SW Ridge (repeat ROV 14-04), UNCW 168

Dive Imagery:

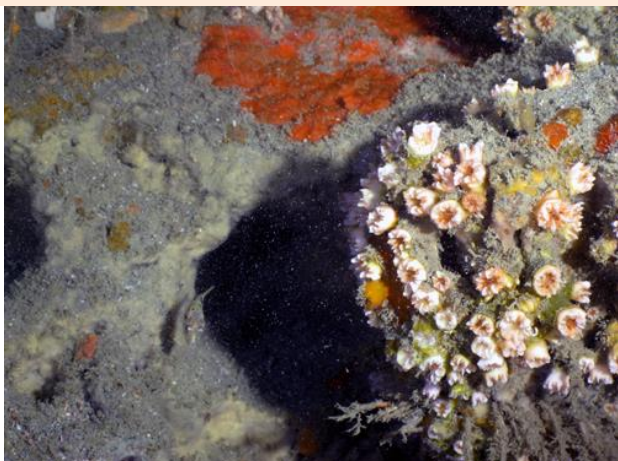


Figure 1: 31°38.0724'N, 79°39.8735'W; -69.1 m
Solitary cup corals (*Phyllangia americana*)



Figure 2: 31°38.0905'N, 79°39.8488'W; -68.6 m
Spotfin butterflyfish and *Diodogorgia* gorgonians

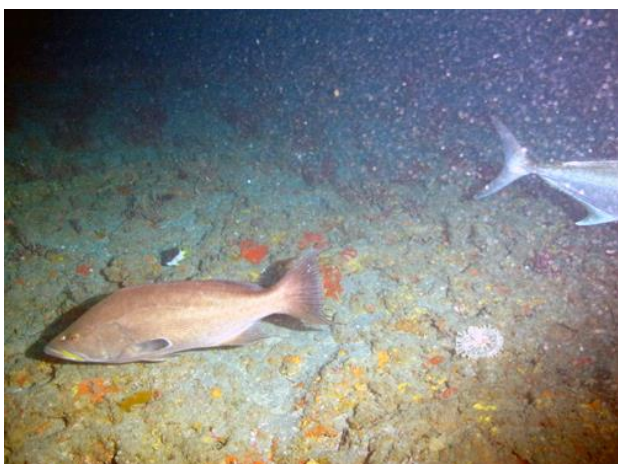


Figure 3: 31°38.1844'N, 79°39.749'W; -67 m
Scamp grouper and jack on pavement



Figure 4: 31°38.0737'N, 79°39.8755'W; -69.1 m
Solitary cup corals and a lionfish

Dive Site: ROV 15-04; Georgia, West of Georgia MPA, 70 m depth, NE/SW Ridge (repeat ROV 14-04), UNCW 168

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 19-VI-15-5, ROV 15-04, Mohawk UNCW Dive 168. Target Site: Georgia, west of Georgia MPA, NE-SW ridge, depth 68 m. Same site as ROV Dive 14-04. MB map- Nancy Foster 14-08_MPA_GA_Grid.

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Dive ended early; unable to get to reef, unable to station keep. Seas 2', wind 10 kn, surface current 1.25 kn.

Site Description/Habitat

Depth range: 66-68.5 m.

MB map shows NE-SW oriented ridge, 1000 m long; 67-71 m. Transect along east edge and slope from NE end to south end.

16:24- on bottom, 66.2 m; top of east edge of ridge, about ½ way between WP 1 and 2. 100% hard bottom, pavement, sediment veneer. Dense biota- *Diodogorgia*, Didemnidae, *Stichopathes*, *Ircinia campana*.

Head SW to WP 2. 66.5 m, few 10 cm ledges, mostly pavement with dense cover.

68 m- east slope, 100% hard bottom, pavement, 10-30 cm relief ledges. Scamp common, most 30 cm.

WP 2- 67.5 m, head to WP 3. On slope, 30-40 cm ledges common on pavement, lots of fish- cubbyu, scamp, AJ, bank butterfly.

WP 3- 68.5 m, top edge of ridge; same biota. Head SW to WP 4 along ridge.

17:23- ½ m ledge with grouper. Top of ridge, flat pavement, longline.

17:27- ½ way to WP 4. Flat rock pavement, small ledges

17:38- 67.0 m; base of reef, pavement with sediment.

17:41- end of dive, near WP 4.

Dominant Macrobiota:

Octocorals- *Diodogorgia*, yellow Plexauridae, *Ellisella* sp., *Titanideum frauenfeldii*

Other Cnidaria- Hydroida, Corallimorpharia

Black coral- *Stichopathes lutkeni*

Porifera- *Ircinia campana*, Axinellidae (3-5 spp), red and yellow encrusting

Decapoda- *Stenorhynchus seticornis*, *Stenopus hispidus*

Asteroidea- *Goniaster tessellatus*

Annelida- *Filograna*

Chordata- Didemnidae

Fish:

Lionfish, blue angelfish, red porgy, bank butterfly, eels, yellowtail reef fish, scamp (common), AJ, black drum

Dive Site: ROV 15-04; Georgia, West of Georgia MPA, 70 m depth, NE/SW Ridge (repeat ROV 14-04), UNCW 168

CPCe Percent Cover Analysis:

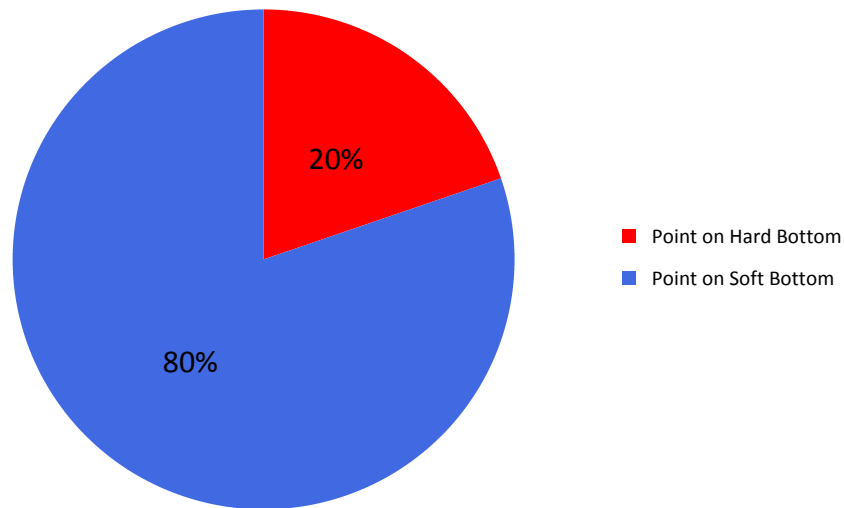
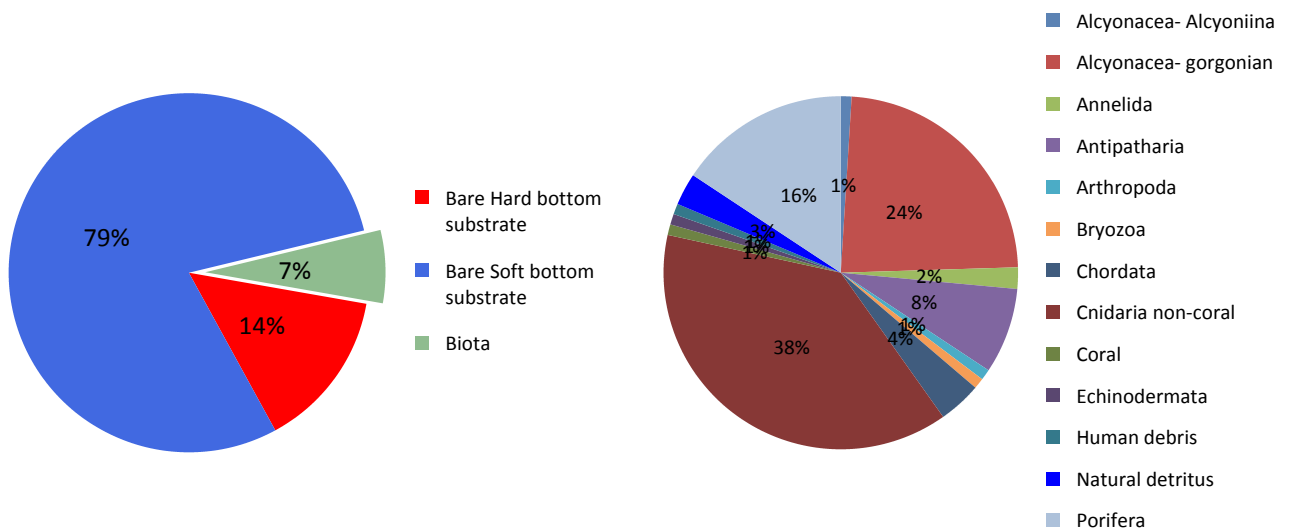


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-04. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-04.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Dive Site: ROV 15-04; Georgia, West of Georgia MPA, 70 m depth, NE/SW Ridge (repeat ROV 14-04), UNCW 168

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-04.

Benthic Macro-biota and Substrate Type	ROV 15-04 Point Count	% Cover
Biota	102	6.56%
Porifera	16	1.03%
Demospongiae	6	0.39%
Spirastrellidae	10	0.64%
Alcyonacea- Alcyoniina	1	0.06%
Nidallia occidentalis	1	0.06%
Alcyonacea- gorgonian	24	1.54%
Diodogorgia sp.	19	1.22%
gorgonian unid	5	0.32%
Antipatharia	8	0.51%
Stichopathes lutkeni	8	0.51%
Cnidaria non-coral	39	2.51%
Hydroidolina	39	2.51%
Coral	1	0.06%
Oculina varicosa	1	0.06%
Annelida	2	0.13%
Filograna sp.	2	0.13%
Arthropoda	1	0.06%
Stenorhynchus seticornis	1	0.06%
Echinodermata	1	0.06%
Goniaster tessellatus	1	0.06%
Bryozoa	1	0.06%
Bryozoa	1	0.06%
Chordata	4	0.26%
Didemnidae	4	0.26%
Natural detritus	3	0.19%
Natural detritus	3	0.19%
Human debris	1	0.06%
Fishing gear/line/long line	1	0.06%
Bare hard bottom substrate	222	14.28%
Bare Hard bottom	222	14.28%
Bare rock- pavement boulder ledge	219	14.08%
Bare rubble- rock	3	0.19%
Bare soft bottom substrate	1231	79.16%
Grand Total	1555	100.00%

Dive Site: ROV 15-04; Georgia, West of Georgia MPA, 70 m depth, NE/SW Ridge (repeat ROV 14-04), UNCW 168

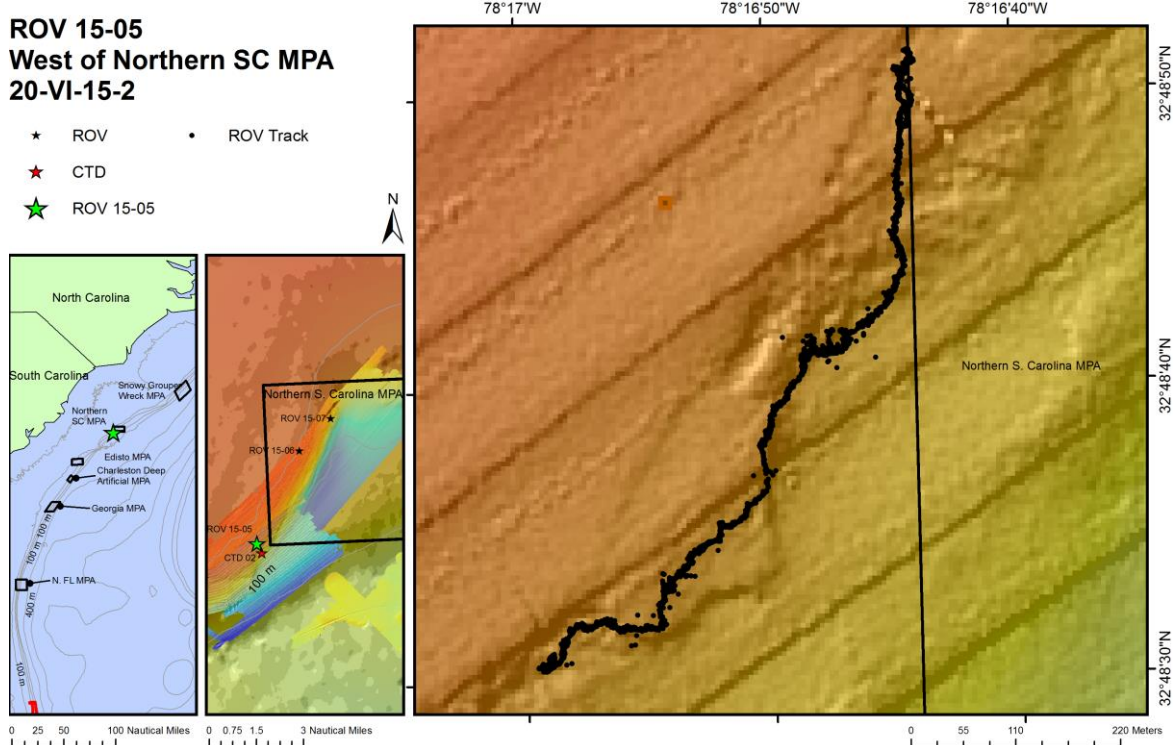
Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 15-04.

Class/Scientific Name	Common Name	ROV 15-04
Actinopterygii		
Anthiinae	anthiid	0.54
<i>Apogon pseudomaculatus</i>	twospot cardinalfish	0.18
<i>Balistes capriscus</i>	gray triggerfish	0.18
<i>Canthigaster</i> sp.	puffer	13.03
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	3.44
<i>Chaetodon sedentarius</i>	reef butterflyfish	5.79
<i>Chromis enchrysurus</i>	yellowtail reeffish	11.58
<i>Chromis scotti</i>	purple reeffish	0.36
<i>Chromis</i> sp.	damselfish	0.18
<i>Halichoeres bathyphilus</i>	greenband wrasse	0.36
<i>Halichoeres</i> sp.	wrasse	3.44
<i>Holacanthus bermudensis</i>	blue angelfish	5.97
Holocentridae	squirrelfish	0.54
<i>Liopropoma eukrines</i>	wrasse bass	1.99
<i>Lutjanus campechanus</i>	red snapper	1.99
<i>Muraena retifera</i>	reticulate moray	0.18
Muraenidae	moray eel	0.18
<i>Mycteroperca microlepis</i>	gag grouper	0.18
<i>Mycteroperca phenax</i>	scamp	4.88
<i>Pagrus pagrus</i>	red porgy	1.08
<i>Pareques iwamotoi</i>	blackbar drum	12.67
<i>Pareques umbrosus</i>	cubbyu	1.81
<i>Priacanthus arenatus</i>	bigeye	0.18
<i>Pristigenys alta</i>	short bigeye	5.43
<i>Prognathodes aya</i>	bank butterflyfish	3.25
<i>Pterois volitans</i>	lionfish	7.78
Scorpaenidae	scorpionfish	0.18
<i>Seriola dumerili</i>	greater amberjack	0.18
<i>Seriola rivoliana</i>	almaco jack	0.72
<i>Seriola</i> sp.	amberjack	0.9
<i>Serranus annularis</i>	orangeback bass	0.18
<i>Serranus phoebe</i>	tattler	2.71
<i>Sphoeroides spengleri</i>	bandtail puffer	1.62

Dive Site: ROV 15-05; South Carolina, West of Northern SC MPA, 65 m depth, Ridges (repeat ROV 14-06), UNCW 169

General Location and Dive Track:



Site Overview:

Project: 2015 MPA Cruise

Vessel: NOAA Ship *Pisces* Cruise 15-02

Principal Investigator: Stacy Harter

PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444

Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington

Ship Position System DGPS

Data Management: Access Database

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/20/2015

ROV: Mohawk ROV

ROV Navigation: Trackpoint II

ROV Sensors: Temperature (°C), Depth (m)

Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs

Digital Photos: 121

Distance (km): 2.17

Sonar Data: Pisces_2012_NorthernSouthCarolinaMPA_MB_Grid

DVD: 2

Hard Drive: 1

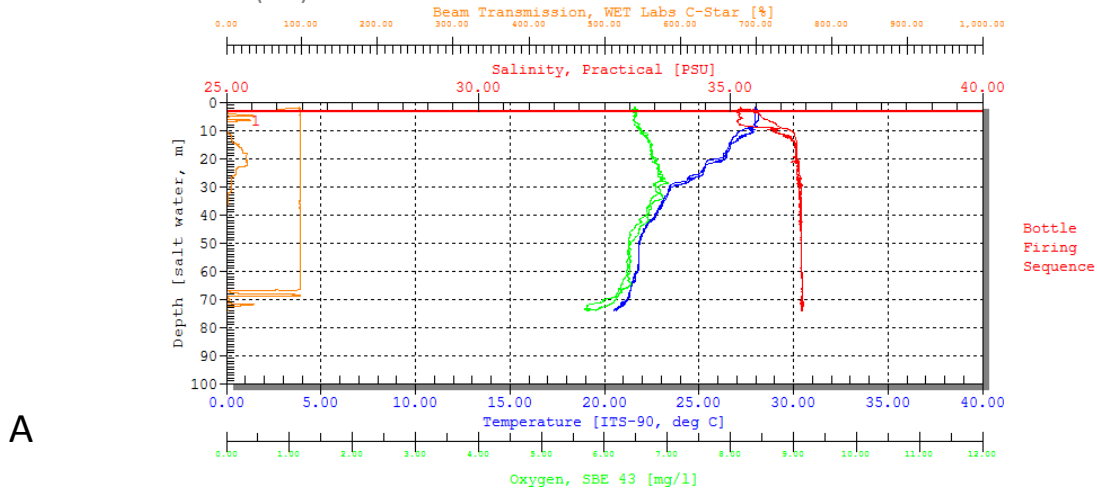
Dive Site: ROV 15-05; South Carolina, West of Northern SC MPA, 65 m depth, Ridges (repeat ROV 14-06), UNCW 169

Dive Data:

Minimum Bottom Depth (m):	64	Total Transect Length (km):	2.170
Maximum Bottom Depth (m):	71	Surface Current (kn):	0.5
On Bottom (Time- GMT):	12:26	On Bottom (Lat/Long):	32.81°N; -78.29°W
Off Bottom (Time- GMT):	13:57	Off Bottom (Lat/Long):	32.81°N; -78.28°W
Physical (bottom); Temp (°C):	21.83	Salinity:	Visibility (ft): 30 Current (kn): 0.75

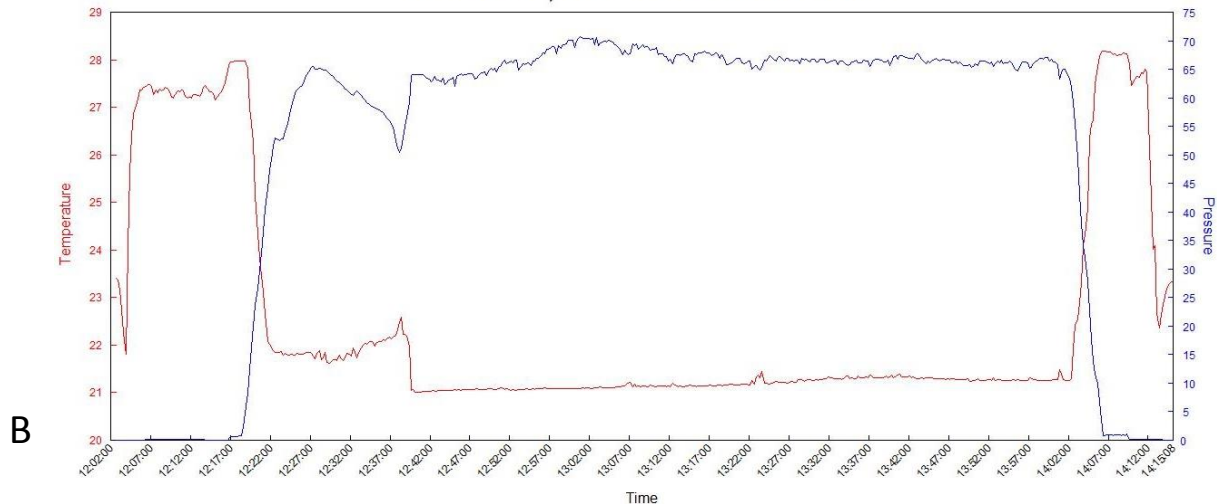
Physical Environment:

Distance from Dive Site(km): 1.18



A

201506202; ROV 15-05- Mohawk169



B

A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 74.2 m, Temperature: 20.5-28.2 °C , Salinity: 34.6-36.5 (PSU), Sound Velocity: 1525.6-1542.5 (m/s), Oxygen Saturation: 4.5-5.1 (ml/l; plot is mg/l), Density: 1022.1-1026 (Kg/m³), Nitrogen Saturation: 8.3-9.4 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-05; South Carolina, West of Northern SC MPA, 65 m depth, Ridges (repeat ROV 14-06), UNCW 169

Dive Imagery:



Figure 1: 32°48.8466'N, 78°16.7495'W; -63.8 m
Orange octocoral (*Swiftia exserta*)



Figure 2: 32°48.846'N, 78°16.745'W; -63.5 m
Hogfish on sediment veneer pavement



Figure 3: 32°48.5339'N, 78°16.9162'W; -67.5 m
Hogfish; super male phase



Figure 4: 32°48.7174'N, 78°16.7577'W; -70.2 m
Yellow and orange gorgonians on pavement

Dive Site: ROV 15-05; South Carolina, West of Northern SC MPA, 65 m depth, Ridges (repeat ROV 14-06), UNCW 169

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 20-VI-15-2, ROV 15-05, Mohawk UNCW Dive 169, Harter Site 30; previous ROV Dive 14-06. Target Site- South Carolina. Outside Northern SC MPA; NE-SW ridge, SW of MPA; 67 m depth. MB: Pisces 2012 _Northern_SCMPA_MB_Grid. Ridge on east slope of plateau; 67 m. Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Launched 1 km from dive site; lots of ship positioning difficulties. Dive delayed due to rain, lightning.

Site Description/Habitat:

Depth range: 64-71 m.

MB map shows NE-SW ridge, 4500 m long. Transect along east slope of ridge.

12:40- 64.3 m, on bottom; pavement/sediment with coarse sand. No exposed rock or ledges, flat, low rugosity. Dense cover of biota, 80% cover- *Diodogorgia*, *Ellisella*, 30 cm *Swiftia*, *Dictyota*, sponges, cake sponges, *Spongosorites siliquaria*, *Aplysina*.

67 m- just outside west boundary of MPA. Sand, rubble, 50-80% biota but very few fish.

69 m- some 10 cm relief ledges, 10-30 cm rock.

13:00- 71 m, edge of MPA but outside. 10-50 cm boulders, but no undercut ledges; 30-80% macrobiota, but very few fish. No rugosity.

70 m- change habitat, 50-100 cm boulders, 10-30 cm relief, high rugosity; more fish, Porgy, bank butterfly, hogfish, scamp.

1310- 68 m, head along ridge S on MB. Very diverse macrobiota, diverse sponges.

67 m- edge of ridge, 5 dg slope, rubble/cobble, low rugosity again, but 80% dense cover.

18:01- 68 m, end of dive, ½ way to WP 2.

Dominant Macrobiota:

Octocoral- *Diodogorgia*, *Ellisella*, *Bebryce*, *Swiftia exerta*, yellow Plexauridae

Porifera- various encrusting demosponges, *Aplysina*, *Spongosorites siliquaria*, Demo cake sponge, *Agelas clathrodes*, *Ircinia campana*, *Cinachyrella*, *C. vaginalis*, *Auleta*, *Xestospongia* sp.

Asteroidea- *Narcissia trigonaria*

Bryozoa- *Schizoporella*

Algae- *Dictyota* (dense), *Caulerpa racemosa*, green algae, crustose coralline

Fish:

Hog snapper, cherubfish, bank butterfly, scamp (1), porgy, tatler

Dive Site: ROV 15-05; South Carolina, West of Northern SC MPA, 65 m depth, Ridges (repeat ROV 14-06), UNCW 169

CPCe Percent Cover Analysis:

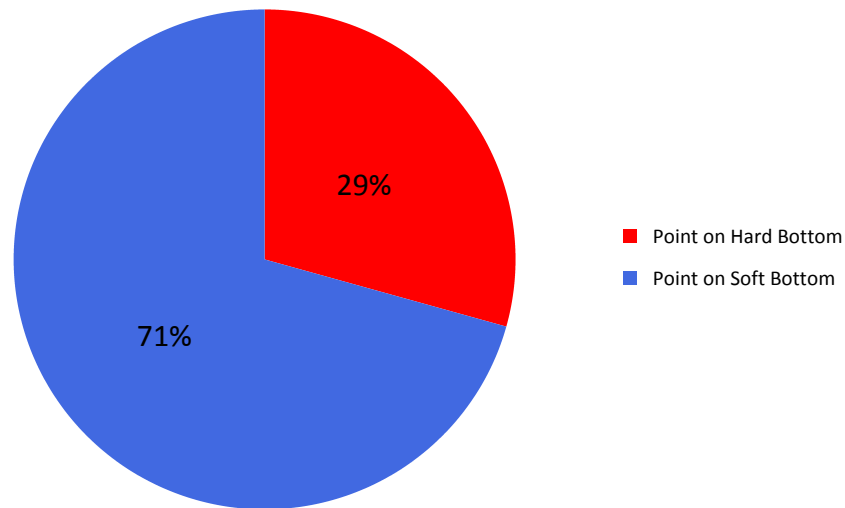
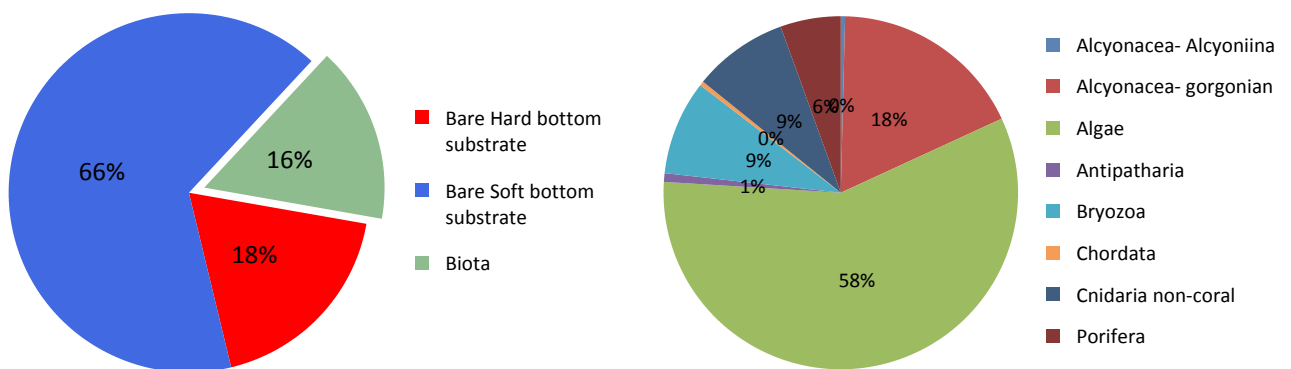


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-05. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-05.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Dive Site: ROV 15-05; South Carolina, West of Northern SC MPA, 65 m depth, Ridges (repeat ROV 14-06), UNCW 169

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-05.

Benthic Macro-biota and Substrate Type	ROV 15-05 Point Count	% Cover
Biota	254	15.88%
Algae	147	9.19%
Corallinales/crustose coralline	13	0.81%
Cyanophyta	44	2.75%
Phaeophyta	79	4.94%
Rhodophyta	11	0.69%
Porifera	14	0.88%
Demospongiae	10	0.63%
Spirastrellidae	4	0.25%
Alcyonacea- Alcyoniina	1	0.06%
Alcyonacea- Alcyoniina	1	0.06%
Alcyonacea- gorgonian	45	2.81%
Diodogorgia sp.	9	0.56%
Ellisella sp.	2	0.13%
Ellisellidae	1	0.06%
gorgonian unid	25	1.56%
Leptogorgia sp.	1	0.06%
Nicella sp.	5	0.31%
Titanideum frauenfeldii	2	0.13%
Antipatharia	2	0.13%
Antipathes atlantica	2	0.13%
Cnidaria non-coral	22	1.38%
Actiniaria	1	0.06%
Hydroidolina	21	1.31%
Bryozoa	22	1.38%
Bryozoa	20	1.25%
Schizoporella sp.	2	0.13%
Chordata	1	0.06%
Ascidacea	1	0.06%
Bare hard bottom substrate	295	18.45%
Bare Hard bottom	295	18.45%
Bare rock- pavement boulder ledge	230	14.38%
Bare rubble- rock	65	4.07%
Bare soft bottom substrate	1050	65.67%
Grand Total	1599	100.00%

Dive Site: ROV 15-05; South Carolina, West of Northern SC MPA, 65 m depth, Ridges (repeat ROV 14-06), UNCW 169

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 15-05.

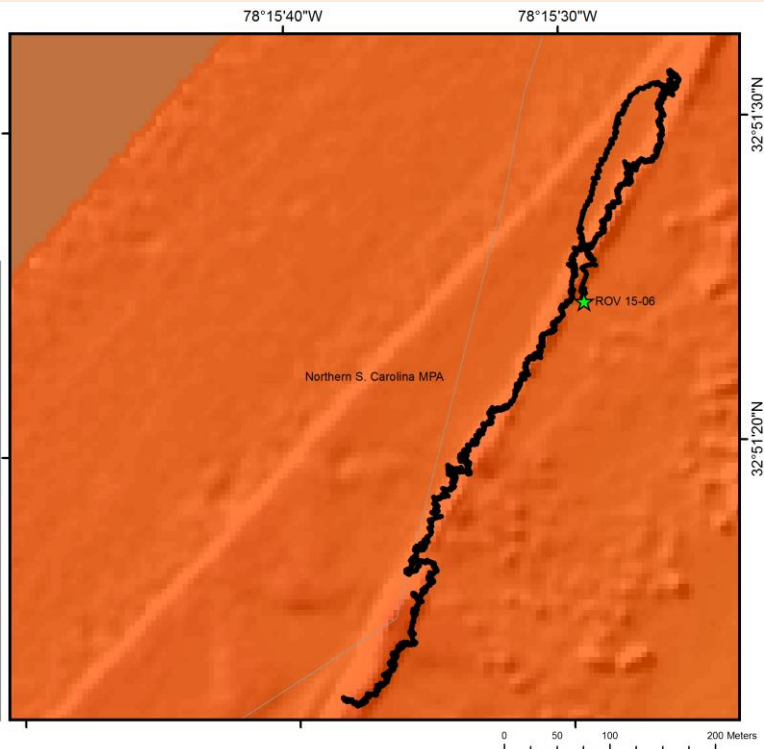
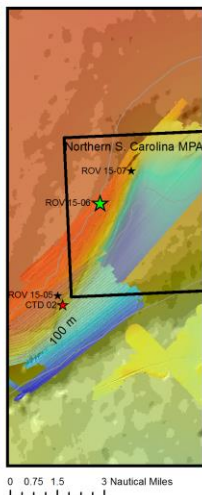
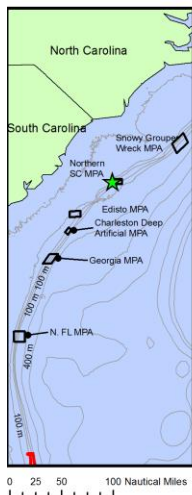
Class/Scientific Name	Common Name	ROV 15-05
Actinopterygii		
<i>Acanthurus</i> sp.	doctorfish	0.37
<i>Bodianus pulchellus</i>	spotfin hogfish	2.59
<i>Calamus</i> sp.	porgy	1.48
<i>Canthigaster</i> sp.	puffer	20.4
<i>Centropyge argi</i>	cherubfish	3.33
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	1.48
<i>Chaetodon sedentarius</i>	reef butterflyfish	8.53
<i>Chromis enchrysurus</i>	yellowtail reeffish	15.95
<i>Chromis insolatus</i>	sunshinefish	8.53
<i>Chromis scotti</i>	purple reeffish	2.22
<i>Chromis</i> sp.	damsel fish	2.22
<i>Halichoeres</i> sp.	wrasse	32.65
<i>Holacanthus bermudensis</i>	blue angelfish	1.85
<i>Holacanthus tricolor</i>	rock beauty	0.37
Holocentridae	squirrelfish	2.59
<i>Lachnolaimus maximus</i>	hogfish	2.96
<i>Lactophrys</i> sp.	cowfish	0.37
<i>Liopropoma eukrines</i>	wrasse bass	1.85
Muraenidae	moray eel	0.37
<i>Mycteroperca microlepis</i>	gag grouper	0.37
<i>Mycteroperca phenax</i>	scamp	0.74
<i>Paranthias furcifer</i>	creole-fish	0.37
<i>Pristigenys alta</i>	short bigeye	2.59
<i>Prognathodes aya</i>	bank butterflyfish	2.96
<i>Pronotogrammus martinicensis</i>	rougtongue bass	2.22
<i>Pterois volitans</i>	lionfish	4.08
Scorpaenidae	scorpionfish	0.37
<i>Seriola dumerili</i>	greater amberjack	0.37
<i>Seriola rivoliana</i>	almaco jack	0.74
<i>Seriola</i> sp.	amberjack	0.74
<i>Serranus annularis</i>	orangeback bass	2.59
<i>Serranus phoebe</i>	tattler	20.4
Sparidae	porgy	0.74

Dive Site: ROV 15-06; S. Carolina, Northern SC MPA, 50 m depth, West Ridge (repeat ROV 12-25, 13-25), UNCW 170

General Location and Dive Track:

ROV 15-06 Northern SC MPA 20-VI-15-3

- ★ ROV
- ROV Track
- ★ CTD
- ★ ROV 15-06



Site Overview:

Project: 2015 MPA Cruise

Vessel: NOAA Ship *Pisces* Cruise 15-02

Principal Investigator: Stacy Harter

PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444

Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington

Ship Position System DGPS

Data Management: Access Database

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/20/2015

ROV: Mohawk ROV

ROV Navigation: Trackpoint II

ROV Sensors: Temperature (°C), Depth (m)

Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs

Digital Photos: 161

Distance (km): 1

Sonar Data: Pisces_2012_NorthernSouthCarolinaMPA_MB_Grid

DVD: 2

Hard Drive: 1

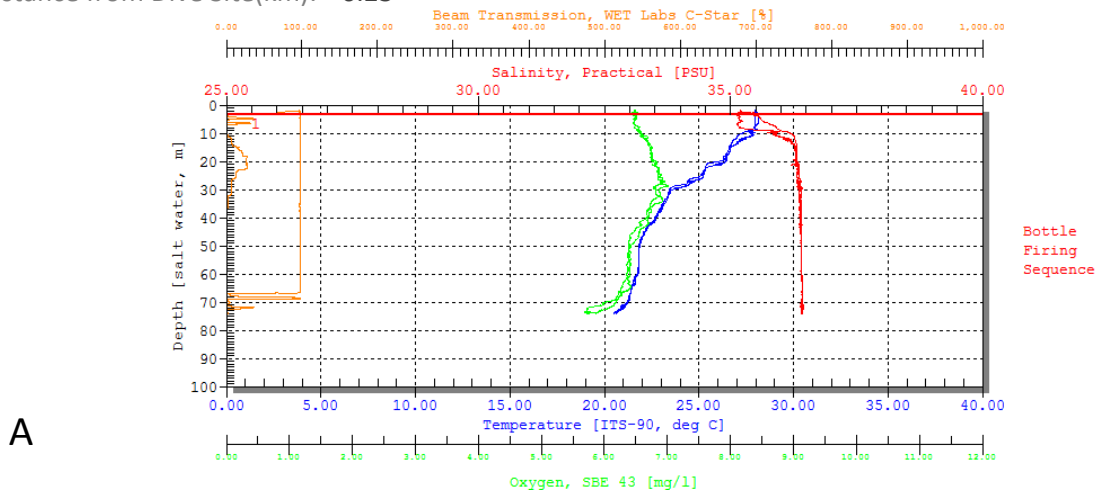
Dive Site: ROV 15-06; S. Carolina, Northern SC MPA, 50 m depth, West Ridge (repeat ROV 12-25, 13-25), UNCW 170

Dive Data:

Minimum Bottom Depth (m):	49	Total Transect Length (km):	1.000
Maximum Bottom Depth (m):	50	Surface Current (kn):	0.75
On Bottom (Time- GMT):	14:55	On Bottom (Lat/Long):	32.86°N; -78.26°W
Off Bottom (Time- GMT):	16:39	Off Bottom (Lat/Long):	32.85°N; -78.26°W
Physical (bottom); Temp (°C):	21.64	Salinity:	Visibility (ft):
			Current (kn):

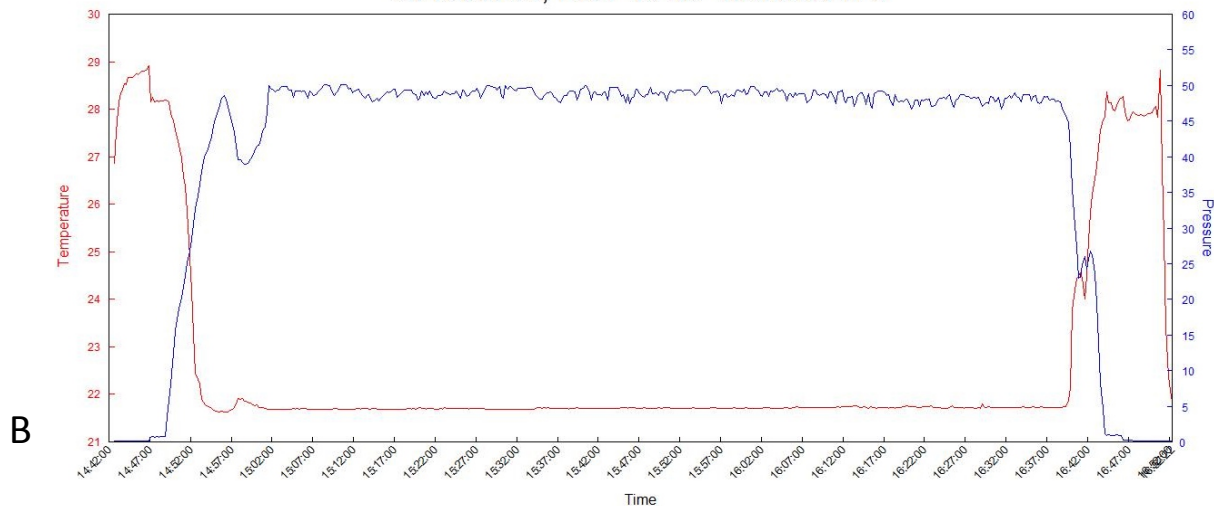
Physical Environment:

Distance from Dive Site(km): 6.23



A

201506203; ROV 15-06- Mohawk 170



B

A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 74.2 m, Temperature: 20.5-28.2 °C , Salinity: 34.6-36.5 (PSU), Sound Velocity: 1525.6-1542.5 (m/s), Oxygen Saturation: 4.5-5.1 (ml/l; plot is mg/l), Density: 1022.1-1026 (Kg/m³), Nitrogen Saturation: 8.3-9.4 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-06; S. Carolina, Northern SC MPA, 50 m depth, West Ridge (repeat ROV 12-25, 13-25), UNCW 170

Dive Imagery:



Figure 1: 32°51.5149'N, 78°15.4358'W; -50.4 m
Dense brown algae (*Dictyota* sp) on rock outcrop habitat



Figure 2: 32°51.4237'N, 78°15.499'W; -49.9 m
Sunshinefish, purple reefish and spotfin hogfish near a hole



Figure 3: 32°51.3202'N, 78°15.5704'W; -49.1 m
Large purple gorgonian (*Muricea* sp.)



Figure 4: 32°51.2873'N, 78°15.5935'W; -48.5 m
Scamp grouper and school of tomtate on moderate relief rock outcrop

Dive Site: ROV 15-06; S. Carolina, Northern SC MPA, 50 m depth, West Ridge (repeat ROV 12-25, 13-25), UNCW 170

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 20-VI-15-3, ROV 15-06, Mohawk UNCW Dive 170, Harter Site 28; previous ROV Dive 12-25, 13-25. Target Site- South Carolina, inside Northern SC MPA; long low relief ridge oriented NE-SW on top of broad plateau; 50 m depth. MB: Pisces 2012_Northern_SCMPA_MB_Grid.

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in TV Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Launched 1 km from dive site; lots of ship positioning difficulties.

Site Description/Habitat

Depth range: 49-50 m.

MB map shows a very long, narrow, well defined ridge, oriented NE-SW on top of broad plateau. Transect heading S along ridge line, covered 500 m from WP 1.

14:55- on bottom. Top of ridge is 49 m, base on either side about 50 m; ridge width varies but about 10-20 m. Nearly 100% hard bottom, mostly pavement with sediment, areas of sediment and rubble. Nearly 100% cover of biota, dense *Dictyota* algae, *Diodogorgia*, *Ellisella* corals. East slope, <10 dg, areas of ½- 1+ m ledges and boulders, high rugosity. West of ridge is coarse sediment and rubble. East slope is smooth rock pavement, no ledges, no rugosity. Dense biota 80-100% cover on top and slopes; dense *Dictyota* algae, *Diodogorgia*, *Ellisella*, sponges, hydroids. Dense fish population, tomtate schools on rugged west slope. Few fish on smooth east slope.

