

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

**NOAA Ship *Pisces* Cruise 16-02  
UNCW *Mohawk* ROV  
June 7-22, 2016**

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## EXECUTIVE SUMMARY

A 16 day research cruise was conducted June 7 to 22, 2016 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, Savannah State 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 second 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 2016 Cruise Report provides detailed quantitative characterization of the benthic habitat, benthic macro-biota, and fish populations for each of the 23 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-three ROV dives were conducted resulting in a total bottom time of 57.5 hours, covering 26.8 km, at depths from 41 to 260 m. A total of 4,199 *in situ* digital images were taken which included quantitative transect images, general habitat, and species documentation images. Twelve shipboard CTD casts were made and a temperature/depth sensor recorded each ROV dive (Appendix 3). The multibeam sonar (ME-70) was used to map 9 areas including inside the *Oculina* OECA and covering a total area of 203.3 km<sup>2</sup>. Of particular interest was the discovery of living *Oculina* coral thickets and coral mounds at the St. Lucie Hump MPA site, which was surveyed for the first time during this cruise. These are now the only known *Oculina* coral mounds in the world outside of the *Oculina* HAPC.

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 DSCRTP, 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 7-22, 2016) 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

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Andrew David	Co-Principal Investigator	NMFS/PC Lab
John Reed	Co-Principal Investigator	HBOI/FAU
Felicia Drummond	Scientist	NMFS/PC Lab
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Jason White	ROV Pilot	UNCW/UVP
Kyle McDermott	ROV Crew	UNCW/UVP
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## 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, N.C. 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 (*Hyporhamphus 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, June 2014, and June 2015. 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, banks 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 DSC RTP,

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
- 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 ~30° 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<sup>®</sup>) 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<sup>™</sup> 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 ~¼ 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 m<sup>2</sup>).
3. Still images captured from the photo transects were analyzed using CPCe<sup>®</sup> 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.

## **CTD Operations**

Temperature and depth (pressure) profiles were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV for each dive. Shipboard CTD casts were made with a Sea-Bird 19 which recorded depth, conductivity, pressure, salinity, sound velocity, density, oxygen saturation, and nitrogen saturation. These were made in conjunction with the multibeam sonar surveys.

## **Multibeam Sonar Surveys**

Multibeam sonar surveys were conducted with the ME-70 multibeam mapping system on the ship.

## **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. Transect area was calculated as transect length \* transect width where transect length was calculated from the ROV tracking and transect width was measured using paired lasers on the ROV. Fish density (# individuals/1000 m<sup>2</sup>) was then calculated as (# of individuals/ transect area) \*1000.

## **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<sup>®</sup>, 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 (Scleractinia), hydrocorals (Stylasteridae), as well 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, Oculina Coral Mound, 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 is generally in the range of 10-20 m, which is the field of view of the ROV.
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 that are available for this region 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, *Oculina* coral mounds, 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 (e.g., shipwreck, barge)

## 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 m<sup>2</sup>) 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.

In addition, species diversity of fish assemblages was examined among MPAs. Biodiversity indices using the DIVERSE routine of PRIMER 6 were compared by location inside and outside each MPA and the *Oculina* OECA. Parameters examined include: total number of species,

diversity, and evenness. The Shannon-Weiner function ( $H'$ ) was used to estimate diversity as  $-\sum p_i \log(p_i)$  where  $p_i$  is the proportion of the total count arising from the  $i$ th species. Evenness ( $J'$ ) was estimated as  $H'/\log(S)$  where  $S$  is the total number of taxa.

## RESULTS

### Study Areas

The cruise was on the continental shelf edge of the South Atlantic Bight from Florida to South Carolina. The ROV surveys covered five shelf-edge MPA sites, including the North Florida MPA, Snowy Wreck MPA, Deep Artificial Reef MPA, Edisto MPA, and for the first time ever the St Lucie Hump MPA. Also the *Oculina* HAPC (OHAPC) and the OECA were surveyed (Figs. 1-4). An additional 7 dive sites were outside but adjacent to the MPAs for comparison.

### Cruise Summary

A total of 23 ROV dives were completed; 16 were inside the MPAs or HAPC and seven were outside. Seven dives were conducted within the OHAPC, including 4 within the OECA. 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. This precluded good video/photo transects. However, we were able to survey the St Lucie Hump MPA for the first time ever. The day we were there, the Florida Current had moved offshore, allowing for the dive. Previously strong current prevented dives at that site. The 23 ROV dives resulted in a total bottom time of 57.5 hours, covering 27.4 km, and at depths ranging from 41 to 260 m (Tables 3 & 4, Figs. 1-4). A total of 4,199 *in situ* digital images (including video frame grabs) were taken which included quantitative transect images, general habitat, and species documentation images. Twelve shipboard CTD casts were made and a temperature/depth sensor recorded each ROV dive (Fig. 5, Table 5). 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 Pc16-02  
Oculina ROV Dives

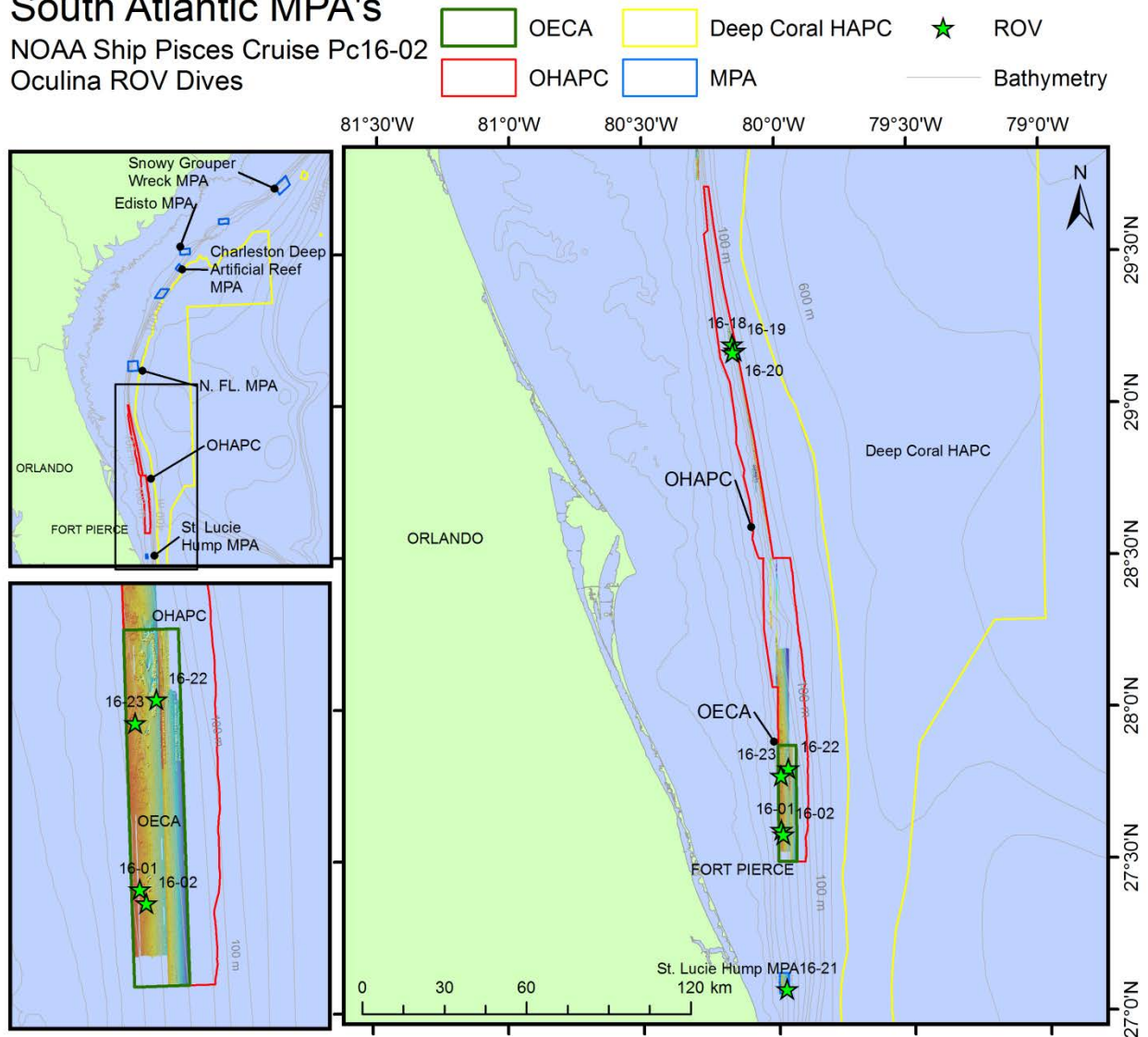


Figure 1. Locations of *Mohawk* ROV dive sites in the *Oculina* HAPC and OECA during the 2016 NOAA Ship *Pisces* cruise, June 7-22, 2016.

# South Atlantic MPA's

NOAA Ship Pisces Cruise Pc16-02  
North Florida ROV Dives

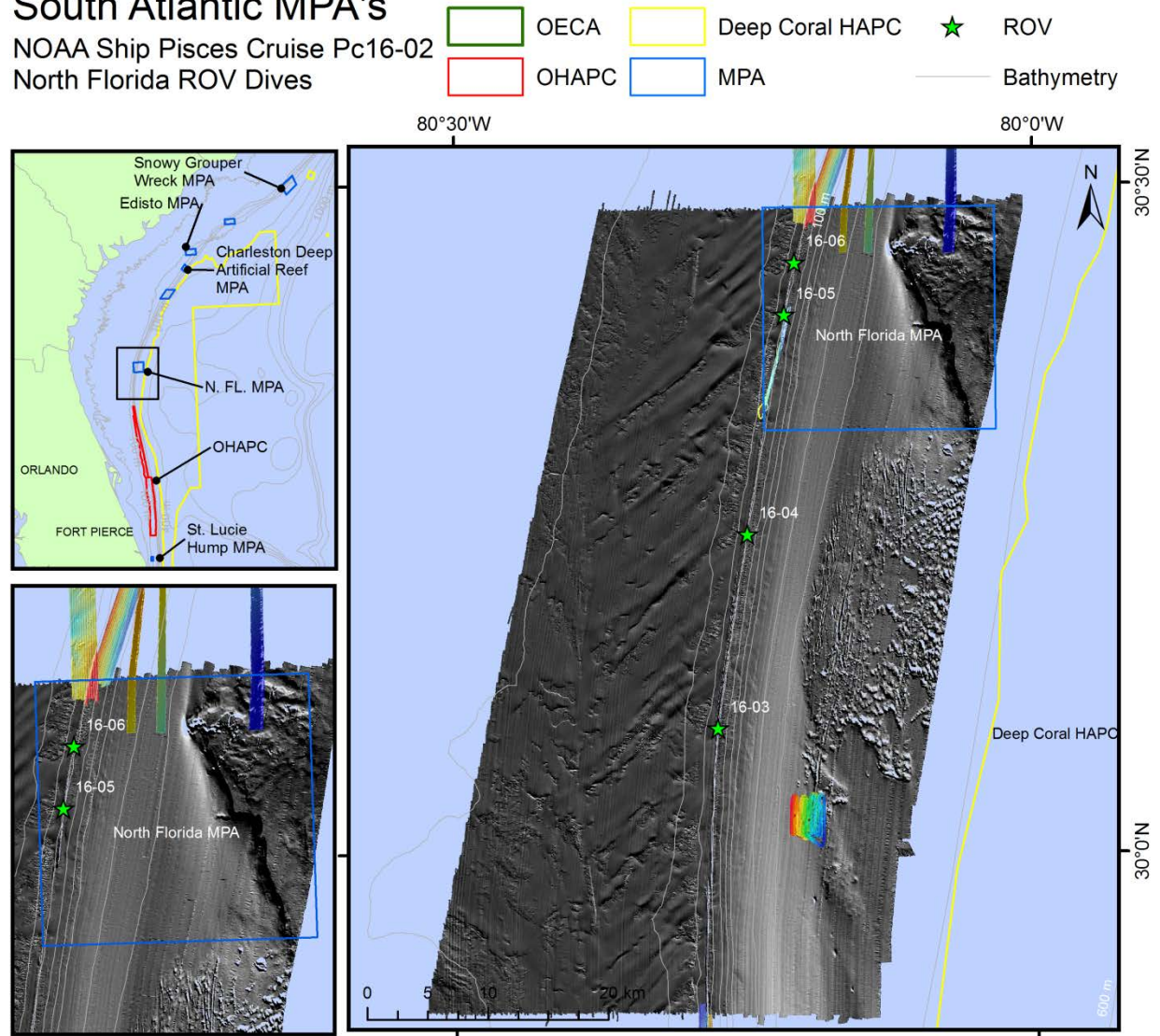


Figure 2. Locations of *Mohawk* ROV dive sites off North Florida during the 2016 NOAA Ship *Pisces* cruise, June 7-22, 2016.

## South Atlantic MPA's

NOAA Ship Pisces Cruise Pc16-02  
Edisto and Charleston Deep  
ROV Dives

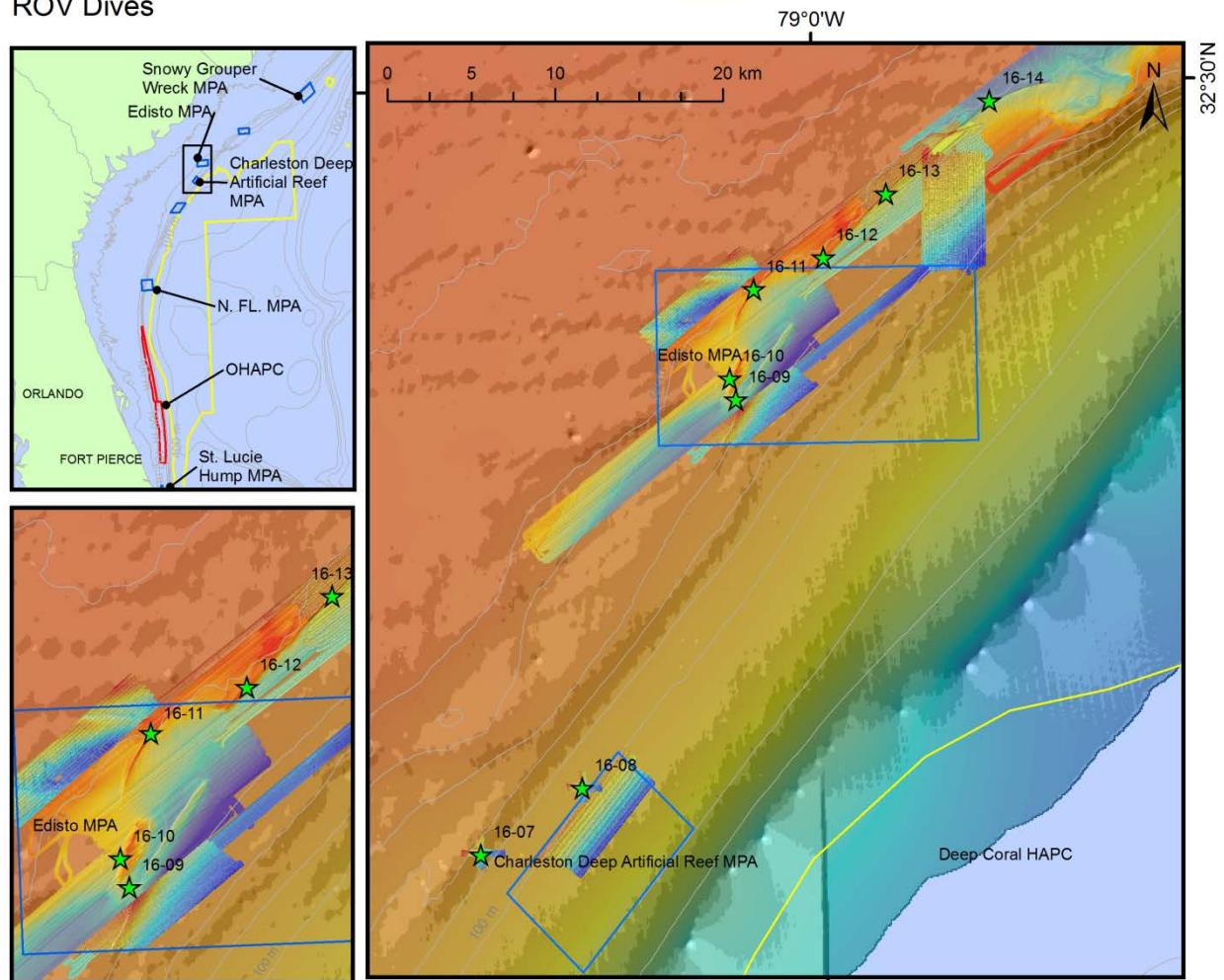
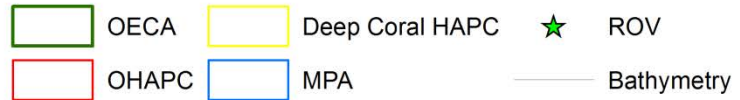


Figure 3. Locations of *Mohawk* ROV dive sites off South Carolina during the 2016 NOAA Ship *Pisces* cruise, June 7-22, 2016.



## South Atlantic MPA's

NOAA Ship Pisces Cruise Pc16-02  
Snowy Wreck ROV Dives

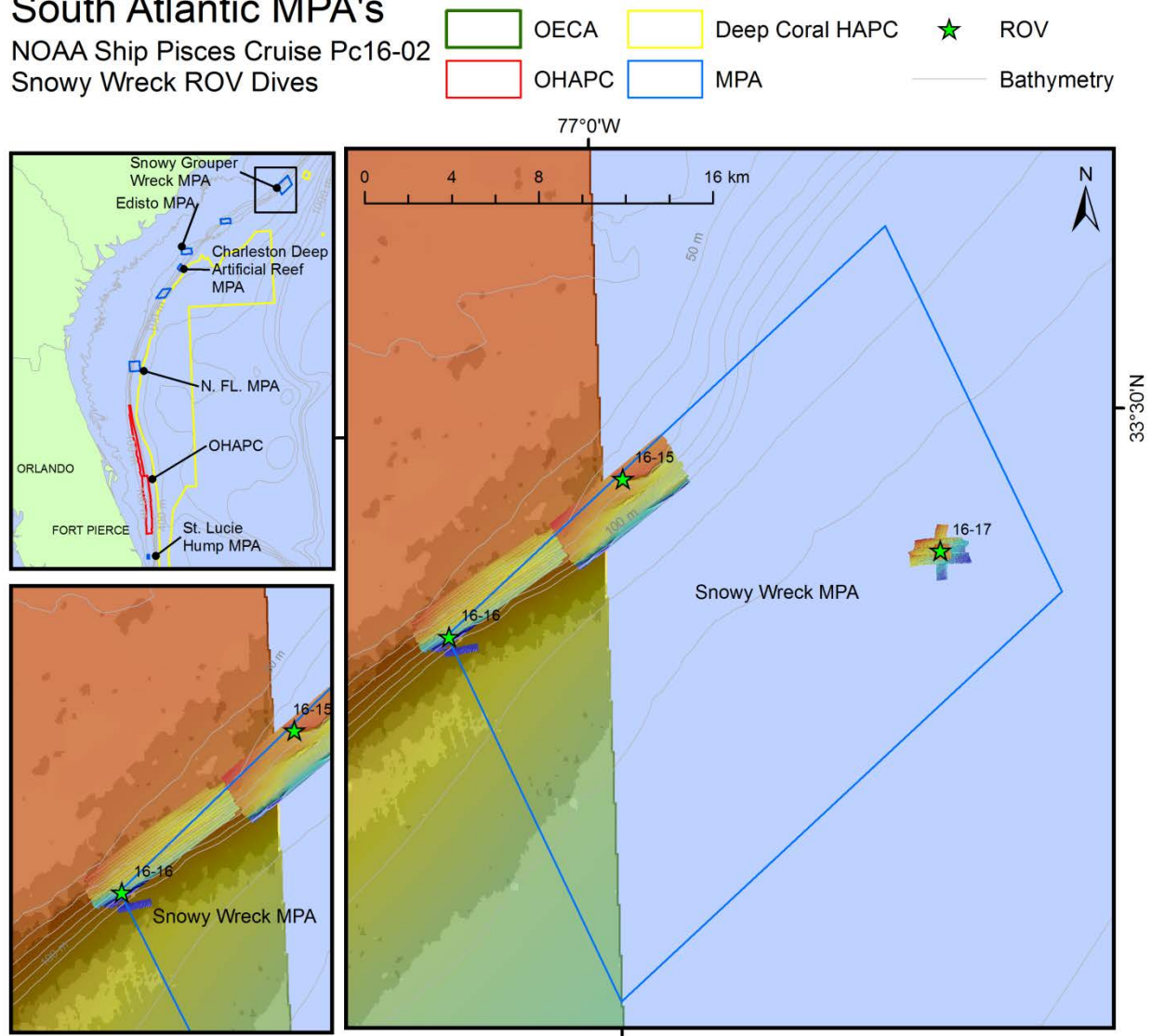


Figure 4. Locations of *Mohawk* ROV dive sites off North Carolina during the 2016 NOAA Ship *Pisces* cruise, June 7-22, 2016.