Dominant Macrobiota:

Octocoral- *Diodogorgia*, *Muricea*

Porifera- *Agelas*, *Ircinia*, *Agelas clathrodes*

Decapoda- *Panulirus argus*

Asciacea- Didemnidae

Algae- *Dictyota*, *Stypopodium*?, gooey Rhodophyta, various Chlorophyta, *Halymenia*, *Ulva*

Fish:

Tomtate (dense), graysby, blackbar drum, blue angelfish, lionfish, soapfish, reef butterfly, scamp, rock hind, speckled hind (1), cornet fish, rock beauty

Dive Site: ROV 15-06; S. Carolina, Northern SC MPA, 50 m depth, West Ridge (repeat ROV 12-25, 13-25), UNCW 170

CPCe Percent Cover Analysis:

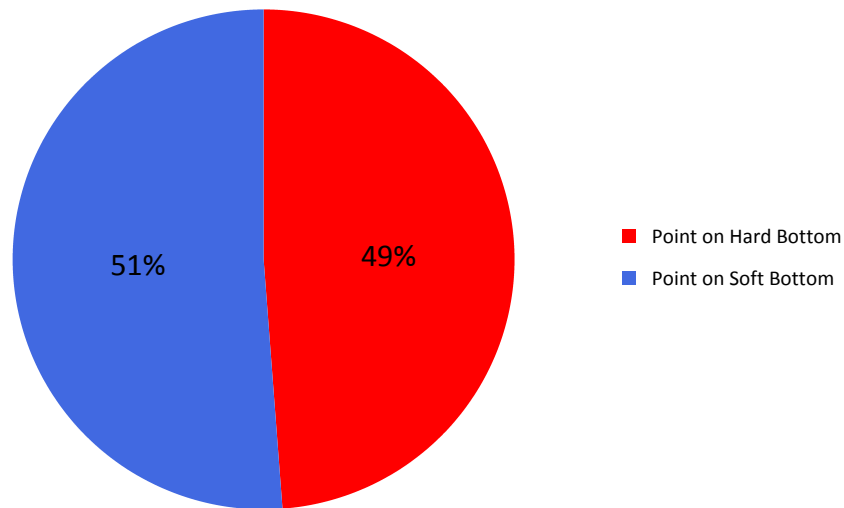
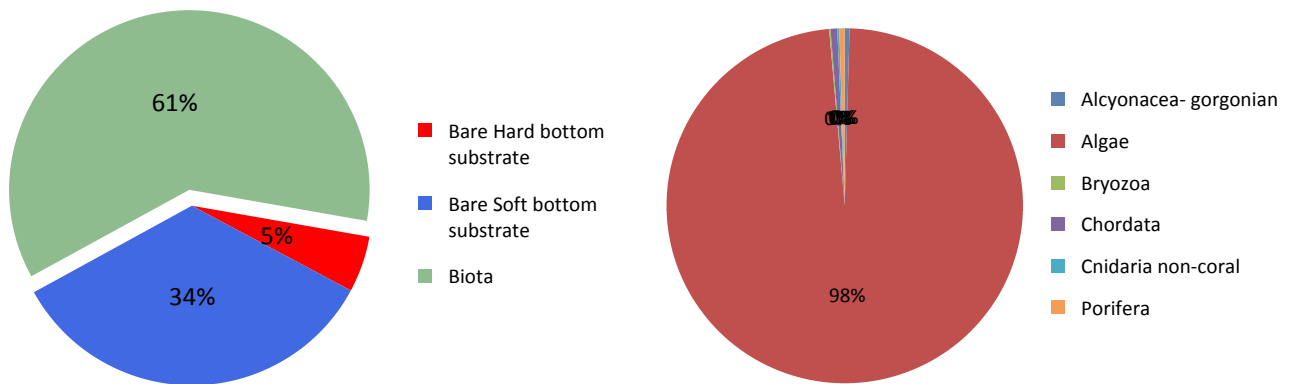


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-06. CPCe® points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-06.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Dive Site: ROV 15-06; S. Carolina, Northern SC MPA, 50 m depth, West Ridge (repeat ROV 12-25, 13-25), UNCW 170

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-06.

Benthic Macro-biota and Substrate Type	ROV 15-06	
	Point Count	% Cover
Biota	1639	60.77%
Algae	1609	59.66%
Chlorophyta	2	0.07%
Corallinales/crustose coralline	6	0.22%
Cyanophyta	3	0.11%
Phaeophyta	1502	55.69%
Rhodophyta	96	3.56%
Porifera	8	0.30%
Aplysina sp.	1	0.04%
Demospongiae- ze tan starlet	3	0.11%
Ircinia sp.	2	0.07%
Spirastrellidae	2	0.07%
Alcyonacea- gorgonian	7	0.26%
Ellisella sp.	7	0.26%
Cnidaria non-coral	3	0.11%
Hydroidolina	3	0.11%
Bryozoa	2	0.07%
Bryozoa	1	0.04%
Schizoporella sp.	1	0.04%
Chordata	10	0.37%
Ascidacea	1	0.04%
Fish	9	0.33%
Bare hard bottom substrate	136	5.04%
Bare Hard bottom	136	5.04%
Bare rock- pavement boulder ledge	133	4.93%
Bare rubble- rock	3	0.11%
Bare soft bottom substrate	922	34.19%
Grand Total	2697	100.00%

Dive Site: ROV 15-06; S. Carolina, Northern SC MPA, 50 m depth, West Ridge (repeat ROV 12-25, 13-25), UNCW 170

Density of Fish:

Table 2. Density (# individuals/1000 m2) of fish from video transects at dive site ROV 15-06.

Class/Scientific Name	Common Name	ROV 15-06
Actinopterygii		
<i>Acanthurus</i> sp.	doctorfish	5.01
Anthiinae	anthiid	0.33
<i>Balistes capriscus</i>	gray triggerfish	0.66
<i>Bodianus pulchellus</i>	spotfin hogfish	22.38
<i>Bodianus rufus</i>	spanish hogfish	1.67
<i>Calamus</i> sp.	porgy	9.35
<i>Canthigaster</i> sp.	puffer	27.39
<i>Centropyge argi</i>	cherubfish	0.66
<i>Cephalopholis cruentata</i>	graysby	2.33
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	4.67
<i>Chaetodon sedentarius</i>	reef butterflyfish	13.36
<i>Chromis cyaneus</i>	blue chromis	0.66
<i>Chromis enchrysurus</i>	yellowtail reeffish	3.34
<i>Chromis insolatus</i>	sunshinefish	40.42
<i>Chromis scotti</i>	purple reeffish	16.7
<i>Chromis</i> sp.	damselfish	10.35
<i>Diodon hystrix</i>	porcupinefish	0.33
<i>Epinephelus adscensionis</i>	rock hind	0.66
<i>Epinephelus guttatus</i>	red hind	0.33
<i>Equetus lanceolatus</i>	jackknife-fish	1.33
<i>Fistularia</i> sp.	cornetfish	0.33
<i>Fistularia tabacaria</i>	bluespotted cornetfish	1.67
<i>Haemulon aurolineatum</i>	tomtate	1871.03
<i>Haemulon plumieri</i>	white grunt	1.33
<i>Haemulon striatum</i>	striped grunt	501.16
<i>Halichoeres garnoti</i>	yellowhead wrasse	28.4
<i>Halichoeres</i> sp.	wrasse	37.75
<i>Holacanthus bermudensis</i>	blue angelfish	6.01
<i>Holacanthus tricolor</i>	rock beauty	2
Holocentridae	squirrelfish	3.34
<i>Kyphosus</i> sp.	chub	0.66
<i>Lachnolaimus maximus</i>	hogfish	0.33
<i>Lactophrys</i> sp.	cowfish	0.33
<i>Liopropoma eukrines</i>	wrasse bass	0.66
<i>Mycteroperca interstitialis</i>	yellowmouth grouper	0.33

Dive Site: ROV 15-06; S. Carolina, Northern SC MPA, 50 m depth, West Ridge (repeat ROV 12-25, 13-25), UNCW 170

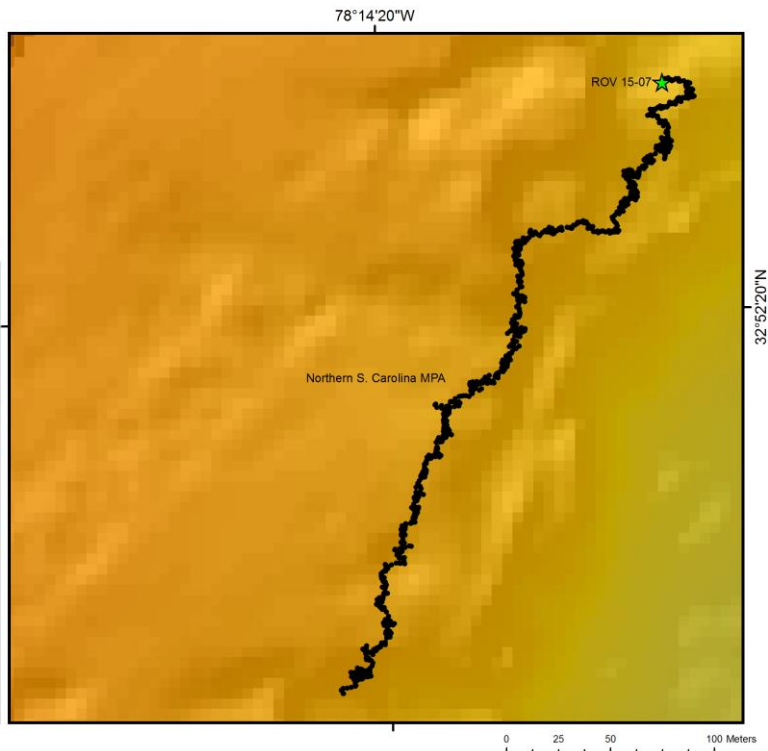
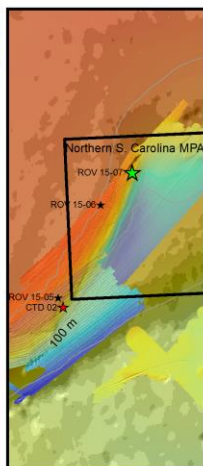
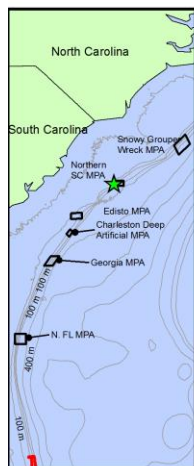
<i>Mycteroperca phenax</i>	scamp	3.34
<i>Myripristis jacobus</i>	blackbar soldierfish	0.33
<i>Pagrus pagrus</i>	red porgy	3.67
<i>Pareques umbrosus</i>	cubbyu	61.47
<i>Prognathodes aya</i>	bank butterflyfish	0.66
<i>Pseudupeneus maculatus</i>	spotted goatfish	8.35
<i>Pterois volitans</i>	lionfish	16.37
<i>Rhomboplites aurorubens</i>	vermillion snapper	10.35
<i>Rypticus saponaceus</i>	greater soapfish	1.33
<i>Seriola rivoliana</i>	almaco jack	2
<i>Seriola</i> sp.	amberjack	0.66
<i>Serranus annularis</i>	orangeback bass	1.33
<i>Serranus phoebe</i>	tattler	4
<i>Serranus tigrinus</i>	harlequin bass	0.33
<i>Sphyraena barracuda</i>	barracuda	0.33
<i>Stegastes partitus</i>	bicolor damselfish	0.33
<i>Synodus intermedius</i>	sand diver	0.33

Dive Site: ROV 15-07; S. Carolina, Northern SC MPA, 66m depth, NE/SW Ridge, (repeat ROV 12-26, 13-26), UNCW 171

General Location and Dive Track:

ROV 15-07 Northern SC MPA 20-VI-15-4

- ★ ROV
- ★ CTD
- ★ ROV 15-07
- ROV Track



Site Overview:

Project: 2015 MPA Cruise

Vessel: NOAA Ship *Pisces* Cruise 15-02

Principal Investigator: Stacy Harter

PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444

Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington

Ship Position System DGPS

Data Management: Access Database

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/20/2015

ROV: Mohawk ROV

ROV Navigation: Trackpoint II

ROV Sensors: Temperature (°C), Depth (m)

Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs

Digital Photos: 55

Distance (km): 0.37

Sonar Data: Pisces_2012_NorthernSouthCarolinaMPA_MB_Grid

DVD: 1

Hard Drive: 1

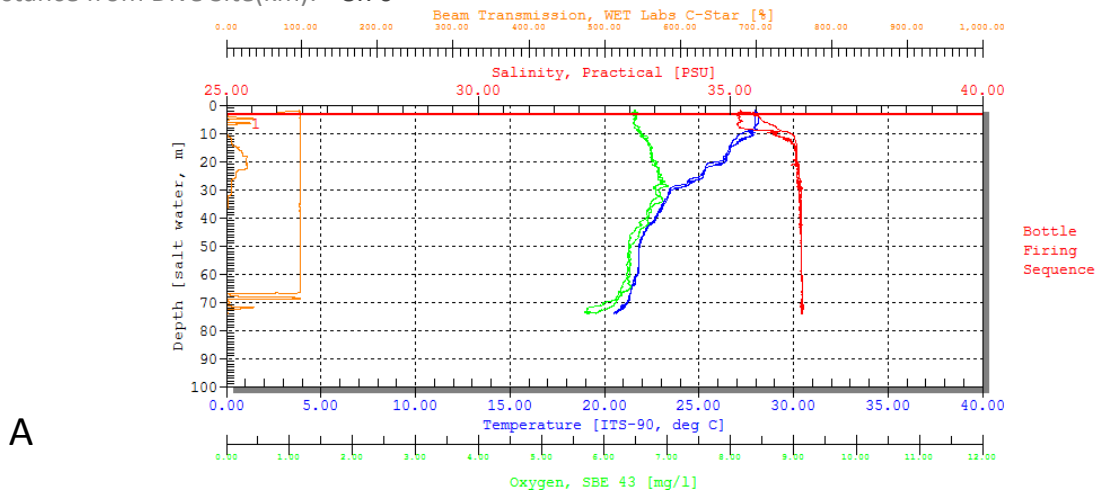
Dive Site: ROV 15-07; S. Carolina, Northern SC MPA, 66m depth, NE/SW Ridge, (repeat ROV 12-26, 13-26), UNCW 171

Dive Data:

Minimum Bottom Depth (m):	63	Total Transect Length (km):	0.370
Maximum Bottom Depth (m):	67	Surface Current (kn):	.2
On Bottom (Time- GMT):	17:57	On Bottom (Lat/Long):	32.87°N; -78.24°W
Off Bottom (Time- GMT):	18:39	Off Bottom (Lat/Long):	32.87°N; -78.24°W
Physical (bottom); Temp (°C):	21.51	Salinity:	Visibility (ft): Current (kn):

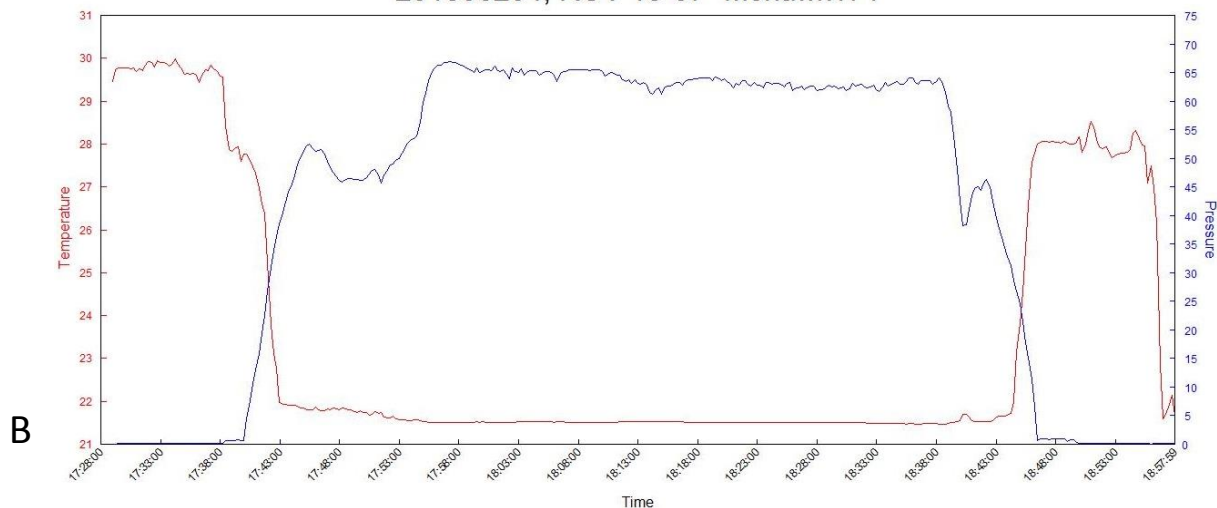
Physical Environment:

Distance from Dive Site(km): 8.70



A

201506204; ROV 15-07- Mohawk171



B

A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 74.2 m, Temperature: 20.5-28.2 °C , Salinity: 34.6-36.5 (PSU), Sound Velocity: 1525.6-1542.5 (m/s), Oxygen Saturation: 4.5-5.1 (ml/l; plot is mg/l), Density: 1022.1-1026 (Kg/m³), Nitrogen Saturation: 8.3-9.4 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-07; S. Carolina, Northern SC MPA, 66m depth, NE/SW Ridge, (repeat ROV 12-26, 13-26), UNCW 171

Dive Imagery:



Figure 1: 32°52.3844'N, 78°14.2549'W; -66.1 m
Hogfish on rock pavement with sediment veneer



Figure 2: 32°52.3783'N, 78°14.2519'W; -66.1 m
Muricea sp. gorgonian

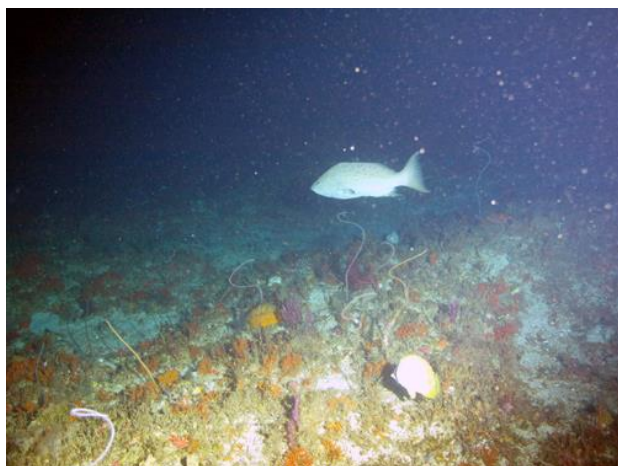


Figure 3: 32°52.3573'N, 78°14.2676'W; -65 m
Scamp and spotfin butterflyfish



Figure 4: 32°52.3295'N, 78°14.2985'W; -64.4 m
Mantis shrimp

Dive Site: ROV 15-07; S. Carolina, Northern SC MPA, 66m depth, NE/SW Ridge, (repeat ROV 12-26, 13-26), UNCW 171

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 20-VI-15-4, ROV 15-07, Mohawk UNCW Dive 171, Harter Site 27; previous ROV Dive 12-26, 13-26. Target Site- South Carolina, inside Northern SC MP; NE-SW ridge, east slope; 68 m depth. MB: Pisces 2012 _Northern_SCPMA_MB_Grid.

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20o to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected.

Site Description/Habitat:

Depth range: 63-67 m.

Transect headed SW along ridge.

17:58- on bottom, 67 m, 150 m S of WP 1. Flat, coarse sand, patchy hard bottom pavement, no ledges. *Diodogorgia*, sponges; hogfish, scamp, porgy.

64 m- top of ridge, sponges, gorgonians, dense bryozoa.

63.5 m- on ridge, hard bottom, low relief rock pavement, few 10-20 cm ledges. Sponges, some *Dictyota*.

MB shows E-W gulley cut through edge of east slope of ridge: Top edge of gulley, 63 m, pavement/sediment, no ledges; sponges, CCA, *Dictyota*. Base of gulley, 64.5 m, 100% soft bottom.

16:39- 64.5 m, end of dive.

Dominant Macrobiota:

Octocoral- *Diodogorgia*, *Ellisella*, *Muricea*, orange gorgonian, *Titanideum frauenfeldii*

Antipatharia- *Stichopathes lutkeni*, *Antipathes furcata*

Porifera- *Agelas* sp., *Agelas clathrodes*, *Aplysina* white tubes, *Ircinia* sp., *Ircinia campana*, Axinellidae

Bryozoa- *Schizoporella*, bushy orange (*Pentophora*?)

Decapoda- Scyllaridae

Asteroidea- *Narcissia trigonaria*

Asciacea- *Eudistoma*?

Algae- crustose coralline, *Dictyota*, Chlorophyta- bushy.

Fish:

Scamp, hogfish, red porgy, lionfish

Dive Site: ROV 15-07; S. Carolina, Northern SC MPA, 66m depth, NE/SW Ridge, (repeat ROV 12-26, 13-26), UNCW 171

CPCe Percent Cover Analysis:

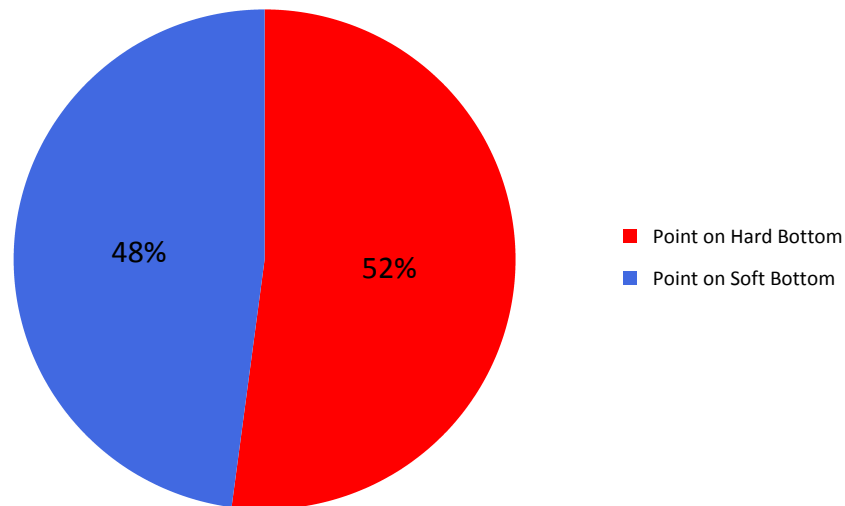
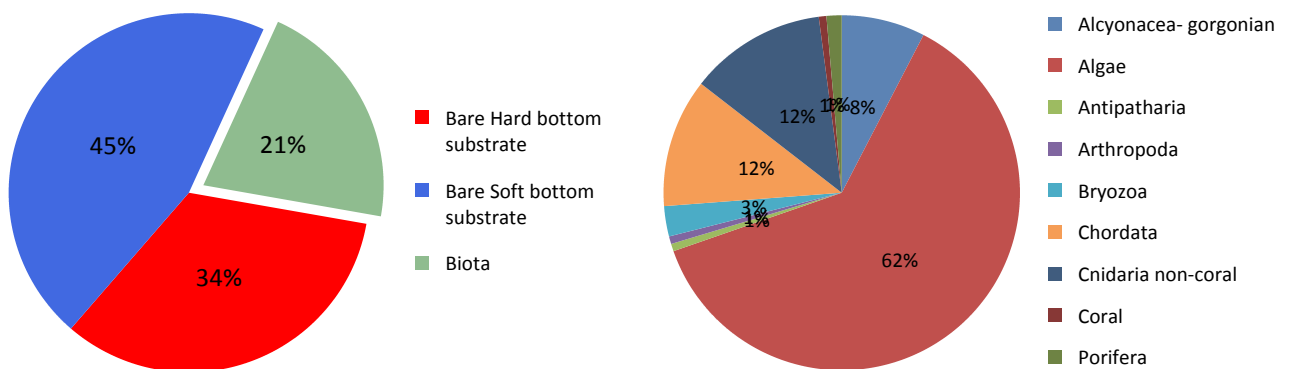


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-07. CPCe® points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-07.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Dive Site: ROV 15-07; S. Carolina, Northern SC MPA, 66m depth, NE/SW Ridge, (repeat ROV 12-26, 13-26), UNCW 171

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-07.

Benthic Macro-biota and Substrate Type	ROV 15-07 Point Count	% Cover
Biota	145	20.98%
Algae	90	13.02%
Corallinales/crustose coralline	8	1.16%
Cyanophyta	2	0.29%
Phaeophyta	75	10.85%
Rhodophyta	5	0.72%
Porifera	2	0.29%
Demospongiae	1	0.14%
Spirastrellidae	1	0.14%
Alcyonacea- gorgonian	11	1.59%
Diodogorgia sp.	5	0.72%
Ellisella sp.	2	0.29%
Ellisellidae	1	0.14%
gorgonian unid	3	0.43%
Antipatharia	1	0.14%
Stichopathes lutkeni	1	0.14%
Cnidaria non-coral	18	2.60%
Hydroidolina	18	2.60%
Coral	1	0.14%
Scleractinia colonial	1	0.14%
Arthropoda	1	0.14%
Scyllaridae	1	0.14%
Bryozoa	4	0.58%
Schizoporella sp.	4	0.58%
Chordata	17	2.46%
Asciacea	14	2.03%
Fish	3	0.43%
Bare hard bottom substrate	232	33.57%
Bare Hard bottom	232	33.57%
Bare rock- pavement boulder ledge	168	24.31%
Bare rubble- rock	64	9.26%
Bare soft bottom substrate	314	45.44%
Grand Total	691	100.00%

Dive Site: ROV 15-07; S. Carolina, Northern SC MPA, 66m depth, NE/SW Ridge, (repeat ROV 12-26, 13-26), UNCW 171

Density of Fish:

Table 2. Density (# individuals/1000 m2) of fish from video transects at dive site ROV 15-07.

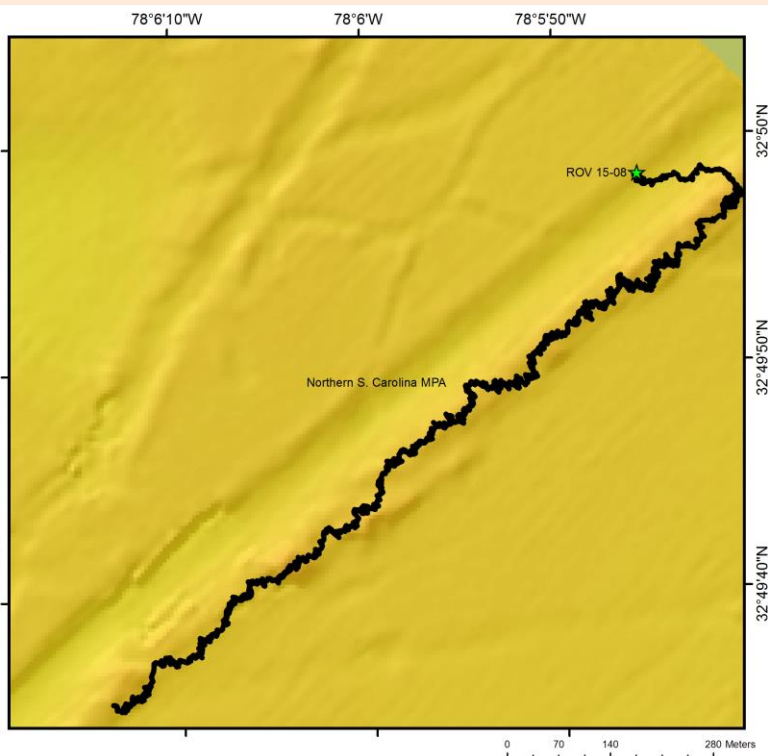
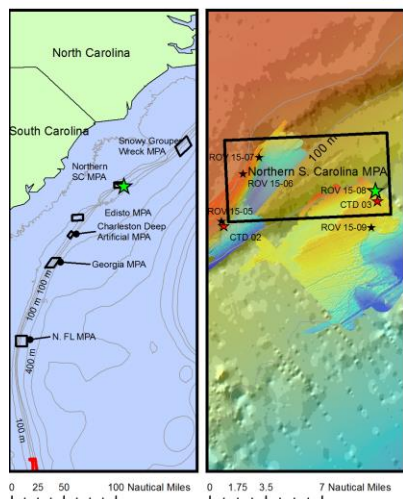
Class/Scientific Name	Common Name	ROV 15-07
Actinopterygii		
<i>Balistes vetula</i>	queen triggerfish	0.78
<i>Bodianus pulchellus</i>	spotfin hogfish	0.78
<i>Calamus</i> sp.	porgy	5.48
<i>Canthigaster</i> sp.	puffer	23.51
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	0.78
<i>Chaetodon sedentarius</i>	reef butterflyfish	11.75
<i>Chromis enchrysurus</i>	yellowtail reeffish	15.67
<i>Chromis insolatus</i>	sunshinefish	5.48
<i>Chromis</i> sp.	damselfish	0.78
<i>Halichoeres bathyphilus</i>	greenband wrasse	7.83
<i>Halichoeres garnoti</i>	yellowhead wrasse	0.78
<i>Halichoeres</i> sp.	wrasse	54.85
<i>Holacanthus bermudensis</i>	blue angelfish	5.48
<i>Lachnolaimus maximus</i>	hogfish	1.56
<i>Liopropoma eukrines</i>	wrasse bass	2.35
<i>Mycteroperca phenax</i>	scamp	1.56
<i>Pagrus pagrus</i>	red porgy	9.4
<i>Pristigenys alta</i>	short bigeye	10.18
<i>Prognathodes aya</i>	bank butterflyfish	2.35
<i>Pterois volitans</i>	lionfish	7.05
<i>Serranus annularis</i>	orangeback bass	8.62
<i>Serranus chionaraia</i>	snow bass	0.78
<i>Serranus phoebe</i>	tattler	25.86
<i>Synodus intermedius</i>	sand diver	1.56

Dive Site: ROV 15-08; South Carolina, Northern SC MPA, (repeat ROV 13-30), 160 m iceberg scour, UNCW 172

General Location and Dive Track:

ROV 15-08 Northern SC MPA 23-VI-15-2

- ★ ROV
- ★ CTD
- ★ ROV 15-08
- ROV Track



Site Overview:

Project: 2015 MPA Cruise
Vessel: NOAA Ship *Pisces* Cruise 15-02
Principal Investigator: Stacy Harter
PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444
Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington
Ship Position System DGPS
Data Management: Access Database
Report Analyst: John Reed, Stephanie Farrington
Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/23/2015
ROV: Mohawk ROV
ROV Navigation: Trackpoint II
ROV Sensors: Temperature (°C), Depth (m)
Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs
Digital Photos: 195
Distance (km): 1.4
Sonar Data: Sedberry_OEBlock2_5m_U TM17N_MB_Grid
DVD: 2
Hard Drive: 1

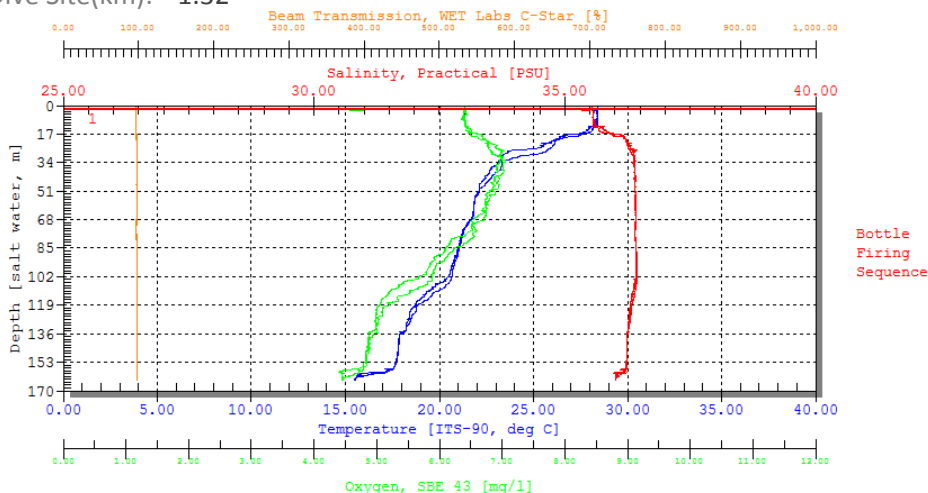
Dive Site: ROV 15-08; South Carolina, Northern SC MPA, (repeat ROV 13-30), 160 m iceberg scour, UNCW 172

Dive Data:

Minimum Bottom Depth (m):	158	Total Transect Length (km):	1.400
Maximum Bottom Depth (m):	162	Surface Current (kn):	.25
On Bottom (Time- GMT):	8:01	On Bottom (Lat/Long):	32.83°N; -78.1°W
Off Bottom (Time- GMT):	10:01	Off Bottom (Lat/Long):	32.83°N; -78.1°W
Physical (bottom); Temp (°C):	15.40	Salinity:	Visibility (ft):
			Current (kn):

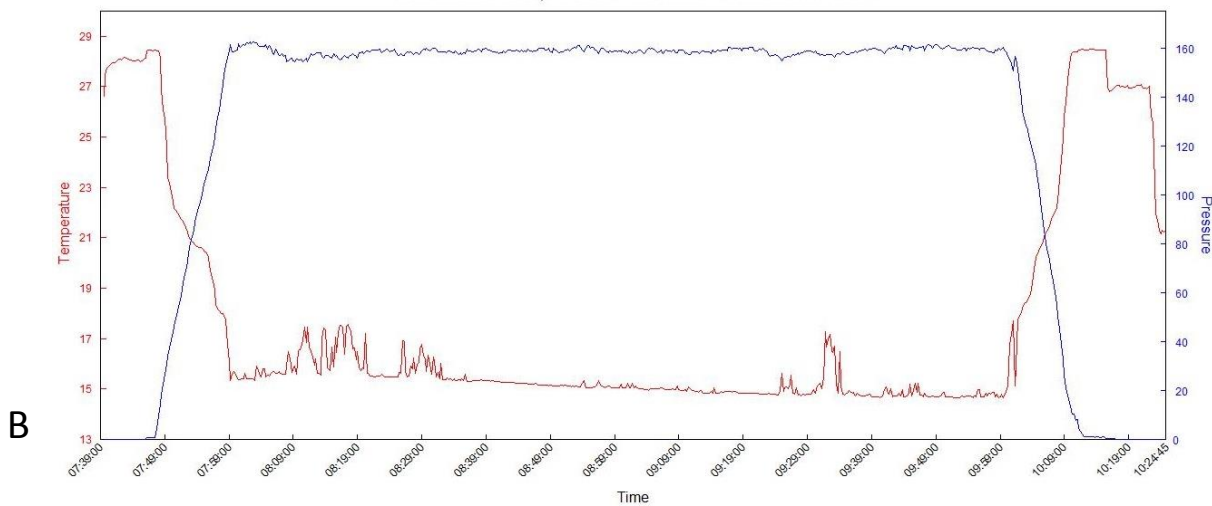
Physical Environment:

Distance from Dive Site(km): 1.32



A

201506232; ROV 15-08- Mohawk172



B

A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 164 m, Temperature: 15.5-28.4 °C , Salinity: 35.3-36.4 (PSU), Sound Velocity: 1512.1-1543 (m/s), Oxygen Saturation: 4.5-5.6 (ml/l; plot is mg/l), Density: 1022.5-1027.4 (Kg/m³), Nitrogen Saturation: 8.3-10.2 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-08; South Carolina, Northern SC MPA, (repeat ROV 13-30), 160 m iceberg scour, UNCW 172

Dive Imagery:



Figure 1: 32°49.6228'N, 78°6.1887'W; -159.5 m
Tube sponge (*Leiodermatium* sp.) and vase sponge (*Corallistes* sp.)



Figure 2: 32°49.7635'N, 78°5.9842'W; -160.2 m
Snowy grouper



Figure 3: 32°49.8249'N, 78°5.8667'W; -161 m
Mithrax spider crab



Figure 4: 32°49.8531'N, 78°5.8466'W; -159.8 m
Blue tunicates

Dive Site: ROV 15-08; South Carolina, Northern SC MPA, (repeat ROV 13-30), 160 m iceberg scour, UNCW 172

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 23-VI-15-2, ROV 15-08, Mohawk UNCW Dive 172, Harter Site 23; previous ROV Dive 13-30. Target Site- South Carolina, inside Northern SC MPA; Ice berg scar site, 160 m. MB: Pisces 2012 _Northern_SCPMA_MB_Grid.

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Inside loop current off Gulf Stream; surface current 0.5 kn to S; greenish surface water; NOAA satellite imagery shows a loop filament off Gulf Stream.

Site Description/Habitat

Depth range: 158-162.5 m.

MB map shows NE-SW oriented scar; transect along the southern rim, heading SW.

08:01- On bottom, 162.5 m, near WP 1. Inside scar, near bottom; 100% soft bottom, fine sediment. Visibility 5-10 m. School of red porgy.

158.5 m- on upper south rim. 30-50 cm boulders, ½ m ledges, 100% hard bottom. Heading SW along top rim. Dense macrobiota and dense fish (see below).

160 m- 30 cm to 1 m boulders; 30-50cm relief. Off rim to the south is 100% soft bottom.

161 m- ½ way to WP 2, still on upper S rim. Varies from pavement/sediment, to high rugosity with ½ m boulders.

158 m- WP 2, top south rim. 10-30 cm boulders.

10:01- 160.5 m, end of dive, south rim.

Dominant Macrobiota:

Very dense biota on all rock surfaces; very dense sponges.

Octocoral- 4-5 spp. of gorgonacea; purple *Nicella*?, yellow gorgonacea, white gorgonacea

Hydroidolina- hydroids (abundant)

Porifera- *Leiodermatium* (abundant), *Corallites typus*, Corallistidae, Pachastrellidae

Mollusca- slit shell, *Perotrochus amabilis*

Holothuroidea- Sea weenies (*Paracoloichirus mysticus*, abundant); *Holothuria lentiginosa*

Asteroidea- unid. Asteroidea

Echinoidea- *Cidaris*

Decapoda- *Mithrax*

Fish:

Bigeye, blackbar drum, blueline tilefish, boarfish, Darwin's slimehead, French butterflyfish, greater amberjack, Laemonema, moray eel, red barbill, red hogfish, rough tongue bass, scamp (3), scorpionfish, snowy grouper (55), vermilion snapper

Dive Site: ROV 15-08; South Carolina, Northern SC MPA, (repeat ROV 13-30), 160 m iceberg scour, UNCW 172

Lots of fishing line on bottom, also several large piles (1 ft x 3 ft) of line.

Dive Site: ROV 15-08; South Carolina, Northern SC MPA, (repeat ROV 13-30), 160 m iceberg scour, UNCW 172

CPCe Percent Cover Analysis:

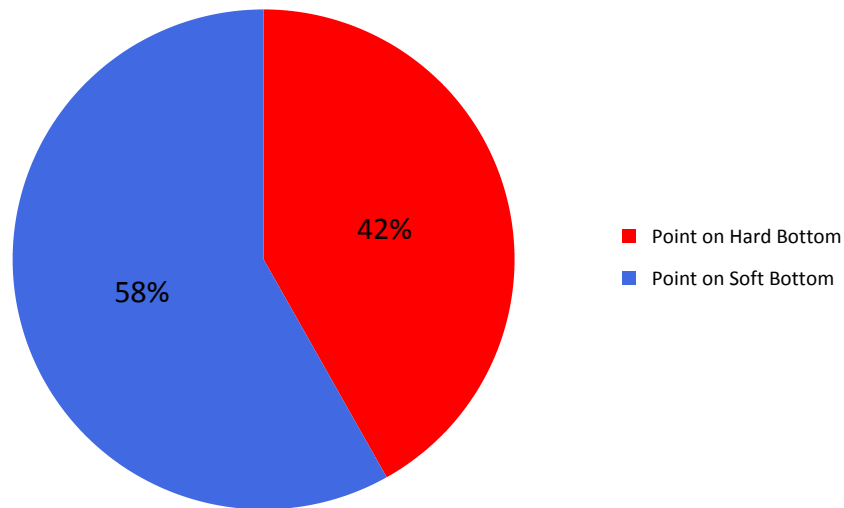
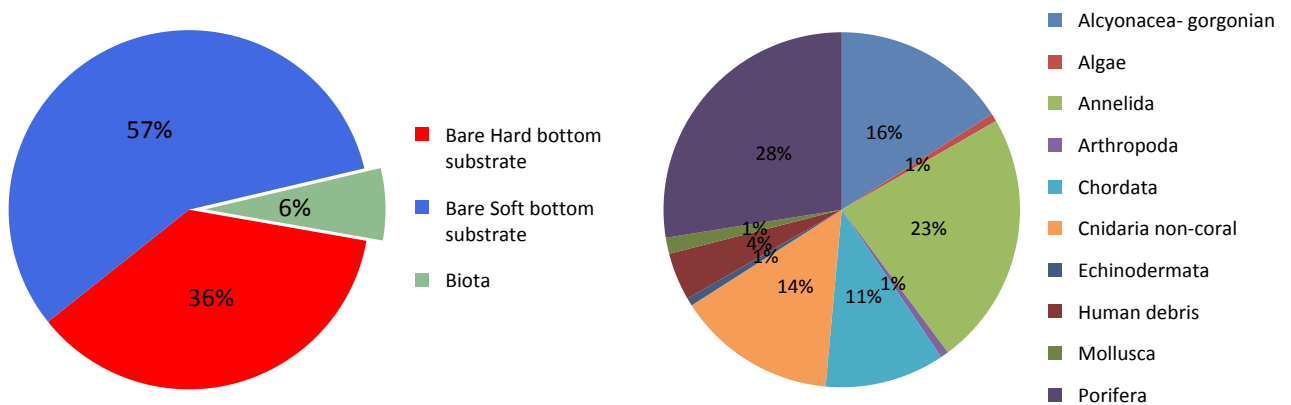


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-08. CPCe® points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-08.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Dive Site: ROV 15-08; South Carolina, Northern SC MPA, (repeat ROV 13-30), 160 m iceberg scour, UNCW 172

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-08.

Benthic Macro-biota and Substrate Type	ROV 15-08	
	Point Count	% Cover
Biota	138	6.47%
Algae	1	0.05%
Phaeophyta	1	0.05%
Porifera	38	1.78%
Demospongiae	11	0.52%
Demospongiae- MPA03	3	0.14%
Hexactinellida	1	0.05%
Leiodermatium sp.	19	0.89%
Lithistida	4	0.19%
Alcyonacea- gorgonian	22	1.03%
gorgonian unid	2	0.09%
Nicella sp.	20	0.94%
Cnidaria non-coral	20	0.94%
Hydroidolina	20	0.94%
Annelida	32	1.50%
Sabellidae	32	1.50%
Mollusca	2	0.09%
Mollusca	2	0.09%
Arthropoda	1	0.05%
Majidae	1	0.05%
Echinodermata	1	0.05%
Paracolochirus mysticus	1	0.05%
Chordata	15	0.70%
Fish	15	0.70%
Human debris	6	0.28%
Fishing gear/line/long line	6	0.28%
Bare hard bottom substrate	778	36.49%
Bare Hard bottom	778	36.49%
Bare rock- pavement boulder ledge	767	35.98%
Bare rubble- rock	11	0.52%
Bare soft bottom substrate	1216	57.04%
Grand Total	2132	100.00%

Dive Site: ROV 15-08; South Carolina, Northern SC MPA, (repeat ROV 13-30), 160 m iceberg scour, UNCW 172

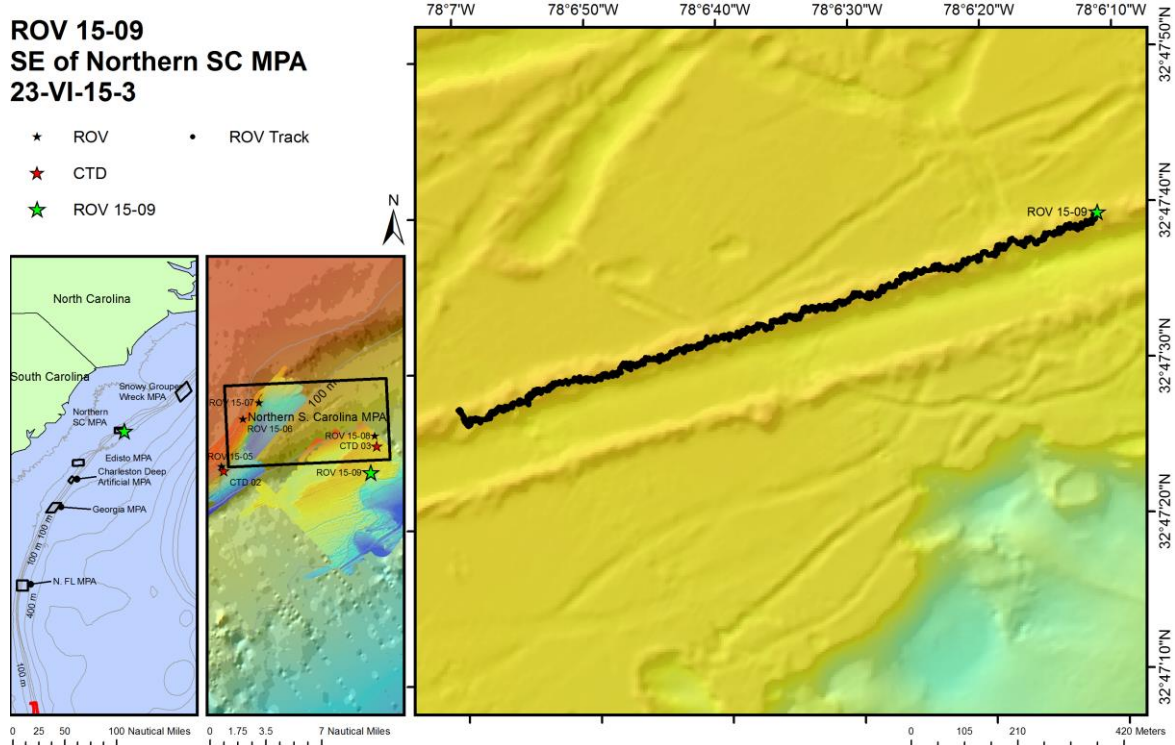
Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 15-08.

Class/Scientific Name	Common Name	ROV 15-08
Actinopterygii		
<i>Anthias nicholsi</i>	yellowfin bass	2.53
Anthiinae	anthiid	117.87
<i>Antigonia capros</i>	deepbody boarfish	24.39
<i>Caulolatilus microps</i>	blueline tilefish	1.56
<i>Decodon puellaris</i>	red hogfish	7.41
<i>Gephyroberyx darwinii</i>	Darwin's slimehead	1.56
<i>Halichoeres bathyphilus</i>	greenband wrasse	0.19
<i>Halichoeres</i> sp.	wrasse	0.39
<i>Hemanthias vivanus</i>	red barbier	7.41
<i>Hyporthodus niveatus</i>	snowy grouper	11.31
Labridae	wrasse	0.58
<i>Laemonema</i> sp.	mora cod	1.36
<i>Liopropoma eukrines</i>	wrasse bass	0.19
Muraenidae	moray eel	0.19
<i>Mycteroperca phenax</i>	scamp	0.58
<i>Ostichthys trachypoma</i>	bigeye soldierfish	1.75
<i>Pagrus pagrus</i>	red porgy	38.25
<i>Pareques iwamotoi</i>	blackbar drum	5.46
<i>Plectranthias garrupellus</i>	apricot bass	10.14
<i>Priacanthus arenatus</i>	bigeye	1.56
<i>Pristigenys alta</i>	short bigeye	1.17
<i>Prognathodes guyanensis</i>	french butterflyfish	0.97
<i>Prognathodes</i> sp.	butterflyfish	0.58
<i>Pronotogrammus martinicensis</i>	rougtongue bass	12.68
<i>Rhomboplites aurorubens</i>	vermilion snapper	0.39
Scorpaenidae	scorpionfish	13.85
<i>Seriola dumerili</i>	greater amberjack	0.39
<i>Seriola</i> sp.	amberjack	0.97
<i>Serranus notospilus</i>	saddle bass	6.04

Dive Site: ROV 15-09; S. Carolina, SE of Northern SC MPA, (repeat ROV 13-31), 167 m iceberg scour, UNCW 173

General Location and Dive Track:



Site Overview:

Project: 2015 MPA Cruise

Vessel: NOAA Ship *Pisces* Cruise 15-02

Principal Investigator: Stacy Harter

PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444

Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington

Ship Position System DGPS

Data Management: Access Database

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/23/2015

ROV: Mohawk ROV

ROV Navigation: Trackpoint II

ROV Sensors: Temperature (°C), Depth (m)

Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs

Digital Photos: 148

Distance (km): 1.38

Sonar Data: Sedberry_OEBlock2_5m_UTM17N_MB_Grid

DVD: 2

Hard Drive: 1

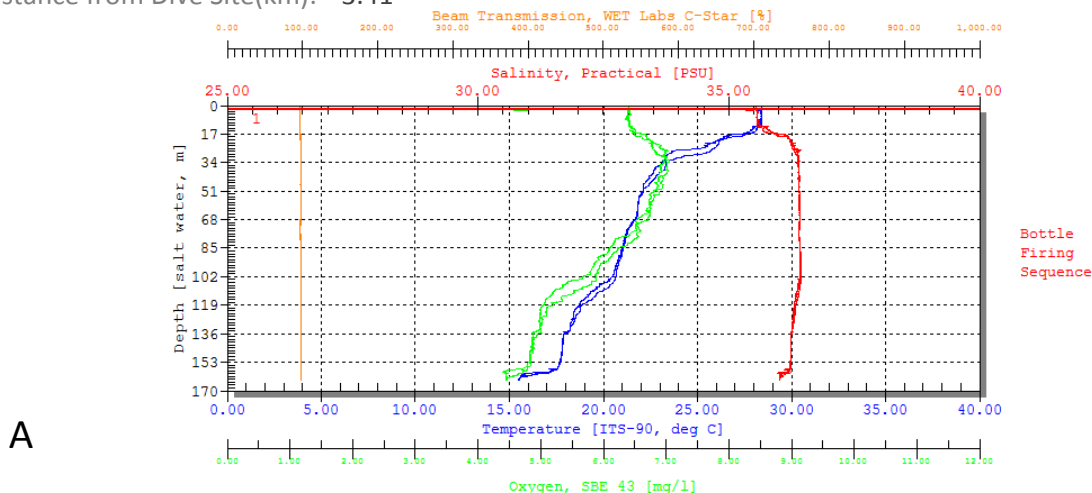
Dive Site: ROV 15-09; S. Carolina, SE of Northern SC MPA, (repeat ROV 13-31), 167 m iceberg scour, UNCW 173

Dive Data:

Minimum Bottom Depth (m):	162	Total Transect Length (km):	1.380
Maximum Bottom Depth (m):	166	Surface Current (kn):	0.5
On Bottom (Time- GMT):	11:45	On Bottom (Lat/Long):	32.79°N; -78.1°W
Off Bottom (Time- GMT):	13:30	Off Bottom (Lat/Long):	32.79°N; -78.12°W
Physical (bottom); Temp (°C):	16.12	Salinity:	Visibility (ft):
			Current (kn):

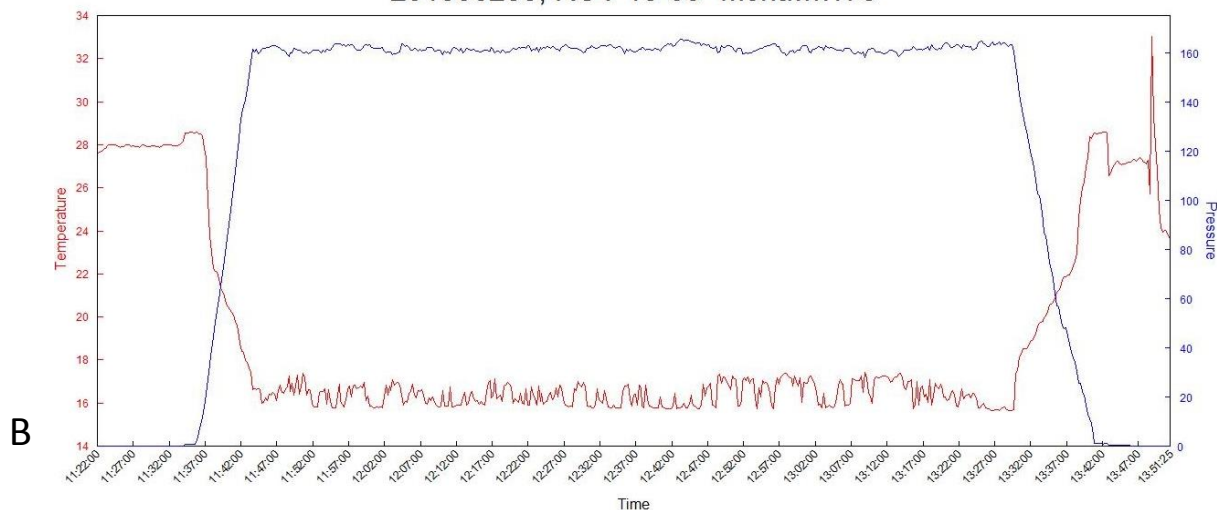
Physical Environment:

Distance from Dive Site(km): 3.41



A

201506233; ROV 15-09- Mohawk173



B

A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 164 m, Temperature: 15.5-28.4 °C , Salinity: 35.3-36.4 (PSU), Sound Velocity: 1512.1-1543 (m/s), Oxygen Saturation: 4.5-5.6 (ml/l; plot is mg/l), Density: 1022.5-1027.4 (Kg/m³), Nitrogen Saturation: 8.3-10.2 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-09; S. Carolina, SE of Northern SC MPA, (repeat ROV 13-31), 167 m iceberg scour, UNCW 173

Dive Imagery:

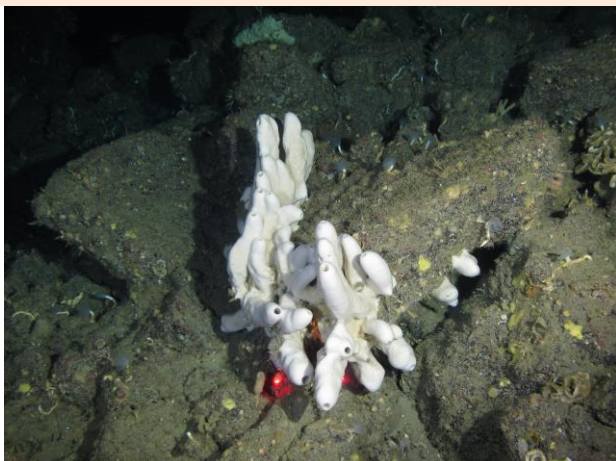


Figure 1: 32°47.4942'N, 78°6.8311'W; -161.4 m
White demersal sponge

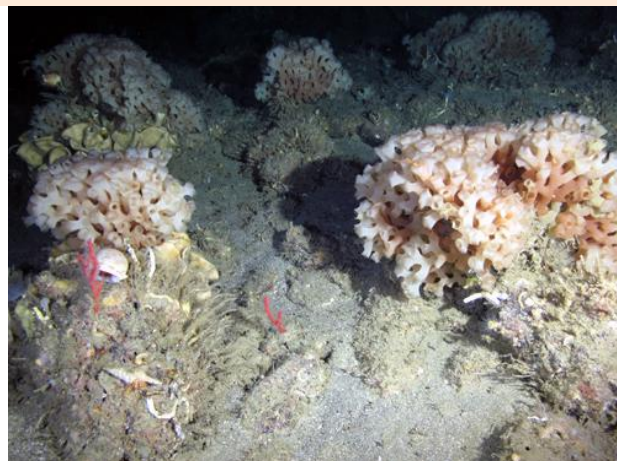


Figure 2: 32°47.6259'N, 78°6.2852'W; -163.8 m
Hexactinellid sponges (*Farrea* sp.)



Figure 3: 32°47.6224'N, 78°6.3251'W; -162.1 m
Slit shell (*Paratrochus amabilis*)



Figure 4: 32°47.6014'N, 78°6.3992'W; -161 m
Deepwater holothurian (*Paracoloichirus mysticus*);
found to have potent biomedical properties (HBOI
Biomedical Program)

Dive Site: ROV 15-09; S. Carolina, SE of Northern SC MPA, (repeat ROV 13-31), 167 m iceberg scour, UNCW 173

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 23-VI-15-3, ROV 15-09, Mohawk UNCW Dive 173, Harter Site 25; previous ROV Dive 13-31. Target Site- South Carolina, outside Northern SC MPA; Ice berg scar site, 162 m. 63 nmi to shore. MB: Pisces 2012 _Northern_SCPMA_MB_Grid.

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Surface current 0.5 kn to 30 dg.

Site Description/Habitat

Depth range: 162-165.5 m.

MB map shows E-W ice berg scar, east of MPA. Transect along top of north rim, heading from WP 1, west toward WP 2.

11:45- 163.5 m. WP 1, on top of north rim. Rugged, high rugosity, rock boulders, 1 m ledge at inside edge of rim top. 100% hard bottom. Areas of 10-30 cm boulders, other areas of ½ to 1 m boulders, jumble of sharp, irregular boulders. Dense sponges, but few gorgonacea. Much more rugose than morning dive.

162 m- areas of pavement/sediment, then boulder zones.

13:30- 165.5 m, top of N rim entire dive; End of dive.

Dominant Macrobiota:

Compared to morning dive inside the MPA, this site had virtually no grouper or porgy. Only few small schools of porgy seen, and only few snowy grouper. Other differences- Cidaroid urchins were very common here, along with several species of asteroids; however, very few gorgonacea seen. Could the snowy's at first site be eating the cidaroids? Many of the rocks at the outside MPA site were barren with several cidaroids on it compared to inside MPA dive site. Could the cidaroids be grazing the gorgonians?

Octocoral- Purple *Nicella*? (few)

Hydrozoa- hydroids (abundant)

Porifera- *Leiodermatium* (abundant), *Corallites typus*, Corallistidae, Pachastrellidae, *Auletta*, yellow encrusting white Demospongiae, white encrusting Demospongiae, large clusters (10-20 cm) Euretidae (*Farrea*?),

Mollusca- slit shell, *Perotrochus amabilis*

Holothuroidea- Sea weenies, *Paracoloichirus mysticus* (abundant); *Holothuria lentiginosa* (very common)

Asteroidea- 4-5 spp. Asteroidea

Echinoidea- *Cidaris* (abundant)

Decapoda- *Cancer*

Fish:

Red porgy (few), Snowy grouper (few), yellow fin grouper (few), red hogfish, boarfish, anthiids, rough tongue

Dive Site: ROV 15-09; S. Carolina, SE of Northern SC MPA, (repeat ROV 13-31), 167 m iceberg scour, UNCW 173

bass, red barbier, bigeye, French angel, blueline tilefish (few), *Laemonema*, greater amberjack, Darwin slimhead (very common)

No fishing line compared to morning dive.

Dive Site: ROV 15-09; S. Carolina, SE of Northern SC MPA, (repeat ROV 13-31), 167 m iceberg scour, UNCW 173

CPCe Percent Cover Analysis:

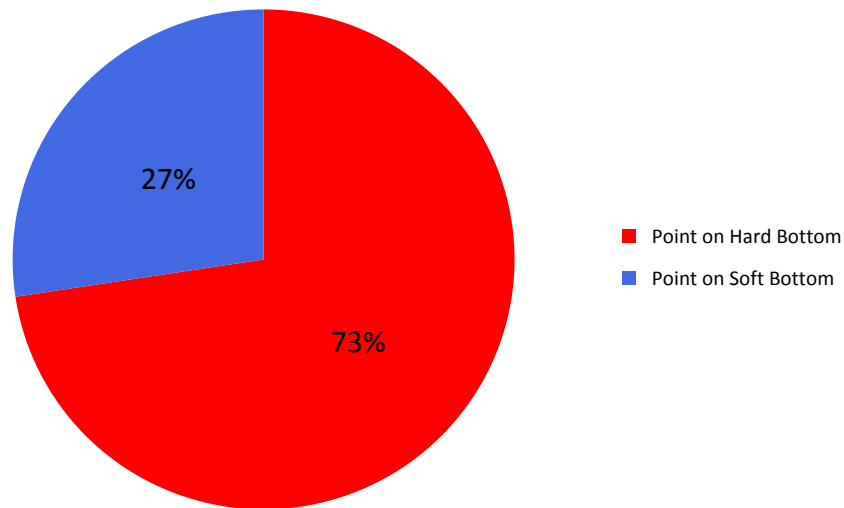
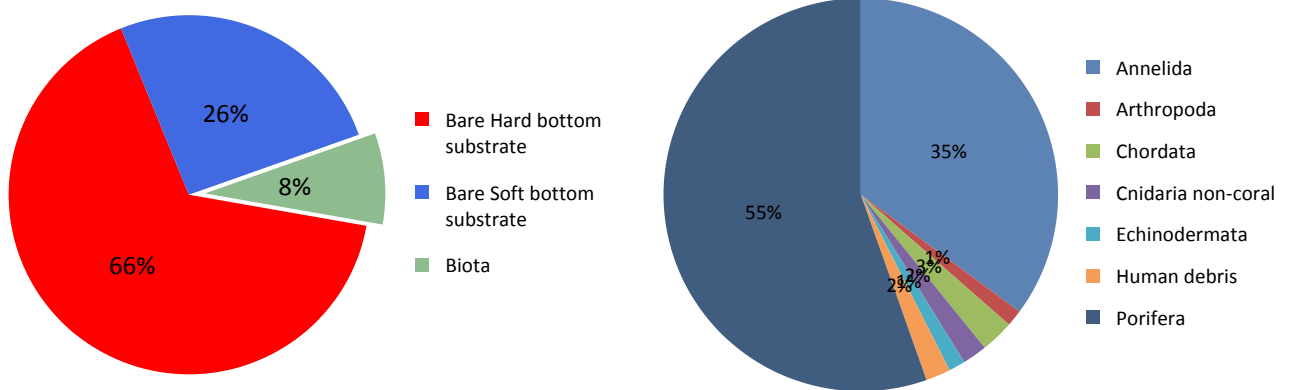


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-09. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-09.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Dive Site: ROV 15-09; S. Carolina, SE of Northern SC MPA, (repeat ROV 13-31), 167 m iceberg scour, UNCW 173

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-09.

Benthic Macro-biota and Substrate Type	ROV 15-09	
	Point Count	% Cover
Biota	148	8.20%
Porifera	82	4.55%
Corallistes sp.	4	0.22%
Demospongiae	25	1.39%
Farrea sp.	4	0.22%
Hexactinellida	1	0.06%
Ircinia sp.	2	0.11%
Leiodermatium sp.	46	2.55%
Cnidaria non-coral	3	0.17%
Hydroidolina	3	0.17%
Annelida	52	2.88%
Sabellidae	52	2.88%
Arthropoda	2	0.11%
Decapoda	2	0.11%
Echinodermata	2	0.11%
Stylocidaris sp.	2	0.11%
Chordata	4	0.22%
Fish	4	0.22%
Human debris	3	0.17%
Human debris- other	3	0.17%
Bare hard bottom substrate	1192	66.08%
Bare Hard bottom	1192	66.08%
Bare rock- pavement boulder ledge	1072	59.42%
Bare rubble- rock	120	6.65%
Bare soft bottom substrate	464	25.72%
Grand Total	1804	100.00%

Dive Site: ROV 15-09; S. Carolina, SE of Northern SC MPA, (repeat ROV 13-31), 167 m iceberg scour, UNCW 173

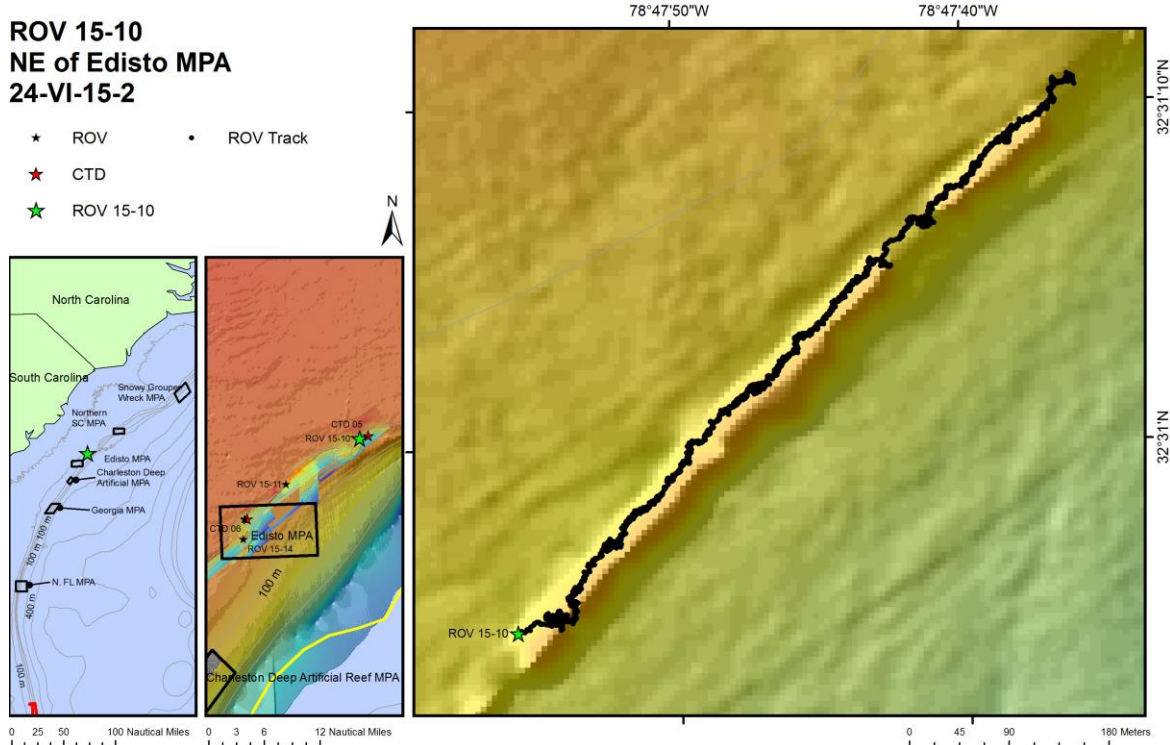
Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 15-09.

Class/Scientific Name	Common Name	ROV 15-09
Actinopterygii		
<i>Anthias nicholsi</i>	yellowfin bass	218.04
Anthiinae	anthiid	393.8
<i>Antigonia capros</i>	deepbody boarfish	11.06
<i>Caulolatilus microps</i>	blueline tilefish	0.49
<i>Decodon puellaris</i>	red hogfish	2.7
<i>Gephyroberyx darwinii</i>	Darwin's slimehead	13.02
<i>Hemanthias vivanus</i>	red barbier	47.44
<i>Hyporthodus flavolimbatus</i>	yellowedge grouper	0.24
<i>Hyporthodus niveatus</i>	snowy grouper	1.72
<i>Laemonema</i> sp.	mora cod	3.19
<i>Muraena retifera</i>	reticulate moray	0.24
Muraenidae	moray eel	1.22
<i>Pagrus pagrus</i>	red porgy	9.58
<i>Pareques iwamotoi</i>	blackbar drum	0.98
<i>Plectranthias garrupellus</i>	apricot bass	24.58
<i>Priacanthus arenatus</i>	bigeye	0.73
Prognathodes sp.	butterflyfish	0.24
<i>Pronotogrammus martinicensis</i>	rougtongue bass	1.47
Scorpaenidae	scorpionfish	9.09
<i>Seriola</i> sp.	amberjack	2.7
<i>Serranus notospilus</i>	saddle bass	0.73
<i>Synodus intermedius</i>	sand diver	0.24

Dive Site: ROV 15-10; South Carolina, NE of Edisto MPA, NE/SW 48 m ridge (repeat ROV 12-15), UNCW 174

General Location and Dive Track:



Site Overview:

Project: 2015 MPA Cruise

Vessel: NOAA Ship *Pisces* Cruise 15-02

Principal Investigator: Stacy Harter

PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444

Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington

Ship Position System DGPS

Data Management: Access Database

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/24/2015

ROV: Mohawk ROV

ROV Navigation: Trackpoint II

ROV Sensors: Temperature (°C), Depth (m)

Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs

Digital Photos: 170

Distance (km): 0.75

Sonar Data: *Pisces_2012_EdistoMPA_MB_Hill*

DVD: 2

Hard Drive: 1

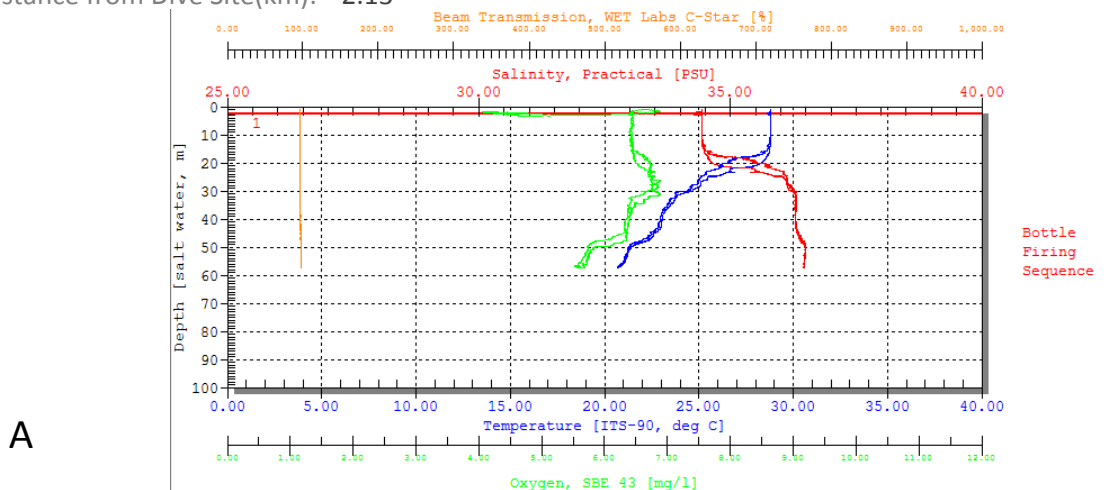
Dive Site: ROV 15-10; South Carolina, NE of Edisto MPA, NE/SW 48 m ridge (repeat ROV 12-15), UNCW 174

Dive Data:

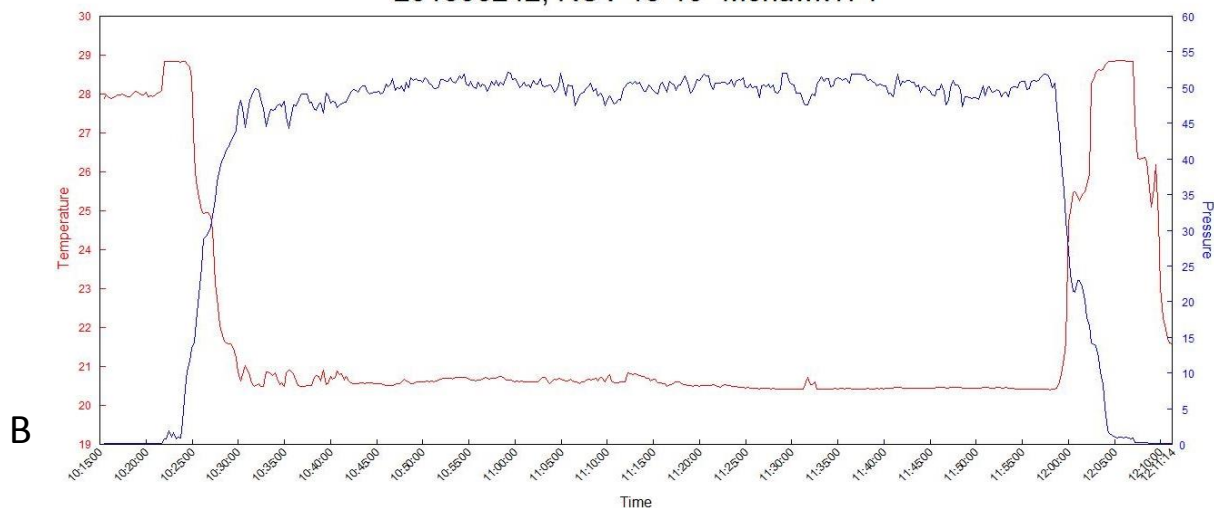
Minimum Bottom Depth (m):	48	Total Transect Length (km):	0.750
Maximum Bottom Depth (m):	52	Surface Current (kn):	0.5
On Bottom (Time- GMT):	10:30	On Bottom (Lat/Long):	32.52°N; -78.8°W
Off Bottom (Time- GMT):	11:59	Off Bottom (Lat/Long):	32.52°N; -78.79°W
Physical (bottom); Temp (°C):	21.03	Salinity:	Visibility (ft): 50 Current (kn):

Physical Environment:

Distance from Dive Site(km): 2.13



201506242; ROV 15-10- Mohawk174



A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 57.4 m, Temperature: 20.7-28.8 °C , Salinity: 34.3-36.5 (PSU), Sound Velocity: 1526-1542.7 (m/s), Oxygen Saturation: 4.5-5.1 (ml/l; plot is mg/l), Density: 1021.6-1025.9 (Kg/m³), Nitrogen Saturation: 8.3-9.3 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-10; South Carolina, NE of Edisto MPA, NE/SW 48 m ridge (repeat ROV 12-15),
UNCW 174

Dive Imagery:



Figure 1: 32°30.9238'N, 78°47.8991'W; -48.4 m
Orange gorgonian (*Swiftia exserta*)

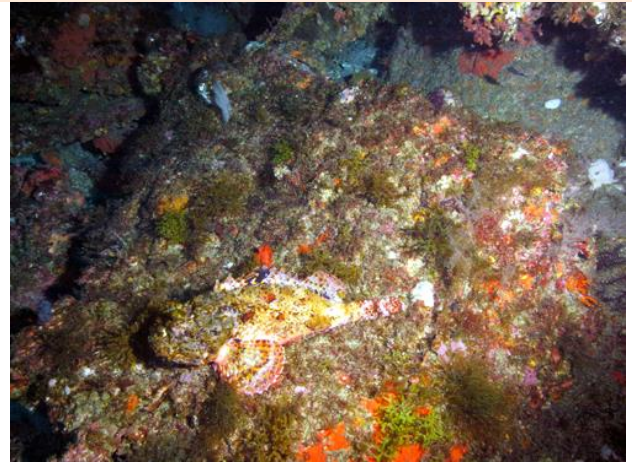


Figure 2: 32°30.9621'N, 78°47.869'W; -51.1 m
Scorpionfish blends in with the rock habitat



Figure 3: 32°31.0524'N, 78°47.7671'W; -51 m
Roughtail stingray



Figure 4: 32°31.0792'N, 78°47.7323'W; -50.7 m
Blue cornetfish

Dive Site: ROV 15-10; South Carolina, NE of Edisto MPA, NE/SW 48 m ridge (repeat ROV 12-15), UNCW 174

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 24-VI-15-2, ROV 15-10, Mohawk UNCW Dive 174, Harter Site 16; previous ROV Dive 12-15. Target Site- South Carolina, outside Edisto MPA. NE-SW ridge, 4000 m long, 48 m depth. MB: Sedberry_OEBlock_10_5 m.

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Surface current 0.5 kn to 270 dg. Visibility 10 m.

Site Description/Habitat

Depth range: 48-52 m.

MB map shows narrow ridge, oriented NE-SW. Transect from WP 1, near south end, along west slope of ridge, heading N.

10:30- On bottom, WP 1, 52 m. West of ridge, 100% sediment, coarse sand. West slope base is a jumble of 1-2 m square rock slabs, which extend from the ridge about 10 m wide. The top of the slope is a vertical escarpment, 2 m relief, which is undercut 1-2 m and rugged. Overall slope is about 30 dg, upper part moderate relief (2-3 m overall), high rugosity. Most of the rock is covered in dense biota (80-100% cover): dense Dictyota, Swiftia, hydroids, several spp of black coral, sponges. Dense fish populations.

49 m- top of ridge, flat pavement, low relief ledges; 100% hard bottom, 100% cover biota, but low rugosity and fewer fish.

11:55- WP 2. MB shows break in ridge, 90 m wide. In gap is sediment and low relief (1/2 m) rock slabs.

11:59- end dive.

Dominant Macrobiota:

Octocoral- *Swiftia exserta* (dense), *Telesto*, *Diodogorgia*, 2' *Paramuriceidae?*, *Ellisella* sp.

Hydroids-

Antipatharia- *Stichopathes lutkeni*, *Antipathes atlantica*, *A. furcata*, *Tanacetipathes*- bushy

Porifera- Demospongiae starlet cake, *Ircinia campana*, *Aplysina* hollow tubes, *Aiolochoia crassa*, *Agelas clathrodes*, *Axinella corrugata*

Decapoda- slipper lobster, *Panulirus argus*

Echinodermata- black Comatulida crinoid

Asciacea- *Eudistoma?*

Algae- *Dictyota* (dominant and dense), Chlorophyta- bottle brush

Fish:

Scamp, AJ, lionfish, blackbar soldierfish, Spanish hog, blue angelfish, cornetfish, tomtate (dense), shortfin butterfly, reef butterfly, bank butterfly, graysby, soapfish, gag (1)

Fishing gear- one line

Dive Site: ROV 15-10; South Carolina, NE of Edisto MPA, NE/SW 48 m ridge (repeat ROV 12-15), UNCW 174

CPCe Percent Cover Analysis:

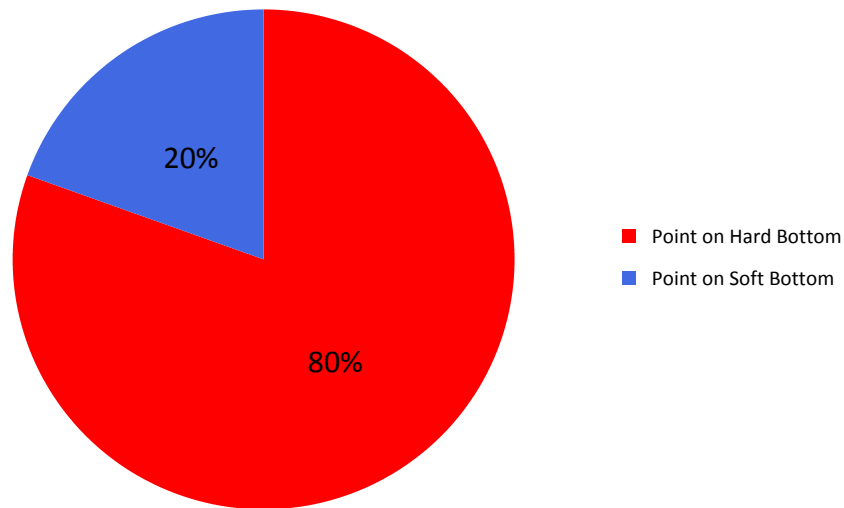
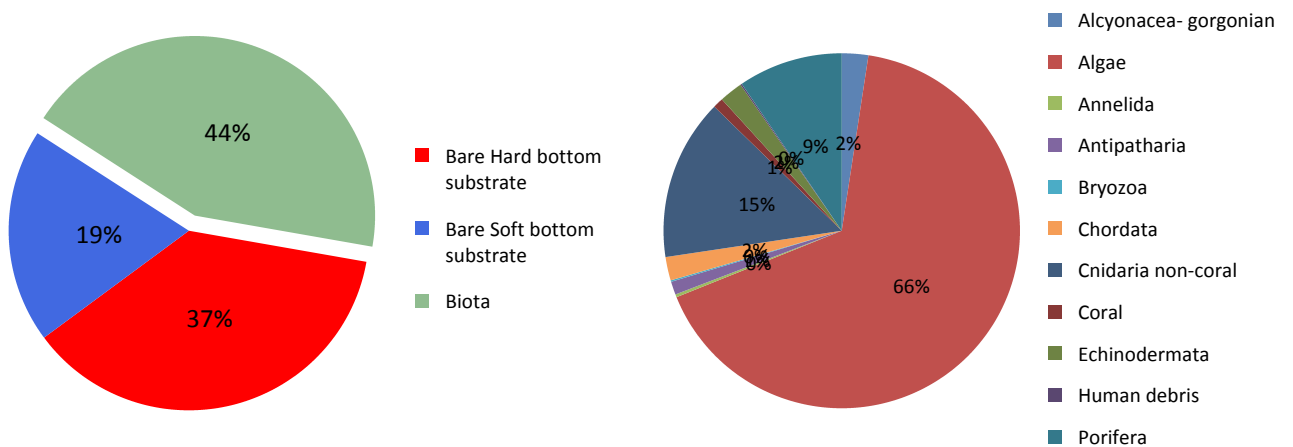


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-10. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-10.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Dive Site: ROV 15-10; South Carolina, NE of Edisto MPA, NE/SW 48 m ridge (repeat ROV 12-15), UNCW 174

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-10.

Benthic Macro-biota and Substrate Type	ROV 15-10 Point Count	% Cover
Biota	749	43.65%
Algae	498	29.02%
Chlorophyta	3	0.17%
Corallinales/crustose coralline	27	1.57%
Phaeophyta	309	18.01%
Rhodophyta	159	9.27%
Porifera	71	4.14%
Agelas sp.	1	0.06%
Aiolochoiria crassa	3	0.17%
Demospongiae	24	1.40%
Demospongiae- ze tan starlet	9	0.52%
Erylus sp.	1	0.06%
Ircinia campana	1	0.06%
Ircinia sp.	8	0.47%
Ircinia strobilina	1	0.06%
Spirastrellidae	23	1.34%
Alcyonacea- gorgonian	18	1.05%
Carijoa sp.	9	0.52%
gorgonian unid	1	0.06%
Swiftia exserta	8	0.47%
Antipatharia	9	0.52%
Antipatharia	1	0.06%
Antipathes atlantica	4	0.23%
Elatopathes abietina	3	0.17%
Tanacetipathes tanacetum	1	0.06%
Cnidaria non-coral	110	6.41%
Hydroidolina	110	6.41%
Coral	7	0.41%
Scleractinia solitary	7	0.41%
Annelida	2	0.12%
Filograna sp.	1	0.06%
Sabellidae	1	0.06%
Echinodermata	16	0.93%
Davidaster discoideus	15	0.87%
Echinoidea	1	0.06%

Dive Site: ROV 15-10; South Carolina, NE of Edisto MPA, NE/SW 48 m ridge (repeat ROV 12-15),
UNCW 174

Bryozoa	1	0.06%
Schizoporella sp.	1	0.06%
Chordata	16	0.93%
Ascidiacea	1	0.06%
Fish	15	0.87%
Human debris	1	0.06%
Fishing gear/line/long line	1	0.06%
Bare hard bottom substrate	636	37.06%
Bare Hard bottom	636	37.06%
Bare rock- pavement boulder ledge	626	36.48%
Bare rubble- rock	10	0.58%
Bare soft bottom substrate	331	19.29%
Grand Total	1716	100.00%

Dive Site: ROV 15-10; South Carolina, NE of Edisto MPA, NE/SW 48 m ridge (repeat ROV 12-15),
UNCW 174

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 15-10.