# South Atlantic MPA's

NOAA Ship *Pisces* Cruise Pc16-02  
CTD Casts

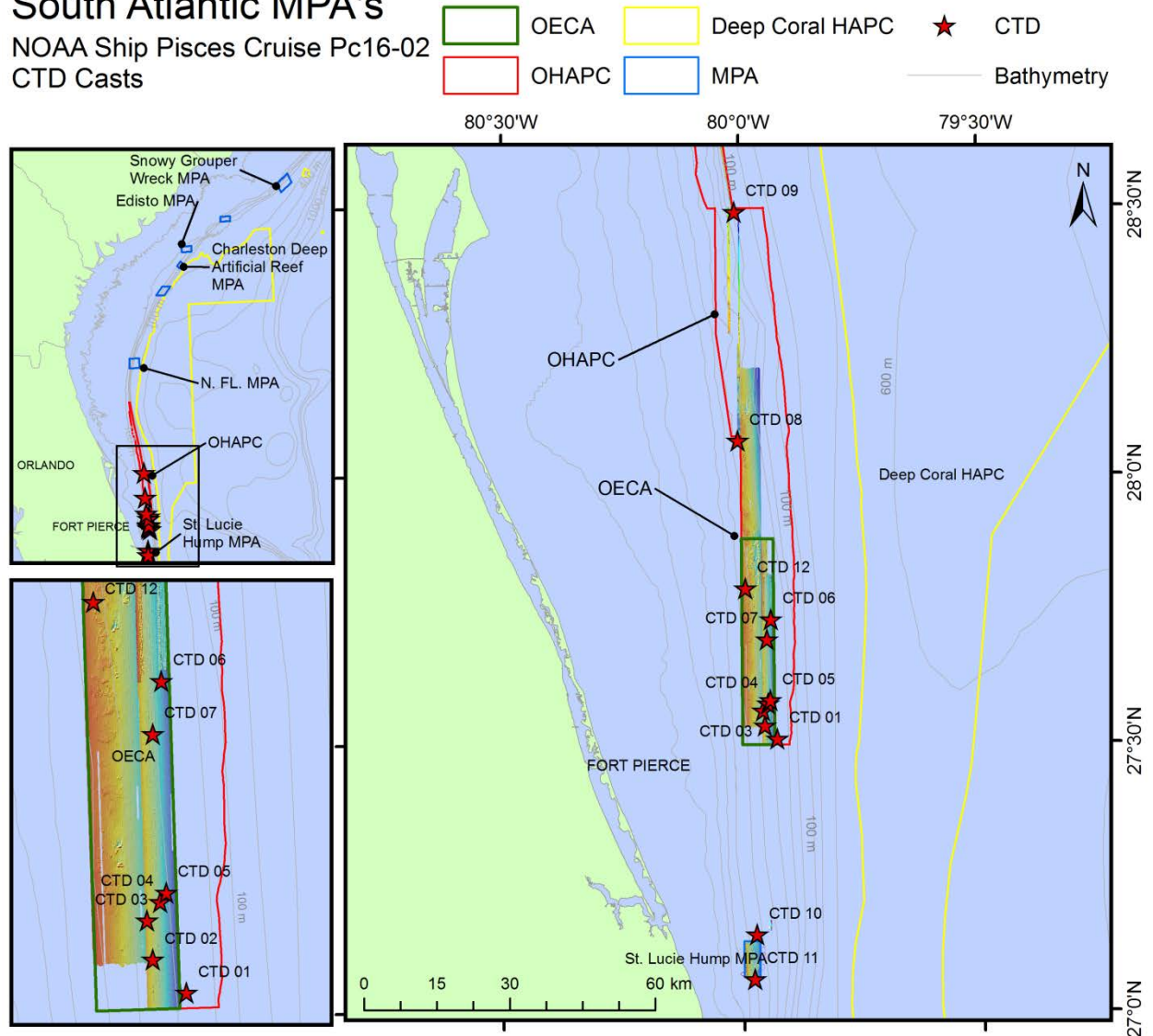


Figure 5. Locations of shipboard CTD casts during the 2016 NOAA Ship *Pisces* cruise, June 7-22, 2016.

Table 3. ROV dive sites and CTD casts from NOAA Ship *Pisces* cruise 16-02, June 7-22, 2016.  
(Site Number= Day-Month-Year-Site).

Site Number	Method	Latitude	Longitude	Latitude	Longitude	Depth Range	Distance
		On Bottom		Off Bottom		(m)	(km)
9-VI-16-1	16-01	27.60	-79.99	27.63	-79.99	70-73	4.2
9-VI-16-2	CTD 01	27.51	-79.93	-	-	134	-
10-VI-16-1	16-02	27.60	-79.98	27.60	-79.98	49-91	2.3
10-VI-16-2	CTD 02	27.54	-79.95	-	-	103	-
10-VI-16-3	CTD 03	27.56	-79.96	-	-	99	-
10-VI-16-4	CTD 04	27.58	-79.95	-	-	112	-
10-VI-16-5	CTD 05	27.58	-79.94	-	-	117	-
10-VI-16-6	CTD 06	27.73	-79.94	-	-	120	-
11-VI-16-1	CTD 07	27.70	-79.95	-	-	112	-
11-VI-16-2	CTD 08	28.07	-80.01	-	-	71	-
11-VI-16-3	CTD 09	28.49	-80.01	-	-	98	-
12-VI-16-1	16-03	30.09	-80.27	30.10	-80.27	48-62	0.73
12-VI-16-2	16-04	30.25	-80.25	30.25	-80.25	48-60	0.52
12-VI-16-3	16-05	30.42	-80.21	30.41	-80.21	56-64	1.1
12-VI-16-4	16-06	30.45	-80.20	30.45	-80.20	52-59	0.97
13-VI-16-1	16-07	32.09	-79.22	32.09	-79.22	76-88	0.66
13-VI-16-2	16-08	32.12	-79.15	32.13	-79.15	91-101	0.42
13-VI-16-3	16-09	32.33	-79.05	32.32	-79.05	61-64	0.55
13-VI-16-4	16-10	32.35	-79.03	32.35	-79.05	43-52	0.81
14-VI-16-1	16-11	32.39	-79.04	32.40	-79.03	46-49	1.31
14-VI-16-2	16-12	32.41	-78.99	32.41	-79.00	45-50	1.24
14-VI-16-3	16-13	32.44	-78.95	32.45	-78.95	46-54	1
14-VI-16-4	16-14	32.49	-78.89	32.49	-78.88	41-49	0.88
15-VI-16-1	16-15	33.48	-76.98	33.48	-76.99	56-66	1.71
15-VI-16-2	16-16	33.42	-77.08	33.42	-77.07	75-105	0.8
15-VI-16-3	16-17	33.44	-76.83	33.44	-76.83	238-260	0.38
18-VI-16-1	16-18	29.21	-80.16	29.22	-80.16	54-89	1.8
18-VI-16-2	16-19	29.18	-80.15	29.20	-80.15	69-96	1.67
18-VI-16-3	16-20	29.18	-80.16	29.19	-80.16	66-86	1.05
19-VI-16-1	16-21	27.08	-79.97	27.08	-79.97	72-97	0.93
19-VI-16-2	CTD 10	27.15	-79.97	-	-	85	-
19-VI-16-3	CTD 11	27.06	-79.98	-	-	81	-
20-VI-16-1	CTD 12	27.79	-79.99	-	-	68	-
21-VI-16-1	16-22	27.81	-79.96	27.82	-79.96	74-93	1.16
21-VI-16-2	16-23	27.78	-79.99	27.79	-79.99	57-75	1.24

Table 4. Summary of ROV dive sites by state and MPA from NOAA Ship *Pisces* cruise 16-02, June 7-22, 2016. See Appendix 3 for description of each dive site number.

State/Site	No. Dives	Dive Nos. Inside MPA	Dive Nos. Outside MPA	Depth Range (m)
<b>Florida (Total Dives)</b>	<b>(12)</b>	<b>(10)</b>	<b>(2)</b>	<b>60-90</b>
N Florida MPA	4	5, 6	3, 4	60
Oculina HAPC	3	18-20		70-90
Oculina OECA	4	1, 2, 22, 23		60-80
St Lucie Hump MPA	1	21		90
<b>South Carolina (Total Dives)</b>	<b>(8)</b>	<b>(3)</b>	<b>(5)</b>	<b>41-100</b>
Deep Artificial Reef MPA	2		7, 8	80-100
Edisto MPA	6	9-11	12-14	41-65
<b>North Carolina (Total Dives)</b>	<b>(3)</b>	<b>(3)</b>		<b>65-250</b>
Snowy Wreck MPA (reefs)	2	15, 16		65-80
Snowy Wreck MPA (shipwreck)	1	17		250
<b>Grand Total (Total Dives)</b>	<b>(23)</b>	<b>(16)</b>	<b>(7)</b>	<b>41-250</b>

### CTD Operations

Temperature and depth (pressure) data were collected during each ROV dive (Table 5; Appendix 3 shows the temperature profile for each dive). A total of 12 shipboard CTD casts were made in conjunction with the multibeam sonar surveys. Most of the shipboard casts were conducted within the *Oculina* HAPC.

Table 5. Shipboard CTD data (CTD 1 to 12) and ROV temperature data (16-xx) from NOAA Ship *Pisces* cruise 16-02, June 7-22, 2016. Surface and bottom temperatures, bottom salinity and bottom oxygen at maximum depth of cast.

<b>Dive No.</b>	<b>Launch</b>	<b>Depth (m)</b>	<b>Surf. Temp (°C)</b>	<b>Bot. Min. Temp (°C)</b>	<b>Bot. Sal. (PSU)</b>	<b>Bot. Oxygen (mg/l)</b>
16-01	6/9/2016 12:44	72.40	26.72	18.13		
CTD 01	6/9/2016 12:33	134.38	28.11	13.67	35.69	5.82
16-02	6/10/2016 8:09	82.70	23.45	15.68		
CTD 02	6/10/2016 21:55	102.71	27.88	15.36	35.89	5.62
CTD 03	6/10/2016 6:49	98.73	27.13	15.31	35.90	5.63
CTD 04	6/10/2016 11:35	112.48	28.11	15.38	35.93	5.62
CTD 05	6/10/2016 14:24	116.76	28.32	13.90	35.75	5.79
CTD 06	6/10/2016 18:41	120.24	28.19	15.22	35.93	5.64
CTD 07	6/10/2016 22:47	111.52	28.07	14.49	35.83	5.72
CTD 08	6/11/2016 7:04	70.70	28.05	18.55	36.26	5.28
CTD 09	6/11/2016 13:40	98.20	28.12	19.02	36.33	5.23
16-03	6/12/2016 8:30	62.30	24.40	22.82		
16-04	6/12/2016 12:37	59.61	27.83	21.19		
16-05	6/12/2016 15:40	61.68	21.27	20.89		
16-06	6/12/2016 17:48	57.92	27.71	21.92		
16-07	6/13/2016 8:31	86.94	22.37	21.06		
16-08	6/13/2016 11:20	100.46	26.70	19.28		
16-09	6/13/2016 15:06	64.22	25.19	22.13		
16-10	6/13/2016 17:38	52.22	25.59	22.50		
16-11	6/14/2016 7:45	48.44	23.84	23.52		
16-12	6/14/2016 10:42	49.51	24.91	23.93		
16-13	6/14/2016 13:17	53.75	26.16	23.20		
16-14	6/14/2016 16:08	48.17	25.97	23.49		
16-16	6/15/2016 13:16	104.31	28.33	20.20		
16-17	6/15/2016 17:47	260.30	27.27	11.07		
16-18	6/18/2016 8:35	89.06	26.76	15.94		
16-19	6/18/2016 11:55	96.27	27.06	17.10		
16-20	6/18/2016 14:29	84.90	25.61	17.30		
16-21	6/19/2016 8:15	96.83	25.65	14.31		
CTD 10	6/19/2016 6:40	84.68	28.24	16.31	36.04	5.51
CTD 11	6/19/2016 11:13	80.58	28.15	16.71	36.09	5.47
CTD 12	6/20/2016 10:44	67.66	28.05	22.44	36.30	4.92
16-22	6/21/2016 8:20	91.25	23.38	17.05		
16-23	6/21/2016 11:26	74.83	27.11	21.11		



## Multibeam Sonar Surveys

Nine multibeam sonar surveys were conducted covering a total area of 203.3 km<sup>2</sup> (Table 6). These were primarily within the OECA (115.8 km<sup>2</sup>), the new St. Lucie Hump MPA, and the three deep artificial reefs.

Table 6. Multibeam sonar survey sites from NOAA Ship *Pisces* cruise 16-02, June 7-22, 2016.

Name	Area (mi <sup>2</sup> )	Area (km <sup>2</sup> )	Resolution (m)	Min Depth (m)	Max Depth (m)
Pisces 2016 St Lucie MPA	7.3	25.0	5	48	129
Pisces 2016 Florida OECA	30.3	104.0	5	72	192
Pisces 2016 Florida OECA	3.4	11.8	5	60	113
Pisces 2016 Oculina HAPC North	11.6	40.0	5	74	110
Pisces 2016 Georgia MPA	1.2	4.2	5	70	82
Pisces 2016 Charleston Artificial Reef MPA- Barge 1	0.5	1.8	5	72	96
Pisces 2016 Charleston Artificial Reef MPA- Barge 2	0.5	1.6	5	93	105
Pisces 2016 Edisto MPA	4.2	14.4	5	34	47
Pisces 2016 Snowy Grouper Wreck	0.2	0.5	5	175	369
Total	59.2	203.3			

## 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<sup>©</sup> 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 site 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 some 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.

A total of 110 taxa of benthic macrobiota were identified from the quantitative photo transects and were used for CPCe percent cover analyses (Appendix 1). These included 35 taxa of Cnidaria which included the following: 8 Scleractinia hard corals (*Oculina varicosa*, *Lophelia pertusa*, *Madracis myriaster*, *Cladocora* sp., *Siderastrea radians*, and *Phyllangia americana*, and unidentified Scleractinia); 13 gorgonians (*Carijoa riisei*, *Diodogorgia* sp., *Ellisella* sp., *Ellisellidae*, *Iciligorgia schrammi*, *Muricea* sp., *Nicella* sp., *Swiftia exserta*, *Titanideum frauenfeldii*, and various unidentified gorgonians); 6 Antipathidae (unidentified Antipatharia, *Antipathes atlantica*, *Antipathes furcata*, *Elatopathes abietina*, *Stichopathes lutkeni*, and *Tanacetipathes tanacetum*); and Alcyonian soft corals (*Nidalia occidentalis*). Non-coral Cnidaria included: Actiniaria, *Actinoscyphia* sp., Cerianthidae, Corallimorpharia, Hydroidolina, *Solandaria gracilis*, and Zoanthidae.

Porifera were most species rich with 30 taxa of demosponges. There are many more species than that as most could only be identified to genus or higher level. The dominant sponges included *Agelas* sp., *Agelas clathrodes*, *Aiolochoia crassa*, *Aplysina* sp., *Callyspongia vaginalis*, *Chondrilla* sp., *Clathria* sp., *Cliona* sp., *Erylus* sp., *Geodia neptuni*, *Geodia gibberosa*, *Ircinia campana*, *Ircinia* sp., *Ircinia strobilina*, *Monanchora* sp., *Niphates* sp., *Placospongia* sp., *Scopalina* sp., *Siphonodictyon coralliphagum*, *Spongosorites siliquaria*, and *Xestospongia* sp. Other fauna included Annelida, Mollusca, Arthropoda, Bryozoa, Echinodermata (14 taxa), and Ascidiacea. Algae were dominant at many of the sites and included Phaeophyta (dominated by *Dictyota* spp.), Chlorophyta, and Rhodophyta; but these were not identified to species level.

Table 7. Percent cover of benthic macrobiota and substrate from CPCe Point Count analysis of ROV photographic transects listed by state and MPA status (i.e., inside MPA or no protection) from NOAA Ship *Pisces* cruise 16-02, June 7-22, 2016. HB= bare hard bottom, AR= bare artificial reef, SB= bare soft bottom; Coral= Scleractinia hard coral, Gorg= Octocoral (gorgonacea), Anti= Antipatharia (black coral), Porifera (sponges), Hum Deb= human debris (fishing lines, trawl nets, anchors), Other= all other benthic macrobiota.

State/MPA/Inside-Outside	% Bare Substrate				% Hum.						
	% HB	% AR	% SB	% Coral	% Gorg.	% Anti.	% Porifera	% Algae	Deb.	% Other	Grand Total
Florida	64.37%	0.00%	15.18%	0.71%	0.36%	1.92%	3.64%	6.37%	0.23%	7.23%	100.00%
North Florida MPA	50.57%	0.00%	17.82%	0.05%	0.51%	5.03%	8.67%	10.51%	0.00%	6.84%	100.00%
North Florida MPA	46.24%	0.00%	22.63%	0.00%	0.41%	5.91%	8.72%	9.17%	0.00%	6.92%	100.00%
Outside North Florida MPA	53.95%	0.00%	14.06%	0.09%	0.58%	4.35%	8.64%	11.56%	0.00%	6.77%	100.00%
Oculina HAPC	68.65%	0.00%	16.52%	0.51%	0.33%	1.10%	2.10%	2.78%	0.29%	7.72%	100.00%
St. Lucie Hump MPA	70.05%	0.00%	5.49%	2.57%	0.27%	0.05%	1.46%	13.81%	0.35%	5.95%	100.00%
South Carolina	24.05%	8.55%	20.45%	0.08%	4.26%	0.77%	4.65%	22.61%	0.03%	14.56%	100.00%
Charleston Deep Reef MPA (Barge 1)	12.73%	58.77%	5.87%	0.00%	0.00%	0.00%	1.22%	0.00%	0.00%	21.42%	100.00%
Charleston Deep Reef MPA (Barge 2)	2.97%	46.90%	7.02%	0.00%	0.00%	0.74%	0.00%	0.00%	0.08%	42.28%	100.00%
Edisto MPA	27.12%	0.00%	23.14%	0.09%	5.08%	0.85%	5.42%	26.96%	0.02%	11.32%	100.00%
Edisto MPA	30.76%	0.00%	27.59%	0.12%	5.51%	0.83%	5.22%	17.34%	0.03%	12.61%	100.00%
Outside Edisto MPA	23.39%	0.00%	18.57%	0.06%	4.63%	0.88%	5.62%	36.85%	0.02%	9.99%	100.00%
North Carolina	26.49%	18.45%	28.69%	0.50%	1.14%	1.37%	3.18%	3.82%	0.53%	15.83%	100.00%
Snowy Wreck MPA (reef sites)	38.62%	0.00%	40.44%	0.61%	1.34%	2.00%	4.61%	5.58%	0.20%	6.61%	100.00%
Snowy Wreck MPA (wreck site)	0.05%	58.69%	3.06%	0.24%	0.72%	0.00%	0.05%	0.00%	1.24%	35.95%	100.00%
Grand Total	45.51%	5.48%	18.86%	0.47%	1.78%	1.46%	3.91%	11.44%	0.20%	10.90%	100.00%

CPCe Point Count analysis was used to calculate the percent cover of bare substrate type and benthic macrobiota at each dive site (Figs. 6 and 7, Table 7, Appendix 1, Appendix 3). In general, the South Carolina sites, Edisto (inside and outside the MPA) had the highest cover of biota which is what we have found previously. For unknown reasons, this is primarily due to the

high cover of macro algae (17-36% cover, primarily *Dictyota* spp.). The North Florida site also had relatively high cover of algae (9-11%). St. Lucie Hump also had high algal cover (13%) but in this case it was primarily crustose coralline algae encrusting the rock and coral rubble rather than the brown algae. The greatest cover of scleractinian coral was found at the *Oculina* reef sites (0.51% at OHAPC) as well as at the newly discovered *Oculina* reefs found within the St. Lucie Humps MPA (2.5% cover) described below. The Edisto sites also had greatest cover of gorgonians (4-5% cover) whereas the North Florida sites had the greatest cover of black corals (4-6%) as well as sponges (8%). The large ‘other’ category (Fig. 6) shown for the artificial reefs were the dense cover of anemones on the Snowy Wreck and oysters on the Charleston Deep Reef barges.

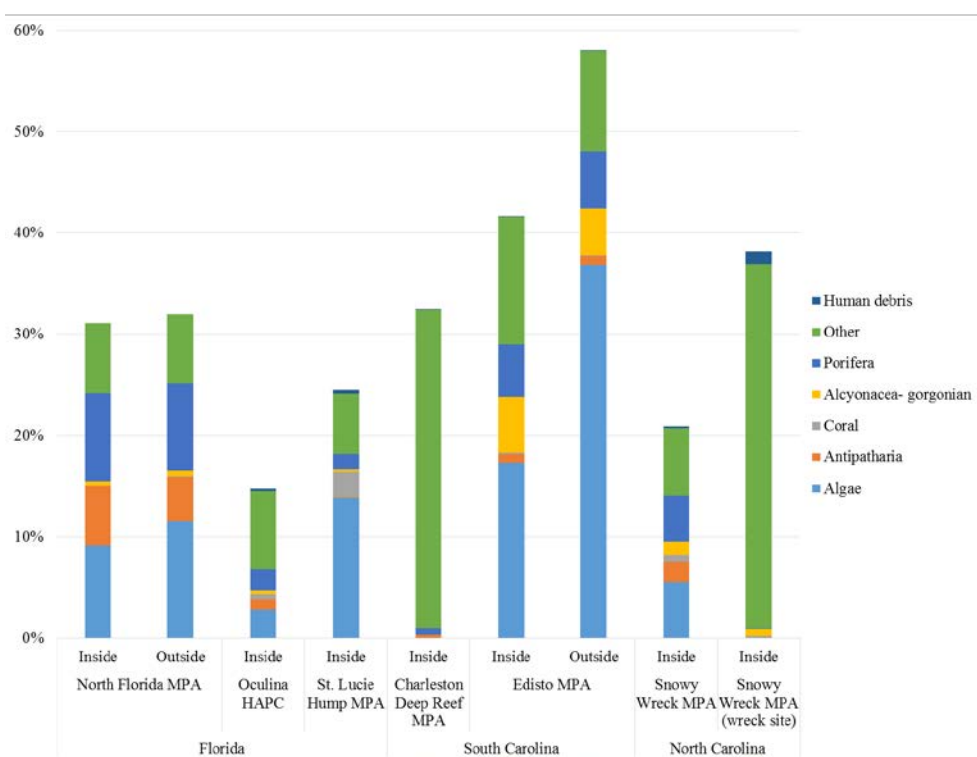


Figure 6. Percent cover of major benthic macrobiota taxa and human debris listed by MPA status and region from CPCe Point Count analysis of ROV photographic transects from the NOAA Ship *Pisces* cruise 16-02, June 7-22, 2016.