Class/Scientific Name	Common Name	ROV 15-10
Actinopterygii		
<i>Acanthurus</i> sp.	doctorfish	2.54
<i>Apogon pseudomaculatus</i>	twospot cardinalfish	0.25
<i>Apogon</i> sp.	cardinalfish	3.81
<i>Aulostomus maculatus</i>	trumpetfish	1.01
<i>Bodianus pulchellus</i>	spotfin hogfish	56.77
<i>Bodianus rufus</i>	spanish hogfish	2.54
<i>Calamus</i> sp.	porgy	9.41
<i>Canthigaster</i> sp.	puffer	37.42
<i>Centropristis ocyurus</i>	bank sea bass	1.27
<i>Cephalopholis cruentata</i>	graysby	4.83
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	5.34
<i>Chaetodon sedentarius</i>	reef butterflyfish	20.87
<i>Chaetodon</i> sp.	butterflyfish	0.5
<i>Chromis enchrysurus</i>	yellowtail reeffish	8.14
<i>Chromis insolatus</i>	sunshinefish	16.54
<i>Chromis scotti</i>	purple reeffish	68.99
<i>Chromis</i> sp.	damsel fish	100.81
<i>Diodon</i> sp.	spiny puffer	0.25
<i>Fistularia</i> sp.	cornetfish	1.01
<i>Fistularia tabacaria</i>	bluespotted cornetfish	1.27
<i>Haemulon aurolineatum</i>	tomtate	371.69
<i>Haemulon</i> sp.	grunt	814.66
<i>Haemulon striatum</i>	striped grunt	19.09
<i>Halichoeres garnoti</i>	yellowhead wrasse	8.4
<i>Halichoeres</i> sp.	wrasse	45.57
<i>Holacanthus bermudensis</i>	blue angelfish	21.63
<i>Holacanthus tricolor</i>	rock beauty	1.01
Holocentridae	soldierfish	1.78
Holocentridae	squirrelfish	3.81
<i>Lactophrys quadricornis</i>	scrawled cowfish	0.25
<i>Lactophrys</i> sp.	cowfish	1.27
<i>Liopropoma eukrines</i>	wrasse bass	4.32
<i>Mulloidichthys martinicus</i>	yellow goatfish	16.29
<i>Mycteroperca interstitialis</i>	yellowmouth grouper	0.25
<i>Mycteroperca microlepis</i>	gag grouper	0.5

Dive Site: ROV 15-10; South Carolina, NE of Edisto MPA, NE/SW 48 m ridge (repeat ROV 12-15),
UNCW 174

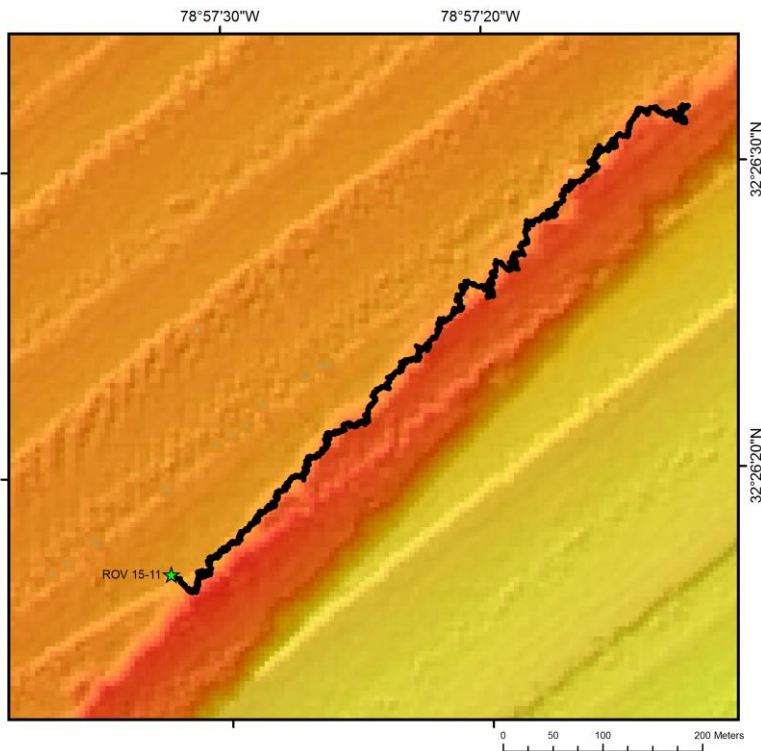
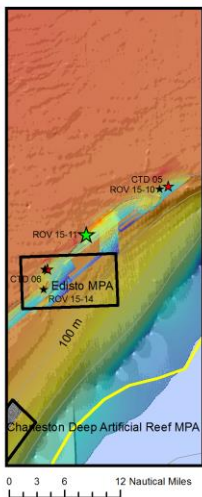
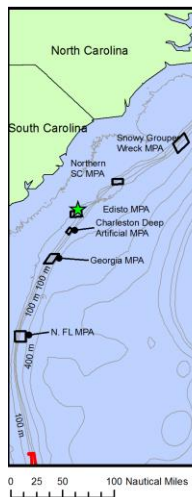
<i>Mycteroperca phenax</i>	scamp	5.6
<i>Myripristis jacobus</i>	blackbar soldierfish	18.07
<i>Pagrus pagrus</i>	red porgy	7.12
<i>Pareques umbrosus</i>	cubbyu	5.34
<i>Pomacanthus arcuatus</i>	gray angelfish	0.25
<i>Pomacanthus paru</i>	french angelfish	0.5
<i>Priacanthus arenatus</i>	bigeye	8.91
<i>Pristigenys alta</i>	short bigeye	14.51
<i>Prognathodes aculeatus</i>	longsnout butterflyfish	1.01
<i>Prognathodes aya</i>	bank butterflyfish	4.32
<i>Pseudupeneus maculatus</i>	spotted goatfish	1.78
<i>Pterois volitans</i>	lionfish	59.82
<i>Rhomboplites aurorubens</i>	vermilion snapper	70.01
<i>Rypticus maculatus</i>	whitespotted soapfish	0.76
<i>Rypticus saponaceus</i>	greater soapfish	0.76
Scaridae	parrotfish	0.5
<i>Scorpaena plumieri</i>	spotted scorpionfish	1.52
Scorpaenidae	scorpionfish	0.5
<i>Seriola rivoliana</i>	almaco jack	5.85
<i>Seriola</i> sp.	amberjack	2.54
Serranidae	grouper	0.5
<i>Serranus annularis</i>	orangeback bass	0.76
<i>Serranus phoebe</i>	tattler	0.25
<i>Serranus</i> sp.	sea bass	0.25
<i>Sphoeroides spengleri</i>	bandtail puffer	1.52
<i>Sphyraena barracuda</i>	barracuda	0.25
<i>Stegastes partitus</i>	bicolor damselfish	4.58
<i>Synodus</i> sp.	lizardfish	0.25
<i>Urophycis</i> sp.	hake	0.5
Elasmobranchii		
<i>Dasyatis</i> sp.	stingray	0.5

Dive Site: ROV 15-11; S. Carolina, NE of Edisto MPA, NE/SW 53 m ridge (repeat ROV 12-8, 13-11, 14-19), UNCW 175

General Location and Dive Track:

ROV 15-11 NE of Edisto MPA 24-VI-15-3

- ★ ROV
- ★ CTD
- ★ ROV 15-11
- ROV Track



Site Overview:

Project: 2015 MPA Cruise
Vessel: NOAA Ship *Pisces* Cruise 15-02
Principal Investigator: Stacy Harter
PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444
Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington
Ship Position System DGPS
Data Management: Access Database
Report Analyst: John Reed, Stephanie Farrington
Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/24/2015
ROV: Mohawk ROV
ROV Navigation: Trackpoint II
ROV Sensors: Temperature (°C), Depth (m)
Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs
Digital Photos: 163
Distance (km): 0.79
Sonar Data: *Pisces_2012_EdistoMPA_MB_Hill*
DVD: 2
Hard Drive: 1

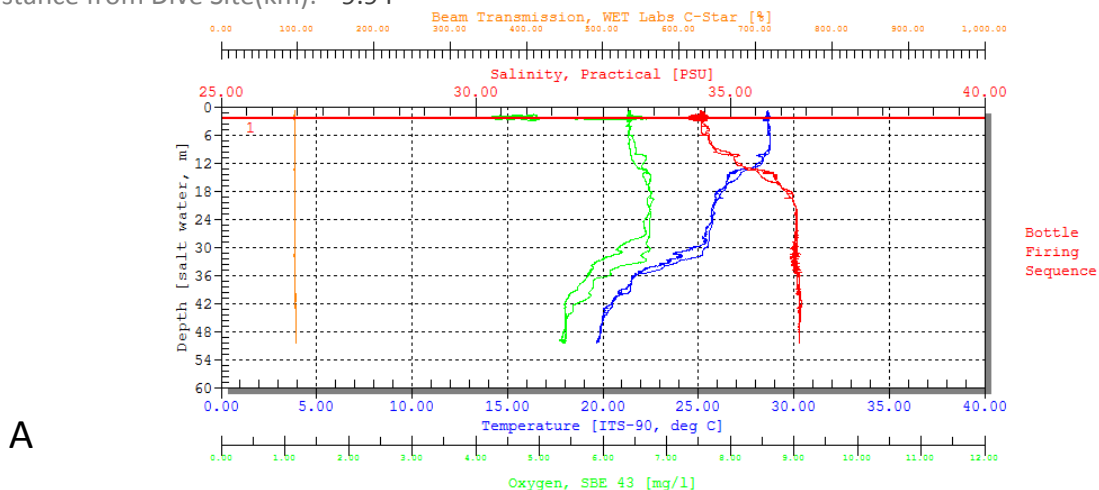
Dive Site: ROV 15-11; S. Carolina, NE of Edisto MPA, NE/SW 53 m ridge (repeat ROV 12-8, 13-11, 14-19), UNCW 175

Dive Data:

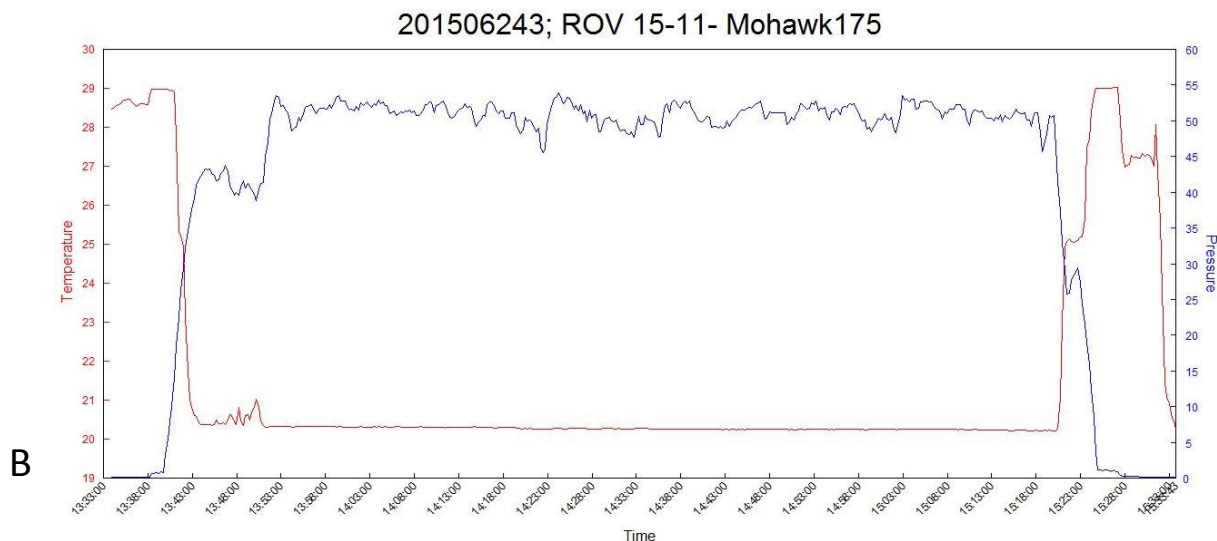
Minimum Bottom Depth (m):	50	Total Transect Length (km):	0.790
Maximum Bottom Depth (m):	54	Surface Current (kn):	0.5
On Bottom (Time- GMT):	13:53	On Bottom (Lat/Long):	32.44°N; -78.96°W
Off Bottom (Time- GMT):	15:21	Off Bottom (Lat/Long):	32.44°N; -78.95°W
Physical (bottom); Temp (°C):	20.33	Salinity:	Visibility (ft):
			Current (kn):

Physical Environment:

Distance from Dive Site(km): 9.94



A



B

A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 50.5 m, Temperature: 19.7-28.8 °C , Salinity: 34.2-36.4 (PSU), Sound Velocity: 1523-1542.8 (m/s), Oxygen Saturation: 4.5-5.2 (ml/l); plot is mg/l, Density: 1021.6-1026.1 (Kg/m³), Nitrogen Saturation: 8.3-9.5 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-11; S. Carolina, NE of Edisto MPA, NE/SW 53 m ridge (repeat ROV 12-8, 13-11, 14-19), UNCW 175

Dive Imagery:



Figure 1: 32°26.2803'N, 78°57.5172'W; -52.3 m
Oculina varicosa coral and solitary cup corals



Figure 2: 32°26.3959'N, 78°57.3787'W; -48.9 m
Scorpionfish



Figure 3: 32°26.5062'N, 78°57.2603'W; -52.9 m
Scamp grouper



Figure 4: 32°26.5262'N, 78°57.23'W; -50.7 m
Gorgonian octocoral (Ellisellidae)

Dive Site: ROV 15-11; S. Carolina, NE of Edisto MPA, NE/SW 53 m ridge (repeat ROV 12-8, 13-11, 14-19), UNCW 175

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 24-VI-15-3, ROV 15-11, Mohawk UNCW Dive 175, Harter Site 15; previous ROV Dive 12-8, 13-11, 14-19. Target Site- South Carolina, outside Edisto MPA. NE-SW ridge, 19 km long, 54 m depth. MB: Sedberry_OEBlock_10_5 m.

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Surface current 0.5-1.0 kn to 150 dg; 18 kn from SW, 3-4' seas, visibility 10 m.

Site Description/Habitat

Depth range: 50.5- 54 m.

MB map shows narrow ridge, oriented NE-SW. Transect from WP 1, near south end, along west slope of ridge, heading NE.

13:55- on bottom, near WP 1, 53.9 m, on flat sand west of reef.

West slope- ½ - 1 m and 2-3 m, flat, squared rock slabs, on 30 dg slope extending about 10 m in width. Top edge of west slope is vertical escarpment 2 m relief, undercut 1-2 m, rugged.

50.5 m- top of ridge, rock pavement, 100% hard bottom, near 100% cover biota.

Dominant Macrobiota:

Scleractinia- *Madracis mirabilis* (1- 15 cm white, under ledge)

Octocoral- *Swiftia exserta*, *Carijoa*, *Diodogorgia*

Hydroids- stinging hydroid, white bushy (dense on top)

Antipatharia- *Stichopathes lutkeni*, *Antipathes atlantica*, *A. furcata*, *Tanacetipathes*- bushy

Porifera- Demospongiae starlet cake, *Ircinia campana*, *Aplysina* hollow tubes, *Aiolochoira crassa*,

Asciacea- Eudistoma?

Algae- *Dictyota* (dominant and dense), Chlorophyta- bottle brush

Fish:

Tomtate (dense), blue angel, trumpet, rock beauty, scamp (common but not abundant), lionfish (common), reef butterfly, sharpnose puffer, spotfin butterfly, hogfish, red porgy, graysby, striped grunt, bigeye, cornetfish, shark (5.5 ft, silky?), gag (1)

Fishing gear- one line

Dive Site: ROV 15-11; S. Carolina, NE of Edisto MPA, NE/SW 53 m ridge (repeat ROV 12-8, 13-11, 14-19), UNCW 175

CPCe Percent Cover Analysis:

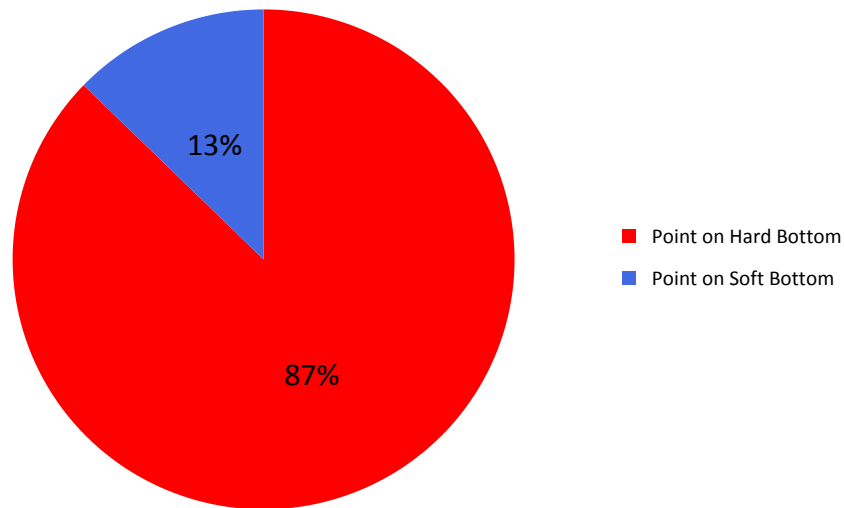
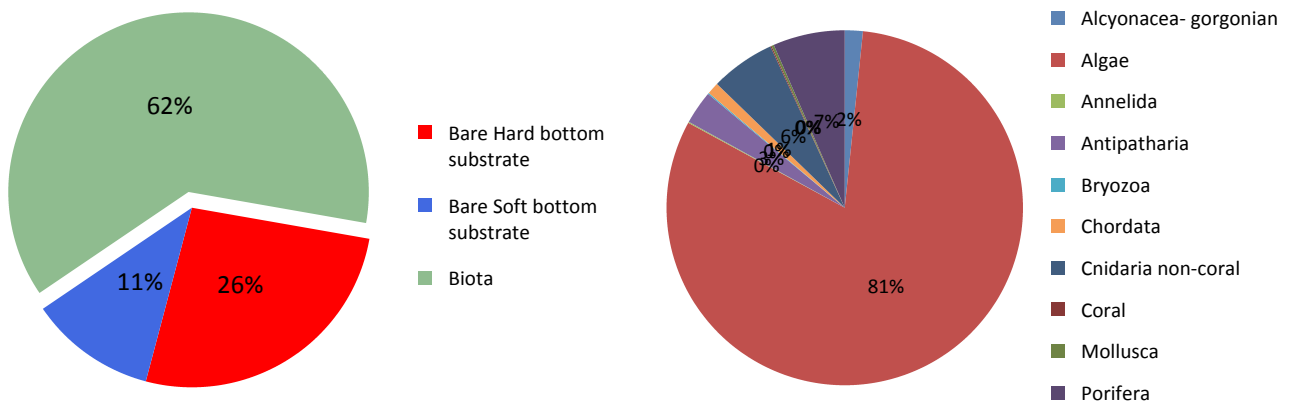


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-11. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-11.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Dive Site: ROV 15-11; S. Carolina, NE of Edisto MPA, NE/SW 53 m ridge (repeat ROV 12-8, 13-11, 14-19), UNCW 175

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-11.

Benthic Macro-biota and Substrate Type	ROV 15-11	
	Point Count	% Cover
Biota	920	62.29%
Algae	748	50.64%
Chlorophyta	2	0.14%
Corallinales/crustose coralline	35	2.37%
Cyanophyta	3	0.20%
Phaeophyta	639	43.26%
Rhodophyta	69	4.67%
Porifera	60	4.06%
Aiolochoia crassa	3	0.20%
Aplysina sp.	2	0.14%
Demospongiae	29	1.96%
Demospongiae- ze tan starlet	1	0.07%
Ircinia campana	1	0.07%
Ircinia sp.	11	0.74%
Spirastrellidae	12	0.81%
Xestospongia sp.	1	0.07%
Alcyonacea- gorgonian	15	1.02%
Carijoa sp.	2	0.14%
Diodogorgia sp.	7	0.47%
gorgonian unid	1	0.07%
Swiftia exserta	5	0.34%
Antipatharia	28	1.90%
Antipatharia	8	0.54%
Antipathes atlantica	17	1.15%
Antipathes furcata	1	0.07%
Elatopathes abietina	1	0.07%
Stichopathes lutkeni	1	0.07%
Cnidaria non-coral	54	3.66%
Hydroidolina	54	3.66%
Coral	1	0.07%
Oculina varicosa	1	0.07%
Annelida	1	0.07%
Filograna sp.	1	0.07%
Mollusca	2	0.14%
Bivalvia	2	0.14%

Dive Site: ROV 15-11; S. Carolina, NE of Edisto MPA, NE/SW 53 m ridge (repeat ROV 12-8, 13-11, 14-19), UNCW 175

Bryozoa	1	0.07%
Schizoporella sp.	1	0.07%
Chordata	10	0.68%
Asciacea	1	0.07%
Didemnidae	6	0.41%
Fish	3	0.20%
Bare hard bottom substrate	389	26.34%
Bare Hard bottom	389	26.34%
Bare rock- pavement boulder ledge	376	25.46%
Bare rubble- rock	13	0.88%
Bare soft bottom substrate	168	11.37%
Grand Total	1477	100.00%

Dive Site: ROV 15-11; S. Carolina, NE of Edisto MPA, NE/SW 53 m ridge (repeat ROV 12-8, 13-11, 14-19), UNCW 175

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 15-11.

Class/Scientific Name	Common Name	ROV 15-11
Actinopterygii		
<i>Acanthurus</i> sp.	doctorfish	1.38
<i>Apogon pseudomaculatus</i>	twospot cardinalfish	0.55
<i>Aulostomus maculatus</i>	trumpetfish	3.6
<i>Balistes caprisus</i>	gray triggerfish	0.55
<i>Balistes vetula</i>	queen triggerfish	0.27
<i>Bodianus pulchellus</i>	spotfin hogfish	38.57
<i>Bodianus rufus</i>	spanish hogfish	1.38
<i>Calamus</i> sp.	porgy	4.99
<i>Cantherhines pullus</i>	orangespotted filefish	0.55
<i>Canthigaster</i> sp.	puffer	59.39
<i>Caranx bartholomaei</i>	yellow jack	3.33
<i>Centropyge argi</i>	cherubfish	0.27
<i>Cephalopholis cruentata</i>	graysby	4.71
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	4.44
<i>Chaetodon sedentarius</i>	reef butterflyfish	29.97
<i>Chaetodon</i> sp.	butterflyfish	0.83
Chaetodontidae	butterflyfish	1.11
<i>Chromis cyaneus</i>	blue chromis	1.94
<i>Chromis enchrysurus</i>	yellowtail reeffish	1.94
<i>Chromis insolatus</i>	sunshinefish	43.57
<i>Chromis scotti</i>	purple reeffish	78.54
<i>Chromis</i> sp.	damsel fish	3.33
<i>Diplodus holbrooki</i>	spottail pinfish	13.04
<i>Fistularia</i> sp.	cornetfish	0.27
<i>Fistularia tabacaria</i>	bluespotted cornetfish	1.94
<i>Haemulon aurolineatum</i>	tomtate	1054.67
<i>Haemulon</i> sp.	grunt	20.81
<i>Haemulon striatum</i>	striped grunt	402.44
<i>Halichoeres garnoti</i>	yellowhead wrasse	10.82
<i>Halichoeres</i> sp.	wrasse	5.55
<i>Holacanthus bermudensis</i>	blue angelfish	16.65
<i>Holacanthus tricolor</i>	rock beauty	0.27
Holocentridae	soldierfish	0.55
Holocentridae	squirrelfish	23.59
<i>Lachnolaimus maximus</i>	hogfish	1.11

Dive Site: ROV 15-11; S. Carolina, NE of Edisto MPA, NE/SW 53 m ridge (repeat ROV 12-8, 13-11, 14-19), UNCW 175

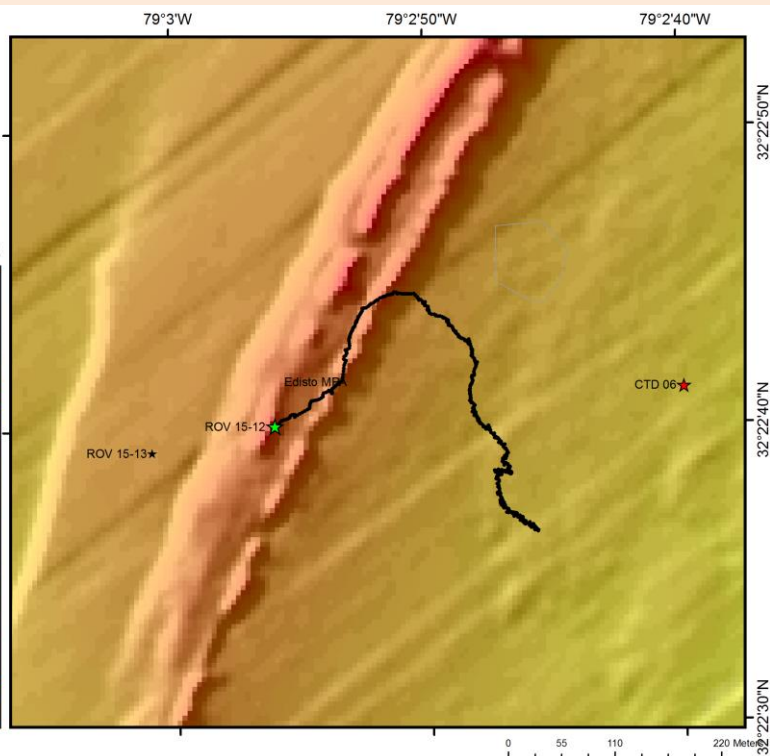
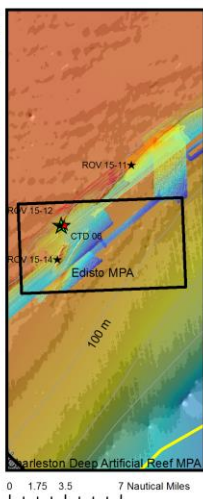
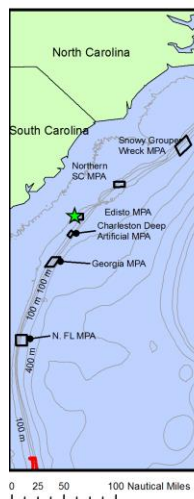
<i>Lactophrys polygonia</i>	honeycomb cowfish	0.27
<i>Lactophrys quadricornis</i>	scrawled cowfish	0.27
<i>Lactophrys</i> sp.	cowfish	0.55
<i>Liopropoma eukrines</i>	wrasse bass	2.22
<i>Mulloidichthys martinicus</i>	yellow goatfish	3.33
<i>Mycteroperca interstitialis</i>	yellowmouth grouper	0.83
<i>Mycteroperca microlepis</i>	gag grouper	0.55
<i>Mycteroperca phenax</i>	scamp	8.32
<i>Myripristis jacobus</i>	blackbar soldierfish	6.66
<i>Pagrus pagrus</i>	red porgy	14.98
<i>Pareques umbrosus</i>	cubbyu	13.04
<i>Plectrypops retrospinis</i>	cardinal soldierfish	0.27
<i>Pomacanthus arcuatus</i>	gray angelfish	0.55
<i>Priacanthus arenatus</i>	bigeye	0.83
<i>Pristigenys alta</i>	short bigeye	3.05
<i>Prognathodes aculeatus</i>	longsnout butterflyfish	0.55
<i>Prognathodes aya</i>	bank butterflyfish	4.16
<i>Pseudupeneus maculatus</i>	spotted goatfish	3.88
<i>Pterois volitans</i>	lionfish	28.86
<i>Rhomboplites aurorubens</i>	vermillion snapper	84.65
<i>Scorpaena plumieri</i>	spotted scorpionfish	0.83
<i>Seriola rivoliana</i>	almaco jack	8.6
<i>Seriola</i> sp.	amberjack	1.38
<i>Serranus annularis</i>	orangeback bass	1.94
<i>Serranus phoebe</i>	tattler	0.55
<i>Sparisoma</i> sp.	parrotfish	0.55
<i>Sphoeroides spengleri</i>	bandtail puffer	0.83
<i>Stegastes partitus</i>	bicolor damselfish	1.94
<i>Stephanolepis hispidus</i>	planehead filefish	0.55
<i>Synodus</i> sp.	lizardfish	0.27
Elasmobranchii		
<i>Carcharhinus falciformis</i>	silky shark	0.27

Dive Site: ROV 15-12; South Carolina, Edisto MPA, NE/SW 47 m ridge (repeat ROV 12-07,13-10, 14-22) UNCW 176

General Location and Dive Track:

**ROV 15-12
Edisto MPA
24-VI-15-4**

- ★ ROV
- ★ CTD
- ★ ROV 15-12
- ROV Track



Site Overview:

Project: 2015 MPA Cruise
Vessel: NOAA Ship *Pisces* Cruise 15-02
Principal Investigator: Stacy Harter
PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444
Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington
Ship Position System DGPS
Data Management: Access Database
Report Analyst: John Reed, Stephanie Farrington
Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/24/2015
ROV: Mohawk ROV
ROV Navigation: Trackpoint II
ROV Sensors: Temperature (°C), Depth (m)
Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs
Digital Photos: 10
Distance (km): 0.46
Sonar Data: Pisces_2012_EdistoMPA_MB_Hill
DVD: 1
Hard Drive: 1

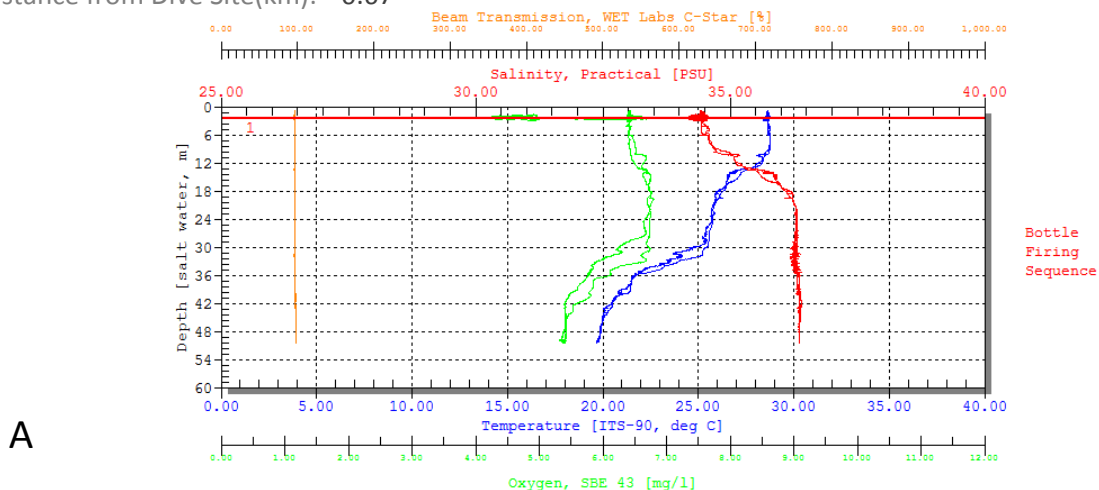
Dive Site: ROV 15-12; South Carolina, Edisto MPA, NE/SW 47 m ridge (repeat ROV 12-07,13-10, 14-22) UNCW 176

Dive Data:

Minimum Bottom Depth (m):	53	Total Transect Length (km):	0.460
Maximum Bottom Depth (m):	54	Surface Current (kn):	0.5
On Bottom (Time- GMT):	16:41	On Bottom (Lat/Long):	32.52°N; -78.78°W
Off Bottom (Time- GMT):	17:01	Off Bottom (Lat/Long):	32.38°N; -79.05°W
Physical (bottom); Temp (°C):	21.47	Salinity:	Visibility (ft):
			Current (kn):

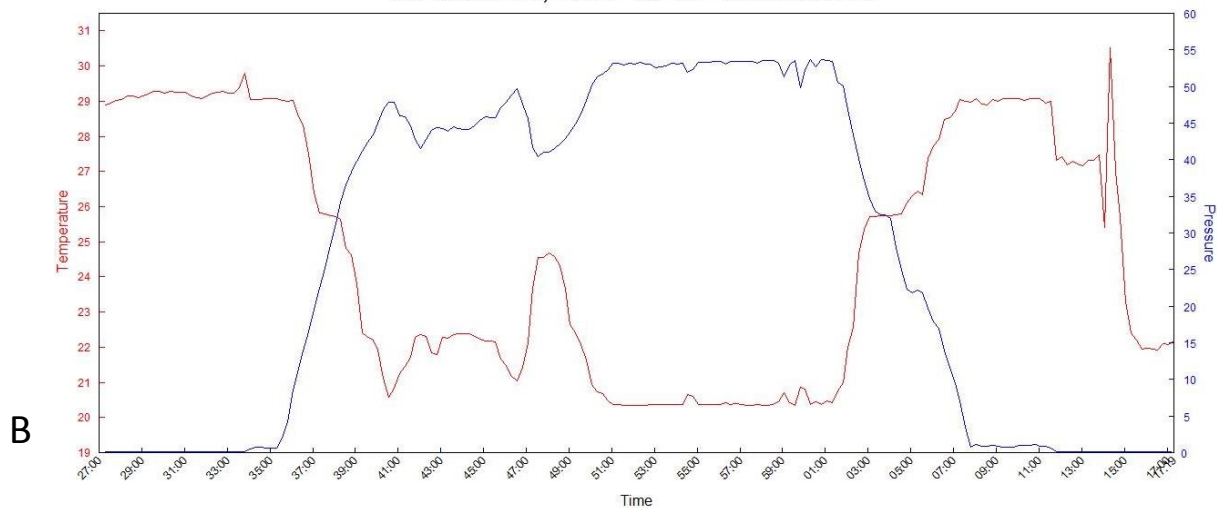
Physical Environment:

Distance from Dive Site(km): 0.67



A

201506244; ROV 15-12- Mohawk176



B

A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 50.5 m, Temperature: 19.7-28.8 °C , Salinity: 34.2-36.4 (PSU), Sound Velocity: 1523-1542.8 (m/s), Oxygen Saturation: 4.5-5.2 (ml/l; plot is mg/l), Density: 1021.6-1026.1 (Kg/m³), Nitrogen Saturation: 8.3-9.5 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-12; South Carolina, Edisto MPA, NE/SW 47 m ridge (repeat ROV 12-07,13-10, 14-22) UNCW 176

Dive Imagery:



Figure 1: 32°22.7408'N, 79°2.8535'W; -45.4 m
Shark, family Carcharhinidae



Figure 2: 32°22.6403'N, 79°2.7829'W; -53.8 m
Lone sponge on barren soft bottom



Figure 3: 32°22.6405'N, 79°2.7896'W; -53.7 m
Fish take shelter under debris



Figure 4: 32°22.6159'N, 79°2.7775'W; -53.9 m
Astropecten sp. starfish

Dive Site: ROV 15-12; South Carolina, Edisto MPA, NE/SW 47 m ridge (repeat ROV 12-07,13-10, 14-22) UNCW 176

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 24-VI-15-4, ROV 15-12, Mohawk UNCW Dive 176, Harter Site 14; previous ROV Dive 12-7, 13-10, 14-22. Target Site- South Carolina, inside Edisto MPA. NE-SW ridge, 5 km long, 53 m depth. MB: Sedberry_OEBlock_10_5 m.

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Surface current 1.0 kn to 300 dg; 18 kn from SW, 3-4' seas, visibility 10 m. Dive aborted early, unable to station keep; no transects on reef; only on bottom east of reef, 100% soft bottom, coarse sand.

Site Description/Habitat

Depth range: 53.5 m.

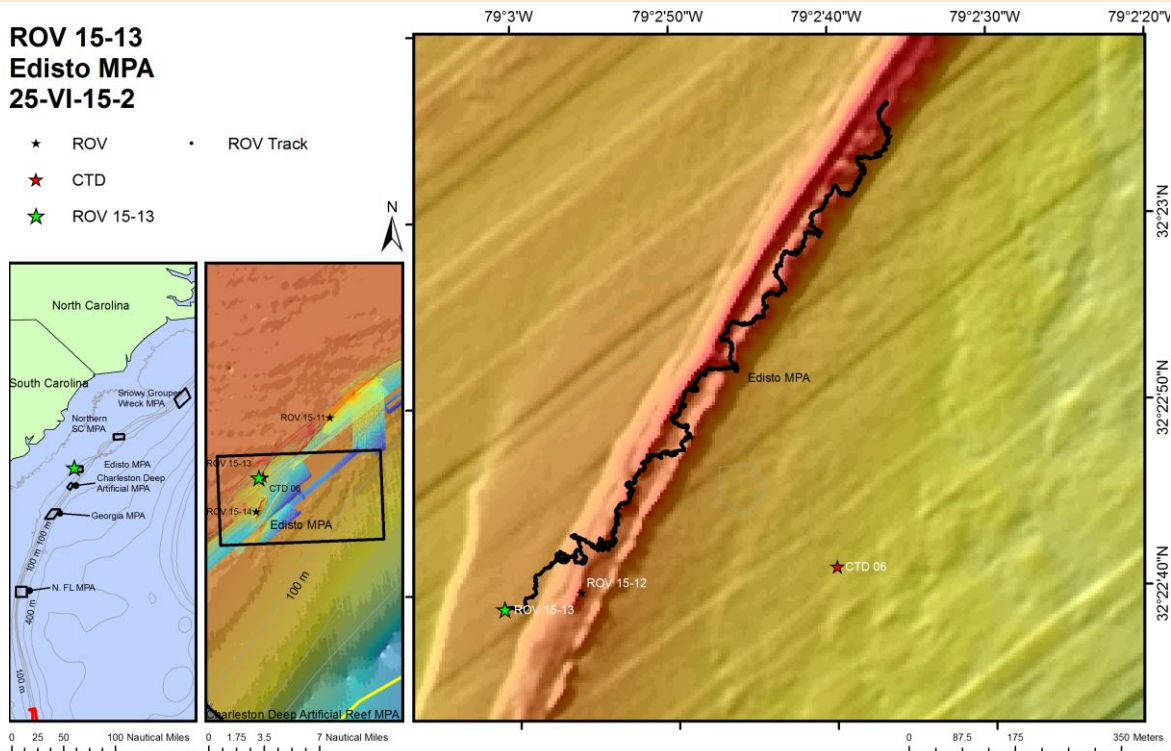
16:34- launch

16:46- on bottom, east of reef, 100% soft bottom, coarse sand; 53.5 m. Sandbar? Shark. *Luidia* starfish.

17:02- end dive, unable to get to reef, unable to station keep.

Dive Site: ROV 15-13; South Carolina, Edisto MPA, NE/SW 47 m ridge (repeat ROV 12-07,13-10, 14-22), UNCW 177

General Location and Dive Track:



Site Overview:

Project: 2015 MPA Cruise

Vessel: NOAA Ship *Pisces* Cruise 15-02

Principal Investigator: Stacy Harter

PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444

Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington

Ship Position System DGPS

Data Management: Access Database

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/25/2015

ROV: Mohawk ROV

ROV Navigation: Trackpoint II

ROV Sensors: Temperature (°C), Depth (m)

Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs

Digital Photos: 120

Distance (km): 1.35

Sonar Data: Pisces_2012_EdistoMPA_MB_Hill

DVD: 2

Hard Drive: 1

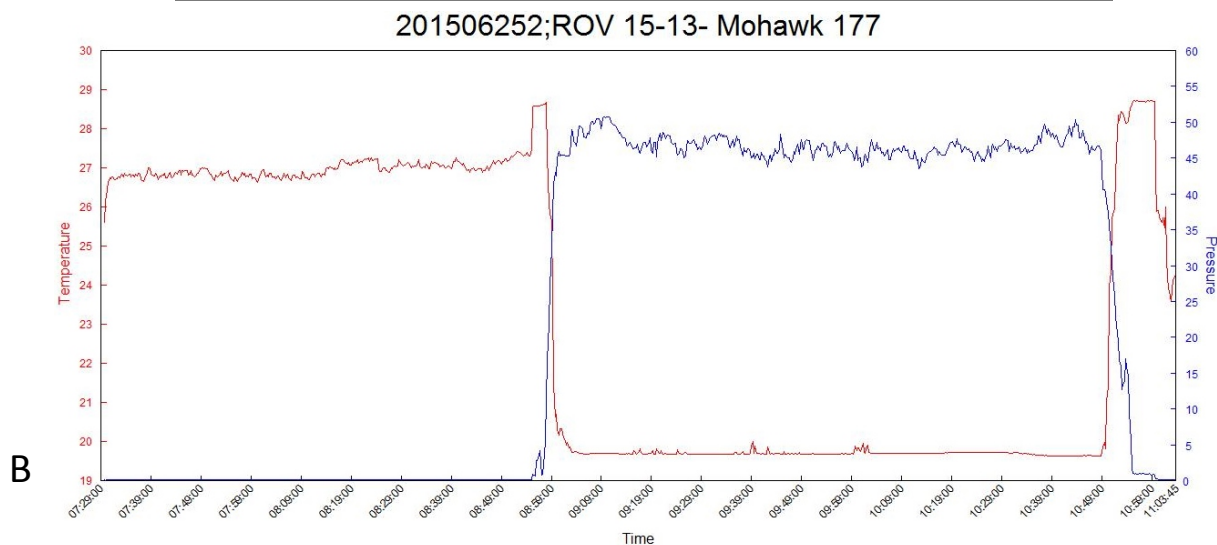
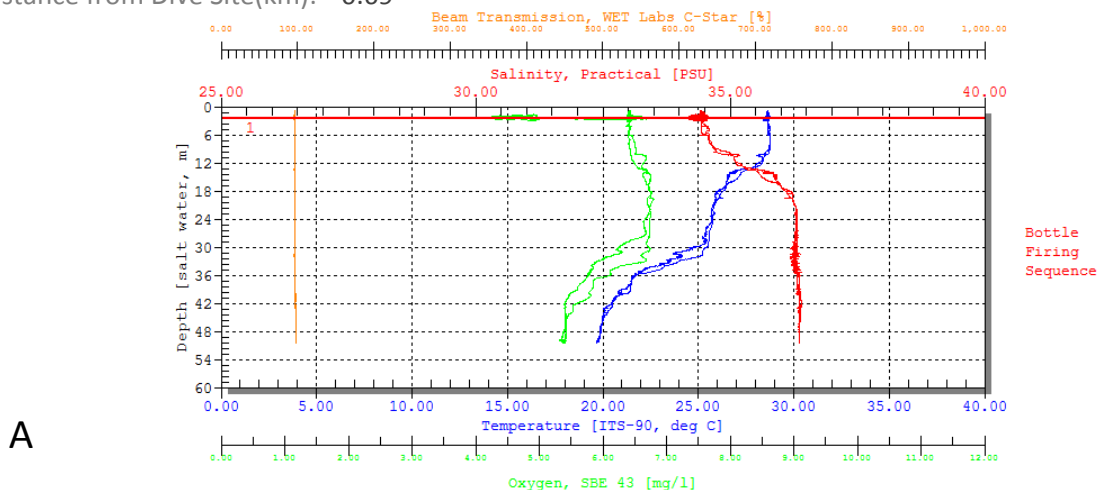
Dive Site: ROV 15-13; South Carolina, Edisto MPA, NE/SW 47 m ridge (repeat ROV 12-07,13-10, 14-22), UNCW 177

Dive Data:

Minimum Bottom Depth (m):	46	Total Transect Length (km):	1.350
Maximum Bottom Depth (m):	51	Surface Current (kn):	0.5
On Bottom (Time- GMT):	9:02	On Bottom (Lat/Long):	32.38°N; -79.05°W
Off Bottom (Time- GMT):	10:50	Off Bottom (Lat/Long):	32.39°N; -79.04°W
Physical (bottom); Temp (°C):	19.85	Salinity:	Visibility (ft): 30 Current (kn): 0.25

Physical Environment:

Distance from Dive Site(km): 0.69



A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 50.5 m, Temperature: 19.7-28.8 °C , Salinity: 34.2-36.4 (PSU), Sound Velocity: 1523-1542.8 (m/s), Oxygen Saturation: 4.5-5.2 (ml/l; plot is mg/l), Density: 1021.6-1026.1 (Kg/m³), Nitrogen Saturation: 8.3-9.5 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-13; South Carolina, Edisto MPA, NE/SW 47 m ridge (repeat ROV 12-07,13-10, 14-22), UNCW 177

Dive Imagery:



Figure 1: 32°22.7'N, 79°2.9594'W; -51.1 m
Diodogorgia sp. gorgonian

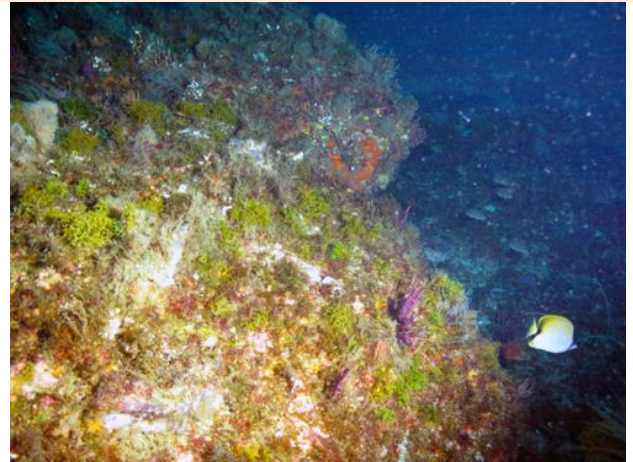


Figure 2: 32°22.7586'N, 79°2.8789'W; -46 m
Reef butterflyfish on rocky habitat



Figure 3: 32°22.8432'N, 79°2.8237'W; -46.2 m
Tube sponge (*Callyspongia vaginalis*)



Figure 4: 32°23.1022'N, 79°2.6069'W; -44.1 m
Loggerhead turtle - before he tried to bite the ROV

Dive Site: ROV 15-13; South Carolina, Edisto MPA, NE/SW 47 m ridge (repeat ROV 12-07,13-10, 14-22), UNCW 177

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 25-VI-15-2, ROV 15-13, Mohawk UNCW Dive 177, Harter Site 14; previous ROV Dive 12-7, 13-10, 14-22. Target Site- South Carolina, inside Edisto MPA. NE-SW ridge, 5 km long, double ridge, 125 m wide, 53 m depth. MB: Sedberry_OEBlock_10_5 m.

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Surface current 0.5 kn to N; 12-15 kn from SW, 2-3' seas, visibility 10 m.

Site Description/Habitat

Depth range: 46-51 m.

9:02- 51 m, on bottom. West of ridge, flat sand/rubble. Start XS at south end of ridge and head along ridge to NE.

West slope of ridge of west ridge- ½ - 1 m boulders, broad boulder zone, 5 dg slope, 80% hard bottom, no vertical escarpment at top. Dense macrobiota- Dictyota, hydroids, Swiftia, sponges, black coral.

48 m- top of ridge. Pavement, large flat, fractured rock slabs, 1-3 m square, but no vertical escarpment at edge. Low rugosity, few fish. 100% cover of macrobiota.

49 m- valley between the two ridges in MB. 50-70% hard bottom, low relief rock slabs and sediment, ½ m relief.

9:42- 46 m, top of west ridge; vertical escarpment at edge. Top of ridge about 10 m wide. Drop-off escarpment on both sides of ridge. 2 m wall on east side of ridge.

47 m- top of east ridge; 1-2 m escarpment at edge; 10 m wide pavement and slabs on top. Large schools of tomtate, vermillion snapper, scamp common, grey snapper school, gag grouper. East slope of east ridge, jumble of rock slabs, 30 dg slope.

10:51- 46 m, top of east ridge; great video of loggerhead turtle swimming; end of dive.

Dominant Macrofauna:

Octocoral- *Swiftia exserta*, *Ellisella*, *Telesto*, *Diodogorgia*, *Muricea*- 2' purple

Hydroida- white hydroids dense on top, stinging hydroids

Antipatharia- *Tanacetipathes*- bushy, *Stichopathes lutkeni*

Porifera- *Aiolochoira crassa*, *Agelas clathrodes*, Demospongiae- starlet, *Ircinia campana*, *Aplysina*- tubes, *Callyspongia vaginalis*,

Holothuroidea- *Isostichopus*

Algae-Dictyota, CCA,

Fish:

Spotfin hogfish, blue angelfish, bank butterfly, tomtate, reef butterfly, hogfish, lionfish, scamp, bigeye, cornet fish, longsnout butterfly, AJ, large schools tomtate, vermillion snapper, scamp- common, school grey snapper- common, gag.