### ***Oculina* Coral Reef Sites**

One dive was conducted on the St. Lucie Hump MPA site where *Oculina* coral mounds were discovered, and seven dives were conducted within the OHAPC (Table 4), including four within the OECA. Unfortunately use of the ROV in the OHAPC has always been difficult or sometimes impossible due to the strong Florida Current producing currents of 1-2 knots over the reefs. The video and photo transects were therefore somewhat limited as the ROV was pulled mostly too fast by the ship or was too high for quantitative transects. We could only get a limited number of good images which could be used for Point Count analysis (Appendix 3), so these are not a good quantitative estimate of the benthic biota. Also, in general, deep-water coral reefs such as *Lophelia* coral and *Oculina* coral reefs have relatively lower density and diversity of macrobiota

than typical shallow water and mesophotic reefs such as the shelf-edge MPAs in the region. For these reasons, typical point count analysis is not a good statistic to use on deep-water reefs. Recent surveys of deep-water corals in the canyons of the Mid-Atlantic Bight used counts of corals from the video transects rather than percent cover (Brooke et al. 2016). The following analysis of the *Oculina* dives (OHAPC and the St. Lucie Hump MPA) used the video to document the coral and sponge communities. The video was first analyzed and divided into habitat types (*Oculina* mound, rock pavement/boulders [i.e., hard bottom], and soft bottom-sand), then further divided into 5 minute increments. For each increment, every individual coral (Scleractinia, gorgonian Octocorals, black corals), sea pen (Pennatulacea), and sponge was identified and counted whenever the ROV was close enough to the bottom. Small (<10 cm) and encrusting sponges were not counted. Since the ROV was frequently pulled off the bottom by the ship's drift, we could not calculate actual density, but present these data as total counts (Table 8). The maps indicate the presence of the taxa during each 5 minute segment (Figures 7, 8). Standing dead *Oculina* coral colonies are also designated. These provide important habitat for the *Oculina* coral community which consists of hundreds of species of invertebrates and juvenile fish which live among the coral branches (Reed et al. 1982; Reed and Mikkelsen 1987; Reed 2002; George et al. 2007).

#### Oculina HAPC

These sites are the only places known on earth where the high-relief *Oculina* coral mounds have formed. Unfortunately bottom trawling, primarily in the 1970s and 80s 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* that are starting to regrow. 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. A total of 459 colonies of live *Oculina varicosa* coral were counted (Table 8). Of these 154 were documented with 3 dives in the new northern extension of the *Oculina* HAPC and 138 colonies were documented by a single dive at Chapman's Reef which was first protected early on in 1984. In addition, black corals, gorgonians, and sponges were fairly diverse and common (Figs. 7, 8). A nice discovery too was an area within the OECA away from the high relief mounds where thickets of live *Oculina* coral were found on low relief sandy bottom (Fig. 9 A). Another pleasant discovery was a large school of red snapper within the OECA which is the first sighting since the mid 1990s (Figure 9 B). Elsewhere within the OHAPC a large (~4 ft) Warsaw grouper was also sighted for the first time on the *Oculina* reefs since the 1990s. Unfortunately, ongoing poaching within the OECA also prevents the buildup of spawning aggregations of grouper which used to dominate these reefs. We still saw evidence of poaching within the OECA, i.e., trawl net remnants and fishing lines on the bottom (Table 8, Fig. 10).

#### St. Lucie Hump MPA

This cruise marked the first time ever that this site has been visually surveyed. In the 1970s HBOI scientists using the *Johnson-Sea-Link* Submersibles dived on the actual St. Lucie Hump which is a large geological rock mound several miles north of the designated St. Lucie Hump MPA. It is uncertain how the MPA designation was made south of the actual mound but it turned out fortuitous. Previously attempts to dive with an ROV on the MPA site failed due to strong currents, but luckily the Florida Current was offshore of the site during this cruise which allowed for a successful dive. Of particular interest was the discovery of living *Oculina* coral thickets and

coral mounds at the St. Lucie Hump MPA site (Fig. 11). A total of 126 live coral colonies were counted from the ROV video. These reefs are now the only known *Oculina* coral mounds in the world outside of the *Oculina* HAPC. Since these are south and upstream of the OHAPC it is critical to protect this site as they may produce coral larvae that may settle within the OHAPC. Many of these corals were also wrapped in lost fishing lines.

Figure 6. Percent cover of major benthic macrobiota (Scleractinia, gorgonian Octocorals, and Antipatharia), Pennatulacea, Porifera, and fishing gear from video analysis of ROV dives on *Oculina* reef sites (*Oculina* HAPC, OECA and St. Lucie Hump MPA during NOAA Ship *Pisces* cruise, June 7-22, 2016.

Phylum/Taxa	Oculina HAPC			OECA				St. Lucie Hump MPA	Grand Total
	16-18	16-19	16-20	16-01	16-02	16-22	16-23	16-21	
<b>Cnidaria</b>	<b>720</b>	<b>509</b>	<b>274</b>	<b>41</b>	<b>723</b>		<b>438</b>	<b>273</b>	<b>2978</b>
Alcyonacea- gorgonian	143		16		6		3	37	205
Antipatharia	253	225	60	2	14		4	1	559
<i>Antipathes atlantica</i>	35	51	48				16		150
<i>Antipathes furcata</i>	4	1							5
<i>Callipodium rubens</i>	1				4		1	6	12
<i>Carijoa</i> sp.	2				27				29
<i>Diodogorgia</i> sp.	46	14	7		1		8	1	77
<i>Elatopathes abietina</i>	5	78	3		3		10		99
<i>Ellisella</i> sp.				2	1				3
<i>Nidalia occidentalis</i>	25	2	11		1		1	87	127
<i>Oculina varicosa</i>	54	44	56	18	138		23	126	459
Pennatulacea	4		1						5
<i>Stichopathes lutkeni</i>	98	87	68	19	470		372	15	1129
<i>Titanideum frauenfeldii</i>	49	7	4		58				118
<i>Virgularia presbytes</i>	1								1
<b>Porifera</b>	<b>31</b>	<b>14</b>	<b>93</b>	<b>32</b>	<b>213</b>	<b>79</b>	<b>121</b>	<b>43</b>	<b>626</b>
<i>Aplysina</i> sp.	1				5		7		13
Demospongiae	20	10	4	32	90	6	50	35	247
<i>Erylus</i> sp.	8	4	89		116	73	63	1	354
<i>Geodia</i> sp.					1		1	7	9
<i>Ircinia campana</i>	2				1				3
<b>Human debris</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>10</b>	<b>4</b>		<b>17</b>	<b>28</b>	<b>67</b>
anchor line	1			2			1		4
fishing line/longline	2	3	2	7	3		13	28	58
trawl net				1	1		3		5
<b>Habitat</b>	<b>20</b>	<b>21</b>	<b>9</b>	<b>8</b>	<b>19</b>	<b>19</b>	<b>16</b>	<b>21</b>	<b>133</b>
dead standing <i>Oculina</i>	20	21	9	8	19	19	16	21	133
Grand Total	774	547	378	91	959	98	592	365	3804



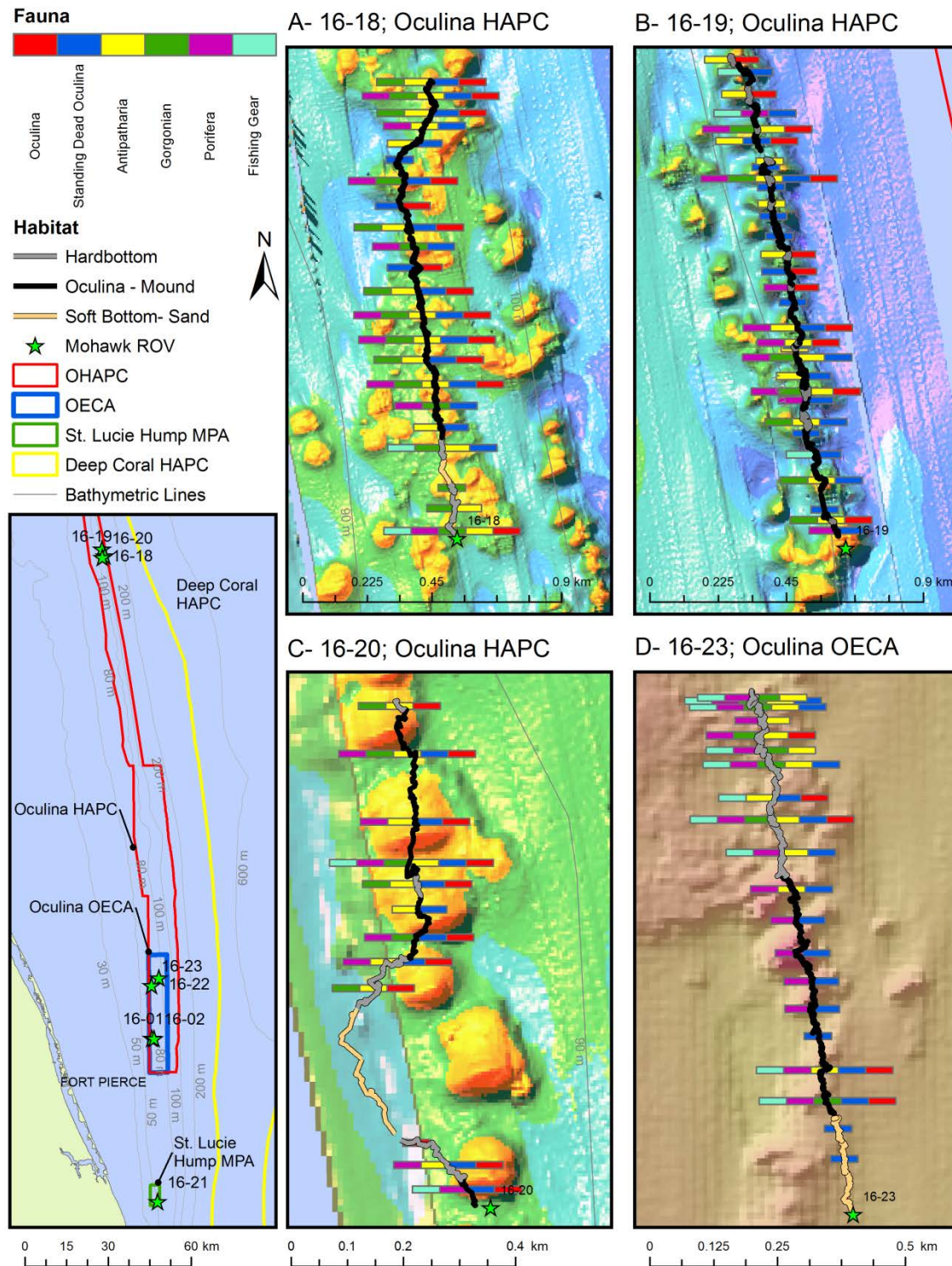


Figure 7. Presence of corals (Scleractinia, gorgonian Octocorals, Antipatharia), sponges, and fishing gear based on video analysis of ROV video in 5-minute increments on *Oculina* reef sites from NOAA Ship *Pisces* cruise 16-02, June 7-22, 2016.

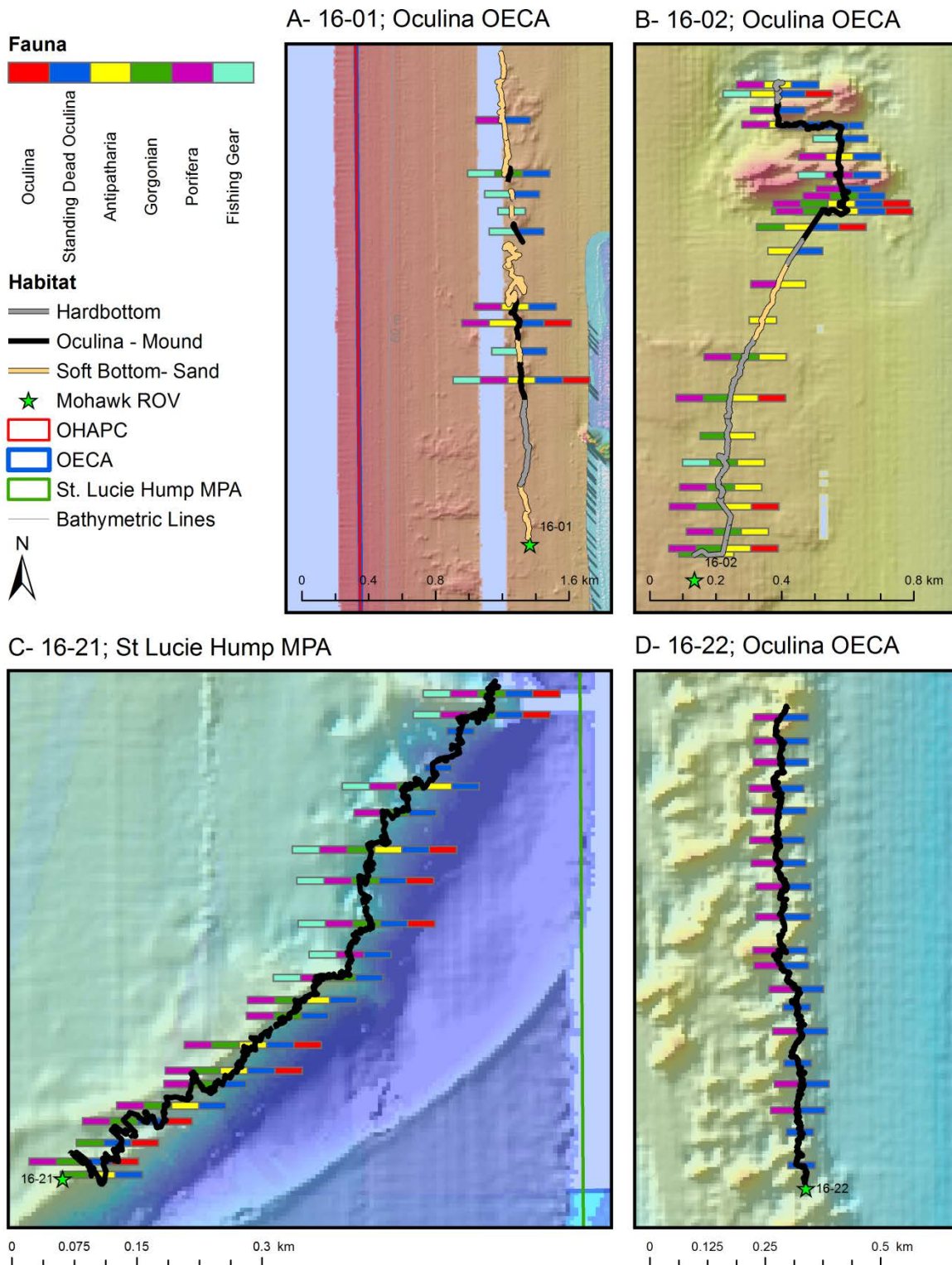


Figure 8. Presence of corals (Scleractinia, gorgonian Octocorals, Antipatharia), sponges, and fishing gear based on video analysis of ROV video in 5-minute increments on *Oculina* reef sites from NOAA Ship *Pisces* cruise, June 7-22, 2016.



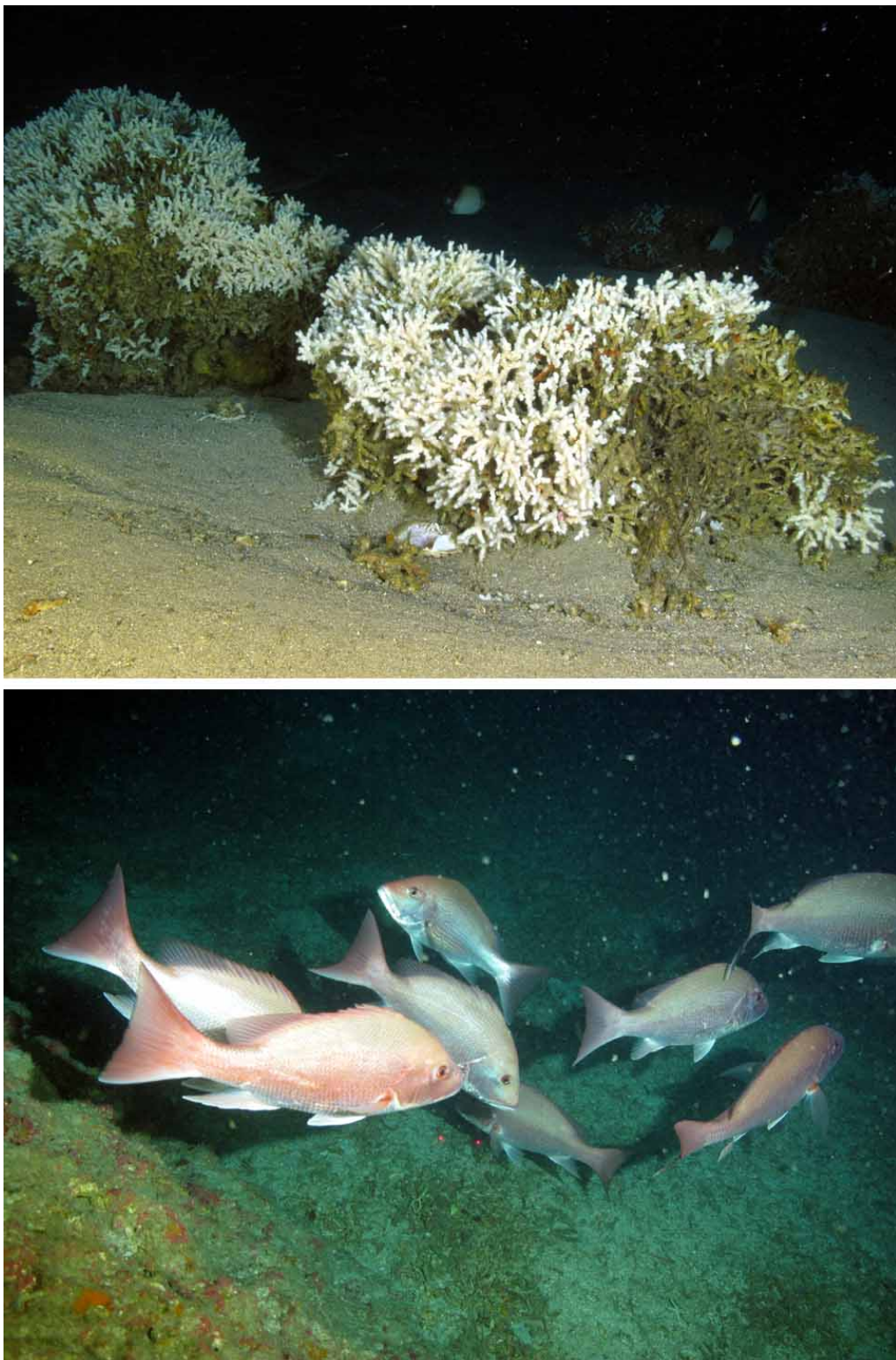


Figure 9. A. Large colonies of live *Oculina varicosa* on low relief, sandy bottom within the OECA. B. School of red snapper within the OECA discovered during the NOAA Ship *Pisces* cruise, June 7-22, 2016.



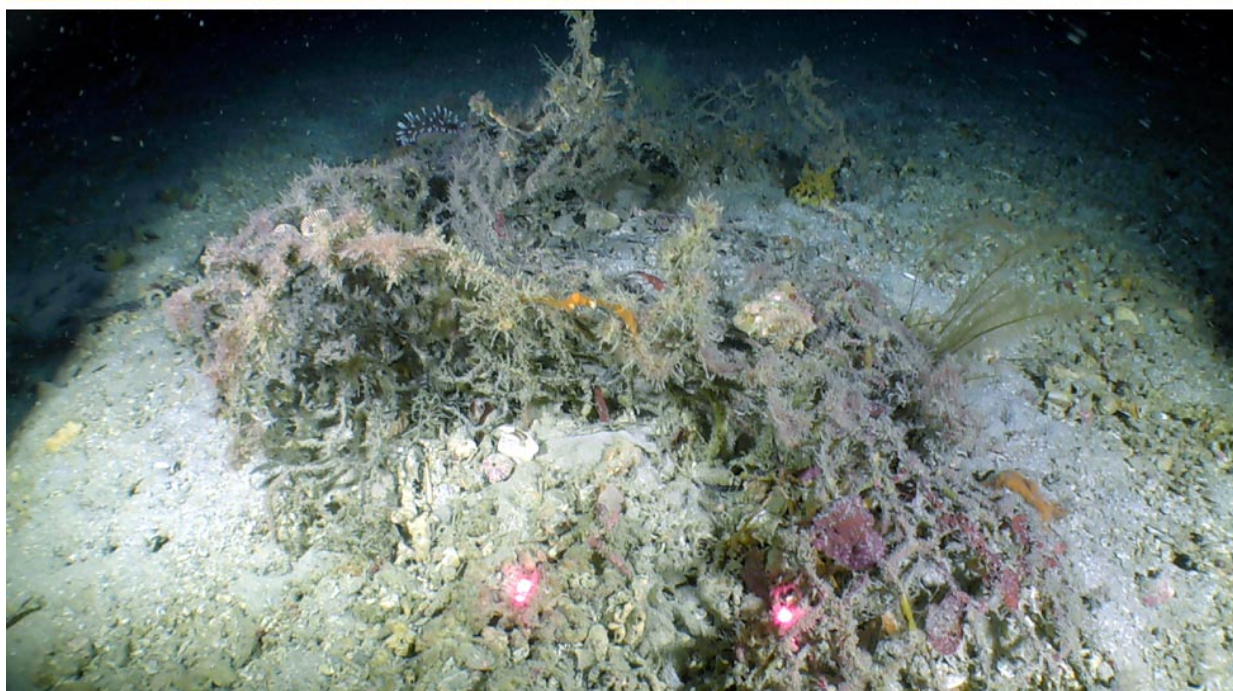


Figure 10. Lost fishing gear (A. longline, B. trawl net) discovered within the OECA during the NOAA Ship *Pisces* cruise, June 7-22, 2016.



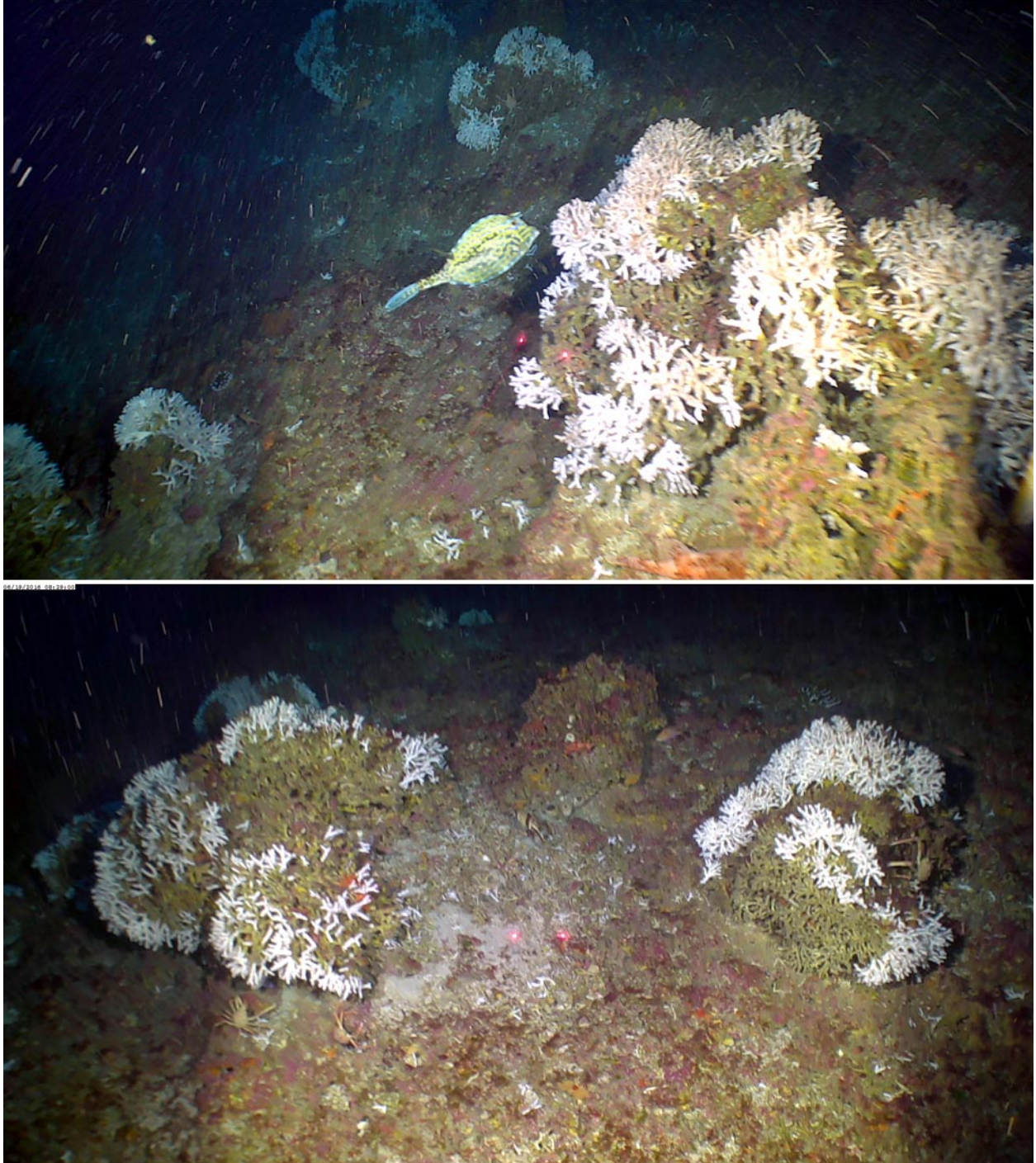


Figure 11. Live *Oculina varicosa* coral thickets discovered within St. Lucie Hump MPA during the NOAA Ship *Pisces* cruise, June 7-22, 2016.

### ***Swiftia exserta* Octocoral Communities within the Shelf-Edge MPAs**

Of interest to the NOAA Deep-sea Coral Program is mapping the distribution of both Scleractinian corals and gorgonian Octocorals in U.S. waters. Our surveys of the shelf-edge MPAs discovered some very dense populations of the gorgonian octocoral *Swiftia exserta*



especially around Edisto MPA and the Snowy Wreck MPA reef sites. This beautiful orange or yellow sea fan that grows to 1-2 ft in height is common on these mesophotic reef sites and provides habitat structure for other invertebrates and fish (Fig. 12). Using the video transects as described above we counted all the visible colonies at four sites where they were most abundant (Table 9). We also plotted the counts of these in 5 minute increments for each dive (Fig. 13).

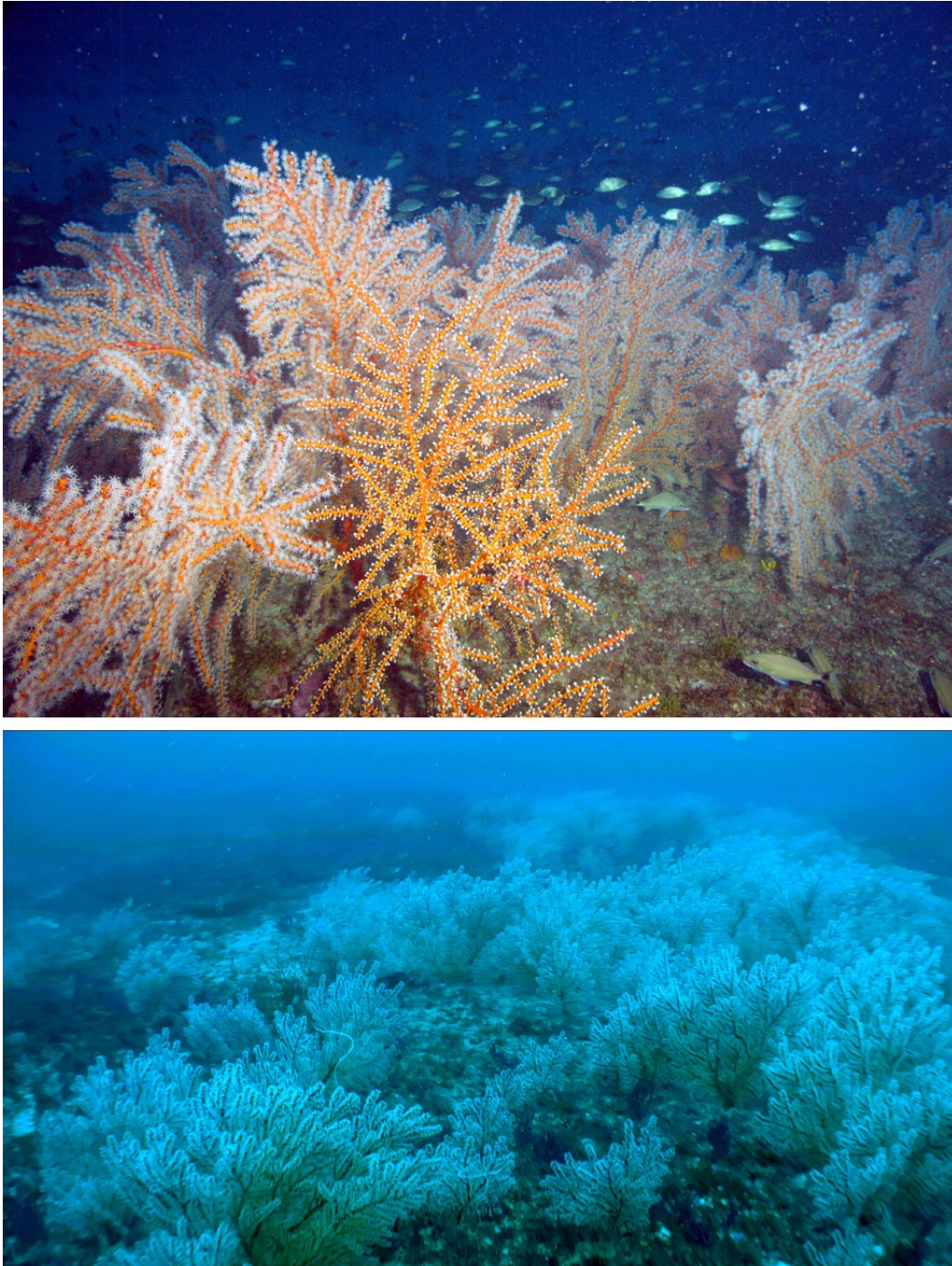


Figure 12. Fields of the gorgonian octocoral *Swiftia exserta* found at Edisto MPA during the NOAA Ship *Pisces* cruise, June 7-22, 2016.

Table 9. Counts of *Swiftia exserta* gorgonians and human debris from video analysis of ROV dives during NOAA Ship *Pisces* cruise 16-02, June 7-22, 2016.

Phylum/Taxa	Edisto MPA	Outside Edisto MPA		Snowy Wreck MPA	Grand Total
	16-11	16-12	16-13	16-15	
Cnidaria	160	170	943	185	1458
<i>Swiftia exserta</i>	160	170	943	185	1458
Human debris	2	1		11	14
Human debris- anchor line	1			1	2
Human debris- fishing line	1			10	11
Human debris- other		1			1

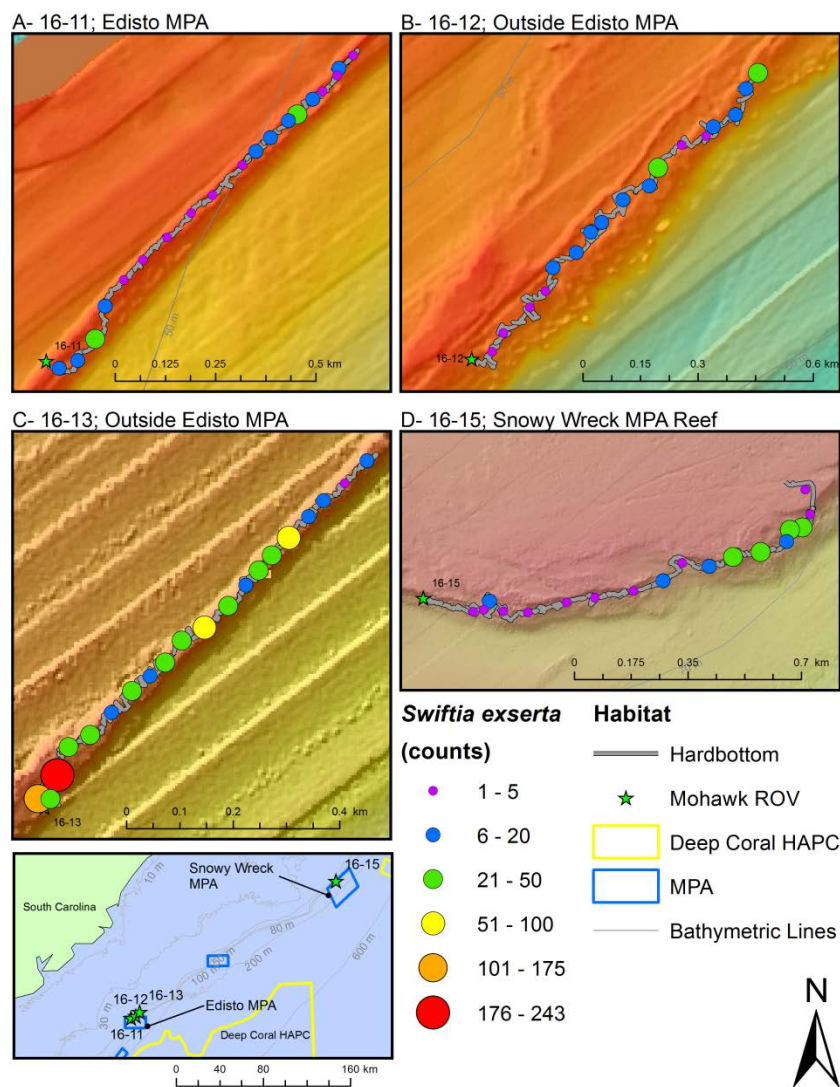


Figure 13. Counts of *Swiftia exserta* gorgonians based on video analysis of ROV video in 5-minute increments at selected sites from NOAA Ship *Pisces* cruise 16-02, June 7-22, 2016.

## 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 using PRIMER 6.0. In general, there were two major groupings, the artificial reefs sites (wreck and barges) and the shelf edge reef sites (Fig. 14). When the artificial reefs are removed from the analysis, the MDS plot (Fig. 15) shows the clear distinction between the *Oculina* reef sites and the more northern shelf edge MPA sites (Northern Florida, Edisto, and Snowy Wreck reef). There is also clustering by region with the North Florida sites clustered with high similarity, then the Edisto sites and the Snowy Wreck reef sites showing less similarity. This shows the importance of having numerous MPA sites, with each having distinct characteristics and benthic communities.

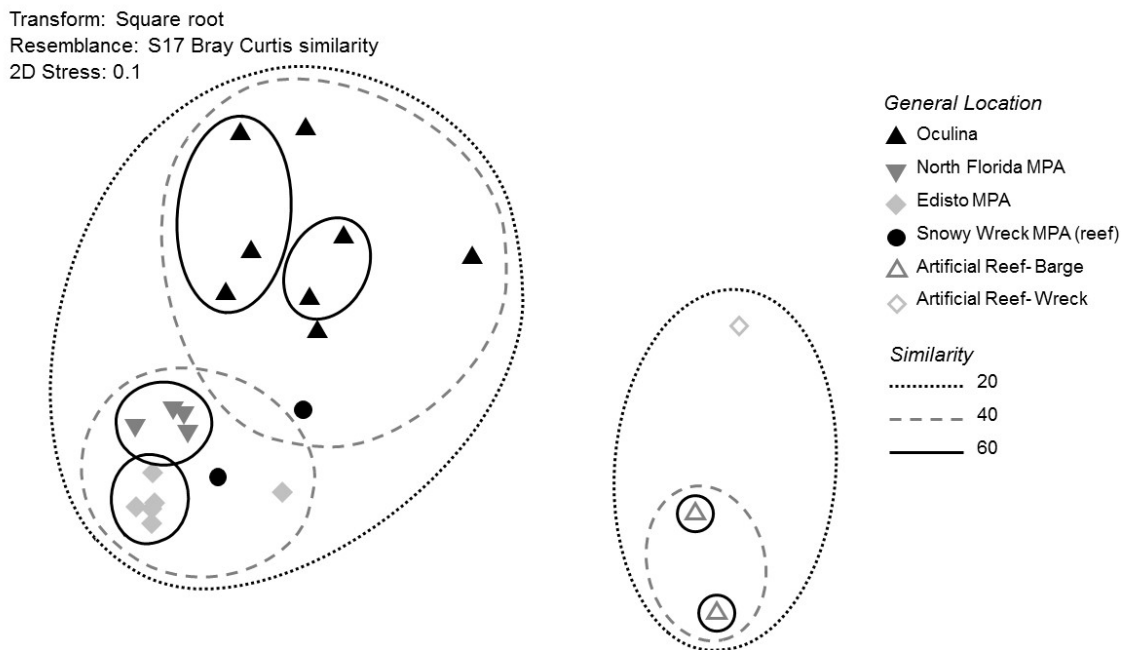


Figure 14. Multi-dimensional scaling (MDS) plot of ROV dives by reef type (artificial reef vs. natural reef), location, and protection status (i.e., MPA sites, non-MPA sites) based on Bray-Curtis similarity matrix calculated from square-root transformation of benthic macrobiota percent cover for the 2016 NOAA Ship Pisces cruise. Assemblage similarity at 20-60% are indicated.



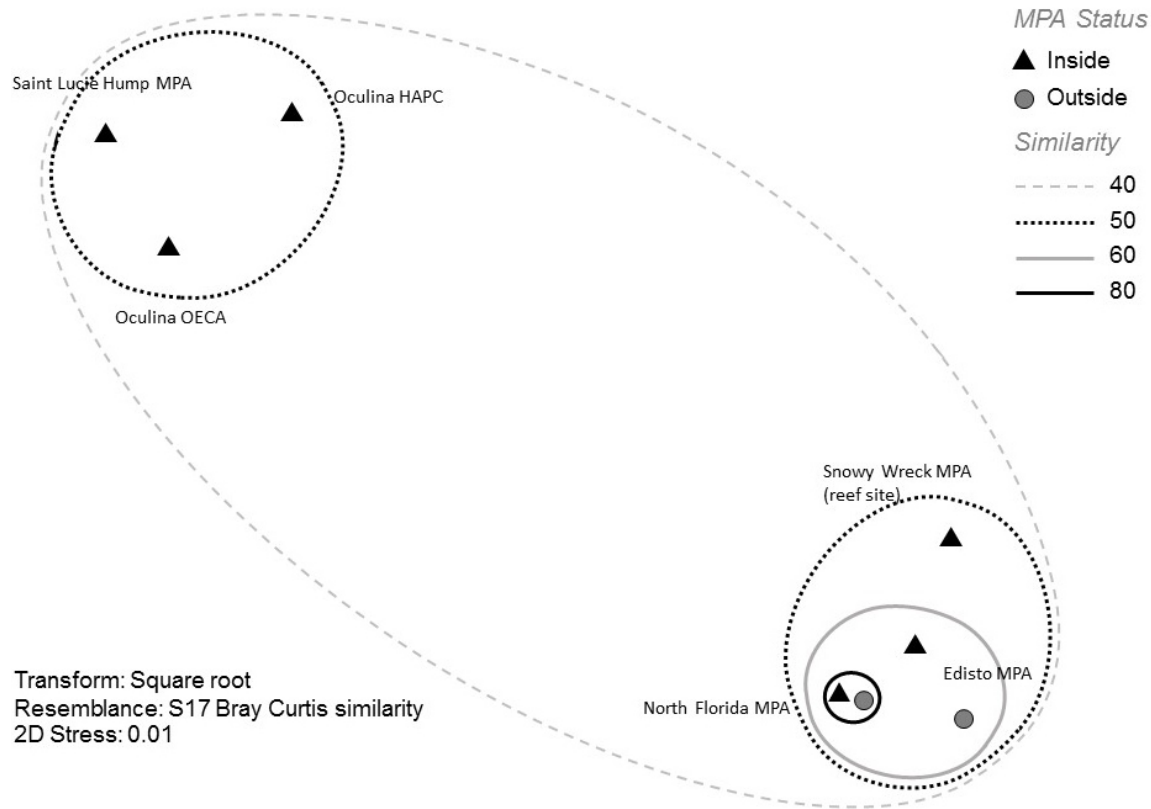


Figure 15. Multi-dimensional scaling (MDS) plot of ROV dives on the shelf-edge MPA and Oculina reef sites, with the artificial reef sites removed, based on Bray-Curtis similarity matrix calculated from square-root transformation of benthic macrobiota percent cover for the 2016 NOAA Ship Pisces cruise. Assemblage similarity at 40-80% 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/1000m<sup>2</sup>). A total of 128 species were observed including five target species: speckled hind (*Epinephelus drummondhayi*), yellowedge grouper (*Hyporthodus flavolimbatus*), snowy grouper (*Hyporthodus niveatus*), warsaw grouper (*Hyporthodus nigratus*), and misty grouper (*Hyporthodus mystacinus*). Dives 7, 8, and 17 are discussed separately, but were excluded from all analyses because they were done on artificial structures. Transects were not conducted on these dives, therefore densities could not be calculated.