Dive Site: ROV 15-13; South Carolina, Edisto MPA, NE/SW 47 m ridge (repeat ROV 12-07,13-10, 14-22), UNCW 177

CPCe Percent Cover Analysis:

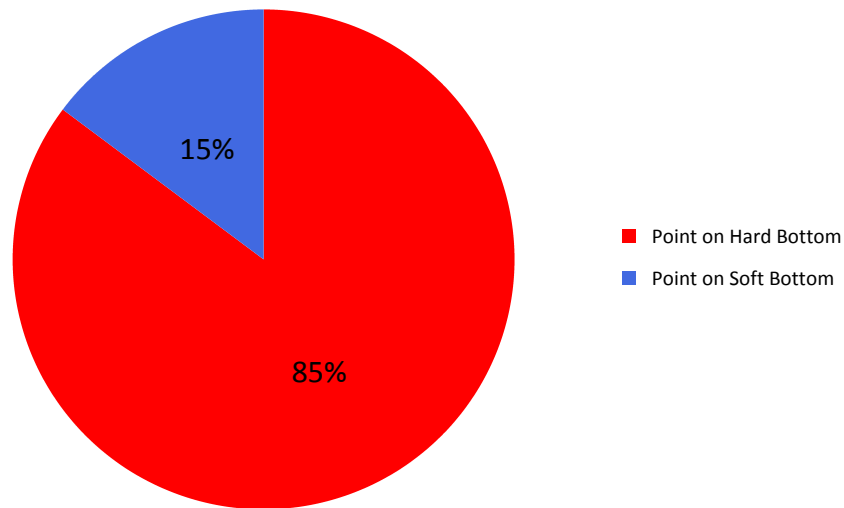
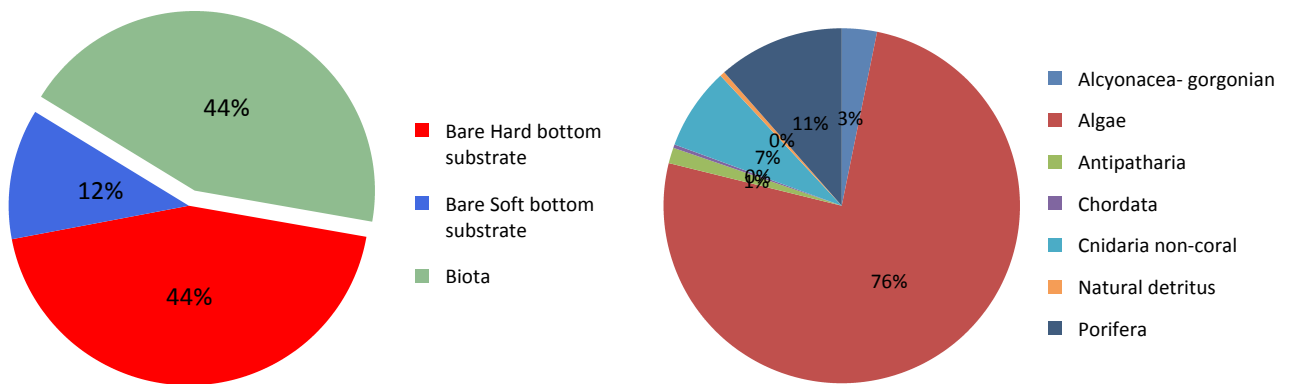


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-13. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-13.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Dive Site: ROV 15-13; South Carolina, Edisto MPA, NE/SW 47 m ridge (repeat ROV 12-07,13-10, 14-22), UNCW 177

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-13.

Benthic Macro-biota and Substrate Type	ROV 15-13 Point Count	% Cover
Biota	629	44.02%
Algae	476	33.31%
Corallinales/crustose coralline	44	3.08%
Phaeophyta	343	24.00%
Rhodophyta	89	6.23%
Porifera	72	5.04%
Agelas sp.	1	0.07%
Callyspongia vaginalis	1	0.07%
Demospongiae	35	2.45%
Demospongiae- ze tan starlet	7	0.49%
Ircinia campana	8	0.56%
Ircinia sp.	4	0.28%
Spirastrellidae	16	1.12%
Alcyonacea- gorgonian	20	1.40%
Diodogorgia sp.	11	0.77%
Ellisella sp.	6	0.42%
gorgonian unid	1	0.07%
Nicella sp.	1	0.07%
Swiftia exserta	1	0.07%
Antipatharia	9	0.63%
Antipatharia	4	0.28%
Antipathes atlantica	2	0.14%
Elatopathes abietina	1	0.07%
Stichopathes lutkeni	1	0.07%
Tanacetipathes tanacetum	1	0.07%
Cnidaria non-coral	47	3.29%
Corallimorpharia	1	0.07%
Hydroidolina	46	3.22%
Chordata	2	0.14%
Didemnidae	1	0.07%
Fish	1	0.07%
Natural detritus	3	0.21%
Natural detritus	3	0.21%
Bare hard bottom substrate	632	44.23%
Bare Hard bottom	632	44.23%

Dive Site: ROV 15-13; South Carolina, Edisto MPA, NE/SW 47 m ridge (repeat ROV 12-07,13-10, 14-22), UNCW 177

Bare rock- pavement boulder ledge	581	40.66%
Bare rubble- rock	51	3.57%
Bare soft bottom substrate	168	11.76%
Grand Total	1429	100.00%

Dive Site: ROV 15-13; South Carolina, Edisto MPA, NE/SW 47 m ridge (repeat ROV 12-07,13-10, 14-22), UNCW 177

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 15-13.

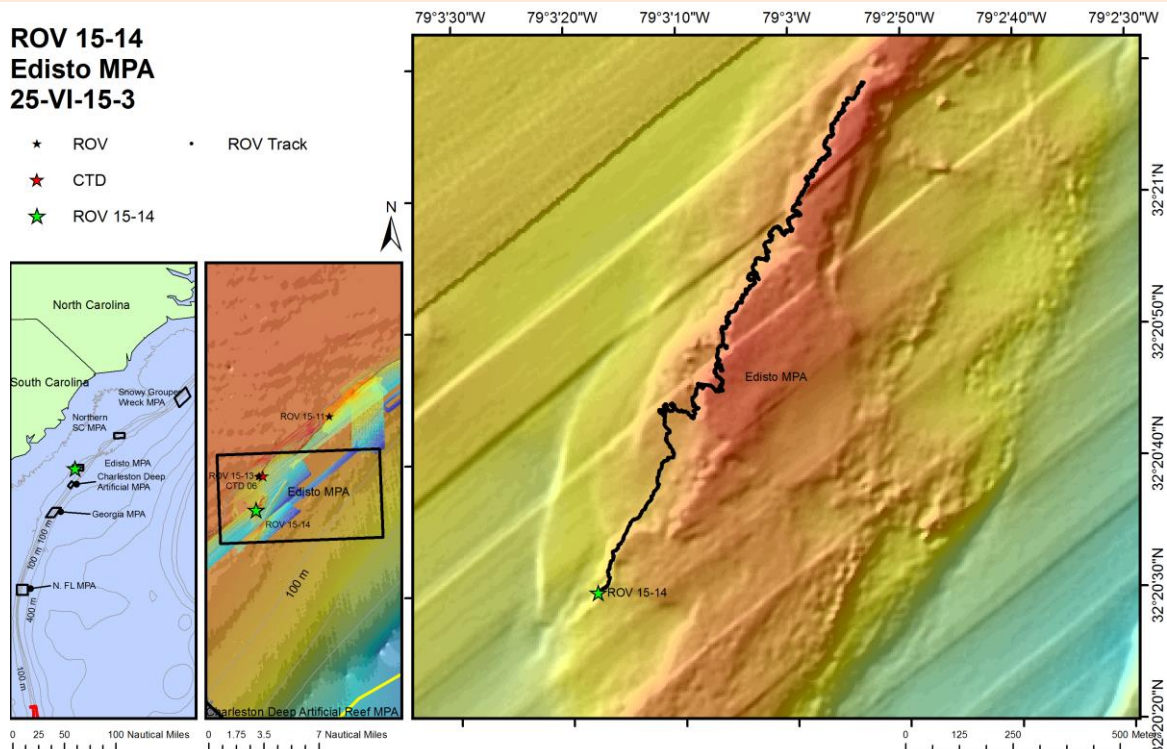
Class/Scientific Name	Common Name	ROV 15-13
Actinopterygii		
<i>Acanthurus</i> sp.	doctorfish	3.22
<i>Apogon</i> sp.	cardinalfish	0.37
<i>Aulostomus maculatus</i>	trumpetfish	0.37
<i>Balistes capriscus</i>	gray triggerfish	0.56
<i>Bodianus pulchellus</i>	spotfin hogfish	30.32
<i>Bodianus rufus</i>	spanish hogfish	0.18
<i>Calamus</i> sp.	porgy	3.6
<i>Canthigaster</i> sp.	puffer	37.9
<i>Centropristis ocyurus</i>	bank sea bass	0.37
<i>Centropyge argi</i>	cherubfish	0.18
<i>Cephalopholis cruentata</i>	graysby	1.13
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	5.11
<i>Chaetodon sedentarius</i>	reef butterflyfish	31.27
<i>Chaetodon</i> sp.	butterflyfish	1.32
Chaetodontidae	butterflyfish	1.51
<i>Chromis enchrysurus</i>	yellowtail reeffish	17.81
<i>Chromis insolatus</i>	sunshinefish	9.47
<i>Chromis scotti</i>	purple reeffish	100.64
<i>Chromis</i> sp.	damselfish	14.59
<i>Clepticus parrai</i>	creole wrasse	0.75
<i>Diodon hystrix</i>	porcupinefish	0.18
<i>Diodon</i> sp.	spiny puffer	0.37
<i>Diplodus holbrooki</i>	spottail pinfish	0.18
<i>Fistularia</i> sp.	cornetfish	0.37
<i>Fistularia tabacaria</i>	bluespotted cornetfish	1.13
<i>Haemulon aurolineatum</i>	tomtate	1019.71
<i>Haemulon plumieri</i>	white grunt	0.18
<i>Haemulon</i> sp.	grunt	47.38
<i>Haemulon striatum</i>	striped grunt	7.58
<i>Halichoeres bathyphilus</i>	greenband wrasse	0.18
<i>Halichoeres garnoti</i>	yellowhead wrasse	6.06
<i>Halichoeres</i> sp.	wrasse	5.68
<i>Holacanthus bermudensis</i>	blue angelfish	24.45
<i>Holacanthus tricolor</i>	rock beauty	0.75
Holocentridae	squirrelfish	5.11

Dive Site: ROV 15-13; South Carolina, Edisto MPA, NE/SW 47 m ridge (repeat ROV 12-07,13-10, 14-22), UNCW 177

<i>Lachnolaimus maximus</i>	hogfish	0.75
<i>Lactophrys</i> sp.	cowfish	1.51
<i>Liopropoma eukrines</i>	wrasse bass	1.13
<i>Lutjanus griseus</i>	gray snapper	4.16
<i>Mulloidichthys martinicus</i>	yellow goatfish	0.94
Muraenidae	moray eel	0.18
<i>Mycteroperca interstitialis</i>	yellowmouth grouper	0.18
<i>Mycteroperca microlepis</i>	gag grouper	0.75
<i>Mycteroperca phenax</i>	scamp	5.11
<i>Myripristis jacobus</i>	blackbar soldierfish	3.79
<i>Pagrus pagrus</i>	red porgy	0.94
<i>Pareques umbrosus</i>	cubbyu	2.84
<i>Pomacanthus arcuatus</i>	gray angelfish	0.37
<i>Pomacanthus paru</i>	french angelfish	0.37
<i>Pomacanthus</i> sp.	angelfish	0.18
<i>Priacanthus arenatus</i>	bigeye	3.41
<i>Pristigenys alta</i>	short bigeye	3.79
<i>Prognathodes aculeatus</i>	longsnout butterflyfish	0.18
<i>Prognathodes aya</i>	bank butterflyfish	2.27
<i>Pseudupeneus maculatus</i>	spotted goatfish	3.03
<i>Pterois volitans</i>	lionfish	37.14
<i>Rhomboplites aurorubens</i>	vermillion snapper	290.94
Scorpaenidae	scorpionfish	0.37
<i>Seriola dumerili</i>	greater amberjack	0.37
<i>Seriola rivoliana</i>	almaco jack	1.7
<i>Seriola</i> sp.	amberjack	0.94
<i>Serranus annularis</i>	orangeback bass	0.56
<i>Serranus phoebe</i>	tattler	0.37
<i>Sparisoma atomarium</i>	greenblotch parrotfish	1.13
<i>Sparisoma aurofrenatum</i>	redband parrotfish	0.37
<i>Sparisoma</i> sp.	parrotfish	0.18
<i>Sphoeroides spengleri</i>	bandtail puffer	0.56
<i>Stegastes partitus</i>	bicolor damselfish	3.22
<i>Stephanolepis hispidus</i>	planehead filefish	0.18
Elasmobranchii		
Carcharhinidae	shark	0.18

Dive Site: ROV 15-14; South Carolina, Edisto MPA, NE/SW 48 m plateau (repeat ROV 12-9, 13-8, 14-23) UNCW 178

General Location and Dive Track:



Site Overview:

Project: 2015 MPA Cruise

Vessel: NOAA Ship *Pisces* Cruise 15-02

Principal Investigator: Stacy Harter

PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444

Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington

Ship Position System DGPS

Data Management: Access Database

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/25/2015

ROV: Mohawk ROV

ROV Navigation: Trackpoint II

ROV Sensors: Temperature (°C), Depth (m)

Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs

Digital Photos: 107

Distance (km): 1.45

Sonar Data: Pisces_2012_EdistoMPA_MB_Hill

DVD: 2

Hard Drive: 1

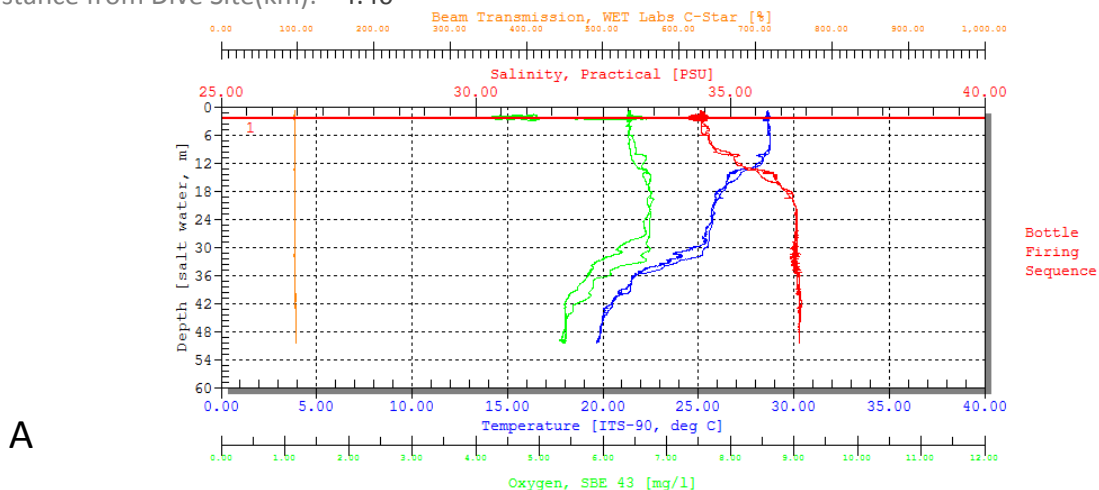
Dive Site: ROV 15-14; South Carolina, Edisto MPA, NE/SW 48 m plateau (repeat ROV 12-9, 13-8, 14-23) UNCW 178

Dive Data:

Minimum Bottom Depth (m):	48	Total Transect Length (km):	1.450
Maximum Bottom Depth (m):	55	Surface Current (kn):	1
On Bottom (Time- GMT):	11:46	On Bottom (Lat/Long):	32.34°N; -79.05°W
Off Bottom (Time- GMT):	13:31	Off Bottom (Lat/Long):	32.35°N; -79.05°W
Physical (bottom); Temp (°C):	19.72	Salinity:	Visibility (ft):
			Current (kn):

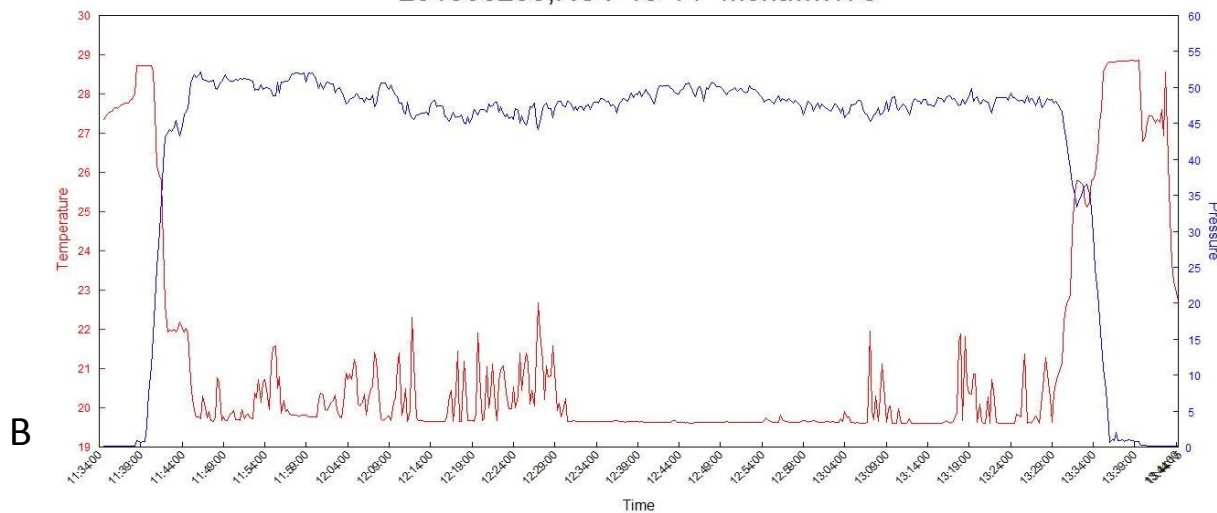
Physical Environment:

Distance from Dive Site(km): 4.40



A

201506253;ROV 15-14- Mohawk178



B

A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 50.5 m, Temperature: 19.7-28.8 °C , Salinity: 34.2-36.4 (PSU), Sound Velocity: 1523-1542.8 (m/s), Oxygen Saturation: 4.5-5.2 (ml/l); plot is mg/l, Density: 1021.6-1026.1 (Kg/m³), Nitrogen Saturation: 8.3-9.5 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-14; South Carolina, Edisto MPA, NE/SW 48 m plateau (repeat ROV 12-9, 13-8, 14-23) UNCW 178

Dive Imagery:



Figure 1: 32°20.7293'N, 79°3.196'W; -52.3 m
Cluster of tube sponge (*Callyspongia vaginalis*)



Figure 2: 32°20.9324'N, 79°3.0373'W; -50.3 m
Panulirus argus



Figure 3: 32°20.9822'N, 79°2.9959'W; -48.1 m
Scamp grouper on hard bottom habitat



Figure 4: 32°20.9807'N, 79°2.9905'W; -47.2 m
Grouper on hard bottom habitat

Dive Site: ROV 15-14; South Carolina, Edisto MPA, NE/SW 48 m plateau (repeat ROV 12-9, 13-8, 14-23) UNCW 178

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 25-VI-15-3, ROV 15-14, Mohawk UNCW Dive 178, Harter Site 12; previous ROV Dive 12-9, 13-8, 14-23. Target Site- South Carolina, inside Edisto MPA. Flat top plateau, 3 km long N-S, 840 m wide, 54 m depth. MB: Sedberry_OEBlock_10_5 m.

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Surface current 1 kn to NE; 12 kn from SW, 2-3' seas, visibility 10 m.

Site Description/Habitat

Depth range: 48-54.5 m.

Transect along west slope of plateau, heading N.

11:42- On bottom, 54.5 m; 270 m SW of WP 1; on lower slope of west slope of plateau. 80% hard bottom, low relief rock, ½-1 m rock slabs, low rugosity, pavement, <1/2 m relief. Drifting 1.5 kn, no photos yet, head toward WP 1.

WP 1- 53 m, base of west slope; 80% soft bottom, rubble/cobble patches, 10 cm relief.

52 m- west slope, 80% hard bottom, low relief rock, ½ m relief. Dense macrobiota- *Dictyota*, *Ellisella*, *Muricea*, sponges, hydroids, black coral. Few fish, low rugosity.

50 m- west slope, higher rugosity, ½-1 m ledges and rock slabs, more fish, shark, scamp.

48.5 m- top of slope, west edge of plateau. 100% hard bottom, pavement/sediment; dense biota; school stripped grunt, few lionfish, few fish, low rugosity on top.

48 m- escarpment at west edge of plateau. 1-2 m undercut ledge, rock slabs. Grey snapper schools, many lionfish.

50.2 m- west slope, broad zone, low slope, of boulders, and slabs, ½ m relief, low rugosity.

13:31- End of dive

Dominant Macrofauna:

Octocoral- *Swiftia exserta*, *Ellisella*, *Telesto*, *Diodogorgia*, *Muricea*- 2' purple

Hydroida- white hydroids dense on top, stinging hydroids

Antipatharia- *Tanacetipathes*- bushy, *Stichopathes lutkeni*,

Porifera- *Ircinia campana*, *Callyspongia vaginalis*, *Ircinia* sp., *Agelas clathrodes*

Decapoda- *Panulirus argus*

Ascidiacea- Didemnidae

Algae-*Dictyota*, *Microdictyon*

Fish:

Spotfin hogfish, spanish hog, blue angelfish, barracuda, reef butterfly, tomtate, scamp, almaco jack, bicolor damsel, several sharks- 5' sand shark?, gag, creole, AJ, stripped grunt, lionfish- many, grey snapper- very common, grey trigger, scorpionfish, squirrel fish, graysby

Dive Site: ROV 15-14; South Carolina, Edisto MPA, NE/SW 48 m plateau (repeat ROV 12-9, 13-8, 14-23) UNCW 178

CPCe Percent Cover Analysis:

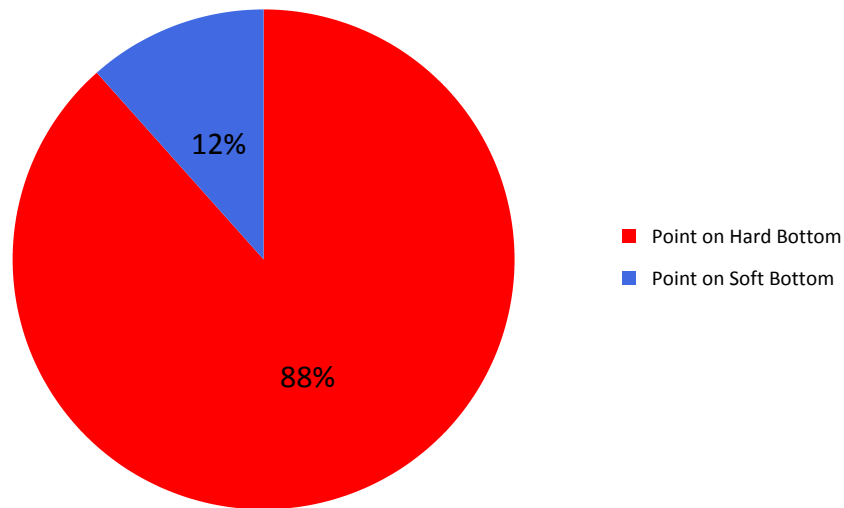
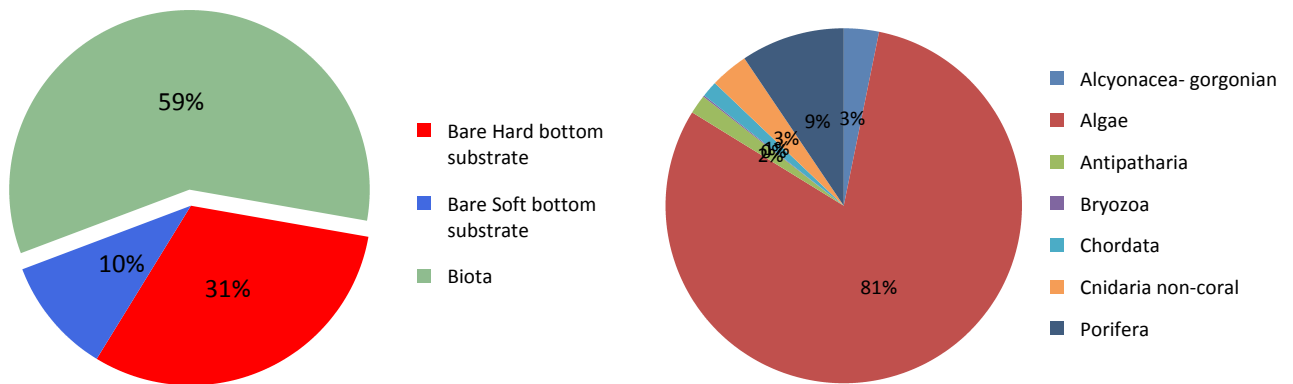


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-14. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-14.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Dive Site: ROV 15-14; South Carolina, Edisto MPA, NE/SW 48 m plateau (repeat ROV 12-9, 13-8, 14-23) UNCW 178

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-14.

Benthic Macro-biota and Substrate Type	ROV 15-14 Point Count	% Cover
Biota	754	58.54%
Algae	608	47.20%
Corallinales/crustose coralline	83	6.44%
Cyanophyta	3	0.23%
Phaeophyta	489	37.97%
Rhodophyta	33	2.56%
Porifera	71	5.51%
Agelas sp.	1	0.08%
Callyspongia sp.	1	0.08%
Callyspongia vaginalis	1	0.08%
Demospongiae	28	2.17%
Demospongiae- ze tan starlet	3	0.23%
Ircinia campana	8	0.62%
Ircinia sp.	19	1.48%
Spirastrellidae	8	0.62%
Xestospongia sp.	2	0.16%
Alcyonacea- gorgonian	24	1.86%
Diodogorgia sp.	9	0.70%
Ellisella sp.	13	1.01%
Leptogorgia sp.	2	0.16%
Antipatharia	13	1.01%
Antipatharia	2	0.16%
Antipathes atlantica	7	0.54%
Antipathes furcata	1	0.08%
Elatopathes abietina	3	0.23%
Cnidaria non-coral	26	2.02%
Hydroidolina	26	2.02%
Bryozoa	1	0.08%
Schizoporella sp.	1	0.08%
Chordata	11	0.85%
Didemnidae	7	0.54%
Fish	4	0.31%
Bare hard bottom substrate	399	30.98%
Bare Hard bottom	399	30.98%
Bare rock- pavement boulder ledge	391	30.36%

Dive Site: ROV 15-14; South Carolina, Edisto MPA, NE/SW 48 m plateau (repeat ROV 12-9, 13-8, 14-23) UNCW 178

Bare rubble- rock	8	0.62%
Bare soft bottom substrate	135	10.48%
Grand Total	1288	100.00%

Dive Site: ROV 15-14; South Carolina, Edisto MPA, NE/SW 48 m plateau (repeat ROV 12-9, 13-8, 14-23) UNCW 178

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 15-14.

Class/Scientific Name	Common Name	ROV 15-14
Actinopterygii		
<i>Acanthurus</i> sp.	doctorfish	0.35
Anthiinae	anthiid	2.33
<i>Apogon pseudomaculatus</i>	twospot cardinalfish	0.11
<i>Apogon</i> sp.	cardinalfish	3.5
<i>Balistes capriscus</i>	gray triggerfish	0.23
<i>Balistes</i> sp.	triggerfish	0.7
<i>Balistes vetula</i>	queen triggerfish	0.11
<i>Bodianus pulchellus</i>	spotfin hogfish	8.52
<i>Bodianus rufus</i>	spanish hogfish	0.93
<i>Calamus</i> sp.	porgy	0.7
<i>Cantherhines pullus</i>	orangespotted filefish	0.11
<i>Canthigaster</i> sp.	puffer	6.88
<i>Caranx bartholomaei</i>	yellow jack	1.28
<i>Centropyge argi</i>	cherubfish	3.38
<i>Cephalopholis cruentata</i>	graysby	0.93
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	0.81
<i>Chaetodon sedentarius</i>	reef butterflyfish	10.5
Chaetodontidae	butterflyfish	0.23
<i>Chromis enchrysurus</i>	yellowtail reeffish	3.26
<i>Chromis insolatus</i>	sunshinefish	25.21
<i>Chromis scotti</i>	purple reeffish	19.14
<i>Chromis</i> sp.	damselfish	18.79
<i>Clepticus parrai</i>	creole wrasse	28.94
<i>Fistularia petimba</i>	red cornetfish	0.11
<i>Fistularia</i> sp.	cornetfish	0.23
<i>Fistularia tabacaria</i>	bluespotted cornetfish	0.23
<i>Haemulon aurolineatum</i>	tomtate	284.23
<i>Haemulon</i> sp.	grunt	64.19
<i>Haemulon striatum</i>	striped grunt	211.85
<i>Halichoeres garnoti</i>	yellowhead wrasse	1.75
<i>Halichoeres</i> sp.	wrasse	2.68
<i>Holacanthus bermudensis</i>	blue angelfish	4.2
<i>Holacanthus tricolor</i>	rock beauty	1.98
Holocentridae	squirrelfish	10.38
<i>Lachnolaimus maximus</i>	hogfish	0.11
<i>Lactophrys</i> sp.	cowfish	0.35

Dive Site: ROV 15-14; South Carolina, Edisto MPA, NE/SW 48 m plateau (repeat ROV 12-9, 13-8, 14-23) UNCW 178

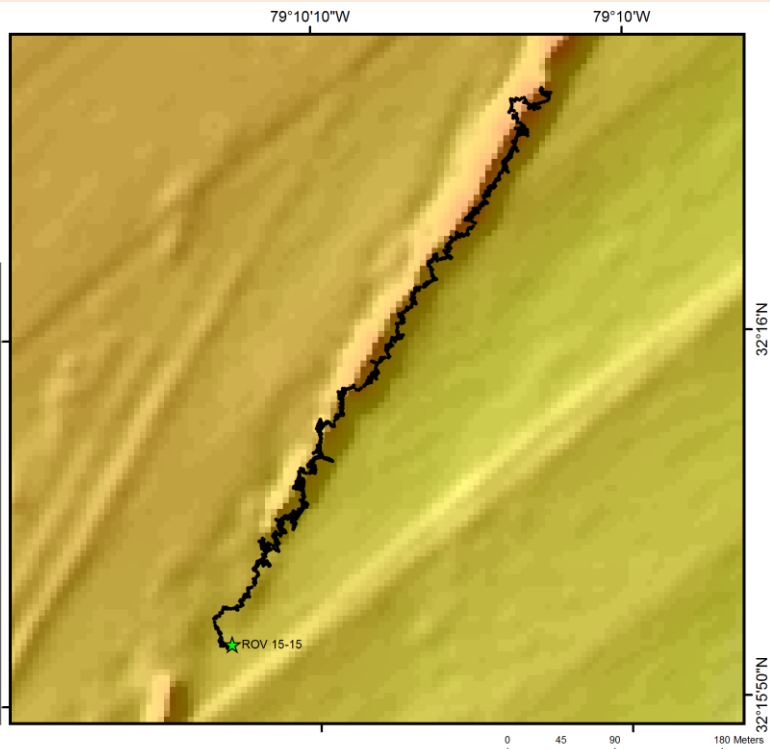
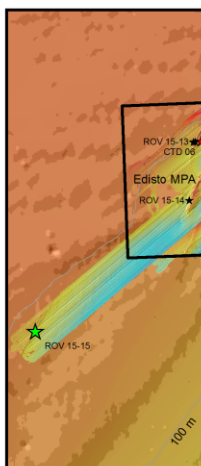
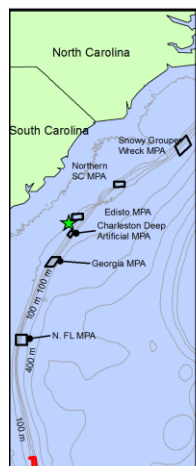
<i>Liopropoma eukrines</i>	wrasse bass	0.23
<i>Lutjanus griseus</i>	gray snapper	10.38
<i>Lutjanus</i> sp.	snapper	0.46
<i>Mulloidichthys martinicus</i>	yellow goatfish	9.22
<i>Mycteroperca microlepis</i>	gag grouper	0.35
<i>Mycteroperca phenax</i>	scamp	5.95
<i>Myripristis jacobus</i>	blackbar soldierfish	1.16
<i>Pareques umbrosus</i>	cubbyu	3.38
<i>Pomacanthus arcuatus</i>	gray angelfish	0.11
<i>Priacanthus arenatus</i>	bigeye	0.11
<i>Prognathodes aculeatus</i>	longsnout butterflyfish	0.11
<i>Prognathodes aya</i>	bank butterflyfish	0.7
<i>Pseudupeneus maculatus</i>	spotted goatfish	3.26
<i>Pterois volitans</i>	lionfish	17.5
<i>Rypticus saponaceus</i>	greater soapfish	0.23
<i>Scorpaena plumieri</i>	spotted scorpionfish	0.35
Scorpaenidae	scorpionfish	0.23
<i>Seriola dumerili</i>	greater amberjack	0.93
<i>Seriola rivoliana</i>	almaco jack	1.4
<i>Seriola</i> sp.	amberjack	2.33
Serranidae	grouper	0.11
<i>Serranus annularis</i>	orangeback bass	0.11
<i>Sparisoma atomarium</i>	greenblotch parrotfish	1.28
<i>Sparisoma aurofrenatum</i>	redband parrotfish	0.11
<i>Sparisoma</i> sp.	parrotfish	1.05
<i>Sphyræna barracuda</i>	barracuda	0.23
<i>Stegastes partitus</i>	bicolor damselfish	1.16
Elasmobranchii		
Carcharhinidae	shark	0.11
<i>Carcharhinus</i> sp.	shark	0.11
<i>Dasyatis</i> sp.	stingray	0.11

Dive Site: ROV 15-15; South Carolina, SW of Edisto MPA, 50 m ridge, UNCW 179

General Location and Dive Track:

ROV 15-15 SE of Edisto MPA 25-VI-15-4

- ★ ROV
- ROV Track
- ★ CTD
- ★ ROV 15-15



Site Overview:

Project: 2015 MPA Cruise
Vessel: NOAA Ship *Pisces* Cruise 15-02
Principal Investigator: Stacy Harter
PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444
Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington
Ship Position System DGPS
Data Management: Access Database
Report Analyst: John Reed, Stephanie Farrington
Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/25/2015
ROV: Mohawk ROV
ROV Navigation: Trackpoint II
ROV Sensors: Temperature (°C), Depth (m)
Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs
Digital Photos: 66
Distance (km): 0.57
Sonar Data: Pisces_2012_EdistoMPA_MB_Hill
DVD: 1
Hard Drive: 1

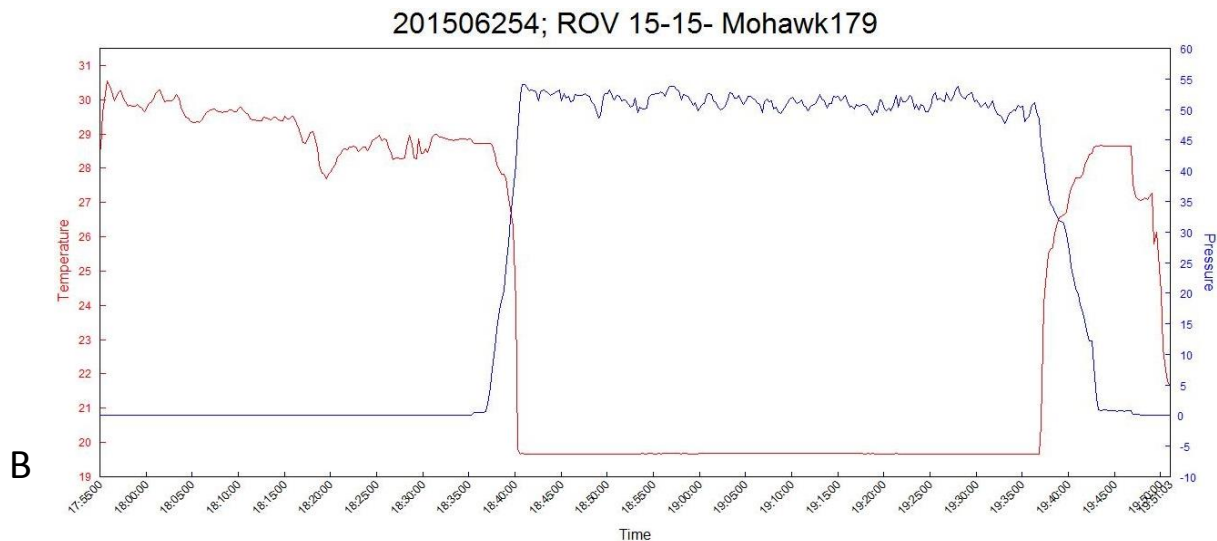
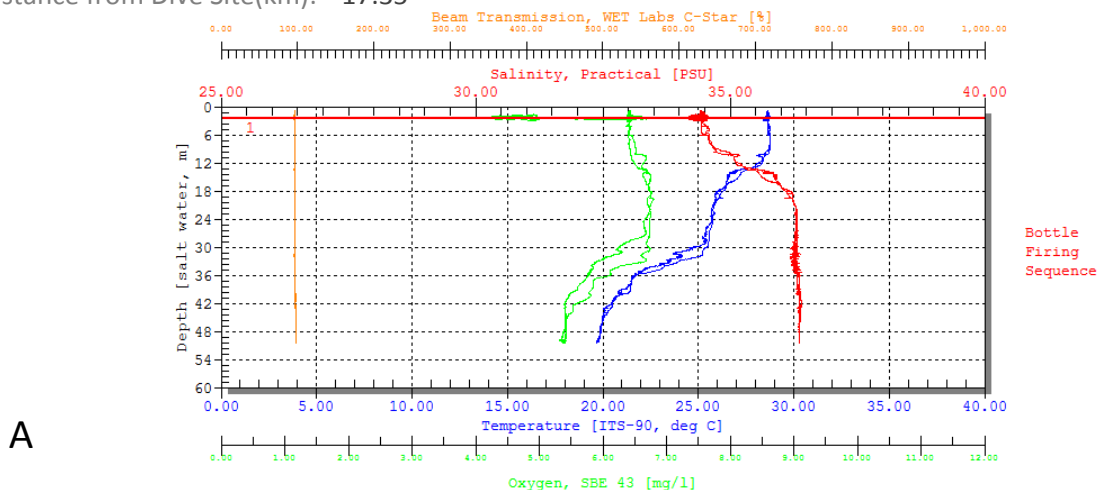
Dive Site: ROV 15-15; South Carolina, SW of Edisto MPA, 50 m ridge, UNCW 179

Dive Data:

Minimum Bottom Depth (m):	51	Total Transect Length (km):	0.570	
Maximum Bottom Depth (m):	55	Surface Current (kn):	1	
On Bottom (Time- GMT):	18:42	On Bottom (Lat/Long):	32.26°N; -79.17°W	
Off Bottom (Time- GMT):	19:36	Off Bottom (Lat/Long):	32.27°N; -79.02°W	
Physical (bottom); Temp (°C):	19.67	Salinity:	Visibility (ft):	Current (kn):

Physical Environment:

Distance from Dive Site(km): 17.35



A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 50.5 m, Temperature: 19.7-28.8 °C , Salinity: 34.2-36.4 (PSU), Sound Velocity: 1523-1542.8 (m/s), Oxygen Saturation: 4.5-5.2 (ml/l; plot is mg/l), Density: 1021.6-1026.1 (Kg/m³), Nitrogen Saturation: 8.3-9.5 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-15; South Carolina, SW of Edisto MPA, 50 m ridge, UNCW 179

Dive Imagery:



Figure 1: 32°15.9065'N, 79°10.1896'W; -53 m
Scamp grouper and jacks



Figure 2: 32°15.9785'N, 79°10.1392'W; -51.1 m
Scamp on rocky hard bottom



Figure 3: 32°15.9'N, 79°10.1961'W; -53.1 m
Diodogorgia sp. (purple) and *Carijoa riisei* (white)
gorgonians on rock pavement

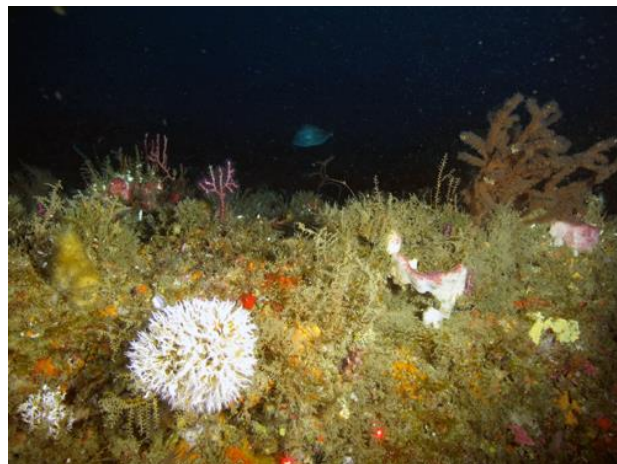


Figure 4: 32°15.8828'N, 79°10.2062'W; -54.4 m
Antipatharian black coral (*Elatopathes abientina*;
upper right) and bushy tube worm (*Filograna* sp.,
lower left).

Dive Site: ROV 15-15; South Carolina, SW of Edisto MPA, 50 m ridge, UNCW 179

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 25-VI-15-4, ROV 15-15, Mohawk UNCW Dive 179, Harter Site 11; previous ROV Dive 12-10. Target Site- South Carolina, outside Edisto MPA. NE-SW narrow ridge, 4.3 km long, 60 m wide, 54 m depth. MB: Sedberry_OEblock_10_5 m.

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Surface current 1/2 kn to NE; 20 kn from SW, 2-3' seas, visibility 10 m.

Site Description/Habitat

Depth range: 51- 54.5 m.

Start at WP 1, at south end of ridge, XS heading NE along east slope of ridge.

18:42- 54.5 m, on bottom. South end of ridge, 50% hard bottom, low relief boulders, ½-1 m diameter, 20 cm relief. 312 m SW of WP 1.

54 m- On ridge, ½ - 1 m relief, fractured, square rock slabs. Dense biota- *Dictyota*, gorgonians, sponges, black coral.

Boulder field 10 m wide on east slope; upper slope, 1-2 m relief, high rugosity. Dense *Telesto* on top edge.

54 m- east base, 100% sand. East slope, 10 m wide, jumble flat rock slabs, 1-2 m relief near top edge, high rugosity. Lots of fish, scamp.

52.5 m- top edge of ridge; rock pavement, rock slabs, ½ m relief. Several gag (70 cm), scamp, jacks. Lots of fish out, twilight, 1 hour before sunset. Top of ridge about 10-15 m wide.

51 m- minimum depth, top of ledge, pavement, fractured rock.

19:36- end dive.