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 16; PRIMER 6.0). Five statistically different groups resulted from the SIMPROF test ( $p < 0.05$ ), indicated by the letters in the figure. Fish assemblages were more similar by geographic region than they were by level of protection (inside vs. outside). At the 75% similarity level, the five distinct groups consisted of 1) inside and outside the OECA, 2) inside the St. Lucie Hump MPA, 3) inside the Snowy Wreck MPA, 4) inside and outside the Edisto MPA, and 5) inside and outside the North Florida MPA. The SIMPER routine (PRIMER 6.0) was used to determine the distinguishing species for each geographic region. Edisto and North

Florida were distinguished by higher densities of the most common schooling species; tomate (*Haemulon aurolineatum*), vermilion snapper (*Rhomboplites aurorubens*), and striped grunt (*Haemulon striatum*). This is most likely a result of habitat type as most of the habitat encountered at Edisto and North Florida was moderate to high relief, high rugosity ledge habitat which is what these species prefer. The differentiating species at North Carolina and St. Lucie Hump were higher densities of anthiids, primarily rough-tongue bass (*Pronotogrammus martinicensis*) and red barbier (*Hemanthias vivanus*). The Oculina Banks were characterized by higher densities of bank sea bass (*Centropristis ocyurus*) and bank butterflyfish (*Prognathodes aya*).

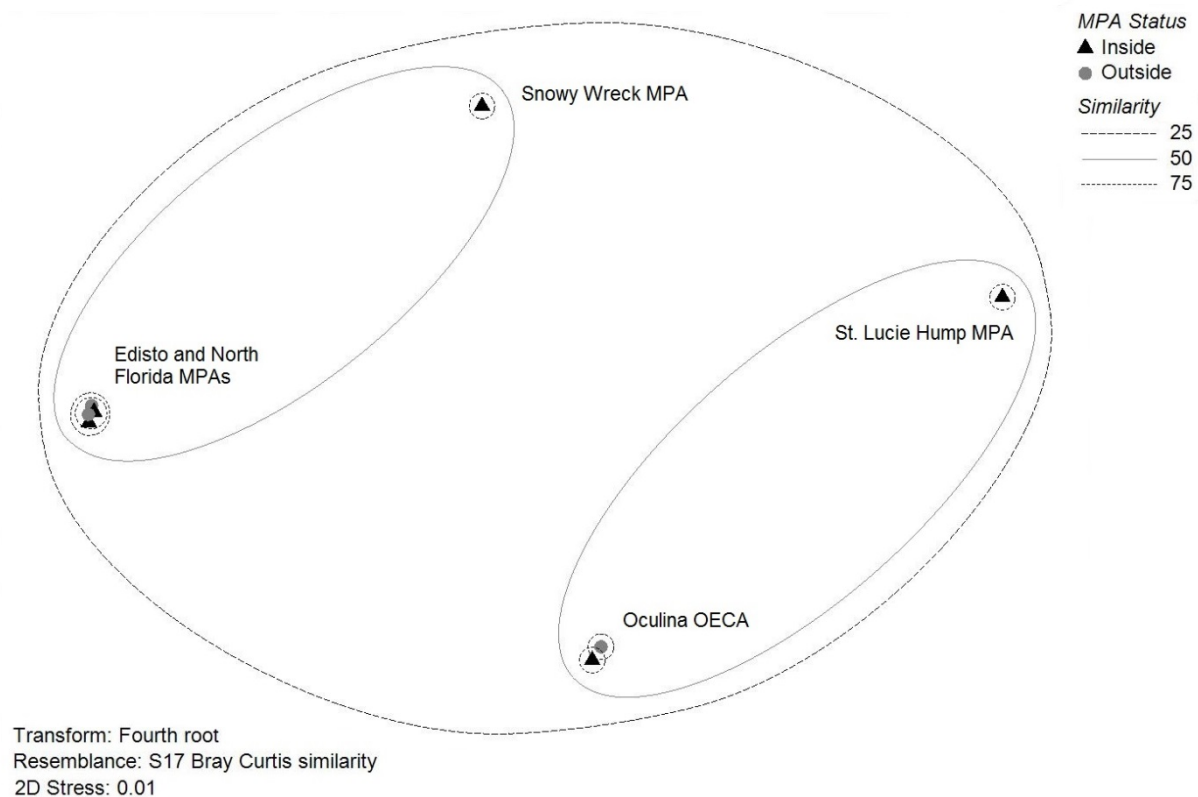


Figure 16. Multi-dimensional scaling (MDS) plot of ROV dives on the shelf-edge MPAs and *Oculina* OECA, with the artificial reef sites removed, based on Bray-Curtis similarity matrix calculated from fourth root transformation of fish densities for the 2016 NOAA Ship *Pisces* cruise. Assemblage similarity at 25-75% are indicated.

The DIVERSE routine (PRIMER 6.0) was used to compare species diversity inside and outside each MPA. The highest number of species was observed inside and outside the Edisto MPA ( $S = 91$ ) while the lowest was inside the St. Lucie Hump MPA ( $S = 30$ ). The same pattern was noted for species diversity. The highest species diversity was inside and outside the Edisto MPA ( $H' = 4.2$ ) while the lowest was inside the St. Lucie Hump MPA ( $H' = 3.3$ ). While not drastically different, species diversity was higher inside the Edisto MPA, North Florida MPA, and the OECA compared to outside (Table 10).

Table 10. Biodiversity indices for fish communities observed during video surveys conducted with a remotely operated vehicle inside and outside the shelf-edge MPAs and *Oculina* OECA, with the artificial sites removed.  $S$  = total number of species;  $H'$  = Shannon-Wiener function of species diversity;  $J'$  = Pielou's evenness.

MPA	S	$H'$	$J'$
St. Lucie Hump - Inside	30	3.28	0.96
OECA – Inside	54	3.73	0.93
OECA – Outside	42	3.53	0.94
North Florida – Inside	72	4.03	0.94
North Florida - Outside	61	3.83	0.93
Edisto – Inside	91	4.20	0.93
Edisto – Outside	91	4.17	0.92
Snowy Wreck - Inside	74	4.11	0.95

### Snapper-Grouper Complex

Densities of fish species in the snapper-grouper complex were compared inside and outside for each of the MPAs (Table 11). No dives were made outside the Snowy Wreck MPA or St. Lucie Hump MPA, so comparisons could not be made for those areas. Most species had higher densities inside the Edisto and North Florida MPAs compared to outside. At Edisto, this included: speckled hind, red snapper (*Lutjanus campechanus*), gag (*Mycteroperca microlepis*), scamp (*Mycteroperca phenax*), red porgy (*Pagrus pagrus*), tomtate, vermilion snapper, and amberjack (*Seriola* spp.). At North Florida, this included: tomtate, cubera snapper (*Lutjanus cyanopterus*), grey snapper (*Lutjanus griseus*), vermilion snapper, and amberjack. A large school of approximately 175 grey snapper was observed inside the North Florida MPA. At the Oculina Banks, however, most species had higher densities outside the OECA (i.e. inside the OHAPC) including warsaw grouper and snowy grouper. Only scamp, red snapper, grey triggerfish (*Balistes capriscus*), red porgy, and black sea bass (*Centropristis striata*) had higher densities inside the OECA. 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 mean densities. Once the research cruises are completed for this grant, results from all cruises will be combined to conduct a comprehensive analysis to test for MPA effects over time on species' densities.

Table 11. Densities (# individuals/1000 m<sup>2</sup>) for species of the snapper-grouper complex inside and outside each MPA and OECA, with the artificial sites removed. 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	Edisto - Inside	Edisto - Outside	Higher Inside?	North Florida - Inside	North Florida - Outside	Higher Inside?	OECA - Inside	OECA - Outside	Higher Inside?	St. Lucie Hump - Inside	Snowy Wreck - Inside
<i>Balistes capriscus</i>	0.48	0.17	YES	0.3		YES	0.53	0.19	YES		0.08
<i>Balistes</i> spp.	0.38	0.11	YES		0.13	NO					
<i>Balistes vetula</i>	0.1	0.06	YES	0.1		YES					



<i>Calamus</i> spp.	1.91	2.5	NO	0.5		YES				1.15	1.95
<i>Canthidermis sufflamen</i>											0.08
<i>Centropristis ocyurus</i>	0.29		YES				2.17	5.02	NO		
<i>Centropristis striata</i>							0.65		YES		
<i>Cephalopholis cruentatus</i>	2.67	2.22	YES	0.6		YES					2.51
<i>Epinephelus adscensionis</i>		0.17	NO								0.16
<b><i>Epinephelus drummondhayi</i></b>	<b>0.19</b>		<b>YES</b>								
<i>Epinephelus guttatus</i>	0.1		YES								
<i>Haemulon aurolineatum</i>	1255.99	501.11	YES	956.88	487.84	YES					30.98
<i>Haemulon plumieri</i>	0.19	0.22	NO	0.1		YES					
<b><i>Hyporthodus flavolimbatus</i></b>											<b>0.16</b>
<b><i>Hyporthodus nigrinus</i></b>								<b>0.06</b>	<b>NO</b>		
<b><i>Hyporthodus niveatus</i></b>							<b>0.12</b>	<b>0.31</b>	<b>NO</b>		<b>43.79</b>
<i>Lachnolaimus maximus</i>		0.17	NO	0.2	0.13	YES					0.08
<i>Lutjanus analis</i>				0.2		YES					
<i>Lutjanus buccanella</i>					0.13	NO					
<i>Lutjanus campechanus</i>	0.29		YES				1.35	0.56	YES		
<i>Lutjanus cyanopterus</i>				1.2		YES					
<i>Lutjanus griseus</i>	0.19	0.11	YES	18.01	2.9	YES					
<i>Lutjanus</i> spp.	0.1	0.28	NO	0.8	0.25	YES					
<i>Mycteroperca interstitialis</i>											0.08
<i>Mycteroperca microlepis</i>	1.05	0.67	YES	0.6	0.5	YES	0.06	0.06	NO		0.49
<i>Mycteroperca phenax</i>	6.01	0.83	YES	1.9	2.27	NO	1.29	0.56	YES		4.14
<i>Mycteroperca</i> sp.	0.1		YES								
<i>Pagrus pagrus</i>	3.15	1.05	YES	0.1	1.51	NO	0.35	0.25	YES		
<i>Rhomboplites aurorubens</i>	462.63	101.32	YES	755.6	505.23	YES	0.7	15.82	NO		3.24
<i>Seriola dumerili</i>	0.86	0.22	YES	0.5	0.25	YES	2	3.95	NO	2.68	0.89

<i>Seriola rivoliana</i>	9.07	1.72	YES	2.4	0.63	YES	0.29	0.69	NO	0.77	2.84
<i>Seriola</i> spp.		4.27	NO		0.76	NO	0.18	1.19	NO	16.84	0.57
Serranidae	0.1		YES								
Sparidae	0.1		YES					0.06	NO		

Several observations were made of juvenile fish. These include juvenile blackfin snapper (*Lutjanus buccanella*) outside the North Florida MPA, juvenile snowy grouper and yellowedge grouper on a barge inside the Charleston Deep Artificial Reef MPA, and a juvenile scamp inside the Snowy Wreck MPA. Reproductive behavior was also observed on some dives. Greyhead scamp (one of their color phases indicating spawning behavior) were observed inside and outside the North Florida MPA, one of the barges inside the Charleston Deep Artificial Reef MPA, inside and outside Edisto MPA, as well as inside the Snowy Wreck MPA.

Species diversity for snapper-grouper complex species was compared inside and outside each MPA using DIVERSE. The highest number of species was observed inside the Edisto MPA ( $S = 22$ ) and the lowest was inside the St. Lucie Hump MPA ( $S = 4$ ). The highest species diversity, however, was inside the OECA ( $H' = 2.1$ ) which had the second lowest number of species ( $S = 12$ ) and the lowest species diversity was outside the Edisto MPA ( $H' = 0.61$ ) which had the second highest number of species ( $S = 18$ ). These discrepancies demonstrate the influence that the evenness of samples ( $J'$ ) has on species diversity. Evenness inside the OECA was high ( $J' = 0.85$ ) while evenness of samples outside the Edisto MPA was low ( $J' = 0.21$ ).

Table 12. Biodiversity indices for snapper-grouper complex species observed during video surveys conducted with a remotely operated vehicle inside and outside the shelf-edge MPAs and *Oculina* OECA, with the artificial sites removed.  $S$  = total number of species;  $H'$  = Shannon-Wiener function of species diversity;  $J'$  = Pielou's evenness.

MPA	S	H'	J'
St. Lucie Hump - Inside	4	0.73	0.52
OECA – Inside	12	2.12	0.85
OECA – Outside	13	1.44	0.56
North Florida – Inside	17	0.78	0.27
North Florida - Outside	13	0.76	0.30
Edisto – Inside	22	0.69	0.22
Edisto – Outside	18	0.61	0.21
Snowy Wreck - Inside	16	1.42	1.42

## Lionfish Populations

A total of 1662 lionfish were recorded on the 2016 ROV dives. The most lionfish on a single dive was noted this year ( $n = 451$ ) since the inception of this project in 2004. This translated into a density (# lionfish/1000m<sup>2</sup>) of 92.1 for that dive which was conducted inside the Edisto MPA. The highest average lionfish densities were also observed inside the Edisto MPA (Figure 17). No lionfish were seen in the St. Lucie Hump MPA and very few were observed inside and

outside the OECA. Lionfish densities compared for each MPA (inside vs. outside) were not significantly different (one-way ANOVA;  $P > 0.05$ ).

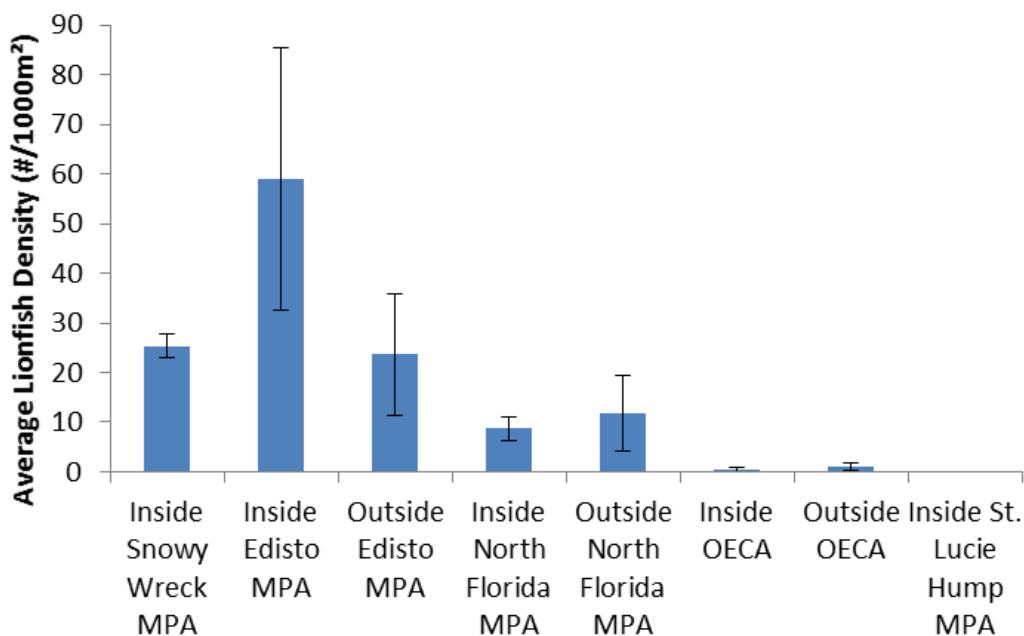


Figure 17. Density of lionfish (# individuals/1000m<sup>2</sup>) from quantitative ROV video transects during 2016 NOAA Ship *Pisces* cruise at sites inside and outside each shelf-edge MPA and *Oculina* OECA, with the artificial sites removed.

### Artificial Reefs

Three ROV dives were made on artificial reefs. One dive on each barge which was sunk to comprise the Deep Charleston Artificial Reef MPA and one dive on the Snowy Wreck inside the Snowy Wreck MPA. Designated transects were not run on these dives, therefore fish densities could not be calculated, but a species list and abundance estimate for each species was made.

Only four fish species were observed on the Snowy Wreck with the vast majority of them being snowy grouper ( $n=540$ ). This is a 125% increase in the abundance of snowy grouper from the previous time we dove here in 2012 where 240 snowy grouper were estimated to be present. Other species observed were approximately 20 anthiids (Anthiinae), 1 mora cod (*Laemonema* sp.), and 2 yellowedge grouper.

The last time we examined the barges in the Deep Charleston Artificial Reef MPA was in 2014, only two months after they had been sunk. At that time, only amberjack were observed. Now that the barges have been down for two years, a number of fish species have recruited to the structures including several species of interest. Barge 1 is at a depth of 80m and species of interest observed were 6 red snapper, 16 scamp, and 1 yellowedge grouper. Barge 2 is at a depth of 100m and species of interest observed were 1 misty grouper (the only one ever observed on this project), 1 red snapper, 15 scamp, 5 warsaw grouper, 26 snowy grouper (juveniles and

adults), and 2 juvenile yellowedge grouper. Lionfish were observed on both barges. For a complete species list, see Table 13.

Table 13. Fish abundances of all species observed on the two barges comprising the Deep Charleston Artificial Reef MPA. Species in bold are the target species.

<b>Barge 1</b>		<b>Barge 2</b>	
Scientific Name	Abundance	Scientific Name	Abundance
Anthiinae	50	<i>Centropristis ocyurus</i>	2
<i>Calamus</i> spp.	2	<i>Equetus lanceolatus</i>	2
<i>Centropristis ocyurus</i>	3	<i>Halichoeres</i> spp.	7
<i>Cephalopholis cruentatus</i>	1	<i>Hemanthias vivanus</i>	350
<i>Chaetodon sedentarius</i>	5	<b><i>Hyporthodus flavolimbatus</i></b>	<b>2</b>
<i>Halichoeres</i> spp.	10	<b><i>Hyporthodus mystacinus</i></b>	<b>1</b>
<i>Hemanthias vivanus</i>	150	<b><i>Hyporthodus nigrinus</i></b>	<b>5</b>
<i>Holacanthus bermudensis</i>	3	<b><i>Hyporthodus niveatus</i></b>	<b>26</b>
<b><i>Hyporthodus flavolimbatus</i></b>	<b>1</b>	<i>Lutjanus campechanus</i>	1
<i>Liopropoma eukrines</i>	2	<i>Mycteroperca phenax</i>	15
<i>Lutjanus campechanus</i>	6	<i>Pareques</i> spp.	18
<i>Mycteroperca phenax</i>	16	<i>Pronotogrammus martinicensis</i>	2
<i>Mycteroperca</i> spp.	4	<i>Pterois volitans</i>	22
<i>Pareques umbrosus</i>	7	<i>Rhomboplites aurorubens</i>	30
<i>Prognathodes aya</i>	1	<i>Seriola</i> spp.	35
<i>Pterois volitans</i>	52	<i>Serranus notospilus</i>	3
<i>Seriola</i> spp.	15		
<i>Serranus notospilus</i>	3		
unknown	1		

## 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

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## **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 2016 NOAA Ship *Nancy Foster* cruise to the South Atlantic MPAs. Still images captured from the photo transects were analyzed using CPCe<sup>®</sup> 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	16-01	16-02	16-03	16-04	16-05	16-06	16-07	16-08	16-09	16-10	16-11	16-12	16-13	16-14	16-15	16-16	16-17	16-18	16-19	16-20	16-21	16-22	16-23	Grand Total
Biota	11.35%	13.67%	32.89%	30.21%	35.99%	25.73%	22.64%	43.02%	17.22%	42.73%	57.44%	53.10%	66.19%	54.58%	26.85%	13.80%	36.96%	13.44%	15.04%	13.29%	24.11%	7.87%	20.38%	29.95%
Algae	0.00%	5.54%	11.66%	11.36%	11.66%	6.39%	0.00%	0.00%	2.04%	19.70%	25.59%	41.89%	44.11%	22.08%	9.65%	0.94%	0.00%	0.40%	0.72%	0.11%	13.81%	1.84%	8.39%	11.44%
Chlorophyta	0.00%	0.00%	0.00%	0.09%	0.00%	0.24%	0.00%	0.00%	0.17%	0.00%	0.04%	0.00%	0.09%	0.16%	0.04%	0.00%	0.03%	0.00%	0.00%	0.05%	0.00%	0.00%	0.04%	
Corallinales/crustose coralline	0.00%	5.36%	3.58%	2.50%	6.47%	2.68%	0.00%	0.00%	1.69%	3.74%	2.14%	2.29%	3.15%	0.58%	0.62%	0.05%	0.00%	0.10%	0.72%	0.11%	12.11%	1.58%	7.12%	2.90%
Cyanophyta	0.00%	0.00%	0.31%	2.07%	0.28%	0.79%	0.00%	0.00%	0.00%	0.20%	1.17%	2.63%	4.90%	2.74%	0.45%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.03%	0.67%
Dictyota sp.	0.00%	0.00%	0.13%	0.17%	0.00%	0.08%	0.00%	0.00%	0.00%	7.03%	16.77%	24.70%	23.97%	12.28%	4.91%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.41%
Padina 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%	0.25%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	
Phaeophyta	0.00%	0.00%	2.38%	1.29%	1.14%	0.00%	0.00%	0.00%	0.00%	4.31%	0.24%	1.40%	4.50%	1.05%	1.86%	0.14%	0.00%	0.03%	0.00%	0.00%	0.00%	0.03%	0.86%	
Rhodophyta	0.00%	0.17%	5.25%	5.25%	3.77%	2.29%	0.00%	0.00%	0.17%	4.43%	5.24%	10.14%	7.51%	5.01%	1.53%	0.38%	0.00%	0.24%	0.00%	0.00%	1.60%	0.26%	1.21%	2.49%
Sargassum sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.72%	0.00%	0.26%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	
Spatoglossum sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	
Porifera	0.44%	2.08%	9.71%	6.54%	9.25%	8.13%	1.22%	0.00%	2.04%	5.56%	7.09%	4.84%	6.38%	5.69%	5.61%	3.47%	0.05%	1.62%	1.46%	1.45%	1.46%	1.33%	4.03%	3.91%
Agelas clathrodes	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	1.73%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.09%	
Agelas sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.00%	0.00%	0.00%	0.00%	0.25%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	
Aiolochroia crassa	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.13%	0.05%	0.04%	0.00%	0.00%	0.10%	0.00%	0.00%	0.00%	0.00%	0.02%	
Aplysina sp.	0.00%	0.00%	0.04%	0.00%	0.00%	0.47%	0.00%	0.00%	0.00%	0.04%	0.16%	0.17%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%	0.06%	
Astroporida	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Axinellida	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Callyspongia vaginalis	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.16%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	
Chondrilla sp.	0.00%	1.73%	0.00%	0.00%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.03%	1.21%	0.17%	
Clathria sp.	0.00%	0.00%	0.04%	0.09%	0.00%	0.16%	0.00%	0.00%	0.00%	0.00%	0.04%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	
Clonia sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Demospongiae	0.44%	0.17%	4.72%	2.75%	4.69%	3.87%	1.22%	0.00%	1.45%	2.97%	3.55%	3.14%	4.36%	2.85%	2.56%	2.86%	0.05%	0.77%	0.50%	0.48%	1.30%	0.26%	1.91%	2.09%
Demospongiae- ze tan starlet	0.00%	0.00%	0.35%	0.69%	0.14%	0.55%	0.00%	0.00%	0.12%	0.20%	0.48%	0.30%	0.45%	0.84%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.16%	
Dictyoceratida	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Erylus sp.	0.00%	0.17%	0.00%	0.00%	0.21%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.06%	0.48%	0.00%	0.31%	0.06%		
Geodia gibberosa complex	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.00%	0.01%		
Geodia neptuni complex	0.00%	0.00%	0.00%	0.00%	0.00%	0.16%	0.00%	0.00%	0.00%	0.00%	0.12%	0.17%	0.00%	0.00%	0.41%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	
Hymeniacidon sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Ircinia campana	0.00%	0.00%	0.22%	0.60%	0.07%	0.32%	0.00%	0.06%	0.97%	0.24%	0.25%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.12%		
Ircinia sp.	0.00%	0.00%	1.28%	1.12%	0.64%	0.63%	0.00%	0.00%	0.61%	0.56%	0.17%	0.36%	0.63%	0.00%	0.00%	0.00%	0.00%	0.12%	0.16%	0.00%	0.04%	0.00%	0.26%	
Ircinia strobiliina	0.00%	0.00%	0.18%	0.60%	0.14%	0.16%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%		
Monanchora sp.	0.00%	0.00%	0.18%	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%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%		
Niphates 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%	0.16%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%		
Placospongia sp.	0.00%	0.00%	0.00%	0.00%	0.21%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%		
Poecilosclerida	0.00%	0.00%	0.18%	0.09%	0.00%	0.24%	0.00%	0.06%	0.04%	0.08%	0.04%	0.04%	0.04%	0.05%	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.28%	0.06%	
Scopalina sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%		
Siphonodictyon coralliphagum	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
Spirastrellidae	0.00%	0.00%	2.47%	0.52%	2.84%	1.50%	0.00%	0.23%	0.53%	1.65%	0.42%	0.85%	0.95%	0.45%	0.52%	0.00%	0.30%	0.78%	0.32%	0.08%	0.00%	0.08%	0.63%	
Spongosorites siliquaria	0.00%	0.00%	0.00%	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%	0.27%	0.00%	0.00%	0.00%	0.00%	0.00%		
Verongida	0.00%	0.00%	0.00%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
Xestospongia sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
Coral	0.00%	0.35%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.28%	0.00%	0.04%	0.16%	0.78%	0.42%	0.24%	0.104%	0.34%	0.65%	2.57%	0.00%	0.53%	0.47%	
Cladocora sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.05%	0.00%	0.00%	0.00%		
Lophelia pertusa	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.24%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%		
Madracis myriaster	0.00%	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%	0.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%		
Oculina varicosa	0.00%	0.35%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.45%	0.14%	0.00%	0.98%	0.31%	0.59%	2.51%	0.00%	0.39%	0.38%	
Phyllangia americana	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.20%	0.00%	0.04%	0.00%	0.25%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.03%		
Scleractinia colonial	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%		
Scleractinia solitary	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.00%	0.00%	0.05%	0.04%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.11%	0.02%		
Siderastrea radians	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
Alcyonacea- gorgonian	0.87%	0.00%	0.79%	0.17%	0.71%	0.08%	0.00%	0.00%	7.21%	3.25%	6.57%	2.97%	6.79%	4.16%	1.90%	0.70%	0.72%	1.45%	0.03%	0.05%	0.27%	0.00%	0.03%	1.78%
Alcyonacea- gorgonian	0.87%	0.00%	0.09%	0.00%	0.14%	0.00%	0.00%	0.00%	0.64%	0.41%	0.08%	0.30%	0.18%	0.05%	0.70%	0.66%	0.72%	0.40%	0.03%	0.05%	0.14%	0.00%	0.23%	
Carioja riisei	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	0.00%	0.00%	0.06%	0.00%	2.38%	0.21%	0.49%	1.79%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.24%		
Diodogorgia sp.	0.00%	0.00%	0.53%	0.17%	0.21%	0.08%	0.00%	0.00%	1.80%	1.58%	3.55%	2.08%	2.47%	1.32%										

Alcyonacea- Alcyoniina	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.03%	0.43%	0.89%	0.00%	0.03%	0.10%
Nidalia occidentalis	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%	0.03%	0.43%	0.89%	0.00%	0.03%	0.10%
Antipatharia	0.44%	0.52%	5.92%	1.29%	7.54%	4.10%	0.00%	0.74%	0.87%	1.10%	0.52%	0.47%	1.71%	0.42%	1.65%	2.39%	0.00%	0.88%	1.99%	1.67%	0.05%	0.00%	1.04%	1.46%
Antipatharia	0.00%	0.00%	0.40%	0.09%	1.56%	0.55%	0.00%	0.00%	0.00%	0.37%	0.04%	0.00%	0.09%	0.11%	0.16%	0.38%	0.00%	0.54%	0.19%	0.05%	0.00%	0.00%	0.03%	0.19%
Antipathes atlantica	0.00%	0.00%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.12%	0.12%	0.08%	0.81%	0.00%	0.21%	0.38%	0.00%	0.00%	0.09%	0.38%	0.00%	0.00%	0.00%	0.11%
Antipathes furcata	0.00%	0.00%	0.18%	0.26%	1.00%	0.95%	0.00%	0.00%	0.29%	0.12%	0.08%	0.00%	0.13%	0.00%	0.00%	0.19%	0.00%	0.07%	0.19%	1.13%	0.03%	0.00%	0.00%	0.17%
Elatopathes abietina	0.00%	0.35%	2.65%	0.00%	2.20%	1.89%	0.00%	0.00%	0.00%	0.16%	0.00%	0.04%	0.13%	0.11%	0.45%	0.05%	0.00%	0.03%	1.21%	0.05%	0.00%	0.00%	0.03%	0.39%
Stichopathes lutkeni	0.44%	0.17%	2.47%	0.95%	2.77%	0.71%	0.00%	0.74%	0.58%	0.28%	0.28%	0.30%	0.54%	0.21%	0.82%	1.22%	0.00%	0.17%	0.22%	0.05%	0.03%	0.00%	0.93%	0.57%
Tanacetipathes tanacetum	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.04%	0.00%	0.00%	0.00%	0.19%	0.00%	0.07%	0.09%	0.00%	0.00%	0.00%	0.06%	0.03%
Cnidaria non-coral	8.30%	2.77%	2.25%	7.23%	3.91%	4.97%	0.84%	3.30%	1.51%	1.87%	10.04%	1.44%	3.91%	15.49%	2.72%	3.76%	30.64%	6.17%	4.02%	6.89%	2.73%	3.72%	4.45%	5.65%
Actiniaria	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.73%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	25.18%	0.00%	0.03%	0.05%	0.03%	0.00%	0.00%	1.20%
Actinoscyphia sp./Hormathiidae	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.26%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.19%
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%	0.00%	0.00%	0.07%	0.28%	0.05%	0.54%	0.77%	0.06%	0.11%
Corallimorpharia	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.22%	0.05%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.11%	0.02%	
Hydroidolina	8.30%	2.77%	2.25%	7.23%	3.91%	4.97%	0.84%	0.58%	1.51%	1.87%	10.04%	1.44%	3.69%	15.38%	2.72%	3.76%	1.15%	5.66%	3.24%	6.67%	1.38%	2.78%	4.14%	3.98%
Solanderia gracilis	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
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%	0.00%	0.44%	0.11%	0.78%	0.17%	0.14%	0.15%	
Annelida	0.00%	0.00%	0.26%	0.34%	0.07%	0.39%	0.53%	0.00%	0.64%	0.28%	0.04%	0.08%	0.18%	0.53%	0.00%	0.00%	3.26%	0.47%	0.12%	0.05%	0.11%	0.04%	0.25%	0.34%
Annelida	0.00%	0.00%	0.00%	0.09%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.04%	0.00%	0.00%	0.00%	0.29%	0.44%	0.09%	0.00%	0.08%	0.00%	0.08%	0.07%
Filigrana sp.	0.00%	0.00%	0.22%	0.26%	0.00%	0.32%	0.00%	0.00%	0.64%	0.28%	0.04%	0.04%	0.09%	0.53%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.03%	0.04%	0.08%	0.11%
Hermodice carunculata	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.15%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.01%	
Sabellidae	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.03%	0.01%	
Serpulidae	0.00%	0.00%	0.04%	0.00%	0.00%	0.08%	0.38%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.97%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.15%	
Mollusca	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	17.38%	36.99%	0.00%	0.04%	0.08%	0.04%	0.04%	0.00%	0.00%	0.33%	0.72%	0.03%	0.06%	0.00%	0.00%	0.38%	0.08%	1.53%
Bivalvia	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	17.38%	36.99%	0.00%	0.04%	0.04%	0.04%	0.04%	0.00%	0.00%	0.00%	0.72%	0.00%	0.06%	0.00%	0.00%	0.00%	0.00%	1.49%
Fasciolaria tulipa	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.00%	
Gastropoda	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%	0.38%	0.03%	0.03%
Pycnodonte sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	
Arthropoda	0.00%	0.00%	0.22%	0.00%	0.00%	0.08%	0.46%	0.17%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.27%	0.06%	0.16%	0.03%	0.17%	0.03%	0.07%
Anoplocladylus lentus	0.00%	0.00%	0.00%	0.00%	0.00%	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%	0.11%	0.00%	0.00%	0.00%	0.01%	
Cirripedia	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.46%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	
Majidae	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Paguridae	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.13%	0.00%	0.00%	0.00%	0.04%	0.00%	0.01%	
Panulirus argus	0.00%	0.00%	0.18%	0.00%	0.00%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	
Parthenope sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Stenorhynchus seticornis	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%	0.03%	0.06%	0.05%	0.03%	0.13%	0.03%	0.02%		
Bryozoa	0.00%	0.00%	0.75%	0.00%	0.78%	0.47%	0.00%	0.00%	0.06%	0.08%	0.28%	0.21%	0.13%	0.00%	0.04%	0.05%	0.00%	0.03%	0.00%	0.00%	0.00%	0.00%	0.12%	
Bryozoa	0.00%	0.00%	0.04%	0.00%	0.07%	0.16%	0.00%	0.00%	0.00%	0.08%	0.13%	0.09%	0.00%	0.00%	0.05%	0.00%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	
Schizoporella sp.	0.00%	0.00%	0.71%	0.00%	0.71%	0.32%	0.00%	0.00%	0.06%	0.08%	0.20%	0.08%	0.04%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.09%	
Echinodermata	0.87%	2.25%	0.00%	0.00%	0.00%	0.00%	1.22%	0.25%	0.00%	0.00%	0.00%	0.00%	0.04%	0.11%	0.00%	0.00%	0.24%	0.17%	4.17%	1.56%	0.81%	0.21%	1.10%	0.61%
Arbacia punctulata	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.07%	0.25%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.04%	
Asteropora annulata	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.03%	0.00%	
Centrostephanus longispinus	0.00%	1.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.53%	0.38%	0.16%	0.00%	0.45%	0.11%	
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%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%	
Coelopleurus floridanus	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.15%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	2.96%	0.00%	0.35%	0.00%	0.24%	
Crinoidea	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Eucidaris tribuloides	0.87%	1.04%	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%	0.17%	0.65%	0.97%	0.08%	0.04%	0.53%	0.16%		
Goniasteridae	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.00%	
Gorgonocephalidae	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.22%	0.00%	0.00%	0.00%	0.01%	
Holothuria lentigenosa enodis	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%	
Narcissia trigonaria	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	
Ophioderma devaneyi	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.05%	0.04%	0.00%	0.01%	
Ophiuroidea	0.00%	0.17%	0.00%	0.00%	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%	0.00%	0.03%	0.00%	0.03%	0.01%	
Tamaria sp.	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.09%	0.00%	0.01%	
Chordata	0.44%	0.00%	0.40%	2.67%	1.64%	0.63%	1.57%	2.62%	5.00%	6.45%	0.81%	2.65%	5.58%	1.73%	1.27%	1.05%	0.37%	1.96%	0					



Bare Substrate	84.72%	86.16%	67.11%	69.79%	64.01%	74.27%	77.36%	56.90%	82.72%	57.23%	42.56%	46.90%	33.81%	45.36%	73.07%	85.87%	61.80%	86.42%	84.96%	86.71%	75.53%	92.13%	78.80%	69.85%
Bare hard bottom substrate	49.34%	64.53%	56.78%	48.45%	51.42%	40.49%	71.49%	49.88%	17.92%	43.42%	27.09%	24.53%	27.79%	16.81%	32.25%	45.87%	58.74%	54.41%	74.41%	70.31%	70.05%	87.47%	63.99%	50.99%
Artificial Reef/Wreck	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	58.77%	46.90%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	58.69%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.48%
Bare rock- pavement boulder ledge	20.52%	3.63%	54.88%	45.09%	45.38%	35.91%	0.00%	0.00%	16.75%	41.39%	25.59%	23.26%	26.71%	16.23%	31.09%	43.38%	0.00%	14.45%	20.58%	14.15%	19.06%	2.99%	18.33%	23.01%
Bare rubble- coral	14.41%	42.39%	0.00%	0.09%	0.43%	0.55%	0.00%	0.00%	0.00%	0.00%	0.16%	0.13%	0.04%	0.00%	0.00%	0.00%	0.00%	34.94%	50.28%	47.93%	45.77%	77.16%	32.46%	18.13%
Bare rubble- rock	13.10%	4.84%	1.77%	2.84%	5.48%	3.95%	12.73%	2.97%	0.99%	2.03%	1.33%	1.15%	1.03%	0.58%	1.03%	2.49%	0.05%	4.38%	0.56%	6.67%	0.46%	1.97%	7.49%	2.78%
Standing dead coral	1.31%	13.67%	0.13%	0.43%	0.14%	0.08%	0.00%	0.00%	0.17%	0.00%	0.00%	0.00%	0.00%	0.00%	0.12%	0.00%	0.00%	0.64%	2.99%	1.56%	4.76%	5.35%	5.72%	1.59%
Bare soft bottom substrate	35.37%	21.63%	10.33%	21.34%	12.59%	33.78%	5.87%	7.02%	64.81%	13.81%	15.48%	22.37%	6.03%	28.56%	40.82%	40.00%	3.06%	32.01%	10.55%	16.41%	5.49%	4.66%	14.81%	18.86%
Bare soft bottom substrate	35.37%	21.63%	10.33%	21.34%	12.59%	33.78%	5.87%	7.02%	64.81%	13.81%	15.48%	22.37%	6.03%	28.56%	40.82%	40.00%	3.06%	32.01%	10.55%	16.41%	5.49%	4.66%	14.81%	18.86%
Human Debris	3.93%	0.17%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.06%	0.04%	0.00%	0.00%	0.00%	0.05%	0.08%	0.33%	1.24%	0.13%	0.00%	0.00%	0.35%	0.00%	0.82%	0.20%
Human debris	3.93%	0.17%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.06%	0.04%	0.00%	0.00%	0.00%	0.05%	0.08%	0.33%	1.24%	0.13%	0.00%	0.00%	0.35%	0.00%	0.82%	0.20%
Anchor line	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.03%	0.02%
Fishing gear/line/longline	0.00%	0.17%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	0.06%	0.04%	0.00%	0.00%	0.00%	0.00%	0.08%	0.05%	1.24%	0.00%	0.00%	0.00%	0.32%	0.00%	0.56%	0.14%
Human debris- other	3.93%	0.00%	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%	0.05%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.03%
Net	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%	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%	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 2016 NOAA Ship *Nancy Foster* cruise to the South Atlantic MPAs. Fish density (# individuals/1000 m<sup>2</sup>) 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/Species	Common Name	2016-01	2016-02	2016-03	2016-04	2016-05	2016-06	2016-09	2016-10	2016-11	2016-12	2016-13	2016-14	2016-15	2016-16	2016-18	2016-19	2016-20	2016-21	2016-22	2016-23	Grand Total
Actinopterygii																						
Acanthuridae						1.01	0.25		0.27	1.43	1.50	0.17	1.91	6.47	0.59							13.61
Acanthurus sp.	doctorfish					1.01	0.25		0.27	1.43	1.50	0.17	1.91	6.47	0.59							13.61
Apogonidae		0.41	0.48	0.37	0.81							2.91	0.96	0.14				0.49	0.77		0.41	7.73
Apogon pseudomaculatus	twospot cardinalfish	0.41	0.48	0.37	0.81								0.96					0.49	0.77			4.27
Apogon sp.	cardinalfish											2.91		0.14							0.41	3.46
Aulostomidae						0.34			0.27	0.41	0.25	0.51	0.48									2.26
Aulostomus maculatus	trumpetfish					0.34			0.27	0.41	0.25	0.51	0.48									2.26
Balistidae		0.41		0.18		0.34	0.49	3.12	0.82	0.20	0.50	0.34		2.48		0.33		0.24			2.48	11.94
Balistes capriscus	grey triggerfish	0.41				0.17	0.49	2.60			0.25	0.17		0.14		0.33		0.24			2.48	7.28
Balistes sp.	triggerfish			0.18				0.52	0.55	0.20	0.25											1.70
Balistes vetula	queen triggerfish					0.17			0.27			0.17										0.61
Canthidermis sufflamen	ocean triggerfish													0.14								0.14
Xanthichthys ringens	sargassum triggerfish													2.20								2.20
Batrachoididae																			0.38			0.38
Opsanus tau	oyster toadfish																		0.38			0.38
Bothidae			0.48																			0.48
Bothidae	flounder		0.48																			0.48
Carangidae		2.17	0.96	0.37	4.44	4.22	0.98	0.52	464.31	12.05	1.25	2.91	190.01	1.79	8.48	0.33	14.87	0.98	20.28	4.21	3.71	738.85
Carangidae	jack								11.48													11.48
Caranx bartholomaei	yellow jack								2.19			1.54										3.73
Caranx crysos	blue runner								0.27													0.27
Caranx lugubris	black jack								0.55						0.59							1.14
Caranx ruber	bar jack								0.27			0.17										0.44
Decapterus sp.	scad								437.52				167.30									604.82
Seriola dumerili	greater amberjack	2.17	0.96	0.18	0.40	0.68	0.25		0.27	1.63	0.13	0.34	0.24	1.24	0.39		10.26	0.73	2.68	3.56	1.24	27.36
Seriola rivoliana	almaco jack			0.18	1.61	3.55	0.74	0.52	11.76	10.41	0.88	0.85	4.54	0.14	6.71		1.88		0.77	0.65	1.24	46.42
Seriola sp.	amberjack				2.42						0.25		17.93	0.41	0.79	0.33	2.74	0.24	16.84		1.24	43.19
Chaetodontidae		3.26	13.71	15.21	31.46	26.19	25.26	7.28	36.64	29.40	14.50	22.56	27.72	23.55	13.61	9.18	12.48	7.33	8.04	2.27	17.33	346.99
Chaetodon ocellatus	spotfin butterflyfish			0.73	0.40	0.84	1.47		4.10	4.70	1.75	1.20	2.15	0.96	0.79							19.10
Chaetodon sedentarius	reef butterflyfish	2.89	8.61	29.04	17.23	21.58	7.28	29.53	23.07	11.88	20.00	24.86	22.31	11.24	1.34	2.39	1.71	0.77	0.65	7.84	244.23	
Chaetodon sp.	butterflyfish			0.18																		0.18
Chaetodontidae	butterflyfish			0.18																		0.18
Prognathodes aculeatus	longsnout butterflyfish				0.81	0.84			1.09			0.34	0.24	0.28								3.60
Prognathodes aya	bank butterflyfish	3.26	10.82	5.50	1.21	7.26	2.21		1.91	1.63	0.88	1.03	0.48		1.38	7.84	10.09	5.62	7.27	1.62	9.49	79.50
Prognathodes guyanensis	french butterflyfish														0.20							0.20
Congrodidae																			0.38			0.38
Conger oceanicus	conger eel																		0.38			0.38
Dactylopteridae						0.34	0.98															1.32
Dactylopterus volitans	flying gurnard					0.34	0.98															1.32
Diodontidae				0.81			0.25								0.39							1.45
Chilomycterus atringa	spotted burrfish														0.39							0.39
Chilomycterus schoepfi	striped burrfish						0.25															0.25
Diodon hystrix	porcupinefish			0.81																		0.81
Echeneidae													0.24									0.24
Remora remora	remora												0.24									0.24
Fistulariidae			0.18		0.84				0.82	0.20		0.68	0.24									2.97
Fistularia sp.	cornetfish		0.18									0.34										0.53
Fistularia tabacaria	bluespotted cornetfish				0.84				0.82	0.20		0.34	0.24									2.45
Haemulidae				223.89	1089.15	1453.12	364.24		1881.87	2586.57	211.80	2146.67	617.59	58.81	9.27							10642.97
Haemulon aurolineatum	tomtate			223.89	1068.98	1402.26	310.28		1665.03	1443.45	123.28	1147.01	320.27	48.48	5.92							7758.84
Haemulon plumieri	white grunt				0.17					0.41			0.96									1.53
Haemulon sp.	grunt						36.79			1014.70	2.50	670.94	9.56	10.33	3.35							1748.17
Haemulon striatum	striped grunt				20.17	50.68	17.17		216.84	128.01	86.02	328.72	286.81									1134.43
Holocentridae		4.76	78.26	30.92	23.79				19.41	21.85	3.25	6.32	11.71	23.55	6.90							230.73
Holocentridae	soldierfish			0.40	0.17					0.20		0.51			0.39							1.68
Holocentridae	soldierfish/squirrelfish	0.55									0.13				0.20							0.87
Holocentridae	squirrelfish	2.38	5.24	2.87	4.17				3.28	0.20	0.50	1.37	0.24	14.19	3.75							38.19
Holocentrus adscensionis	squirrelfish	1.47	33.48	11.66	5.40				14.77	12.05	2.25	3.59	5.26	7.16	0.20							97.27
Myripristis jacobus	blackbar soldierfish	0.37	39.13	16.22	14.23				0.82	9.39	0.25	0.85	6.21	2.20	0.20							89.87
Plectrypops retrospinis	cardinal soldierfish								0.55			0.13			2.17							2.84
Labridae		1.63	8.90	12.83	58.49	40.72	33.85	23.41	28.99	40.63	31.26	45.13	63.10	65.83	19.13	18.36	28.03	22.98	4.59	8.75	34.67	591.26
Bodianus pulchellus	spotfin hogfish			10.26	25.82	15.54	11.53	0.52	12.31	27.36	7.38	29.91	21.27	11.29	7.69							180.88