Dominant Macrofauna:

Octocoral- *Swiftia exserta*, *Ellisella*, *Telesto*, *Diodogorgia*, *Muricea*- 2' purple, common

Hydroida- white hydroids, stinging hydroids

Antipatharia- *Tanacetipathes*- bushy, *Stichopathes lutkeni*

Porifera- *Ircinia campana*, Demospongiae- starlet, *Callyspongia vaginalis*, *Agelas clathrodes*, *Aplysina*- purple fingers,

Crinoidea- yellow Comatulida

Ascidacea- Didemnidae

Algae-*Dictyota*

Fish:

Spotfin hogfish, blue angelfish, reef butterfly, tomtate, bank butterfly, hogfish, red porgy, scamp- common, yellow mouth grouper, red snapper- 1, 70 cm gag-2, scamp, school of barracuda, almaco school, cornet fish, sharks.

Dive Site: ROV 15-15; South Carolina, SW of Edisto MPA, 50 m ridge, UNCW 179

CPCe Percent Cover Analysis:

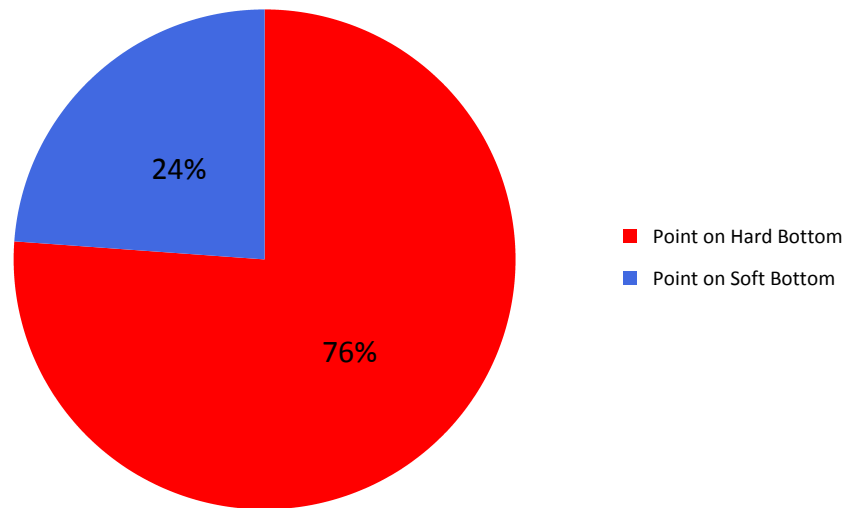
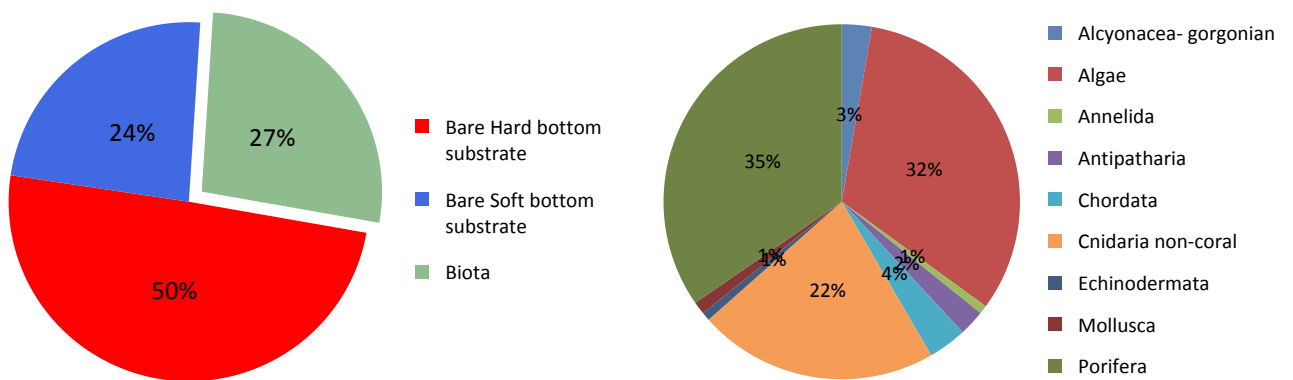


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-15. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-15.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Dive Site: ROV 15-15; South Carolina, SE of Edisto MPA, 50 m ridge, UNCW 179

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-15.

Benthic Macro-biota and Substrate Type	ROV 15-15 Point Count	% Cover
Biota	257	26.77%
Algae	83	8.65%
Chlorophyta	1	0.10%
Corallinales/crustose coralline	47	4.90%
Phaeophyta	14	1.46%
Rhodophyta	21	2.19%
Porifera	89	9.27%
Aiolochoia crassa	1	0.10%
Callyspongia sp.	1	0.10%
Demospongiae	44	4.58%
Demospongiae- ze tan starlet	7	0.73%
Erylus sp.	1	0.10%
Ircinia sp.	14	1.46%
Spirastrellidae	21	2.19%
Alcyonacea- gorgonian	7	0.73%
Diodogorgia sp.	5	0.52%
Ellisella sp.	1	0.10%
gorgonian unid	1	0.10%
Antipatharia	6	0.63%
Antipatharia	1	0.10%
Antipathes atlantica	1	0.10%
Antipathes furcata	3	0.31%
Elatopathes abietina	1	0.10%
Cnidaria non-coral	56	5.83%
Hydroidolina	56	5.83%
Annelida	2	0.21%
Filograna sp.	1	0.10%
Sabellidae	1	0.10%
Mollusca	3	0.31%
Bivalvia	3	0.31%
Echinodermata	2	0.21%
Davidaster discoideus	2	0.21%
Chordata	9	0.94%
Ascidacea	2	0.21%
Didemnidae	2	0.21%

Dive Site: ROV 15-15; South Carolina, SE of Edisto MPA, 50 m ridge, UNCW 179

Fish	5	0.52%
Bare hard bottom substrate	476	49.58%
Bare Hard bottom	476	49.58%
Bare rock- pavement boulder ledge	449	46.77%
Bare rubble- coral	1	0.10%
Bare rubble- rock	26	2.71%
Bare soft bottom substrate	227	23.65%
Grand Total	960	100.00%

Dive Site: ROV 15-15; South Carolina, SE of Edisto MPA, 50 m ridge, UNCW 179

Density of Fish:

Table 2. Density (# of individuals m⁻³) of fish from video transects at dive site ROV 15-15.

Class/Scientific Name	Common Name	ROV 15-15
Actinopterygii		
<i>Acanthurus</i> sp.	doctorfish	0.9
<i>Aulostomus maculatus</i>	trumpetfish	0.45
<i>Bodianus pulchellus</i>	spotfin hogfish	28.54
<i>Calamus</i> sp.	porgy	6.79
<i>Canthigaster</i> sp.	puffer	40.77
<i>Centropristis ocyurus</i>	bank sea bass	1.35
<i>Centropristis</i> sp.	sea bass	0.45
<i>Centropyge argi</i>	cherubfish	0.45
<i>Cephalopholis cruentata</i>	graysby	0.9
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	0.45
<i>Chaetodon sedentarius</i>	reef butterflyfish	33.98
Chaetodontidae	butterflyfish	0.45
<i>Chromis enchrysurus</i>	yellowtail reeffish	16.76
<i>Chromis insolatus</i>	sunshinefish	6.34
<i>Chromis scotti</i>	purple reeffish	43.95
<i>Chromis</i> sp.	damselfish	3.17
<i>Fistularia</i> sp.	cornetfish	0.45
<i>Fistularia tabacaria</i>	bluespotted cornetfish	0.9
<i>Haemulon aurolineatum</i>	tomtate	666.06
<i>Haemulon striatum</i>	striped grunt	22.65
<i>Halichoeres</i> sp.	wrasse	7.24
<i>Holacanthus bermudensis</i>	blue angelfish	30.81
Holocentridae	squirrelfish	7.24
<i>Holocentrus</i> sp.	squirrelfish	1.35
<i>Lachnolaimus maximus</i>	hogfish	0.9
<i>Lactophrys</i> sp.	cowfish	0.45
<i>Liopropoma eukrines</i>	wrasse bass	1.81
<i>Lutjanus campechanus</i>	red snapper	0.45
Monacanthidae	filefish	0.45
<i>Mulloidichthys martinicus</i>	yellow goatfish	0.9
<i>Mycteroperca interstitialis</i>	yellowmouth grouper	0.9
<i>Mycteroperca microlepis</i>	gag grouper	1.35
<i>Mycteroperca phenax</i>	scamp	6.79
<i>Myripristis jacobus</i>	blackbar soldierfish	2.26
<i>Pagrus pagrus</i>	red porgy	12.23

Dive Site: ROV 15-15; South Carolina, SE of Edisto MPA, 50 m ridge, UNCW 179

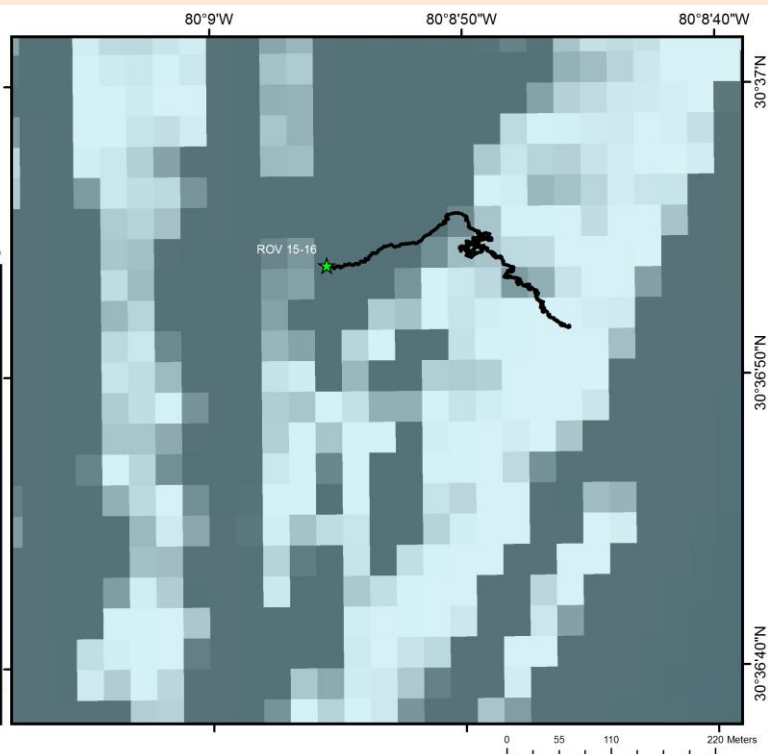
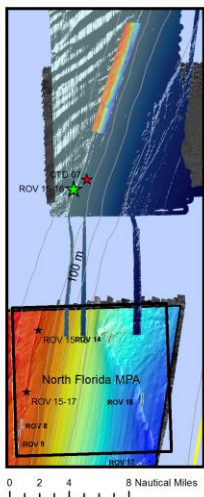
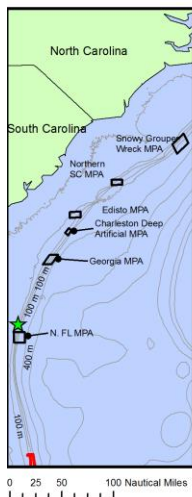
<i>Pareques umbrosus</i>	cubbyu	2.71
<i>Pomacanthus</i> sp.	angelfish	0.45
<i>Priacanthus arenatus</i>	bigeye	0.45
<i>Pristigenys alta</i>	short bigeye	6.79
<i>Prognathodes aculeatus</i>	longsnout butterflyfish	0.45
<i>Prognathodes aya</i>	bank butterflyfish	9.06
<i>Pseudupeneus maculatus</i>	spotted goatfish	2.71
<i>Pterois volitans</i>	lionfish	34.43
<i>Rhomboplites aurorubens</i>	vermillion snapper	99.68
<i>Rypticus</i> sp.	soapfish	0.45
Scorpaenidae	scorpionfish	0.45
<i>Seriola dumerili</i>	greater amberjack	1.81
<i>Seriola fasciata</i>	lesser amberjack	6.79
<i>Seriola rivoliana</i>	almaco jack	5.89
<i>Seriola</i> sp.	amberjack	4.07
Serranidae	grouper	0.45
<i>Serranus annularis</i>	orangeback bass	2.26
<i>Serranus baldwini</i>	lantern bass	0.45
<i>Serranus phoebe</i>	tattler	0.45
<i>Serranus</i> sp.	sea bass	0.9
<i>Sparisoma atomarium</i>	greenblotch parrotfish	0.9
<i>Sphyræna barracuda</i>	barracuda	3.62
<i>Stegastes partitus</i>	bicolor damselfish	2.26
<i>Stephanolepis hispidus</i>	planehead filefish	0.9
Elasmobranchii		
Carcharhinidae	shark	0.45

Dive Site: ROV 15-16; Florida, N of North Florida MPA (Fernandina, repeat ROV 12-35) NE/SW Ridge 50 m, UNCW 180

General Location and Dive Track:

ROV 15-16 N of North Florida MPA 26-VI-15-2

- ★ ROV
- ★ CTD
- ★ ROV 15-16
- ROV Track



Site Overview:

Project: 2015 MPA Cruise

Vessel: NOAA Ship *Pisces* Cruise 15-02

Principal Investigator: Stacy Harter

PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444

Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington

Ship Position System DGPS

Data Management: Access Database

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/26/2015

ROV: Mohawk ROV

ROV Navigation: Trackpoint II

ROV Sensors: Temperature (°C), Depth (m)

Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs

Digital Photos: 7

Distance (km): 0.31

Sonar Data: Pisces_2013_NorthOfNorthFloridaMPA_MB_Hill

DVD: 1

Hard Drive: 1

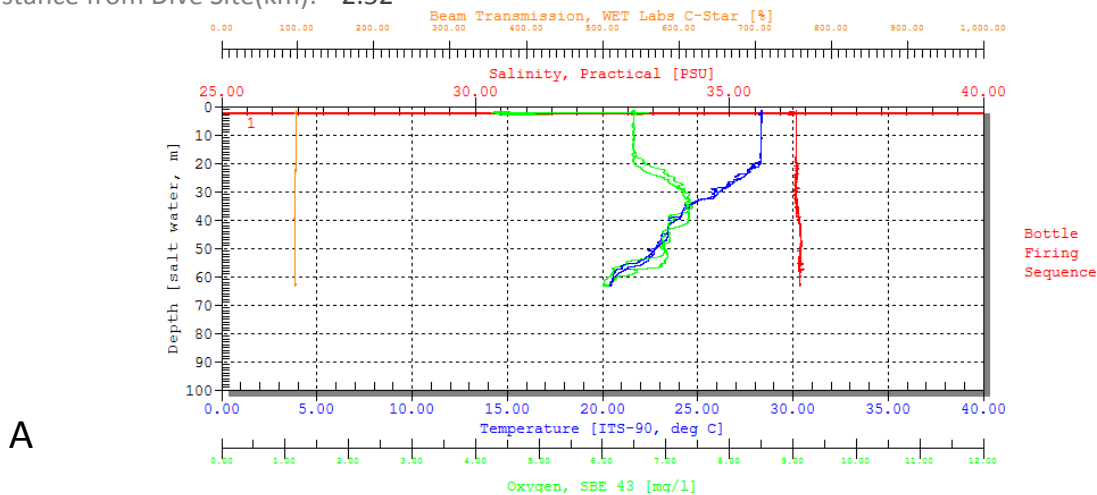
Dive Site: ROV 15-16; Florida, N of North Florida MPA (Fernandina, repeat ROV 12-35) NE/SW Ridge 50 m, UNCW 180

Dive Data:

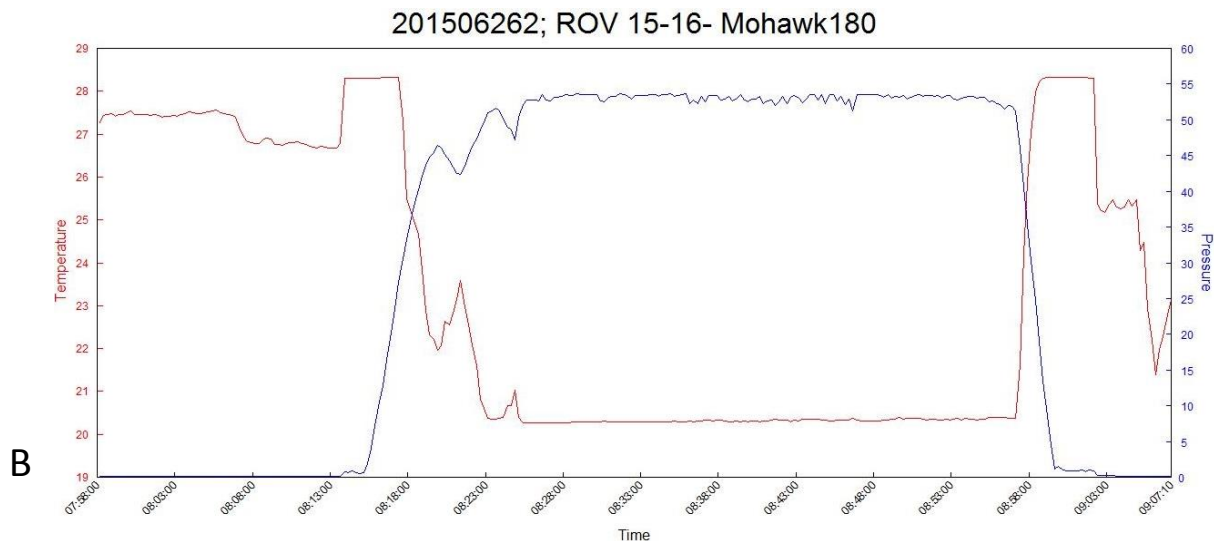
Minimum Bottom Depth (m):	54	Total Transect Length (km):	0.310
Maximum Bottom Depth (m):	55	Surface Current (kn):	1
On Bottom (Time- GMT):	8:24	On Bottom (Lat/Long):	30.61°N; -80.15°W
Off Bottom (Time- GMT):	8:56	Off Bottom (Lat/Long):	30.61°N; -80.15°W
Physical (bottom); Temp (°C):	21.03	Salinity:	Visibility (ft): 20 Current (kn): 0.25

Physical Environment:

Distance from Dive Site(km): 2.52



A



B

A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 63.4 m, Temperature: 20.4-28.4 °C , Salinity: 36.2-36.5 (PSU), Sound Velocity: 1525.1-1543.8 (m/s), Oxygen Saturation: 4.4-5.1 (ml/l; plot is mg/l), Density: 1023.2-1026 (Kg/m³), Nitrogen Saturation: 8.3-9.4 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-16; Florida, N of North Florida MPA (Fernandina, repeat ROV 12-35) NE/SW Ridge
50 m, UNCW 180

Dive Imagery:



Figure 1: 30°36.8729'N, 80°8.7836'W; -53.7 m
Sea pen (*Virgularia presbytes*)



Figure 2: 30°36.9112'N, 80°8.8276'W; -53.9 m
Detritus on soft bottom



Figure 3: 30°36.8602'N, 80°8.7664'W; -53.5 m
Amberjack



Figure 4: 30°36.9146'N, 80°8.8256'W; -54.2 m
Rippled sediment bottom

Dive Site: ROV 15-16; Florida, N of North Florida MPA (Fernandina, repeat ROV 12-35) NE/SW Ridge 50 m, UNCW 180

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 26-VI-15-2, ROV 15-16, Mohawk UNCW Dive 180, Harter Site 7; previous ROV Dive 12-35. Target Site- Florida, north of North Florida MPA, Fernandina. NE-SW oriented ridge, 29 km long, 225 m wide, 55 m. MB- ??

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Surface current 1 kn to N; 22 kn from SW, 2-3' seas. Bottom current <1/4 kn from E, visibility 10 m

Site Description/Habitat

Depth range: 54.5 m.

8:24- on bottom, 54.5 m. 300 m west of reef; 100% soft bottom, flat sand.

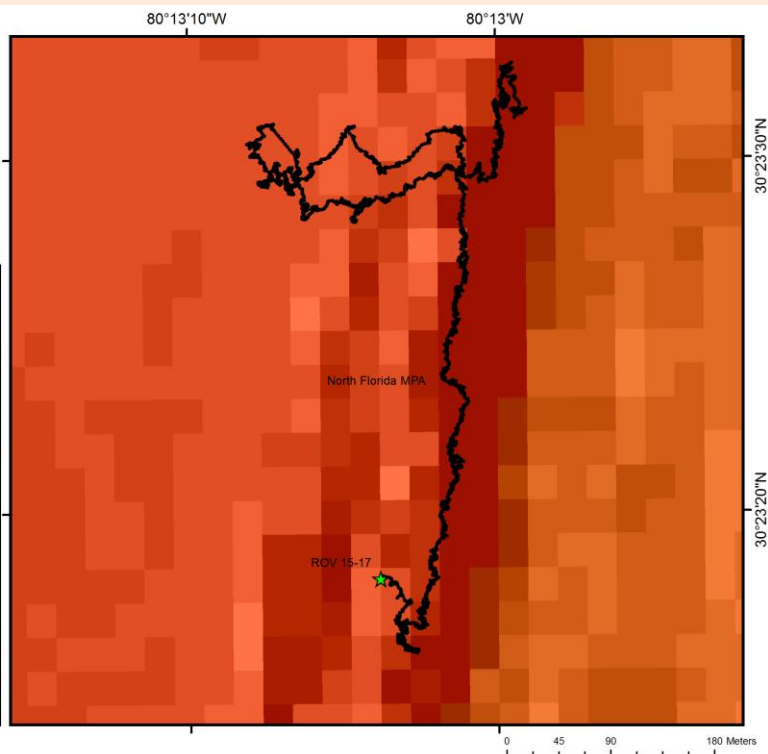
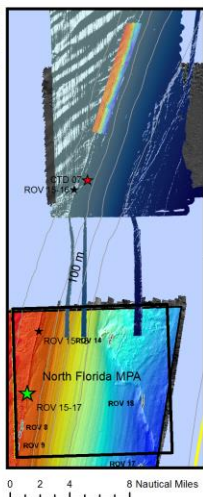
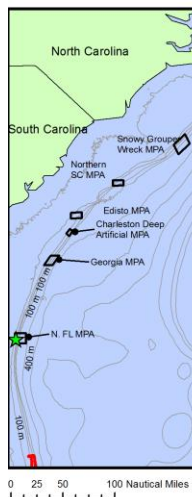
8:57- dive aborted, ship unable to station keep; no photo transects. 20-25 kn wind from squall.

Dive Site: ROV 15-17; Florida, North Florida MPA, NE/SW Ridge 50 m (repeat ROV 13-04, 12-03), UNCW 181

General Location and Dive Track:

ROV 15-17 North Florida MPA 26-VI-15-3

- ★ ROV
- ★ CTD
- ★ ROV 15-17
- ROV Track



Site Overview:

Project: 2015 MPA Cruise

Vessel: NOAA Ship *Pisces* Cruise 15-02

Principal Investigator: Stacy Harter

PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444

Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington

Ship Position System DGPS

Data Management: Access Database

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/26/2015

ROV: Mohawk ROV

ROV Navigation: Trackpoint II

ROV Sensors: Temperature (°C), Depth (m)

Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs

Digital Photos: 141

Distance (km):

Sonar Data: Navy_2011_CONFIDENTIAL_USWTR_Tif

DVD: 2

Hard Drive: 1

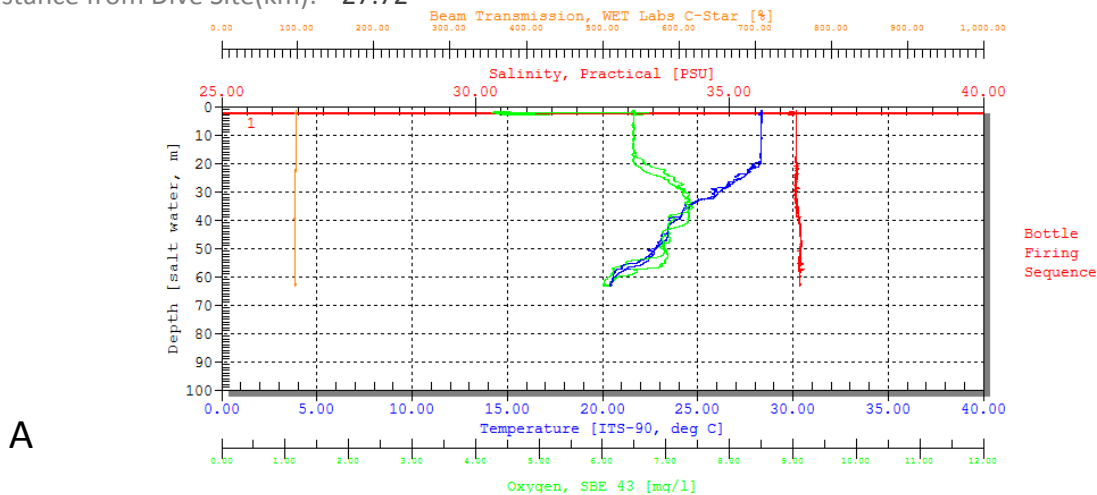
Dive Site: ROV 15-17; Florida, North Florida MPA, NE/SW Ridge 50 m (repeat ROV 13-04, 12-03), UNCW 181

Dive Data:

Minimum Bottom Depth (m):	55	Total Transect Length (km):	1.250
Maximum Bottom Depth (m):	65	Surface Current (kn):	1
On Bottom (Time- GMT):	12:14	On Bottom (Lat/Long):	30.39°N; -80.22°W
Off Bottom (Time- GMT):	14:16	Off Bottom (Lat/Long):	30.39°N; -80.22°W
Physical (bottom); Temp (°C):	18.37	Salinity:	Visibility (ft): 50 Current (kn):

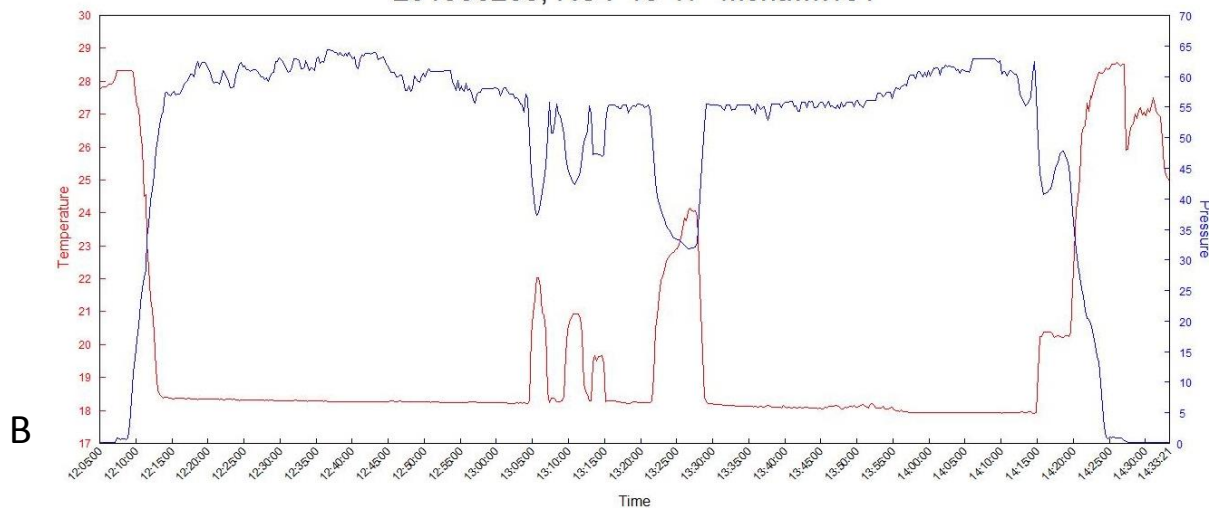
Physical Environment:

Distance from Dive Site(km): 27.72



A

201506263; ROV 15-17- Mohawk181



B

A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 63.4 m, Temperature: 20.4-28.4 °C , Salinity: 36.2-36.5 (PSU), Sound Velocity: 1525.1-1543.8 (m/s), Oxygen Saturation: 4.4-5.1 (ml/l; plot is mg/l), Density: 1023.2-1026 (Kg/m³), Nitrogen Saturation: 8.3-9.4 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-17; Florida, North Florida MPA, NE/SW Ridge 50 m (repeat ROV 13-04, 12-03), UNCW 181

Dive Imagery:



Figure 1: 30°23.4388'N, 80°13.0226'W; -61 m
Spiny lobster (*Panulirus argus*)



Figure 2: 30°23.4463'N, 80°13.018'W; -61.1 m
Orangeback bass with *Ircinia* sponges



Figure 3: 30°23.4862'N, 80°13.0175'W; -58.3 m
Florida regal sea goddess nudibranch (*Hypselodoris edenticulata*) on red sponges



Figure 4: 30°23.3996'N, 80°13.0286'W; -60 m
Scamp grouper in rugged boulder zone

Dive Site: ROV 15-17; Florida, North Florida MPA, NE/SW Ridge 50 m (repeat ROV 13-04, 12-03), UNCW 181

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 26-VI-15-3, ROV 15-17, Mohawk UNCW Dive 181, Harter Site 3; previous ROV Dive 12-3. Target Site- Florida, inside North Florida MPA. NE/SW oriented ridge, 64 m depth. MB Map- Navy_2011_Confidential_USWTR_Tif (no grid file)

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Surface current 1 kn to N; 12 kn from SW, 2-3' seas, visibility 10 m.

Site Description/Habitat

Depth range: 55.5- 64.6 m.

Transect heading N along ridge and slopes on east and west side.

12:15- on bottom, 62.5 m, east slope of ridge. Scattered boulders, ½-1 m diameter; 70% HB cover, ½ m relief, 5-10 dg slope. Piles of fishing line common.

62 m- top of ridge. 70% hard bottom, low relief boulders, ½ m relief, 15 dg slope. Flat rock slabs, ½ m relief near top edge. Lower slope of scattered boulders extends about 10-15 m wide, then to sand.

64.5 m- sand at east base. MB appears off- shifted to east.

59 m- top of ridge. 100% hard bottom, flat fractured rock slabs, ½ - 1 m relief, upper slope 30 dg; lower slope, 50% hard bottom, ½ m boulders, extending over 10-15 m.

59m- further north, the ridge top changes to flat pavement/sediment, cobble/rubble.

Trouble station keeping with ship, pulled off bottom.

13:30- 56.5 m, west of reef. 80% cover sand, flat rock, 30 cm relief.

59 m- back on ridge, pavement/sand, low relief boulders.

14:17- abort dive, poor ship station keeping.

Dominant Macrofauna:

Octocoral- *Diodogorgia*

Hydroida- Hydroida- bushy black

Antipatharia- *Stichopathes lutkeni*, *Tanacetipathes*- bushy, 2'

Porifera- *Ircinia* spp., *Ircinia campana*, Demospongiae- starlet, Clathriidae, ye-bushy Axinellid, *Ircinia strobilina*, *Cinachyra*, *Geodia*, dense and diverse sponges, Verongida, *Aplysina*

Annelida- *Filograna*

Bryozoa- *Schizoporella*

Decapoda- *Panulirus argus*

Ascidiacea- Didemnidae, *Eudistoma*?

Fish:

Blue angelfish, tomtate, spotfin hog, reef butterfly, scamp- common, lionfish, squirrelfish, harlequin bass, gag- few, wrasse bass, bigeye, orange back bass, 2 spot cardinal

Dive Site: ROV 15-17; Florida, North Florida MPA, NE/SW Ridge 50 m (repeat ROV 13-04, 12-03),
UNCW 181

CPCe Percent Cover Analysis:

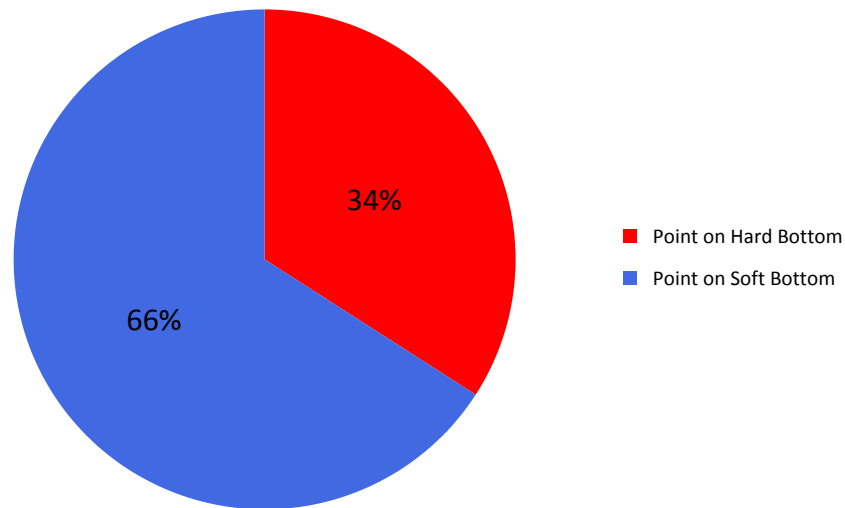
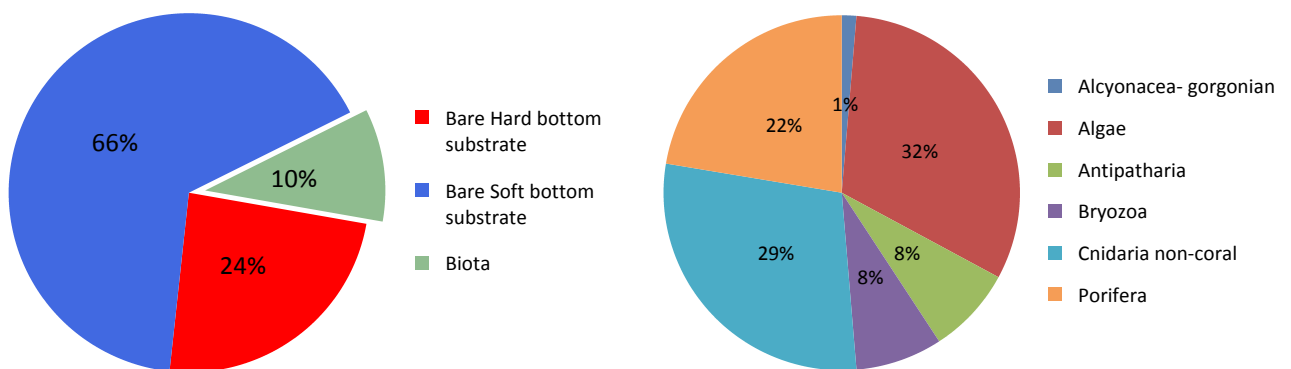


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-17. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-17.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Dive Site: ROV 15-17; Florida, North Florida MPA, NE/SW Ridge 50 m (repeat ROV 13-04, 12-03), UNCW 181

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-17.

Benthic Macro-biota and Substrate Type	ROV 15-17	
	Point Count	% Cover
Biota	76	10.16%
Algae	24	3.21%
Corallinales/crustose coralline	7	0.94%
Phaeophyta	7	0.94%
Rhodophyta	10	1.34%
Porifera	17	2.27%
Clathria sp.	1	0.13%
Demospongiae	10	1.34%
Erylus sp.	1	0.13%
Ircinia sp.	2	0.27%
Spirastrellidae	3	0.40%
Alcyonacea- gorgonian	1	0.13%
Iciligorgia schrammi	1	0.13%
Antipatharia	6	0.80%
Antipathes furcata	2	0.27%
Elatopathes abietina	1	0.13%
Stichopathes lutkeni	3	0.40%
Cnidaria non-coral	22	2.94%
Hydroidolina	22	2.94%
Bryozoa	6	0.80%
Schizoporella sp.	6	0.80%
Bare hard bottom substrate	179	23.93%
Bare Hard bottom	179	23.93%
Bare rock- pavement boulder ledge	141	18.85%
Bare rubble- coral	1	0.13%
Bare rubble- rock	37	4.95%
Bare soft bottom substrate	493	65.91%
Grand Total	748	100.00%

Dive Site: ROV 15-17; Florida, North Florida MPA, NE/SW Ridge 50 m (repeat ROV 13-04, 12-03), UNCW 181

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 15-17.

Class/Scientific Name	Common Name	ROV 15-17
Actinopterygii		
<i>Acanthurus</i> sp.	doctorfish	0.26
<i>Apogon pseudomaculatus</i>	twospot cardinalfish	0.26
<i>Aulostomus maculatus</i>	trumpetfish	0.26
<i>Balistes capriscus</i>	gray triggerfish	0.26
<i>Balistes</i> sp.	triggerfish	0.26
<i>Bodianus pulchellus</i>	spotfin hogfish	16.45
<i>Calamus</i> sp.	porgy	0.26
<i>Canthigaster</i> sp.	puffer	28.04
<i>Centropristis ocyurus</i>	bank sea bass	0.26
<i>Cephalopholis cruentata</i>	graysby	0.26
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	0.53
<i>Chaetodon sedentarius</i>	reef butterflyfish	30.47
Chaetodontidae	butterflyfish	0.26
<i>Chromis enchrysurus</i>	yellowtail reeffish	86.56
<i>Chromis insolatus</i>	sunshinefish	18.33
<i>Chromis scotti</i>	purple reeffish	28.04
<i>Chromis</i> sp.	damsel fish	15.1
<i>Haemulon aurolineatum</i>	tomtate	162.08
<i>Halichoeres bathyphilus</i>	greenband wrasse	0.8
<i>Halichoeres garnoti</i>	yellowhead wrasse	5.39
<i>Halichoeres</i> sp.	wrasse	28.85
<i>Holacanthus bermudensis</i>	blue angelfish	11.05
<i>Holacanthus tricolor</i>	rock beauty	1.88
Holocentridae	squirrelfish	9.97
<i>Lachnolaimus maximus</i>	hogfish	0.26
<i>Liopropoma eukrines</i>	wrasse bass	2.96
<i>Lutjanus buccanella</i>	blackfin snapper	0.26
<i>Lutjanus griseus</i>	gray snapper	0.26
<i>Malacanthus plumieri</i>	sand tilefish	0.26
<i>Muraena robusta</i>	stout moray	0.26
Muraenidae	moray eel	0.26
<i>Mycteroperca microlepis</i>	gag grouper	0.8
<i>Mycteroperca phenax</i>	scamp	2.15
<i>Myripristis jacobus</i>	blackbar soldierfish	17.79
<i>Pagrus pagrus</i>	red porgy	1.34

Dive Site: ROV 15-17; Florida, North Florida MPA, NE/SW Ridge 50 m (repeat ROV 13-04, 12-03), UNCW 181

<i>Paranthias furcifer</i>	creole-fish	5.66
<i>Pareques umbrosus</i>	cubbyu	8.62
<i>Priacanthus arenatus</i>	bigeye	0.8
<i>Pristigenys alta</i>	short bigeye	0.53
<i>Prognathodes aya</i>	bank butterflyfish	2.96
<i>Pterois volitans</i>	lionfish	17.52
<i>Rhomboplites aurorubens</i>	vermilion snapper	137
<i>Seriola rivoliana</i>	almaco jack	0.8
<i>Serranus annularis</i>	orangeback bass	3.23
<i>Serranus baldwini</i>	lantern bass	0.8
<i>Serranus phoebe</i>	tattler	4.58
<i>Serranus tigrinus</i>	harlequin bass	0.26
<i>Sparisoma atomarium</i>	greenblotch parrotfish	0.53
<i>Sparisoma</i> sp.	parrotfish	1.61
<i>Stegastes partitus</i>	bicolor damselfish	0.8
<i>Synodus intermedius</i>	sand diver	0.26
Elasmobranchii		
<i>Dasyatis centroura</i>	rougtail stingray	0.26

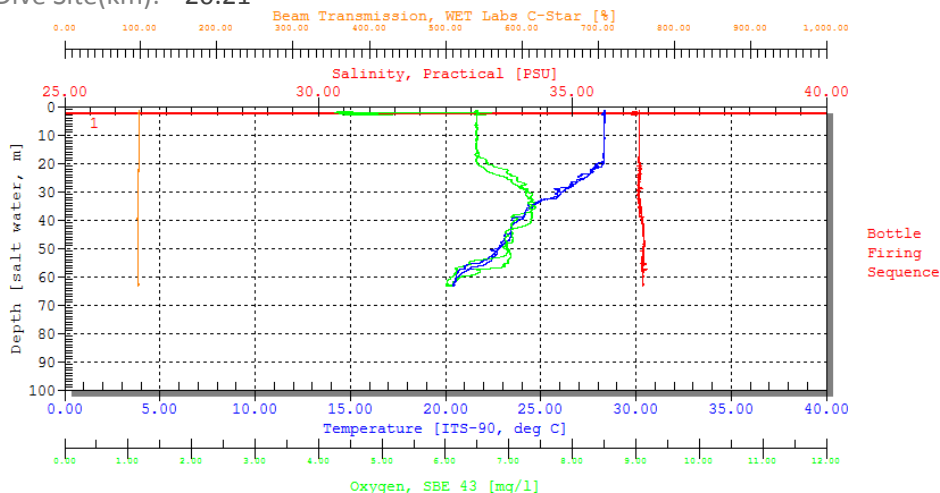
Dive Site: ROV 15-18; Florida, North Florida MPA, NE/SW Ridge 60 m (repeat ROV 12-1, 14-29), UNCW 182

Dive Data:

Minimum Bottom Depth (m):	53	Total Transect Length (km):	1.320
Maximum Bottom Depth (m):	61	Surface Current (kn):	1.25
On Bottom (Time- GMT):	16:38	On Bottom (Lat/Long):	30.46°N; -80.2°W
Off Bottom (Time- GMT):	18:09	Off Bottom (Lat/Long):	30.47°N; -80.2°W
Physical (bottom); Temp (°C):	18.74	Salinity:	Visibility (ft): 30 Current (kn): 0.25

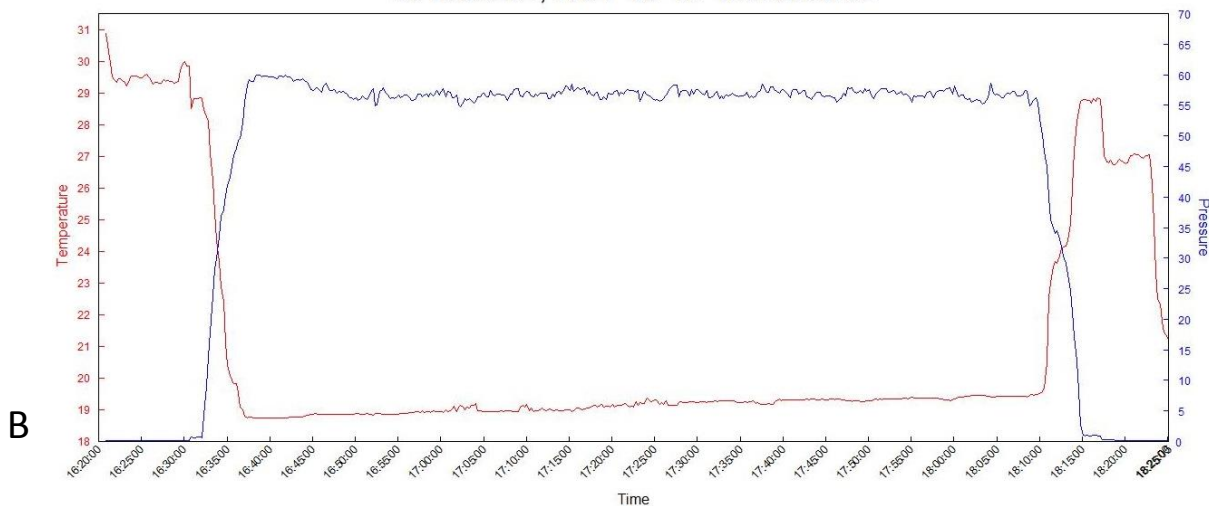
Physical Environment:

Distance from Dive Site(km): 20.21



A

201506264; ROV 15-18- Mohawk182



B

A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 63.4 m, Temperature: 20.4-28.4 °C , Salinity: 36.2-36.5 (PSU), Sound Velocity: 1525.1-1543.8 (m/s), Oxygen Saturation: 4.4-5.1 (ml/l; plot is mg/l), Density: 1023.2-1026 (Kg/m³), Nitrogen Saturation: 8.3-9.4 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-18; Florida, North Florida MPA, NE/SW Ridge 60 m (repeat ROV 12-1, 14-29), UNCW 182

Dive Imagery:



Figure 1: 30°27.4905'N, 80°12.0247'W; -58 m
Ghost trap (camera on top suggests a NOAA fisheries trap) with bank butterflyfish and a spotfin hogfish



Figure 2: 30°27.6787'N, 80°11.9659'W; -58.3 m
Scamp grouper under a ledge



Figure 3: 30°27.7664'N, 80°11.9401'W; -58.3 m
Goldentail moray eel



Figure 4: 30°27.947'N, 80°11.8834'W; -56.6 m
Flying gurnard

Dive Site: ROV 15-18; Florida, North Florida MPA, NE/SW Ridge 60 m (repeat ROV 12-1, 14-29), UNCW 182

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 26-VI-15-4, ROV 15-18, Mohawk UNCW Dive 182, Harter Site 6; previous ROV Dive 12-1, 14-29. Target Site- Florida, inside North Florida MPA. NE/SW oriented ridge, extensive, 200 m wide, 60 m depth. MB Map- Navy_2011_Confidential_USWTR_Tif (no grid file)
Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Surface current 1.5 kn to N; 12 kn from SW, 1-2' seas. Visibility 10 m, bottom current ¼ knot.

Site Description/Habitat

Depth range: 56.3- 61.5 m.

Transect N along top and east slope of ridge.

16:38- on bottom, 61.5 m. East of ridge, coarse sand, pavement, rubble. Black coral, sponges, Filograna, green algae, Didemnidae.

16:42- video of two lionfish, mouth to mouth, then chasing the other- male territoriality? Mating?

60.2 m- lower east slope, flat rock slabs, ½ m relief, 5-10 dg slope, scattered boulders, 50% hard bottom. 100% cover of biota on rocks.

16:53- video of W fish trap, with large camera mounted on top. Well overgrown, *Madracis* (or *Oculina*) on sides, 50 m.

51.5 m- top of ridge, 100% hard bottom, fractured flat rock slabs, 1-3 m diameter, ½ m relief, 10 dg slope to east. East slope of boulder zone extends about 10-15 m. Sand at base.

17:51- good video of pair of flying gurnard.

58.7 m- east base.

18:10- end dive.

Dominant Macrobiota:

Coral- *Madracis mirabilis*

Octocoral- *Ellisella*- whip, *Muricea*- 2' purple,

Antipatharia- *Stichopathes lutkeni*, *Antipathes atlantica*, *Tanacetipathes*- bushy 2', *Antipathes furcata*

Hydroida- very dense; Hydroida- black stinging, Hydroida

Porifera- Demospongiae- starlet, *Aplysina*- pu fingers, Axinellida- ye bushy, *Ircinia* spp., *Ircinia campana*, Axinellida- red bushy, Clathriidae, *Aplysina*- purple tubes, *Holopsamma*

Annelida- *Filograna*, Cerianthidae

Decapoda- *Panulirus argus*

Ascidacea- Didemnidae

Fish:

Dense fish; Flying gurnard, juvenile French angel, Spanish hog, cowfish, blue angel, scamp- common, lionfish, spotfin hog, tomtate, squirrel fish, AJ, reef butterfly, grey trigger, wrasse bass, bicolor damsel, tattler, queen

Dive Site: ROV 15-18; Florida, North Florida MPA, NE/SW Ridge 60 m (repeat ROV 12-1, 14-29),
UNCW 182

CPCe Percent Cover Analysis:

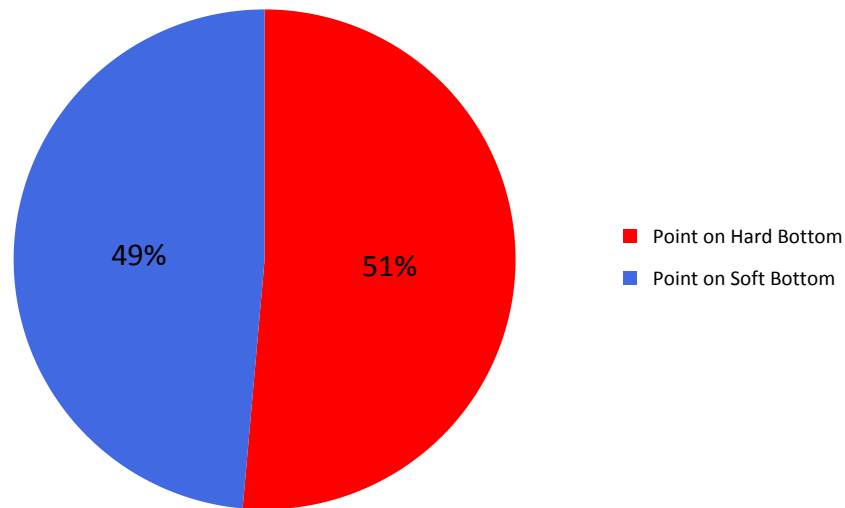
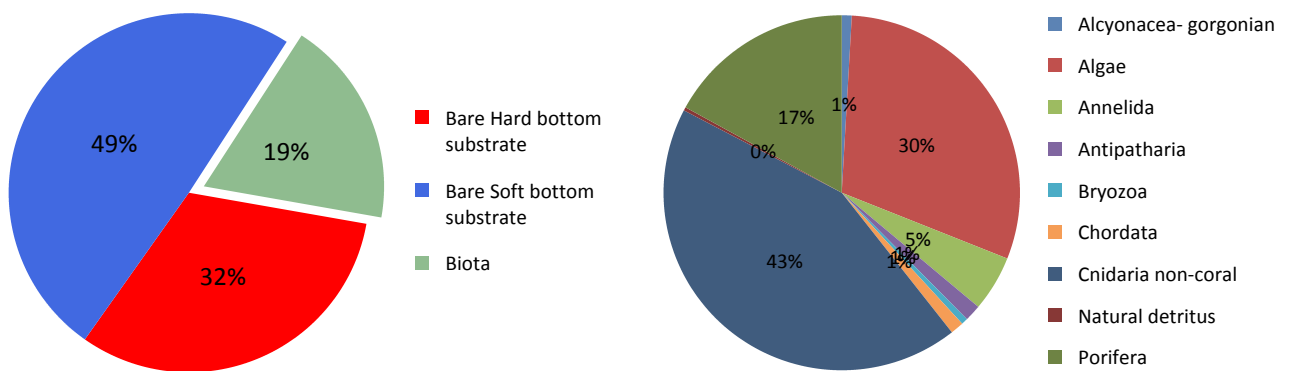


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-18. CPCe® points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-18.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Dive Site: ROV 15-18; Florida, North Florida MPA, NE/SW Ridge 60 m (repeat ROV 12-1, 14-29),
UNCW 182

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-18.

Benthic Macro-biota and Substrate Type	ROV 15-18 Point Count	% Cover
Biota	335	18.65%
Algae	101	5.62%
Chlorophyta	3	0.17%
Corallinales/crustose coralline	25	1.39%
Cyanophyta	5	0.28%
Phaeophyta	24	1.34%
Rhodophyta	44	2.45%
Porifera	57	3.17%
Aiolochoia crassa	1	0.06%
Clathria sp.	1	0.06%
Demospongiae	12	0.67%
Demospongiae- ze tan starlet	9	0.50%
Ircinia campana	12	0.67%
Ircinia sp.	3	0.17%
Neofibularia sp.	2	0.11%
Poecilosclerida	3	0.17%
Spirastrellidae	14	0.78%
Alcyonacea- gorgonian	3	0.17%
Carijoa sp.	1	0.06%
Diodogorgia sp.	1	0.06%
gorgonian unid	1	0.06%
Antipatharia	5	0.28%
Elatopathes abietina	1	0.06%
Stichopathes lutkeni	4	0.22%
Cnidaria non-coral	145	8.07%
Hydroidolina	145	8.07%
Annelida	17	0.95%
Filograna sp.	17	0.95%
Bryozoa	2	0.11%
Schizoporella sp.	2	0.11%
Chordata	4	0.22%
Didemnidae	2	0.11%
Fish	2	0.11%
Natural detritus	1	0.06%
Natural detritus	1	0.06%

Dive Site: ROV 15-18; Florida, North Florida MPA, NE/SW Ridge 60 m (repeat ROV 12-1, 14-29),
UNCW 182

Bare hard bottom substrate	575	32.02%
Bare Hard bottom	575	32.02%
Bare rock- pavement boulder ledge	517	28.79%
Bare rubble- rock	58	3.23%
Bare soft bottom substrate	886	49.33%
Grand Total	1796	100.00%

Dive Site: ROV 15-18; Florida, North Florida MPA, NE/SW Ridge 60 m (repeat ROV 12-1, 14-29),
UNCW 182

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 15-18.

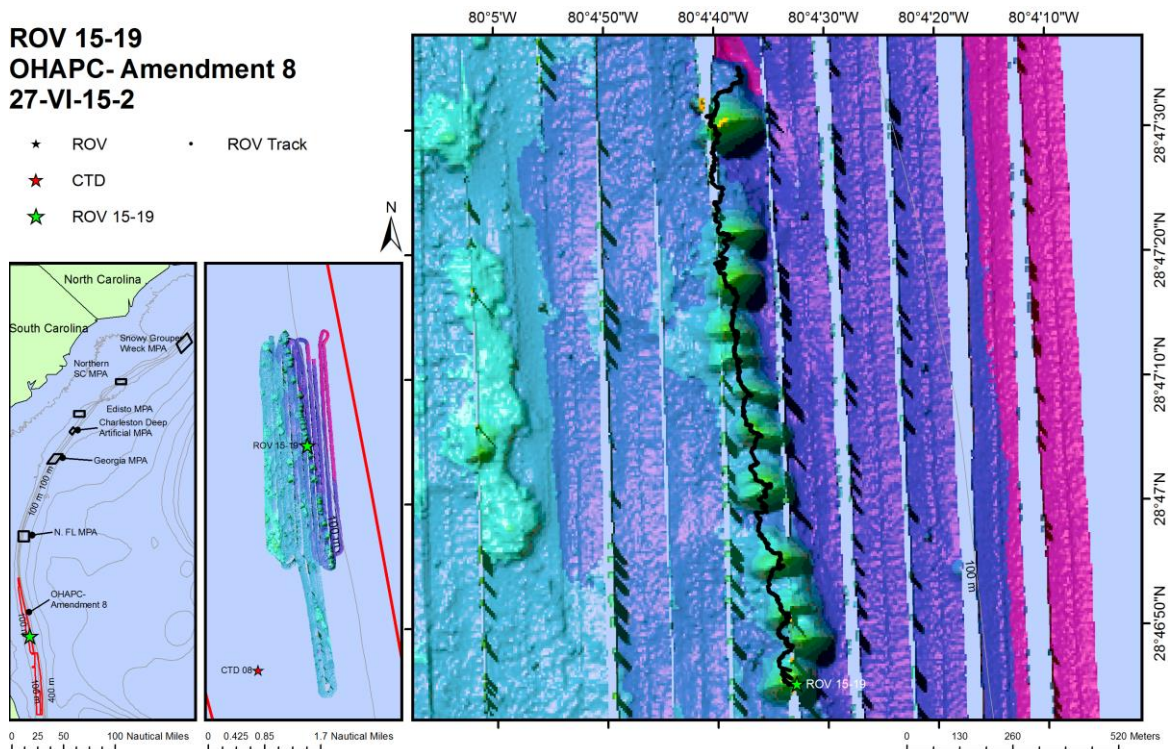
Class/Scientific Name	Common Name	ROV 15-18
Actinopterygii		
<i>Apogon pseudomaculatus</i>	twospot cardinalfish	0.33
<i>Balistes capriscus</i>	gray triggerfish	5.53
<i>Balistes</i> sp.	triggerfish	0.16
<i>Balistes vetula</i>	queen triggerfish	0.33
<i>Bodianus pulchellus</i>	spotfin hogfish	19.8
<i>Bodianus rufus</i>	spanish hogfish	0.16
<i>Canthigaster</i> sp.	puffer	24.67
<i>Centropristis ocyurus</i>	bank sea bass	0.16
<i>Cephalopholis cruentata</i>	graysby	0.16
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	2.68
<i>Chaetodon sedentarius</i>	reef butterflyfish	28.03
<i>Chaetodon</i> sp.	butterflyfish	0.33
<i>Chromis enchrysurus</i>	yellowtail reeffish	63.28
<i>Chromis insolatus</i>	sunshinefish	26.35
<i>Chromis scotti</i>	purple reeffish	19.64
<i>Chromis</i> sp.	damselfish	18.8
<i>Dactylopterus volitans</i>	flying gurnard	0.67
<i>Fistularia tabacaria</i>	bluespotted cornetfish	0.16
<i>Gymnothorax miliaris</i>	goldentail moray	0.16
<i>Gymnothorax</i> sp.	moray eel	0.16
<i>Haemulon aurolineatum</i>	tomtate	94.34
<i>Haemulon striatum</i>	striped grunt	32.73
<i>Halichoeres garnoti</i>	yellowhead wrasse	6.37
<i>Halichoeres</i> sp.	wrasse	19.97
<i>Holacanthus bermudensis</i>	blue angelfish	10.07
<i>Holacanthus tricolor</i>	rock beauty	0.33
Holocentridae	squirrelfish	13.76
<i>Lachnolaimus maximus</i>	hogfish	0.33
<i>Lactophrys</i> sp.	cowfish	0.16
<i>Liopropoma eukrines</i>	wrasse bass	2.01
<i>Lutjanus analis</i>	mutton snapper	0.16
<i>Lutjanus</i> sp.	snapper	0.5
<i>Malacanthus plumieri</i>	sand tilefish	0.16
Muraenidae	moray eel	0.16
<i>Mycteroperca microlepis</i>	gag grouper	0.33

Dive Site: ROV 15-18; Florida, North Florida MPA, NE/SW Ridge 60 m (repeat ROV 12-1, 14-29),
UNCW 182

<i>Mycteroperca phenax</i>	scamp	3.02
<i>Mycteroperca</i> sp.	grouper	0.16
<i>Myripristis jacobus</i>	blackbar soldierfish	10.57
<i>Opsanus</i> sp.	toadfish	0.16
<i>Pagrus pagrus</i>	red porgy	1.17
<i>Pareques umbrosus</i>	cubbyu	10.91
<i>Pomacanthus paru</i>	french angelfish	0.16
<i>Pomacanthus</i> sp.	angelfish	0.67
<i>Prognathodes aculeatus</i>	longsnout butterflyfish	0.16
<i>Prognathodes aya</i>	bank butterflyfish	1.67
<i>Pterois volitans</i>	lionfish	10.74
<i>Rhomboplites aurorubens</i>	vermilion snapper	83.93
<i>Seriola dumerili</i>	greater amberjack	0.5
<i>Seriola rivoliana</i>	almaco jack	0.16
<i>Seriola</i> sp.	amberjack	0.16
<i>Serranus annularis</i>	orangeback bass	2.51
<i>Serranus baldwini</i>	lantern bass	1
<i>Serranus phoebe</i>	tattler	4.36
<i>Serranus tigrinus</i>	harlequin bass	0.33
<i>Sparisoma atomarium</i>	greenblotch parrotfish	0.16
<i>Stegastes partitus</i>	bicolor damselfish	1.51
<i>Synodus</i> sp.	lizardfish	0.16
<i>Thalassoma bifasciatum</i>	bluehead wrasse	0.16

Dive Site: ROV 15-19; Florida, OHAPC- proposed Amendment 8 north extension, UNCW 183

General Location and Dive Track:



Site Overview:

Project: 2015 MPA Cruise

Vessel: NOAA Ship *Pisces* Cruise 15-02

Principal Investigator: Stacy Harter

PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444

Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington

Ship Position System DGPS

Data Management: Access Database

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/27/2015

ROV: Mohawk ROV

ROV Navigation: Trackpoint II

ROV Sensors: Temperature (°C), Depth (m)

Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs

Digital Photos: 172

Distance (km):

Sonar Data: Pisces_2011_Oculina_titus_ville_5m_MB_TIF

DVD: 3

Hard Drive: 1

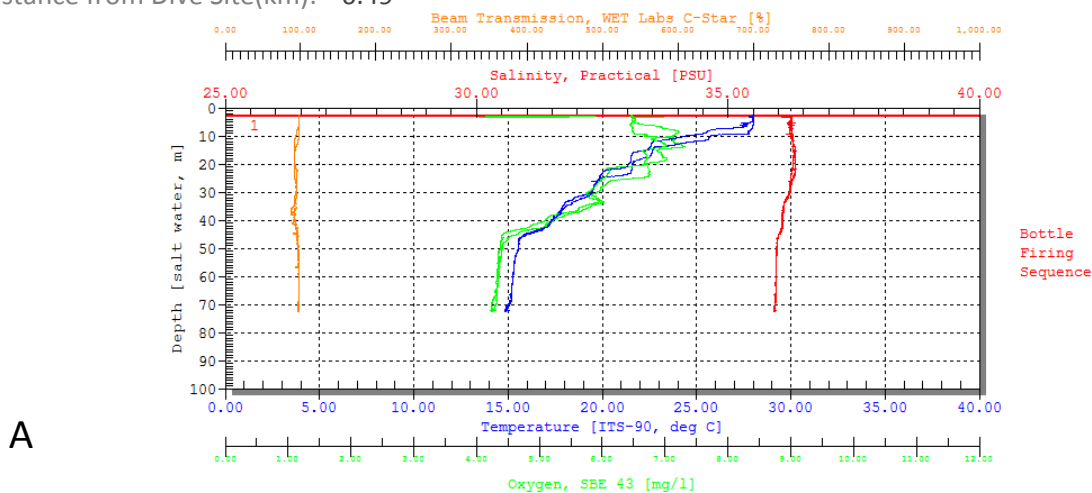
Dive Site: ROV 15-19; Florida, OHAPC- proposed Amendment 8 north extension, UNCW 183

Dive Data:

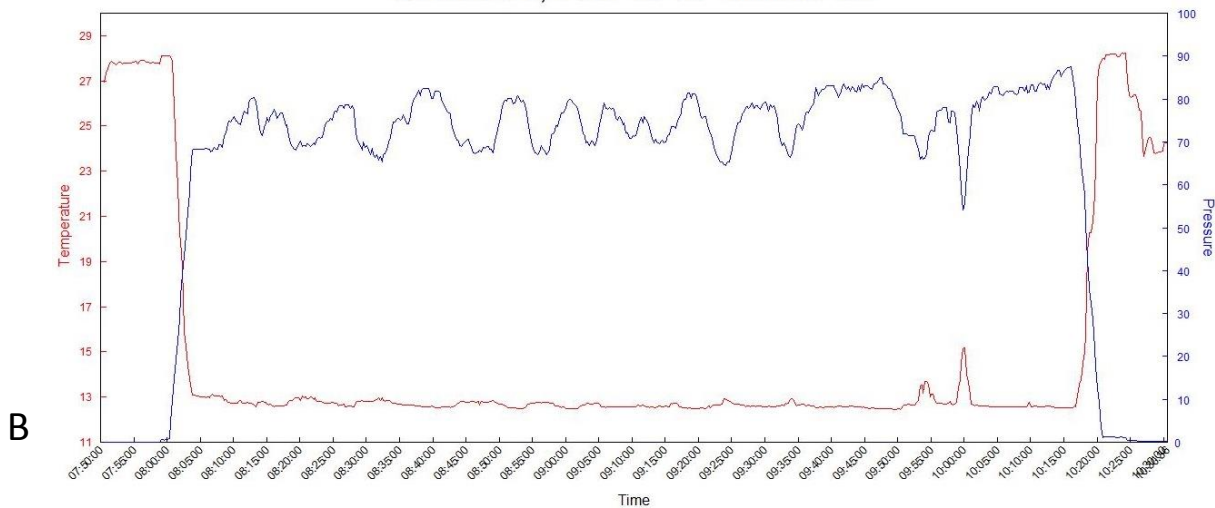
Minimum Bottom Depth (m):	68	Total Transect Length (km):	1.790	
Maximum Bottom Depth (m):	88	Surface Current (kn):	0.5	
On Bottom (Time- GMT):	8:05	On Bottom (Lat/Long):	28.78°N; -80.08°W	
Off Bottom (Time- GMT):	10:17	Off Bottom (Lat/Long):	28.79°N; -80.08°W	
Physical (bottom); Temp (°C):	13.00	Salinity:	Visibility (ft):	Current (kn):

Physical Environment:

Distance from Dive Site(km): 6.49



201506272; ROV 15-19- Mohawk183



A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 72.6 m, Temperature: 14.8-28 °C , Salinity: 35.9-36.4 (PSU), Sound Velocity: 1508.4-1542.8 (m/s), Oxygen Saturation: 4.5-5.7 (ml/l; plot is mg/l), Density: 1023.2-1027 (Kg/m³), Nitrogen Saturation: 8.3-10.3 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Imagery:



Figure 1: 28°47.3912'N, 80°4.6628'W; -83.5 m
Oculina varicosa coral; white is a healthy live azooxanthellate colony



Figure 2: 28°47.0452'N, 80°4.6166'W; -80.3 m
Oculina varicosa coral



Figure 3: 28°47.5381'N, 80°4.6664'W; -83.2 m
Longnose batfish on *Oculina varicosa* coral rubble

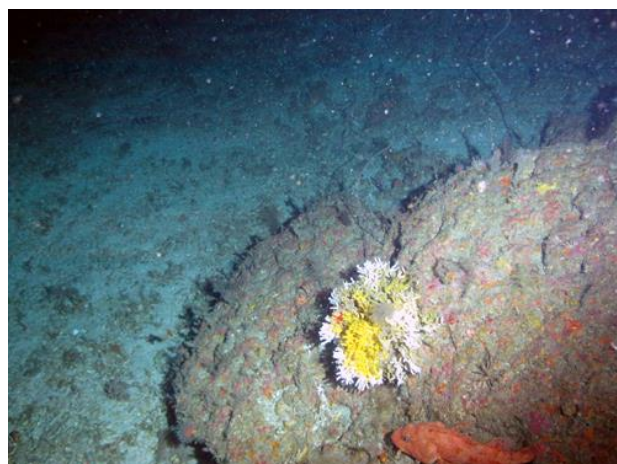


Figure 4: 28°47.4207'N, 80°4.6611'W; -83.5 m
Oculina varicosa coral on rock outcrop at base of *Oculina* mound with scorpion fish

Dive Site: ROV 15-19; Florida, OHAPC- proposed Amendment 8 north extension, UNCW 183

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 27-VI-15-2, ROV 15-19, Mohawk UNCW Dive 183; previous ROV Dive 11-157A. Target Site- Florida, Proposed Northern Extension of Oculina HAPC, Titusville MB Site. MB Map- 2011_Pisces_Oculina_Titusville_5m_MB_TIF (grid files missing).

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Surface current 0.6 kn to N, wind 5 kn from SW, seas 1-2'; visibility- 8-10 m, bottom current <1/4 kn. CTD showed 15 dg thermocline at 45 m to bottom. Nepheloid layer with lots POM starting at 45 m to bottom, 80 m. Multibeam of this site from 2011 Pisces cruise is off- shifted about 15-20 m to the North. So the video transects heading north see the peaks before it shows on the MB.

Site Description/Habitat

Depth range: 68- 88 m.

Transect north along reef line; north of previous dive site. Transected 12 Oculina coral mounds, S to N, very little travel E or W. Could not explore along base of reefs. Could not explore the east slopes or along the base where the main ledges and fish are usually found. Could only travel north with the current so miss much of the habitat. Visibility low (5 -8 m) with the nepheloid particulates, mostly large gelatinous matter.

8:05- On bottom, 70 m. Top of Mound 1.

Transect over 12 coral mounds in a N-S oriented row. Base of mounds 80-82 m; top of mounds, east- west linear coral rubble ridge, 68-70 m. Transects mostly on SW and S slope, and N slope.

Slopes and top mostly 100% coral rubble, some sand patches, no exposed rock on upper slopes or top. Dense small biota encrusting on rubble. Dominated by hydroids, several species of Antipatharia, red algae on upper slopes, Stichopathes, brittle stars. Live Oculina varicosa (5-15 cm diameter), white and healthy seen mostly near base and between the mounds on rock. Few fish seen. Valleys between the mounds is coral rubble, sand, and areas of low relief rock, 10-20 cm relief with more fish. North of the last Mound 12, is a deep scoured area to the NE. Transected along top edge of scour, depth 85 m, low relief rock pavement, coral rubble, and few 1 m rock boulders.

8:05- on bottom, 70 m.

Mound 1: top- 70 m; N base 82 m. 100% coral rubble, Stichopathes, Tanacetipathes and Antipathes white fans common, Nidalia soft coral common, Diodogorgia, Cerianthids. Fish- bank butterfly, short bigeye.

Mound 3: north base, 79 m, 10 cm live Oculina varicosa white; 20 cm live O. varicosa.

Mound 4: peak, 68 m; dense black coral; base- 80 m, some low relief rock pavement, 20 cm ledges.

Mound 5- peak, 68 m, 100% coral rubble, some leafy Rhodophyta, Peyssonnelia, maybe Cyanobacteria; north base- 80.4 m, 20 cm live O. varicosa, Nidalia common; 10 cm live O. varicosa. **First lionfish documented on the Oculina Reefs.**

Mound 6- peak, 68.5 m, live O. varicosa, standing dead O. varicosa. North slope with black coral common- Tanacetipathes- bushy, Antipathes atlantica fans; standing dead O. varicosa.

Mound 7- 76 m, live 10 cm O. varicosa.

Mound 8- peak, 72 m; Antipathes.

Mound 9- peak, 71 m; 10 cm live *O. varicosa*; second lionfish sighting on *Oculina* reefs; north base, 82m, 100% coral rubble, solitary coral; hydroids, *Centrostephanus* urchins.

Mound 10- 68 m, peak. Antipathes, short bigeye; 79.5 m, north base, 5 cm live *O. varicosa*.

Mound 11- 68 m, peak. Large flat area to Mound 12; Large *Tanacetipathes* bushy black coral with 2 lionfish; several black coral.

Valley between Mound 11 and 12- 83.5 m, coral rubble, low relief rock pavement. ½ m rock boulder; 15 cm live *O. varicosa*, two 10 cm *O. varicosa*; *Nidalia* common, hydroids, 20 cm *O. varicosa*, two more 10 cm *O. varicosa*; snowy grouper; 15 cm standing dead *Oculina*.

Mound 12- sw slope, coral rubble, bank sea bass, lionfish, *Stichopathes*; 5 cm cluster of white coral (sp?); peak 72 m. Boarfish- first on *Oculina* reefs?; north base 82.5 m,

Head NE to scour area northeast of Mound 12; 82.5 m. Low relief rock pavement, some ledges, *Stichopathes*, Antipathes, *Tanacetipathes*- 2 spp., sponges.

Edge of scour- 85 m; rock pavement and coral rubble; two 20 cm live *O. varicosa*; 2 m diameter flat boulder; hydroids, *Phyllangia Americana*, rough tongue bass; 10 dg slope, no large ledge.

10:17- end dive.

Dominant Macrobiota:

Coral- *Oculina varicosa*, live white, 5-20 cm, few per reef; *Cladocora*?; *Phyllangia americana*

Octocoral- *Nidalia*, common; *Diodogorgia*, *Anthomastus rubens*?

Antipatharia- *Stichopathes lutkeni*, *Tanacetipathes*- bushy black, common; ye stalk; *Antipathes atlantica*-fan, common; *Antipathes furcata*

Actiniaria- Cerianthidae

Hydroids- Hydroida- bushy black, abundant

Porifera- thin encrusting yellow, orange; Axinellidae- bushy orange,

Annelida- Terebellidae

Echinoidea- *Centrostephanus longispinus* (long black spines), *Eucidaris tribuloides*

Decapoda- hermit crab

Asciacea- Didemnidae- spheres.

Algae- Rhodophyta- flat, bifurcate blades on peaks; CCA on pavement at mound base, *Peyssonnelia*- some on peaks

Fish:

Apricot bass, bank butterflyfish, bank seabass, batfish, boarfish, eel, greenband bass, moray eel, orangeback bass, red hogfish, reef butterflyfish, roughtongue bass, saddle bass, scorpionfish, sharpnose puffer, short bigeye, snowy grouper, squirrelfish, tattler, toadfish, twospot cardinalfish, wrasse bass, yellowtail reeffish

Lionfish- 10 (first ever recorded on *Oculina* banks)

CPCe Percent Cover Analysis:

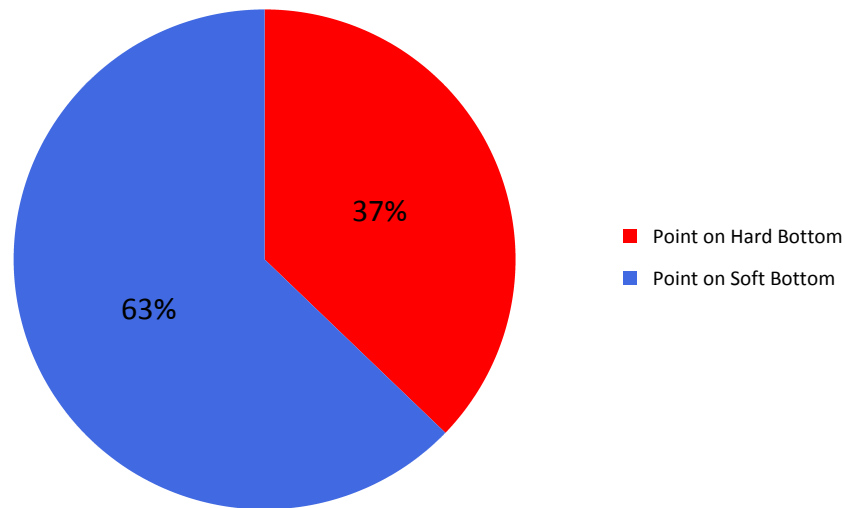
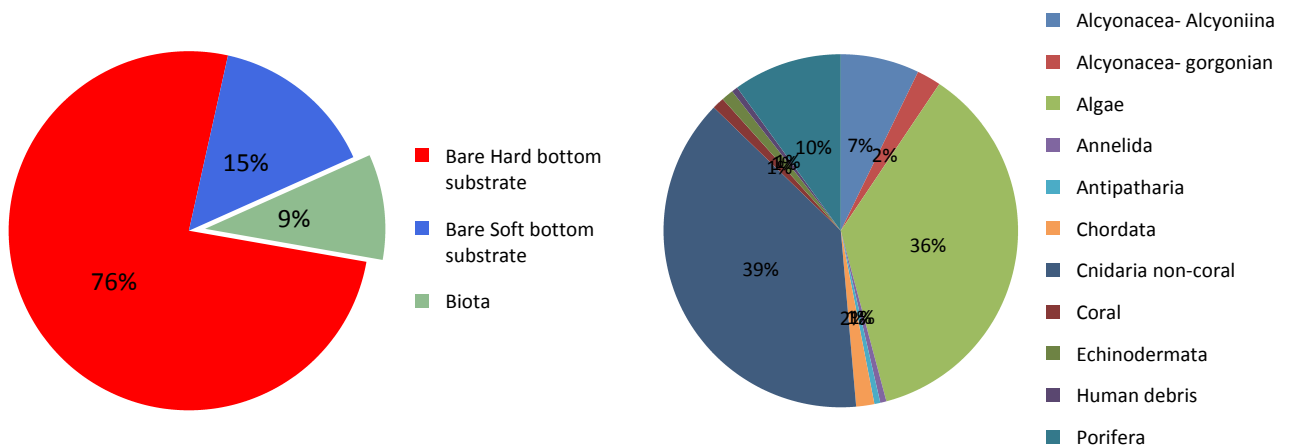


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-19. CPCe® points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-19.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-19.

Benthic Macro-biota and Substrate Type	ROV 15-19 Point Count	% Cover
Biota	181	9.50%
Algae	66	3.46%
Corallinales/crustose coralline	20	1.05%
Phaeophyta	1	0.05%
Rhodophyta	45	2.36%
Porifera	18	0.94%
Demospongiae	11	0.58%
Demospongiae- ze tan starlet	1	0.05%
Ircinia sp.	1	0.05%
Spirastrellidae	5	0.26%
Alcyonacea- Alcyoniina	13	0.68%
Nidallia occidentalis	13	0.68%
Alcyonacea- gorgonian	4	0.21%
Diodogorgia sp.	4	0.21%
Antipatharia	1	0.05%
Antipathes atlantica	1	0.05%
Cnidaria non-coral	70	3.67%
Cerianthidae	2	0.10%
Hydroidolina	67	3.52%
Zoanthidae	1	0.05%
Coral	2	0.10%
Oculina varicosa	1	0.05%
Scleractinia colonial	1	0.05%
Annelida	1	0.05%
Sabellidae	1	0.05%
Echinodermata	2	0.10%
Arbacia punctulata	1	0.05%
Cidaroida	1	0.05%
Chordata	3	0.16%
Didemnidae	2	0.10%
Fish	1	0.05%
Human debris	1	0.05%
Human debris- other	1	0.05%
Bare hard bottom substrate	1443	75.71%
Bare Hard bottom	1443	75.71%

Dive Site: ROV 15-19; Florida, OHAPC- proposed Amendment 8 north extension, UNCW 183

Bare rock- pavement boulder ledge	199	10.44%
Bare rubble- coral	1236	64.85%
Bare rubble- rock	5	0.26%
Standing dead coral	3	0.16%
Bare soft bottom substrate	282	14.80%
Grand Total	1906	100.00%

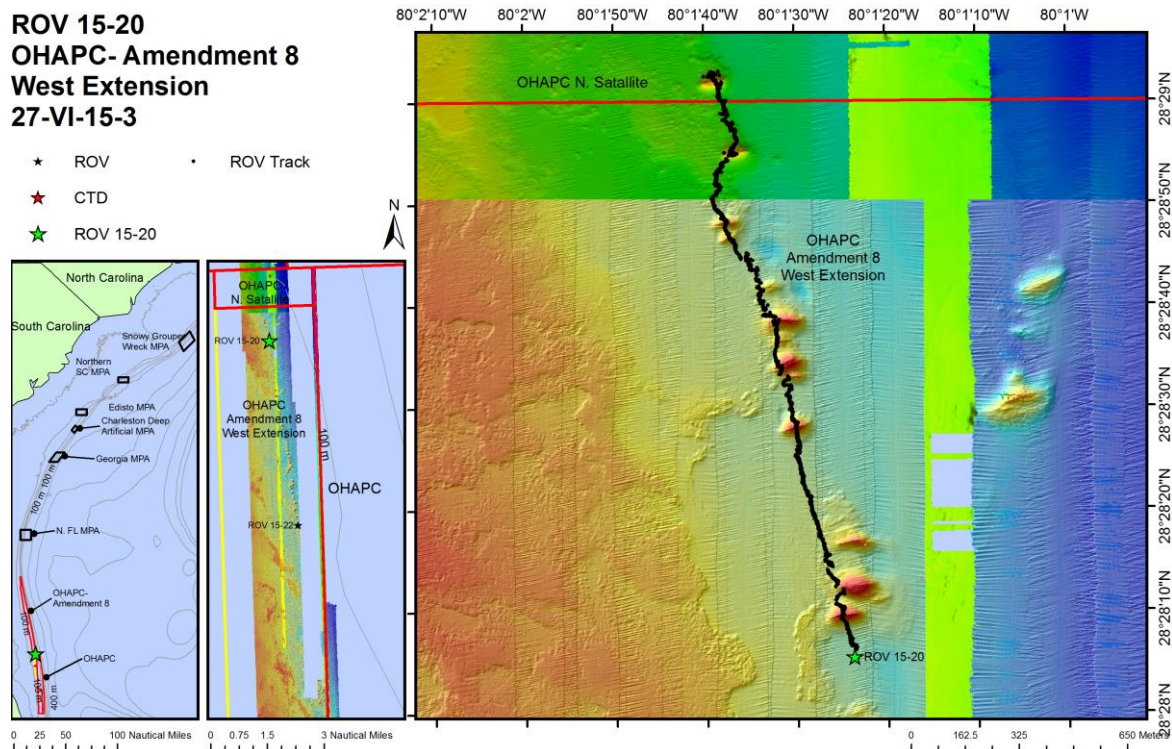
Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 15-19.

Class/Scientific Name	Common Name	ROV 15-19
Actinopterygii		
<i>Antigonia capros</i>	deepbody boarfish	0.23
<i>Apogon pseudomaculatus</i>	twospot cardinalfish	0.11
<i>Centropristis ocyurus</i>	bank sea bass	3.04
<i>Chaetodon sedentarius</i>	reef butterflyfish	2.1
<i>Chaetodon</i> sp.	butterflyfish	0.11
Chaetodontidae	butterflyfish	0.11
<i>Chromis enchrysurus</i>	yellowtail reeffish	3.51
<i>Decodon puellaris</i>	red hogfish	0.7
<i>Halichoeres bathyphilus</i>	greenband wrasse	0.35
<i>Halichoeres</i> sp.	wrasse	1.17
Holocentridae	squirrelfish	0.23
<i>Hyporthodus niveatus</i>	snowy grouper	0.11
<i>Liopropoma eukrines</i>	wrasse bass	0.93
Muraenidae	moray eel	0.11
<i>Ogcocephalus corniger</i>	longnose batfish	0.11
<i>Opsanus</i> sp.	toadfish	0.11
<i>Plectranthias garrupellus</i>	apricot bass	0.11
<i>Pristigenys alta</i>	short bigeye	3.62
<i>Prognathodes aya</i>	bank butterflyfish	7.95
<i>Pronotoqrammus martinicensis</i>	rougthead bass	1.05
<i>Pterois volitans</i>	lionfish	1.17
<i>Rypticus</i> sp.	soapfish	0.11
Scorpaenidae	scorpionfish	2.45
<i>Seriola dumerili</i>	greater amberjack	0.7
<i>Serranus annularis</i>	orangeback bass	0.46
<i>Serranus notospilus</i>	saddle bass	0.11
<i>Serranus phoebe</i>	tattler	8.66

Dive Site: ROV 15-20; Florida, OHAPC- proposed Amendment 8 west extension, UNCW 184

General Location and Dive Track:



Site Overview:

Project: 2015 MPA Cruise
Vessel: NOAA Ship *Pisces* Cruise 15-02
Principal Investigator: Stacy Harter
PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444
Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington
Ship Position System DGPS
Data Management: Access Database
Report Analyst: John Reed, Stephanie Farrington
Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/27/2015
ROV: Mohawk ROV
ROV Navigation: Trackpoint II
ROV Sensors: Temperature (°C), Depth (m)
Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs
Digital Photos: 88
Distance (km):
Sonar Data: Shepard_2005_Oculina
DVD: 2
Hard Drive: 1

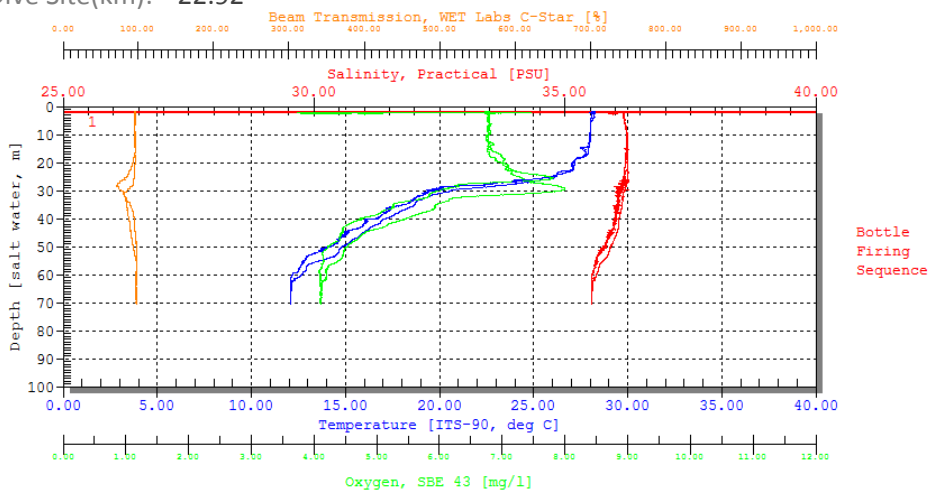
Dive Site: ROV 15-20; Florida, OHAPC- proposed Amendment 8 west extension, UNCW 184

Dive Data:

Minimum Bottom Depth (m):	69	Total Transect Length (km):	1.990	
Maximum Bottom Depth (m):	85	Surface Current (kn):	1.0	
On Bottom (Time- GMT):	14:53	On Bottom (Lat/Long):	28.47°N; -80.02°W	
Off Bottom (Time- GMT):	16:00	Off Bottom (Lat/Long):	28.48°N; -80.03°W	
Physical (bottom); Temp (°C):	11.99	Salinity:	Visibility (ft):	Current (kn):

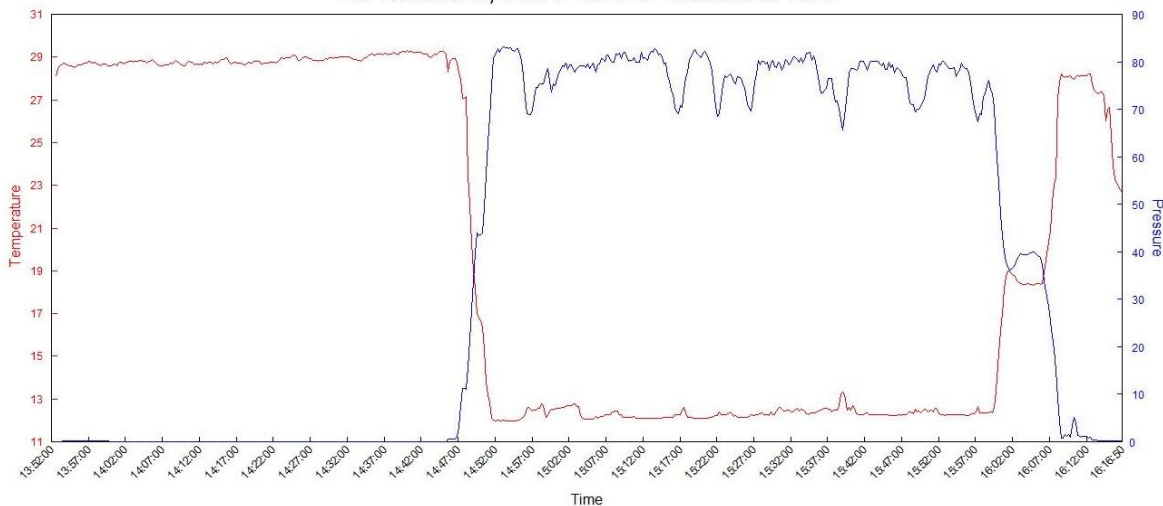
Physical Environment:

Distance from Dive Site(km): 22.92



A

201506273; ROV 15-20- Mohawk 184



B

A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 70.5 m, Temperature: 12.1-28.3 °C , Salinity: 35.5-36.3 (PSU), Sound Velocity: 1498.8-1543.2 (m/s), Oxygen Saturation: 4.5-6 (ml/l; plot is mg/l), Density: 1023-1027.3 (Kg/m³), Nitrogen Saturation: 8.3-10.9 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Imagery:



Figure 1: 28°28.7854'N, 80°1.6249'W; m
Eucidaris tribuloides urchins on algae crusted pavement



Figure 2: 28°28.6498'N, 80°1.5608'W; m
Antipatharia black coral (*Elatopathes abientina*)



Figure 3: 28°28.8642'N, 80°1.6451'W; m
Oculina varicosa coral and black sea bass

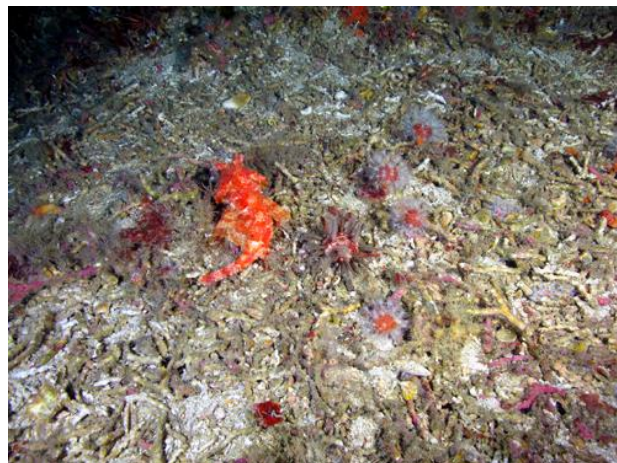


Figure 4: 28°28.9157'N, 80°1.6149'W; m
Scorpionfish on *Oculina varicosa* coral rubble

Dive Site: ROV 15-20; Florida, OHAPC- proposed Amendment 8 west extension, UNCW 184

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 27-VI-15-3, ROV 15-20, Mohawk UNCW Dive 184. Target Site- Florida, proposed western extension of OHAPC. Series of *Oculina* mounds between the OHAPC satellite areas. MB Map- 2005 _*Oculina*_Shepard_MB_TIF (grid files missing).