Sparisoma sp.	parrotfish				0.34															0.34			
Sciaenidae		0.14		1.28	13.72	5.41	11.28	6.24	5.47	8.57	4.75	2.39	1.67	9.23	15.98			26.79		112.92			
Equetus lanceolatus	jackknife-fish				0.40		2.21													2.61			
Pareques umbrosus	cubbyu	0.14		1.28	13.31	5.41	9.08	6.24	5.47	8.57	4.75	2.39	1.67	9.23	15.98			26.79		110.31			
Scorpaenidae		0.14	1.68	4.58	19.77	11.32	7.11	7.28	79.85	92.28	3.50	22.22	46.13	22.86	29.19	1.84	3.42	0.49	11.10	0.32	3.71	368.79	
Neomerinthe hemingwayi	spinycheek scorpionfish														0.17						0.17		
Pterois volitans	lionfish	0.14		4.21	19.36	10.98	6.38	6.76	78.21	92.08	3.50	21.88	45.65	22.86	27.81	0.33	2.39	0.24		1.65		344.44	
Scorpaena plumieri	spotted scorpionfish												0.24								0.24		
Scorpaenidae	scorpionfish		1.68	0.37	0.40	0.34	0.74	0.52	1.64	0.20		0.34	0.24		1.38	1.34	1.03	0.24	11.10	0.32	2.06	23.94	
Serranidae		8.68	55.06	7.51	21.78	6.25	10.79	38.50	22.70	15.52	4.50	7.52	9.56	56.47	1045.36	37.38	60.68	31.29	333.33	15.23	21.46	1809.58	
Anthias nicholsi	yellowfin bass																		0.38			0.38	
Anthiinae	anthiids			12.02											817.55	0.83	22.22	1.22	227.71			1081.56	
Centropristis ocyurus	bank sea bass	3.53	1.68							0.61						4.01	4.79	6.84		0.97	0.41	22.84	
Centropristis striata	black sea bass	1.09	0.72																			1.81	
Cephalopholis cruentatus	graysby					0.68	0.49		1.09	4.90	0.38	2.74	5.02	2.62	2.37							20.27	
Diplectrum formosum	sand perch	0.14																				0.14	
Epinephelus adscensionis	rock hind												0.72	0.28								0.99	
Epinephelus adscensionis	speckled hind							1.04														1.04	
Epinephelus guttatus	red hind								0.20													0.20	
Gonioplectrus hispanus	spanish flag			0.55																		0.55	
Hemanthias vivanus	red barbler	0.68	1.44												38.07	1.34	3.08		11.10			55.70	
Hyporthodus nigrilus	warsaw grouper																0.17					0.17	
Hyporthodus niveatus	snowy grouper	0.27														0.67		0.24				1.18	
Liopropoma eukrines	wrasse bass	0.41	2.16	1.65	2.82	1.35	0.98	2.08	1.64	0.41	0.75	0.34		0.69	4.93	1.00	1.37	0.98	5.74		1.65	30.96	
Mycteroperca interstitialis	yellowmouth grouper														0.20							0.20	
Mycteroperca microlepis	gag grouper			0.18	1.21	1.01			1.09	1.43	0.13	0.85	1.43	0.41	0.59		0.17				0.41	8.93	
Mycteroperca phenax	scamp	0.27	3.85	0.92	5.24	2.20	1.47	3.64	9.84	4.08	0.25	2.05	0.24	1.93	7.30	0.17	1.37			1.65		46.47	
Mycteroperca sp.	grouper								0.27													0.27	
Paranthias furcifer	creolefish			1.10	3.63				2.19	0.61				47.51	0.20							55.24	
Plectranthias garrupellus	apricot bass		1.68													0.33	2.56		1.62			6.20	
Pronotogrammus martinicensis	rougthead bass		0.24												161.74	2.34	11.97		79.60		0.41	256.29	
Rypticus maculatus	whitespotted soapfish					0.17				0.20	0.13		0.72							0.41		1.63	
Rypticus saponaceus	greater soapfish				1.61	0.17	0.98		0.27				0.24	1.51	1.18							5.97	
Rypticus sp.	soapfish		0.48	0.18			0.25			0.41		0.17			0.59							2.08	
Rypticus subbifrenatus	spotted soapfish														0.39							0.39	
Serranidae	grouper									0.20												0.20	
Serranidae	sea bass		0.48				0.25											0.24				0.97	
Serranus annularis	orangeback bass		3.85	1.83	2.02		1.23		4.65	0.20	0.75	0.51	0.24	0.41	2.76	0.17	0.34	1.96	0.38	0.32	0.83	22.45	
Serranus baldwini	lantern bass		2.89	0.18	3.23	0.34	2.21		0.27		0.25		0.24									9.60	
Serranus chionaraia	snow bass								0.55											0.32		0.87	
Serranus notospilus	saddle bass	0.14	10.58														0.17		0.38	0.32	1.65	13.24	
Serranus phoebe	tattler	2.17	12.50	0.92	0.81	0.17	2.94	31.74	0.55	1.22	1.88	0.51	0.72	1.10	7.50	26.54	12.48	19.80	8.04	11.67	12.79	156.03	
Serranus sp.	sea bass				0.81					0.82										0.83		2.45	
Serranus subligarius	belted sandfish		0.24																			0.24	
Serranus tigrinus	harlequin bass		0.24		0.40	0.17			0.27	0.20		0.34										1.63	
Serranus tortugarum	chalk bass																			0.41		0.41	
Sparidae			1.20	2.20		0.51	0.74	16.65	2.19	12.25	1.88	4.62	6.93	2.34	1.38	0.33	0.34	0.24	1.15		0.41	55.35	
Calamus sp.	porgy					0.51	0.49	1.56	1.09	2.65	1.38	2.39	4.78	2.34	1.38				1.15			19.72	
Diplodus holbrookii	spottail pinfish								0.27	9.19		0.34	1.20									11.00	
Pagrus pagrus	red porgy		1.20	2.20		0.25	15.09		0.55	0.41	0.50	1.88	0.96			0.33	0.17	0.24		0.41		24.19	
Sparidae	porgy								0.27								0.17					0.44	
Sphyrænidae									2.73	0.41				0.14								3.28	
Sphyræna barracuda	barracuda								2.73	0.41				0.14								3.28	
Synodontidae			2.40			0.74			0.55		0.13		0.24			0.33						4.38	
Synodus intermedius	sand diver					0.25																0.25	
Synodus sp.	lizardfish		2.40			0.25			0.55		0.13		0.24			0.33						3.89	
Synodus synodus	red lizardfish					0.25																0.25	
Tetraodontidae		0.24	16.31	19.36	10.47	17.17	7.80	23.79	35.52	10.38	21.71	19.12	13.50	2.96	0.50			0.24		0.41		199.49	
Canthigaster sp.	puffer	0.24	16.31	19.36	10.47	17.17	7.80	23.52	34.10	10.25	21.37	18.88	13.50	2.76						0.41		196.14	
Sphoeroides spengleri	bandtail puffer							0.27	1.43	0.13	0.34	0.24		0.20	0.50		0.24					3.35	
Unknown/Other		1.63	7.21	1.83	1.21	2.53	139.32	3.12	3.28	2.86	1.50	8.21	435.71	117.61	170.22	5.51	4.44		5.13	1.91	2.59	5.37	921.20
Gadiformes	hake																	0.24				0.24	
mixed school	mixed school													17.22	167.65							184.87	
unknown	snapper/porgy					0.49																0.49	

unknown	unknown	1.63	7.21	1.83	1.21	2.53	138.83	3.12	3.28	2.86	1.50	8.21	435.71	100.40	2.56	5.51	4.44	4.89	1.91	2.59	5.37	735.59
Elasmobranchii																						
Carcharhinidae		0.27																				0.27
Carcharhinus plumbeus	sandbar shark	0.27																				0.27
Dasyatidae		0.52																				0.96
Dasyatis centroura	rougthead stingray	0.52																				0.52
Dasyatis sp.	stingray	0.20																				0.44
Myliobatidae		0.20																				0.20
Manta birostris	manta ray	0.20																				0.20
Unknown/Other		0.82																				1.47
Carcharhinidae	shark	0.82																				1.47
Grand Total		36.64	107.96	598.20	2534.49	2965.53	788.32	167.01	3700.57	3162.31	400.85	2774.01	1604.20	550.89	1358.38	89.28	188.20	96.55	415.61	35.32	130.42	21704.75



## **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 2016 NOAA Ship *Nancy Foster* cruise to the South Atlantic MPAs:

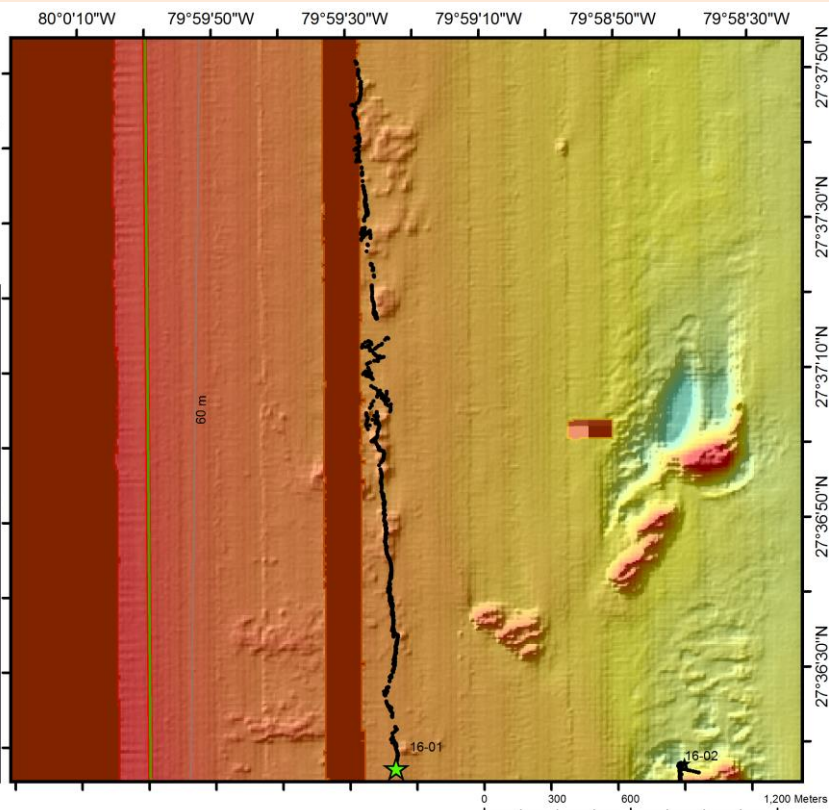
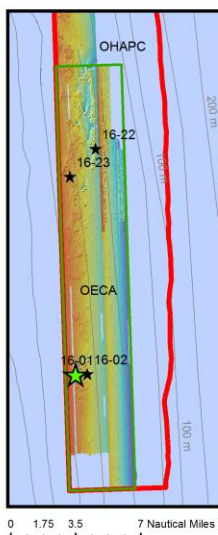
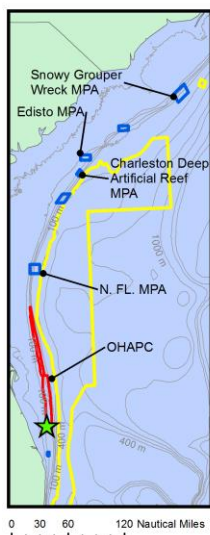
- cruise and ROV dive metadata and objectives
- figures showing each ROV dive track and habitat zones overlaid on multibeam sonar maps
- ROV dive track data (start and end coordinates, time, and depth)
- CTD plots from shipboard casts and temperature profiles for each ROV dive
- images characterizing 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<sup>®</sup> 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 16-01, UNCW Dive 332; Florida, Oculina OECA, Oculina coral mounds, west of Chapman's Reef, 70 m

### General Location and Dive Track:

**ROV 16-01; Florida, Oculina OECA, Low Relief Hard Bottom, West Of Chapman's Reef, 70 m; 9-VI-16-1**

- ★ 16-01
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andy David, John Reed, Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Oculina\_MB\_UNCW\_2002\_Grid

**Purpose:** Survey and monitor Shelf-Edge MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/9/2016

**Specimens:** 1

**Digital Photos:** 79

**DVD:** 1

**Hard Drive:** 1

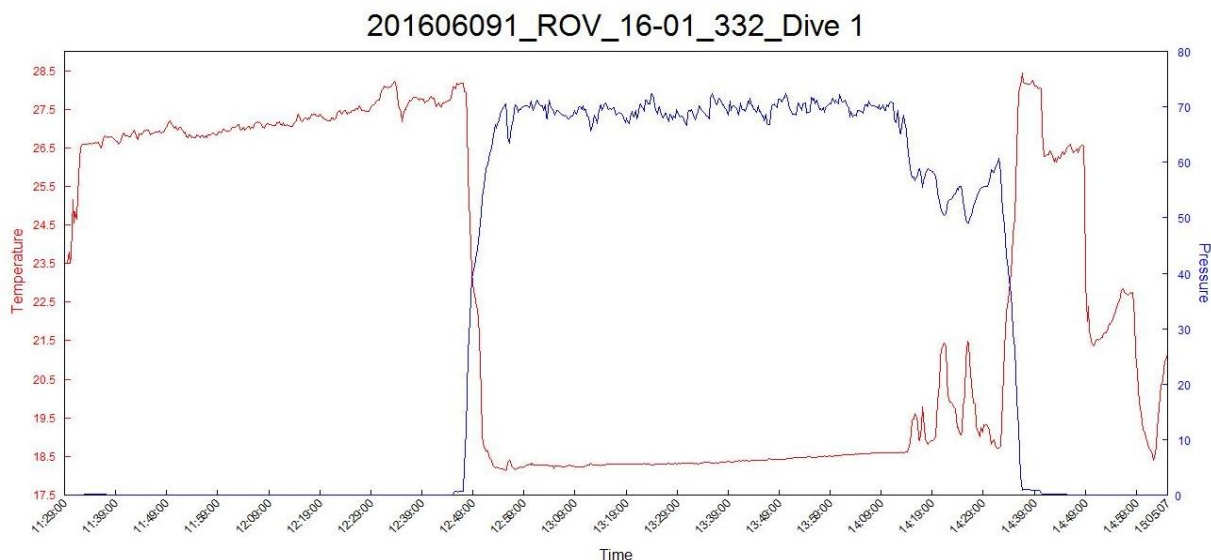
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-01, UNCW Dive 332; Florida, Oculina OECA, Oculina coral mounds, west of Chapman's Reef, 70 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	70	<b>Total Transect Length (km):</b>	4.200
<b>Maximum Bottom Depth (m):</b>	73	<b>Surface Current (kn):</b>	1.5
<b>On Bottom (Time- EDST):</b>	12:53	<b>On Bottom (Lat/Long):</b>	27.6°N; -79.99°W
<b>Off Bottom (Time- EDST):</b>	14:13	<b>Off Bottom (Lat/Long):</b>	27.63°N; -79.99°W
<b>Physical (bottom); Temp (°C):</b>	18.21	<b>Salinity:</b>	<b>Visibility (m):</b> 15 <b>Current (kn):</b> 1.2

**Physical Environment:**



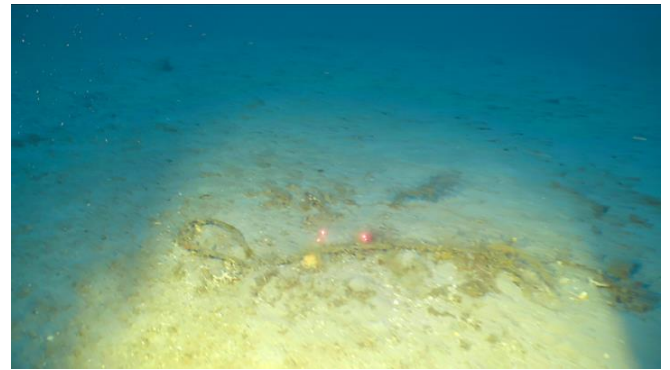
Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-01 are as follows: Depth Maximum: 72.4 m, Temperature: 18.1-18.6 °C.

**Dive Site:** ROV 16-01, UNCW Dive 332; Florida, Oculina OECA, Oculina coral mounds, west of Chapman's Reef, 70 m

**Dive Imagery:**



**Figure 1:** Depth: ~70 m  
School of greater amberjack over mound of dead *Oculina* coral rubble.



**Figure 2:** Depth: ~70 m  
Anchor line in OECA.



**Figure 3:** Depth: ~70 m  
Hard bottom with vermillion snapper.



**Figure 4:** Depth: ~70 m  
Encrusted dead *Oculina* coral with bank butterfly, short bigeye, bank seabass, and urchin (*Eucidaris tribuloides*).

**Dive Site:** ROV 16-01, UNCW Dive 332; Florida, Oculina OECA, Oculina coral mounds, west of Chapman's Reef, 70 m

**Dive Notes:**

**Objectives, Site Description, Habitat, Fauna:**

Site/Objectives:

Site #- 9-VI-16-1; ROV 16-01, UNCW Dive 332; Florida, Oculina OECA, Oculina Coral Mounds, west of Chapman's Reef, 67-73 m.

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Surface current 2 kn to N. Most of dive drifted as SOG of 1.2 kn, and often 1-3 m altitude; too fast and high for transect photos. No quantitative, downward XS photos were taken. All photos and screen grabs were non-random, purposeful.

Site Description/Habitat:

Depth range: 67-73 m

MB map showed series of patches of moderate relief mounds and ridges to the west of Chapman's Reef. Transect from S to N across series of mounds.

Mounds were all Oculina coral mounds, base 72-73 m, top 67-68 m, 2-3 m relief; 5-10° slope, low relief; 30-70% cover of coral rubble, 10-50 cm standing Oculina, sparse live coral 10-20 cm. Flat areas between the mounds was mostly flat sand with scallop shells (dead), occasional 1' rock ledges or boulders, most with fish.

12:53- On bottom, 72 m, visibility 15-20 m, current 1 kn?