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Surface current 1.5 kn to NW, wind 12 kn from S, seas 1'; visibility-10 m, no nepheloid layer, bottom current- calm. Ship unable to go slow, transect mostly 1 kn, so not able to stop or see bottom close up. MB is in correct position.

Site Description/Habitat

Depth range: 69.4- 85.5 m.

Transect North across nine *Oculina* coral mounds. Valleys between mounds 80-82 m, peaks 69-72 m. All coral rubble on mounds; valleys coral rubble and areas of low relief rock pavement, low ledges.

14:53- on bottom, 86 m, flat between mounds; rock/coral rubble, 1-2 m flat rock slabs, ½ m relief; 25 cm live white *Oculina varicosa*, 15 cm live *O. varicosa*; 50% cover 30-50 cm boulders; 100% hard bottom.

Mound 1- base, 85.5 m; two 10 cm live *O. varicosa*; top, 70 m.

Mound 2- missed mound, on west slope; *Nidalia*, CCA on rock pavement, hydroids, *Prognathodes aya*.

Valley between 2 and 3- 80.5 m, 100% coral rubble; missed M-3 along west base. 380 m on flats to Mound 4. Low relief rock pavement, coral rubble, no ledges, few small boulders. *Antipathes* black coral, Cerianthidae, *Eucidaris tribuloides*. 50% cover 10-20 rock boulders; dense hydroids- bushy black, *Asteropora annulata*, bank seabass.

Mound 4- south slope, 10-20 dg, hydroids, white cluster coral; peak 70 m; *Eucidaris*, *Nidalia*. North base, 10 cm live *O. varicosa*; 80% cover, 10-20 cm boulders.

Mound 5- 1 kn SOG.

Flat between Mound 5 and 6- Lumpy hard bottom on MB. 100% hard bottom, rock pavement, rubble with CCA and *Peyssonnelia*.

Mound 6- 100% coral rubble, peak 71 m; base 81 m, hard bottom, low relief pavement; two 5 cm live *O. varicosa*, yellow sponges, orange sponges, Axinellida, *Tanacetipathes*- bushy coral, 2 spp., *Stichopathes*, Hydroida.

Flat between Mound 6 and 7- 82 m.

Mound 7- peak, 72 m. Rock with CCA and coral rubble; recent dead *Oculina*

Head to Mound 8 just south of satellite OHAPC, and Mound 9 within satellite HAPC.

Valley between 7 and 8- standing dead coral, 30 cm; 10-20 cm rock ledges; 80.3 m. Live 20 cm *O. varicosa*. Black seabass- several by coral; bank seabass, CCA on rock; flat rock slabs with 20 cm relief. 20 cm live *O. varicosa*.

Mound 8- peak 71.3 m;

Valley between Mound 8 and 9- 227 m to Mound 9 inside OHAP; flat hard bottom; low relief pavement, coral

Dive Site: ROV 15-20; Florida, OHAPC- proposed Amendment 8 west extension, UNCW 184

rubble, standing dead coral; *Tanacetipathes* black coral, two 10 cm *O. varicosa*; black seabass; 25 cm live *O. varicosa*.

Inside OHAPC north satellite- 80.5 m.

Mound 9- south slope, coral rubble, white cluster coral, dense hydroids, Rhodophyta flat blades on upper slope; peak, 69.4 m. Appears to have more biota on south slope.

15:59- end dive.

Dominant Macrobiota:

Coral- *Oculina varicosa*, live, white, 5-20 cm, few on most mounds; cluster white corals on upper slopes

Octocoral- *Nidalia*, common

Antipatharia- *Antipathes atlantica*; *Tanacetipathes*- bushy; *Stichopathes lutkeni*

Hydroida- *Hydroida*- bushy, abundant

Actiniaria- *Cerianthidae*

Porifera- yellow and orange encrusting *Demospongiae*, *Axinellida*

Echinoidea- *Eucidaris tribuloides*

Ophiuroidea- *Asteropora annulata*, *Ophioderma* (giant red)

Algae- Crustose coralline algae on rocks

Fish:

Bank butterfly fish, bank seabass, black sea bass, batfish, greenband wrasse, red hogfish, reef butterfly fish, rough tongue bass, scorpionfish, spotfin butterflyfish, tattler, wrasse bass, yellowtail reeffish

Dive Site: ROV 15-20; Florida, OHAPC- proposed Amendment 8 west extension, UNCW 184

CPCe Percent Cover Analysis:

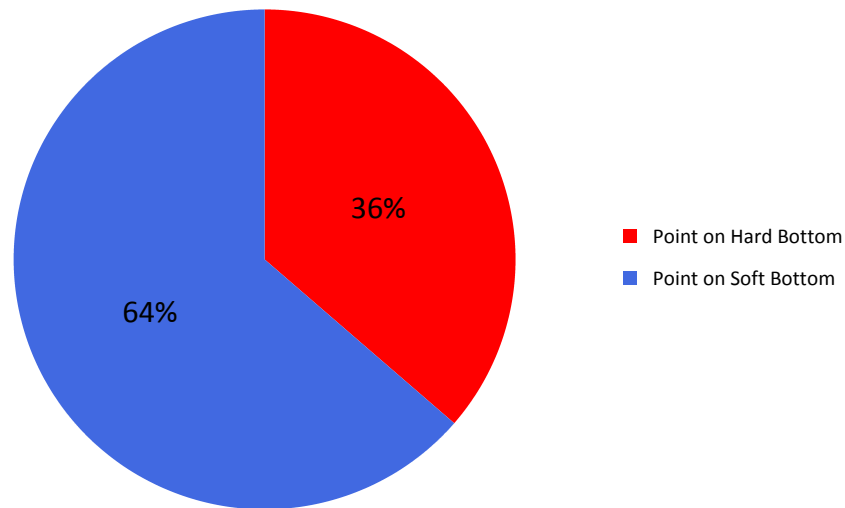
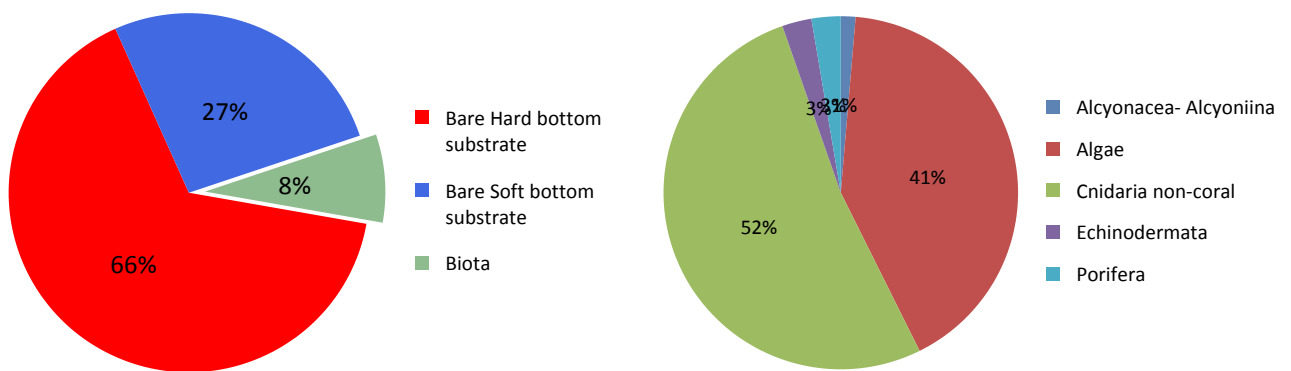


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-20. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-20.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-20.

Benthic Macro-biota and Substrate Type	ROV 15-20	
	Point Count	% Cover
Biota	75	7.93%
Algae	31	3.28%
Corallinales/crustose coralline	18	1.90%
Rhodophyta	13	1.37%
Porifera	2	0.21%
Spirastrellidae	2	0.21%
Alcyonacea- Alcyoniina	1	0.11%
Nidallia occidentalis	1	0.11%
Cnidaria non-coral	39	4.12%
Actiniaria	1	0.11%
Hydroidolina	36	3.81%
Zoanthidae	2	0.21%
Echinodermata	2	0.21%
Cidaroidea	2	0.21%
Bare hard bottom substrate	620	65.54%
Bare Hard bottom	620	65.54%
Bare rock- pavement boulder ledge	97	10.25%
Bare rubble- coral	414	43.76%
Bare rubble- rock	89	9.41%
Standing dead coral	20	2.11%
Bare soft bottom substrate	251	26.53%
Grand Total	946	100.00%

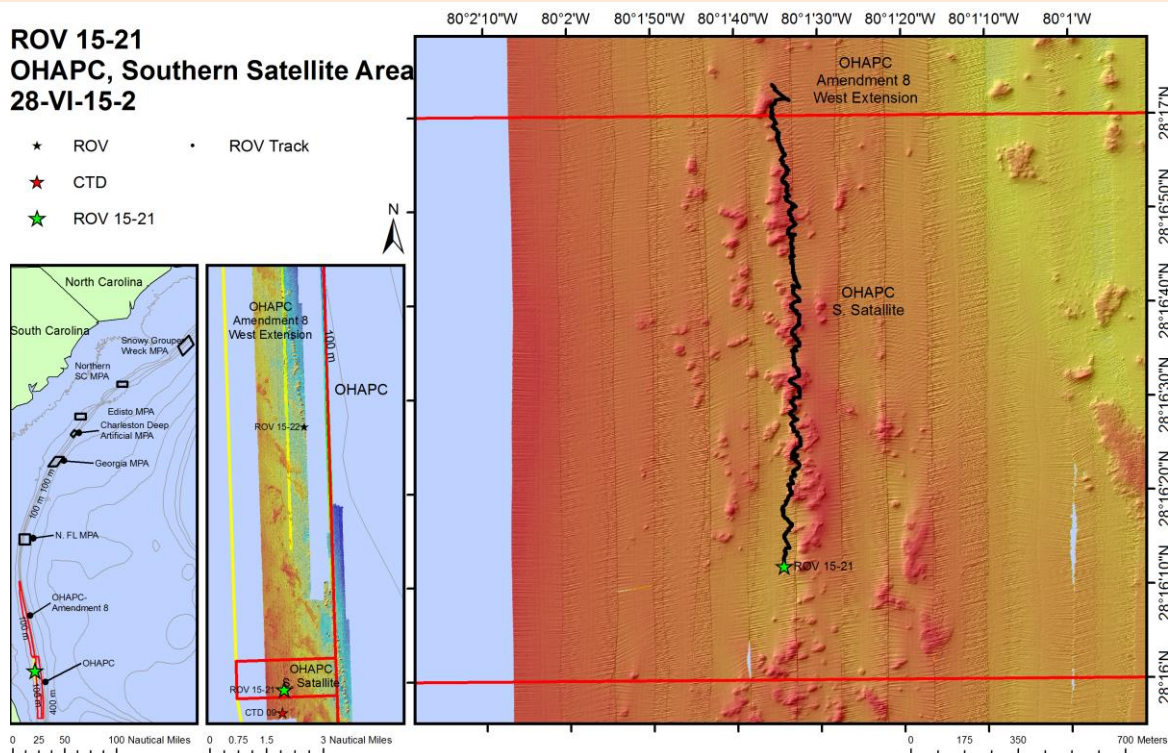
Density of Fish:

Table 2. Density (# individuals/1000 m2) of fish from video transects at dive site ROV 15-20.

Class/Scientific Name	Common Name	ROV 15-20
Actinopterygii		
<i>Centropristis ocyurus</i>	bank sea bass	2.1
<i>Centropristis</i> sp.	sea bass	0.17
<i>Centropristis striata</i>	black sea bass	6.13
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	0.17
<i>Chaetodon sedentarius</i>	reef butterflyfish	0.52
<i>Chromis enchrysurus</i>	yellowtail reeffish	0.52
<i>Decodon puellaris</i>	red hogfish	0.35
<i>Halichoeres bathyphilus</i>	greenband wrasse	0.7
<i>Halichoeres</i> sp.	wrasse	0.87
<i>Liopropoma eukrines</i>	wrasse bass	0.17
<i>Ogcocephalus</i> sp.	batfish	0.35
<i>Prognathodes aya</i>	bank butterflyfish	1.4
<i>Pronotoqrammus martinicensis</i>	rougtongue bass	0.35
Scorpaenidae	scorpionfish	1.4
<i>Serranus phoebe</i>	tattler	4.03

Dive Site: ROV 15-21; Florida, OHAPC, Southern Satellite Area, UNCW 185

General Location and Dive Track:



Site Overview:

Project: 2015 MPA Cruise

Vessel: NOAA Ship *Pisces* Cruise 15-02

Principal Investigator: Stacy Harter

PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444

Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington

Ship Position System DGPS

Data Management: Access Database

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/28/2015

ROV: Mohawk ROV

ROV Navigation: Trackpoint II

ROV Sensors: Temperature (°C), Depth (m)

Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs

Digital Photos: 71

Distance (km):

Sonar Data: Shepard_2005_Oculina

DVD: 1

Hard Drive: 1

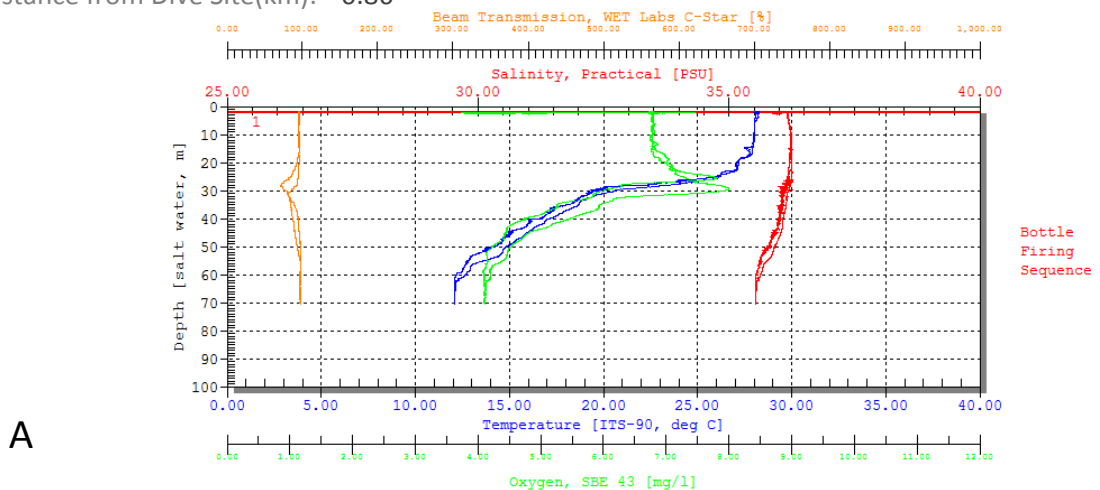
Dive Site: ROV 15-21; Florida, OHAPC, Southern Satellite Area, UNCW 185

Dive Data:

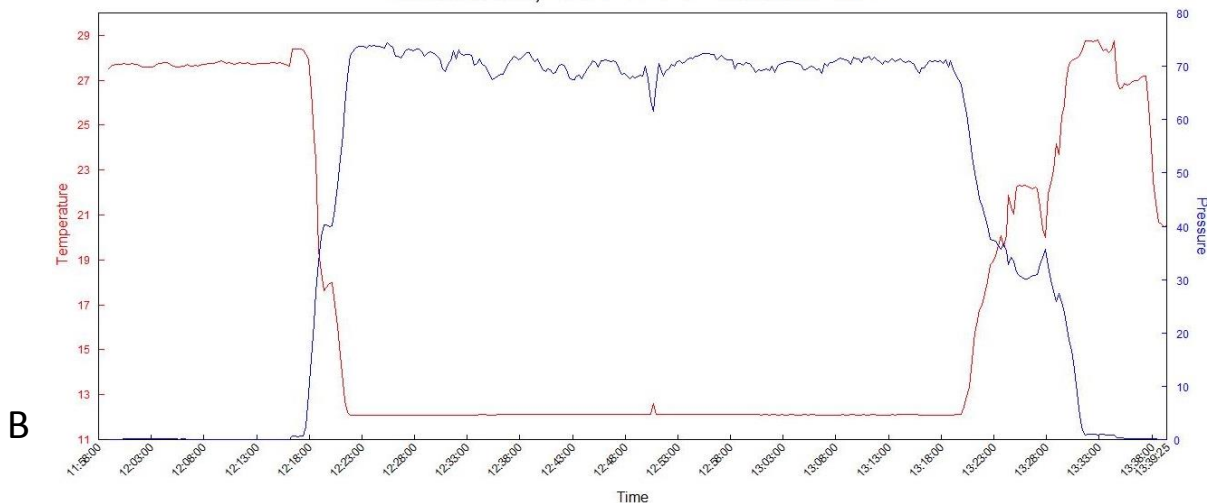
Minimum Bottom Depth (m):	71	Total Transect Length (km):	1.610	
Maximum Bottom Depth (m):	75	Surface Current (kn):	1.25	
On Bottom (Time- GMT):	12:23	On Bottom (Lat/Long):	28.27°N; -80.03°W	
Off Bottom (Time- GMT):	13:19	Off Bottom (Lat/Long):	28.28°N; -80.03°W	
Physical (bottom); Temp (°C):	12.08	Salinity:	Visibility (ft):	Current (kn):

Physical Environment:

Distance from Dive Site(km): 0.86



201506282; ROV 15-21- Mohawk 185



A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 70.5 m, Temperature: 12.1-28.3 °C , Salinity: 35.5-36.3 (PSU), Sound Velocity: 1498.8-1543.2 (m/s), Oxygen Saturation: 4.5-6 (ml/l; plot is mg/l), Density: 1023-1027.3 (Kg/m³), Nitrogen Saturation: 8.3-10.9 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-21; Florida, OHAPC, Southern Satellite Area, UNCW 185

Dive Imagery:



Figure 1: 28°16.3013'N, 80°1.5745'W; -74 m
Lost anchor line or trawl line



Figure 2: 28°16.3932'N, 80°1.5574'W; -69.9 m
Grouper under ledge

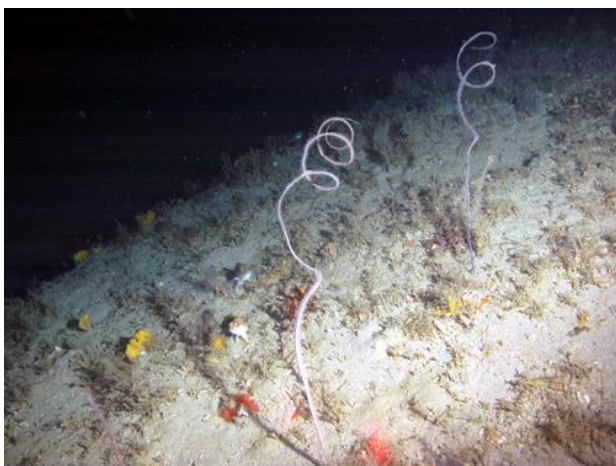


Figure 3: 28°16.4414'N, 80°1.5525'W; -72.4 m
Antipatharia black coral (*Stichopathes lutkeni*)



Figure 4: 28°16.962'N, 80°1.581'W; -72.1 m
Black sea bass on standing dead coral

Dive Site: ROV 15-21; Florida, OHAPC, Southern Satellite Area, UNCW 185

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 28-VI-15-2, ROV 15-21, Mohawk UNCW Dive 185. Target Site- Florida, OHAPC, South satellite. Series of low relief hard bottom mounds west of high relief mound zone; 68-74 m mounds. MB Map- 2005 _Oculina_Shepard_MB_TIF (grid files missing). Previous dive- J. Reed with JSL on Cocoa Beach transect (100'- 1000') in 1978. Notes indicate 4.4 mile wide region (= to satellite area) of flat hard bottom, coral rubble and <1 m live *Oculina varicosa*.

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Surface current 1.25 kn to NW, wind 7 kn from SW, seas 1'. CTD shows strong thermocline at 30 m from 25°C to 15°C, then 12°C on bottom at 75 m. Transmissivity also peak at 30-35 m. Video showed dense green layer around 35 m; then nephroid layer with gelatinous matter below; bottom visible at 10 m altitude; horizontal visibility-10 m. Entire transect made at an unacceptable speed of 1 kn; ship unable maneuver either east or west or slow down- makes no sense, they were headed into the current, could have taken off DP and increased forward speed to slow down. Crew clearly unable and incapable to run ROV ops efficiently.

Speed too fast to stop and view ledges of hard bottom and to identify fauna on rocks.

Site Description/Habitat

Depth range: 71- 74.5 m.

MB Map shows extensive area of low relief, flat topped mounds in west part of south Satellite of OHAPC. MB shows 74 m along western base of mounds, and 68 m on top.

12:24- on bottom, 74.5 m; west of low relief mounds target area. 100% flat sand, no bioturbation, sparse rubble, shell hash (possibly coral rubble but too fast to see).

Mounds- series of low relief, smooth rock knolls, from few meter diameter to >100 m. Peaks mostly 70-71 m. Some low relief ledges (10-30 cm) along west edges, but unable to get to these areas with the ship. Between the mounds mostly sand and/or rock pavement with sediment veneer, 73-74 m. Some areas of ¼ m E-W sand waves. Biota on rocks dense hydroids, *Stichopathes*, encrusting sponges, Axinellid bushy yellow sponges, and black coral- *Antipathes*. Fish mostly bank seabass, some black sea bass. Long line common.

12:30- pile anchor line, fairly recent.

Mound- 5 m diameter, 71 m top, 73.8 m base. *Stichopathes*, hydroids, Vermillion snapper; *Virgularia* sea pens common on sediment.

Mound- 71-73 m. *Antipathes atlantica*, *Stichopathes*, hydroids, encrusting sponges. Red snapper; 1 m ledge, 3 gag in rock hole, porgy, tattler, blue angelfish.

Mound- 160 m long N-S, 73 m base, 71 m top. Smooth rock knoll, *Stichopathes*. Edge of mound with ½ m ledges. 5 lionfish. Didemnidae, encrusting sponges, hydroids, *Centrostephanus* black urchin.

12:48- Longline, *Asteropora*.

15 cm live white *Oculina varicosa*, 20 cm old dead standing dead coral, 5 cm live *O. varicosa* on rock pavement, 10 cm live *O. varicosa*. 2 tilefish burrows? In sediment, *Eucidaris*, *Antipathes*.

Dive Site: ROV 15-21; Florida, OHAPC, Southern Satellite Area, UNCW 185

Mound- 71.5 m, standing dead coral, old encrusted; 25 cm dead standing dead coral; bank sea bass, red hog snapper, 2 black seabass, sea robin, *Diogenes?* Hermit crab.

13:20- End dive.

Dominant Macrobiota:

Coral- *Oculina varicosa*, white, live, 5-15 cm; standing dead *Oculina*, old encrusted.

Octocoral-

Antipatharia- *Stichopathes lutkeni*, *Antipathes atlantica*, *Antipathes*- bushy black

Hydroidea- Hydroidea, abundant

Pennatulacea- *Virgularia*, common

Actiniaria- Cerianthidae

Porifera- thin encrusting Demospongiae, Axinellida- bushy yellow

Echinoidea- *Centrostephanus longispinus*, *Eucidaris tribuloides*

Ophiuroidea- *Asteropora annulata*

Decapoda- *Diogenes?* Hermit crab

Fish:

Bank butterflyfish, bank seabass, black seabass, blue angelfish, calamus porgy, cubbyu, flounder, gag grouper, greenband bass, lizardfish, red hogfish, reef butterflyfish, saddle bass, sea robin, sharpnose puffer, short bigeye, snapper, tattler, vermilion snapper, yellowtail reeffish

Lionfish- 16 (first documented inside *Oculina* HAPC).

Fishing gear- pile anchor line, several longlines

Dive Site: ROV 15-21; Florida, OHAPC, Southern Satellite Area, UNCW 185

CPCe Percent Cover Analysis:

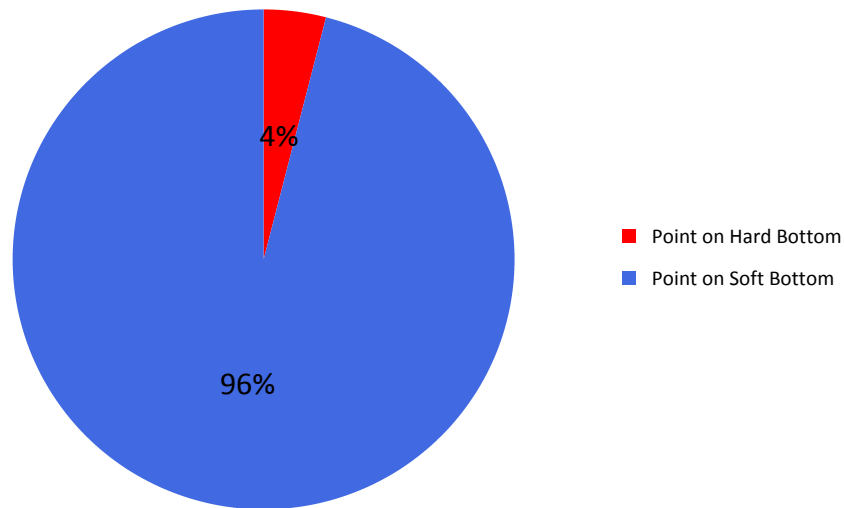
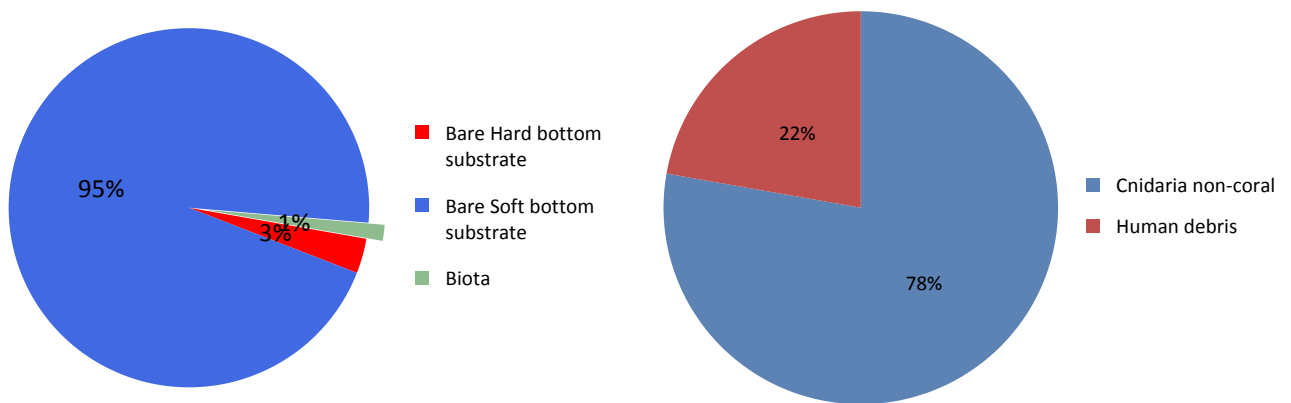


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 15-21. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 15-21.

A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Dive Site: ROV 15-21; Florida, OHAPC, Southern Satellite Area, UNCW 185

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Percent cover of benthic macro-biota and substrate types from CPCe Point Count analysis of photographic transects at dive site ROV 15-21.

Benthic Macro-biota and Substrate Type	ROV 15-21	
	Point Count	% Cover
Biota	18	1.44%
Cnidaria non-coral	14	1.12%
Hydroidolina	14	1.12%
Human debris	4	0.32%
Fishing gear/line/long line	4	0.32%
Bare hard bottom substrate	39	3.12%
Bare Hard bottom	39	3.12%
Bare rock- pavement boulder ledge	31	2.48%
Bare rubble- coral	3	0.24%
Bare rubble- rock	5	0.40%
Bare soft bottom substrate	1192	95.44%
Grand Total	1249	100.00%

Dive Site: ROV 15-21; Florida, OHAPC, Southern Satellite Area, UNCW 185

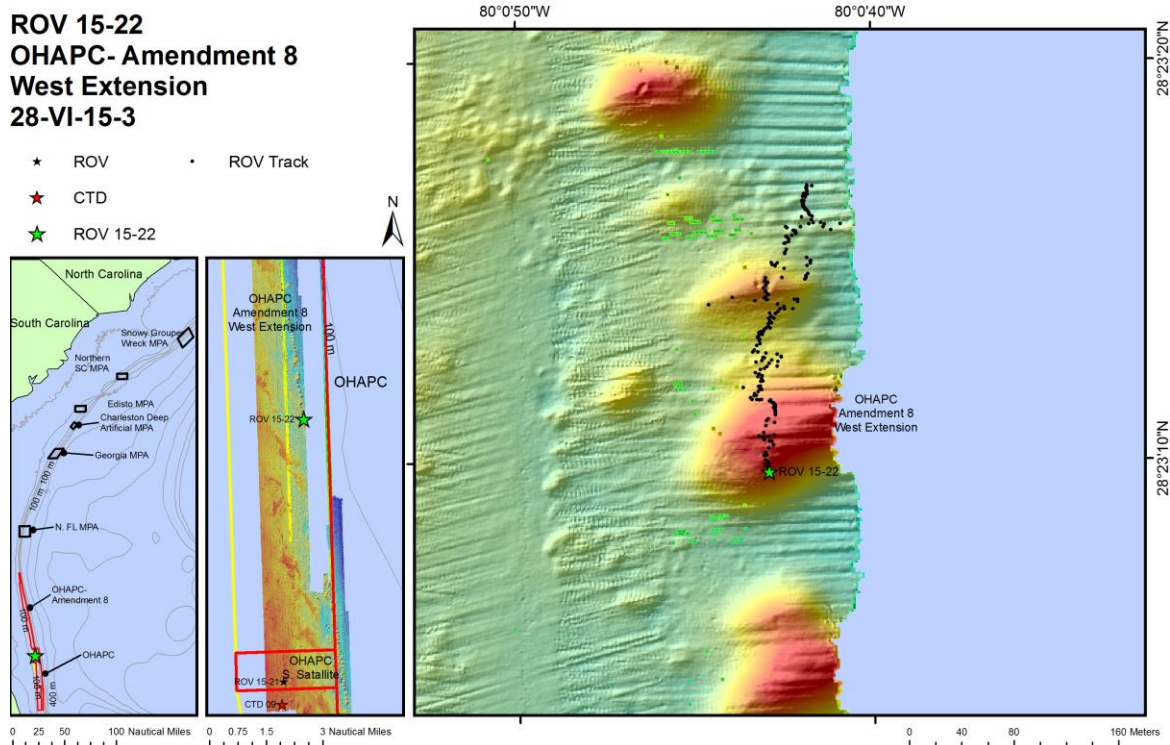
Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 15-21.

Class/Scientific Name	Common Name	ROV 15-21
Actinopterygii		
Bothidae	flounder	0.25
Calamus sp.	porgy	0.12
<i>Canthigaster</i> sp.	puffer	0.12
<i>Centropristis ocyurus</i>	bank sea bass	2.97
<i>Centropristis</i> sp.	sea bass	0.77
<i>Centropristis striata</i>	black sea bass	1.16
<i>Chaetodon sedentarius</i>	reef butterflyfish	0.51
<i>Chromis enchrysurus</i>	yellowtail reefish	0.25
<i>Decodon puellaris</i>	red hogfish	0.51
<i>Halichoeres bathyphilus</i>	greenband wrasse	2.84
<i>Halichoeres</i> sp.	wrasse	2.32
<i>Holacanthus bermudensis</i>	blue angelfish	0.12
<i>Lutjanus</i> sp.	snapper	0.12
<i>Mycteroperca microlepis</i>	gag grouper	0.51
<i>Opsanus</i> sp.	toadfish	0.12
<i>Pareques umbrosus</i>	cubbyu	2.58
<i>Pristigenys alta</i>	short bigeye	0.38
<i>Prognathodes aya</i>	bank butterflyfish	0.12
<i>Pterois volitans</i>	lionfish	2.58
<i>Rhomboplites aurorubens</i>	vermillion snapper	0.12
<i>Serranus notospilus</i>	saddle bass	0.25
<i>Serranus phoebe</i>	tattler	0.77
<i>Synodus</i> sp.	lizardfish	0.12
Triglidae	searobin	0.12

Dive Site: ROV 15-22; Florida, OHAPC- proposed Amendment 8 west extension, UNCW 186

General Location and Dive Track:



Site Overview:

Project: 2015 MPA Cruise

Vessel: NOAA Ship *Pisces* Cruise 15-02

Principal Investigator: Stacy Harter

PI Contact Info: 3500 Delwood Beach Rd., Panama City, FL 32444

Scientific Observers: Andrew W. David, Heather Moe, Jason White, John Reed, Lance Horne, Stacy Harter, Stephanie Farrington

Ship Position System DGPS

Data Management: Access Database

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 3/1/2016

Dive Overview:

Date of Dive: 6/28/2015

ROV: Mohawk ROV

ROV Navigation: Trackpoint II

ROV Sensors: Temperature (°C), Depth (m)

Purpose: Conduct ROV surveys and multibeam sonar of shelf-edge MPAs

Digital Photos: 5

Distance (km): 0.13

Sonar Data: Shepard_2005_Oculina

DVD: 1

Hard Drive: 1

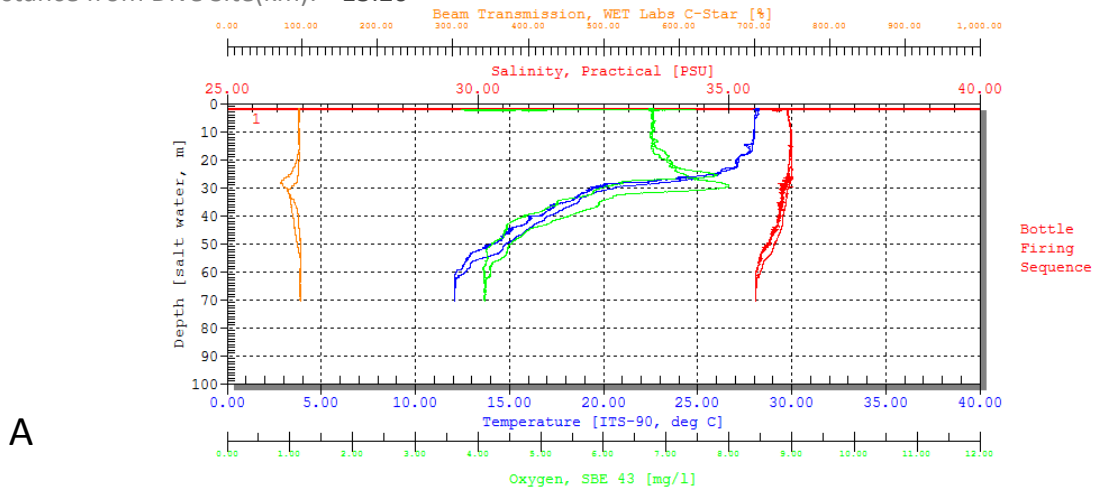
Dive Site: ROV 15-22; Florida, OHAPC- proposed Amendment 8 west extension, UNCW 186

Dive Data:

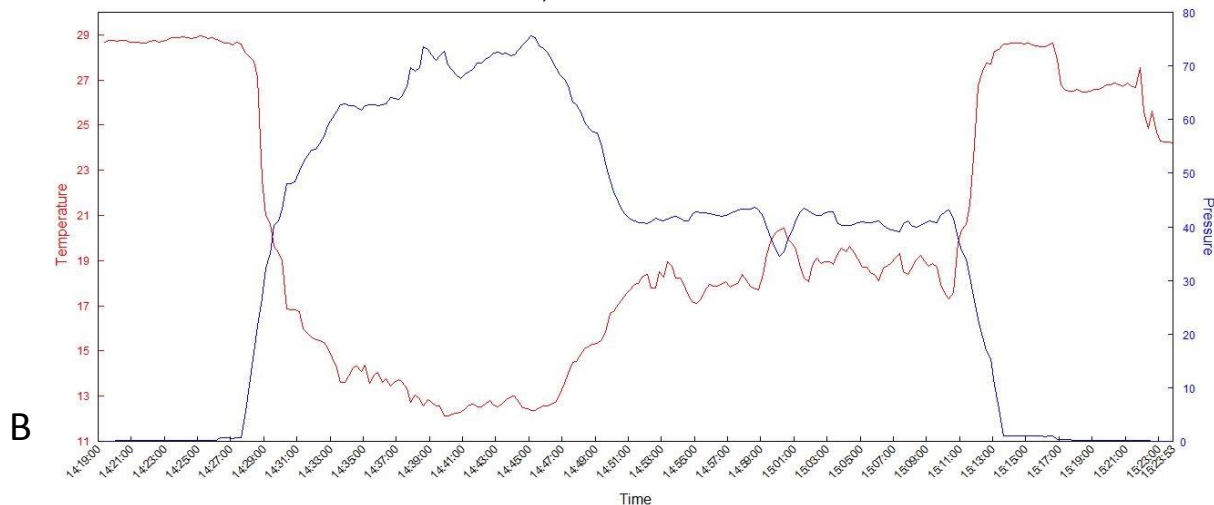
Minimum Bottom Depth (m):	69	Total Transect Length (km):	0.130	
Maximum Bottom Depth (m):	76	Surface Current (kn):	2	
On Bottom (Time- GMT):	14:41	On Bottom (Lat/Long):	28.39°N; -80.01°W	
Off Bottom (Time- GMT):	14:48	Off Bottom (Lat/Long):	28.39°N; -80°W	
Physical (bottom); Temp (°C):	12.45	Salinity:	Visibility (ft):	Current (kn):

Physical Environment:

Distance from Dive Site(km): 13.26



201506283; ROV 15-22- Mohawk186



A) Plot of shipboard CTD cast nearest the dive site: Max Depth: 70.5 m, Temperature: 12.1-28.3 °C , Salinity: 35.5-36.3 (PSU), Sound Velocity: 1498.8-1543.2 (m/s), Oxygen Saturation: 4.5-6 (ml/l; plot is mg/l), Density: 1023-1027.3 (Kg/m³), Nitrogen Saturation: 8.3-10.9 (ml/l); B) Plot of temperature from a SeaBird CTD that was attached to the ROV (Y axis = depth in m).

Dive Site: ROV 15-22; Florida, OHAPC- proposed Amendment 8 west extension, UNCW 186

Dive Imagery:

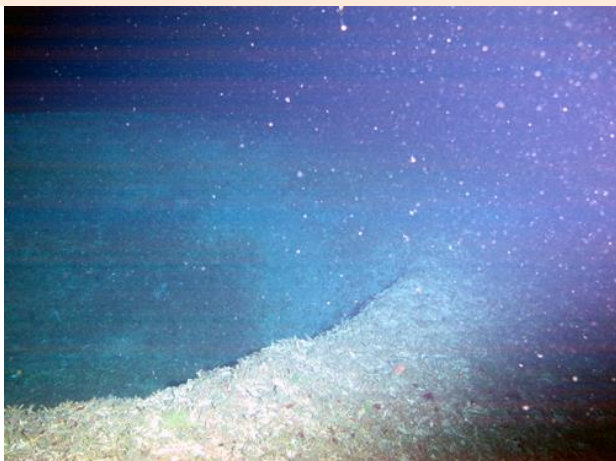


Figure 1: 28°23.2336'N, 80°0.722'W; -73 m
Large pit in *Oculina varicosa* rubble



Figure 2: 28°23.234'N, 80°0.7036'W; -73 m
Rock ledge at base of *Oculina* mound

Dive Site: ROV 15-22; Florida, OHAPC- proposed Amendment 8 west extension, UNCW 186

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 28-VI-15-3, ROV 15-22, Mohawk UNCW Dive 186. Target Site- Florida, outside OHAPC, proposed west extension. High relief coral mounds between the HAPC satellites. MB Map- 2005 _Oculina_Shepard_MB_Grid.

Objectives- ground truth MB map; conduct video transects for fish population characterization and photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

Digital still images shot in Tv Mode, fixed speed at 1/125, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos taken every 2 minutes. Non-quantitative photos logged for habitat and species identifications. Video for fish counts and transects used the video camera pointed forward and down ~20° to view the horizon to close up. Both cameras had 10-cm parallel lasers for scale. No manipulator or tool sled on ROV and no samples were collected. Surface current 2 kn to N, wind 12 kn from SW, seas 1'. Video showed dense green layer around 30 m; but no nepheloid layer; visibility 10 m. Entire dive made at an unacceptable speed of 1 kn; ship unable to slow down. Speed too fast to stop and view ledges of hard bottom and to identify fauna on rocks. Most of dive at height of 5-10 m altitude. No photo transects, too high off bottom. Aborted dive early.

Site Description/Habitat

Depth range: 72 m.

MB map shows continuous N-S row of 15 m tall *Oculina* mounds just west of the OHAPC boundary, but in the proposed Western Extension. Base about 84 m, peaks 70 m.

14:39- On bottom, 82 m. 10 m off bottom, drifting north at 1 kn.

Mound 1- 72 m peak, 100% coral rubble, flat branching Rhodophyta; unable to get to bottom for photos.

Mound 2- 72 m peak. Peak had ½ m diameter vertical burrow over 2 m deep; could not see bottom; tilefish?

Valley between Mound 2 and 3- 83 m, 8 m off bottom.

14:48- abort dive; unable to get to bottom or slow down; no photo transects.