14:13- Off bottom

*Dominant Benthic Macrobiota:*

*Oculina varicosa*- live 10-20 cm; standing dead coral abundant 10-50 cm providing lots of habitat; hydroids, encrusting red Alcyonina, *Stichopathes*, *Eucidaris tribuloides*, asteroidea, Portunidae

*Dominant Fish:*

Bank butterfly fish, reef butterfly, bigeye, black sea bass, snowy grouper, triggerfish, yellowtail reef, scamp, vermillion snapper, tattler

**Dive Site:** ROV 16-01, UNCW Dive 332; Florida, Oculina OECA, Oculina coral mounds, west of Chapman's Reef, 70 m

**CPCe Percent Cover Analysis:**

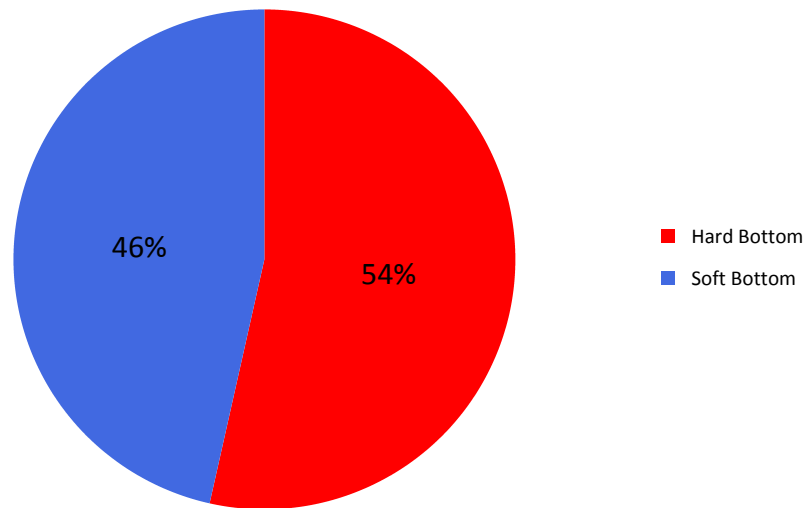
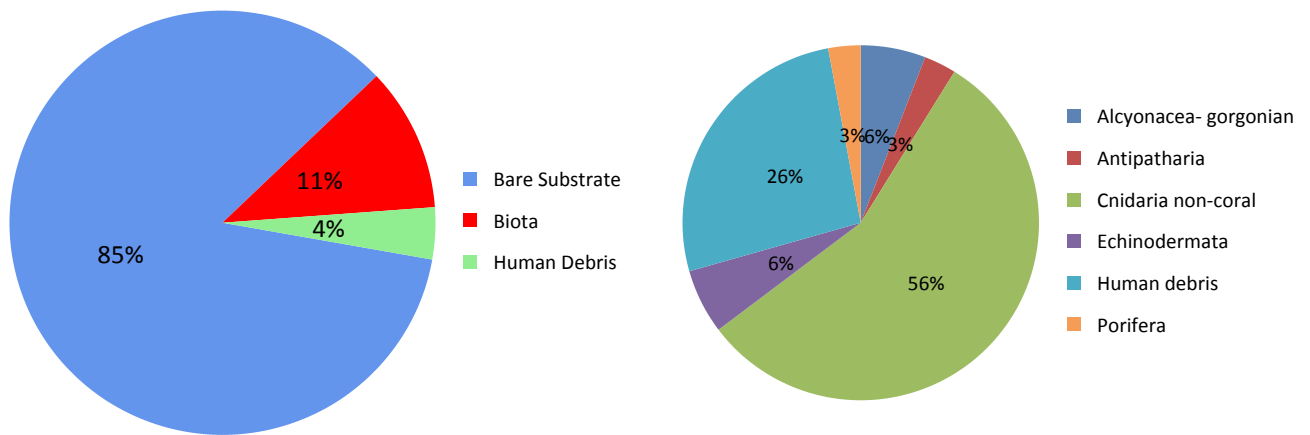


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-01. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-01.

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 16-01, UNCW Dive 332; Florida, Oculina OECA, low relief hard bottom, west of Chapman's Reef

**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 16-01.

	16-01	
Group/Phylum/Taxonomic Name	CPCe	dive notes
Biota	10.96%	X
Porifera	0.44%	
Demospongiae	0.44%	
Cnidaria	9.65%	X
Alcyonacea- gorgonian	0.88%	
Alcyoniina		X
<i>Callipodium rubens</i>		X
Hydroidolina	8.33%	X
<i>Oculina varicosa</i>		X
<i>Stichopathes lutkeni</i>	0.44%	X
Arthropoda		X
Portunidae		X
Echinodermata	0.88%	X
Asteroidea		X
Echinoidea		X
<i>Eucidaris tribuloides</i>	0.88%	X
Chordata		X
Gnathostomata		X
Human Debris	3.95%	X
Human debris	3.95%	X
Human debris- fish line/gear		X
Human debris- other	3.95%	
Human debris- long line		X
Bare Substrate	85.09%	X
Habitat	85.09%	X
dead standing Oculina	1.32%	X
Bare rock	20.61%	
Bare rubble- coral	14.47%	
Bare rubble/cobble	13.16%	
Bare soft bottom	35.53%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>



**Dive Site:** ROV 16-01, UNCW Dive 332; Florida, Oculina OECA, low relief hard bottom, west of Chapman's Reef

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-01.

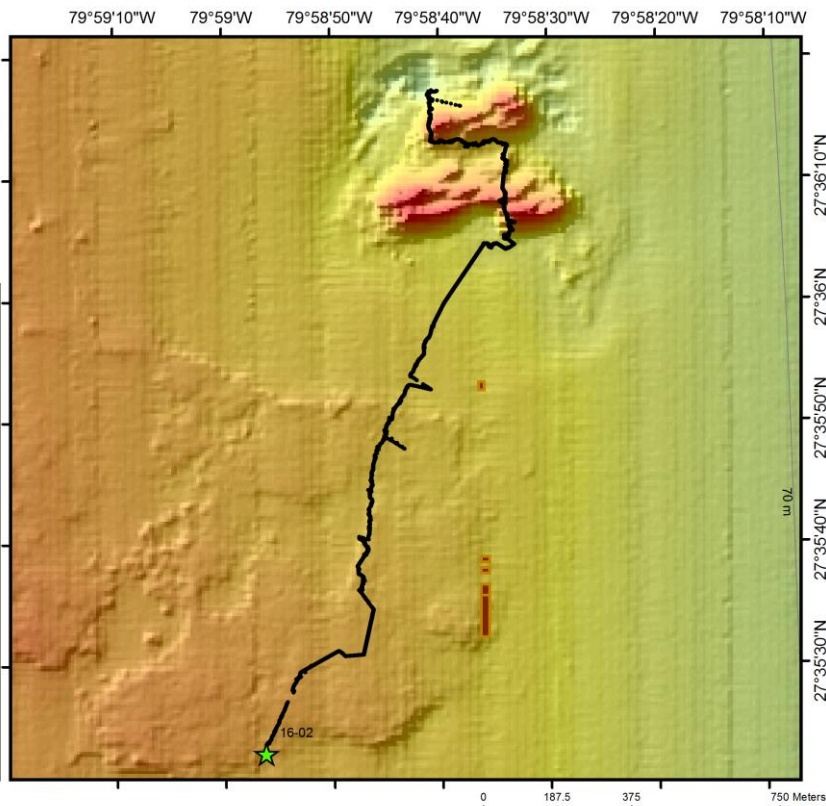
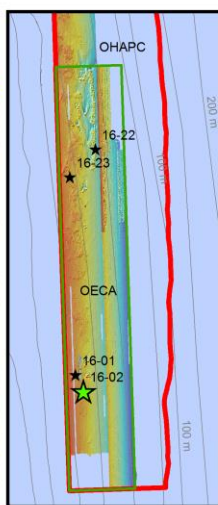
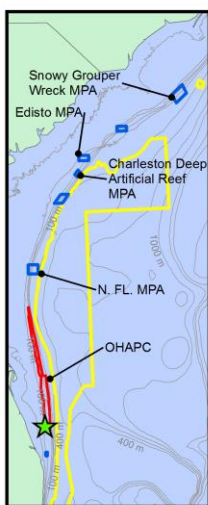
Class/Species	Common Name	2016-01
Actinopterygii		
<i>Apogon pseudomaculatus</i>	twospot cardinalfish	0.41
<i>Balistes capriscus</i>	grey triggerfish	0.41
<i>Centropristis ocyurus</i>	bank sea bass	3.53
<i>Centropristis striata</i>	black sea bass	1.09
<i>Chromis enchrysurus</i>	yellowtail reefish	13.57
<i>Diplectrum formosum</i>	sand perch	0.14
<i>Halichoeres</i> sp.	wrasse	1.63
<i>Hemanthias vivanus</i>	red barbier	0.68
<i>Hyorthodus niveatus</i>	snowy grouper	0.27
<i>Liopropoma eukrines</i>	wrasse bass	0.41
<i>Muraena retifera</i>	reticulate moray eel	0.14
<i>Mycteroperca phenax</i>	scamp	0.27
<i>Pareques umbrosus</i>	cubbyu	0.14
<i>Priacanthus arenatus</i>	bigeye	0.14
<i>Pristigenys alta</i>	short bigeye	3.39
<i>Prognathodes aya</i>	bank butterflyfish	3.26
<i>Pterois volitans</i>	lionfish	0.14
<i>Rhomboplites aurorubens</i>	vermillion snapper	0.95
<i>Seriola dumerili</i>	greater amberjack	2.17
<i>Serranus notospilus</i>	saddle bass	0.14
<i>Serranus phoebe</i>	tattler	2.17
unknown	unknown	1.63

**Dive Site:** ROV 16-02, UNCW Dive 333; Florida, Oculina OECA, Chapman's Reef, South Mound, 60-80 m

### General Location and Dive Track:

**ROV 16-02; Florida, Oculina OECA, Chapman's Reef, South Mound, 60-80 M; 10-VI-16-1**

- ★ 16-02
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andy David, John Reed, Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Oculina\_MB\_UNCW\_2002\_Grid

**Purpose:** Survey and monitor Shelf-Edge MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/10/2016

**Specimens:** 0

**Digital Photos:** 161

**DVD:** 3

**Hard Drive:** 1

**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-02, UNCW Dive 333; Florida, Oculina OECA, Chapman's Reef, South Mound, 60-80 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	49	<b>Total Transect Length (km):</b>	2.300
<b>Maximum Bottom Depth (m):</b>	91	<b>Surface Current (kn):</b>	2
<b>On Bottom (Time- EDST):</b>	8:09	<b>On Bottom (Lat/Long):</b>	27.6°N; -79.98°W
<b>Off Bottom (Time- EDST):</b>	10:50	<b>Off Bottom (Lat/Long):</b>	27.6°N; -79.98°W
<b>Physical (bottom); Temp (°C):</b>	15.7	<b>Salinity:</b>	<b>Visibility (m):</b> 20 <b>Current (kn):</b> 0.25

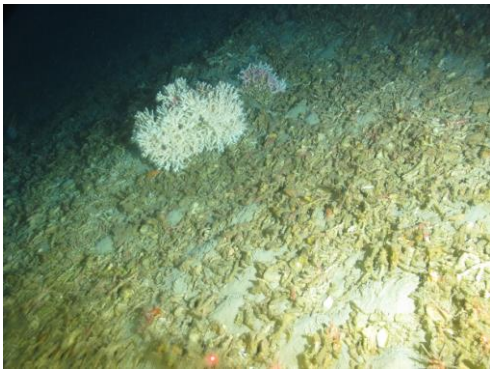
**Physical Environment:**



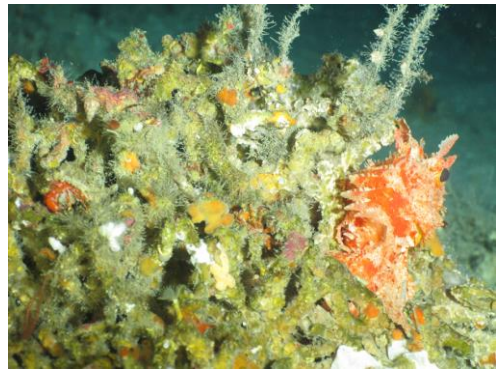
Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-02 are as follows: Depth Maximum: 82.7 m, Temperature: 15.7-18.9 °C.

**Dive Site:** ROV 16-02, UNCW Dive 333; Florida, Oculina OECA, Chapman's Reef, South Mound, 60-80 m

**Dive Imagery:**



**Figure 1:** Depth: -78 m  
Live azooxanthellate colony of *Oculina varicosa* on slope of coral mound.



**Figure 2:** Depth: -75.6 m  
Encrusted standing *Oculina* coral with community of hydroids, sponges, crabs and scorpion fish



**Figure 3:** Depth: -82.3 m  
Scamp and blue angelfish on low relief hard bottom at base of *Oculina* mound.



**Figure 4:** Depth: -76 m  
Short bigeye on *Oculina* coral mound.



**Figure 5:** Depth: -76.5 m  
Trawl net within OCEA which has been closed to rock shrimp trawling since 1985.



**Figure 6:** Depth: -85.5 m  
Pile of fishing line on rock ledges inside the OCEA which has been closed to fishing.



**Dive Site:** ROV 16-02, UNCW Dive 333; Florida, Oculina OECA, Chapman's Reef, South Mound, 60-80 m

## **Dive Notes:**

### **Objectives, Site Description, Habitat, Fauna:**

#### Site/Objectives:

Site #- 10-VI-16-1; ROV Dive 16-02; Mohawk UNCW Dive 333. Target Site: Florida, Oculina OECA, Chapman's Reef, South Mound, 60-89 m.

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

#### ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale. Direction of transects were random, but generally headed N, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Surface current 2 kn, but bottom current was <1/4 kn, so were able to station keep and maneuver the ROV very well. Visibility 20 m, bottom temp 15.5°C. No quantitative, downward XS photos were taken. All photos and screen grabs were non-random, purposeful.

#### Site Description/Habitat

Depth range: 60- 89 m

MB map and Dive Transect: On bottom 2000 m south of Chapmans Reef South; low relief hard bottom; then transited N to south base of South Reef, base 84 m depth; transited HD E along south base then up slope to top of southern mound of South Reef, top 60.5 m; transect heading W along top of mound and along south slope; Hd N over top of mound into valley, 80 m depth between South and North Mound of Chapman's Reef South.

Hd W along south slope of North Mound, to west end of mound; Hd N to top of mound 63.5 m; Hd N to base of North Mound of Chapman's Reef South, then along south rim and east rim of scour to the north of the mound. Edge of the scour 84-90 m. End of dive at scour.

8:09- Launch

8:21- on bottom, 75 m; MB- low relief hard bottom; series of low relief knolls, 50% hard bottom, rock pavement with sediment veneer, scattered live *Oculina varicosa*, white, live, 15-50 cm diameter; photo of piece of trawl net, fairly recent; biota- hydroids, *Stichopathes*, *Diogenes* hermit crab in large welk shell, demosponges, *Asteropora*, *Oculina*; short bigeyes, yellow tail reeffish, AJ, tatler, saddleback bass.

9:25- 25 m south of south base of Southern Mound of Chapman's Reef South; depth 84 m, dense bioturbation mud, 30 cm standing dead coral, several 15-50 cm live *Oculina*, 30-100 cm flat rock boulders; several scamp, blue angelfish. Base of reef and lower slope, 84-68 m- dozens to hundreds of live white



**Dive Site:** ROV 16-02, UNCW Dive 333; Florida, Oculina OECA, Chapman's Reef, South Mound, 60-80 m

Oculina, 10-25 cm diameter, 75 m depth. 68 m, south slope near eastern end of reef- hundred of live Oculina 10-15 cm, dense Centrostephanus long spine black urchins, 6-9 spp of Demosponges, Eucidaris pencil urchins, 100% coral rubble, standing dead coral and live coral.

Top of south mound, 60.5 m, 100% coral rubble, crustose coralline pink algae on rubble; hd W along top of mound and upper south slope; 1/4 kn current, 20 m visibility; bank butterfly common.

10:00- 68 m, hd N down north slope of South Mound; 100% coral rubble, standing dead coral; porgies, reef fish. 77 m- north slope of South Mound, 4 scamp. In valley between South and North Mound of Chapman's Reef South, 84 m, coral rubble.

10:15- hd W along south slope and base of North Mound, 74 m; 100% coral rubble, CCA, hummocky bottom, standing dead coral, some live Oculina, Centrostephanus, Eucidaris, hydroids.

10:36- top of North Mound of South Reef, 63.5m; 100% coral rubble, lots of bank butterfly fish. Hd N down north slope; porgie and scamp common. Base of North Mound of Chapman's Reef south, 80 m.

10:42- Hd N toward scour north of North Reef, 84 m, 1 m flat rock slabs, <1/2 m relief, coral rubble; pile of fishing line (recent). Transect along south rim and along east rim of scour, 84-90 m; 50/50% sediment and rubble, flat rock boulders, standing dead coral.

10:50- end dive, off bottom

*Dominant Benthic Macrobiota:*

Scleractinian Coral- *Oculina varicosa*- live 10-50 cm; hundreds of live coral at south base of South Mound; standing dead coral abundant 10-50 cm providing lots of habitat;

Gorgonacea- *Titanideum frauenfeldii*

Black Coral- *Stichopathes lutkeni*, *Tanacetipathes*

Hydroida- several spp.

Porifera- 6-8 spp Demospongiae, *Ircinia*

Echinoderms- *Eucidaris tribuloides*, *Centrostephanus* long spined black urchin, *Asteropora annulata* ophiuroid

Decapoda- *Diogenes* sp. in large welk shells, *Calappa* shame faced crab

Algae-crustose coralline algae.

*Dominant Fish:*

Bank butterfly fish, reef butterfly, short bigeye, black sea bass, scamp common, blue angelfish, yellowtail reef, greater amberjack, saddleback bass, porgie, tattler, NO LIONFISH

*Human Debris:*

Trawl net

Fishing line (recent)

**Dive Site:** ROV 16-02, UNCW Dive 333; Florida, Oculina OECA, Chapman's Reef, South Mound, 60-80 m

**CPCe Percent Cover Analysis:**

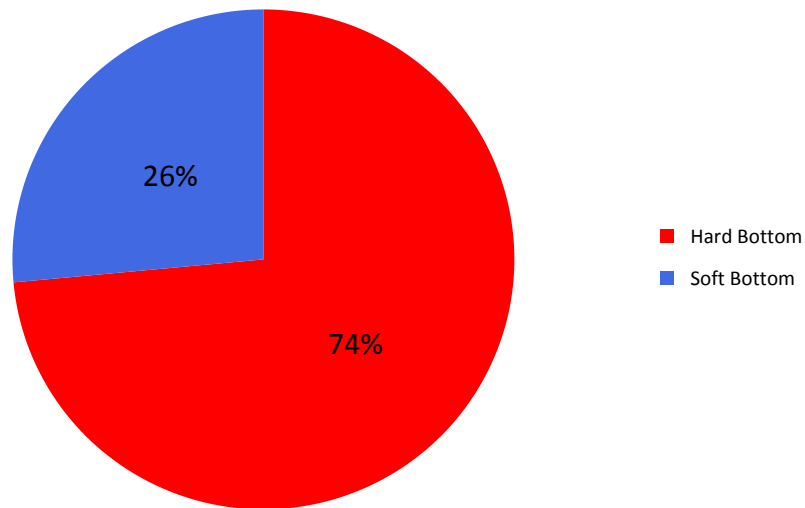
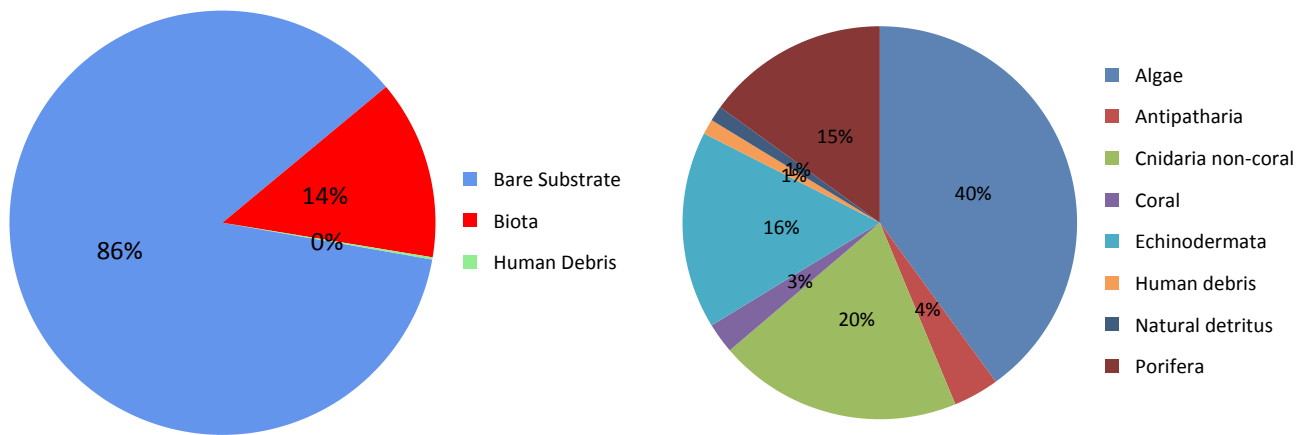


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-02. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-02.

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 16-02, UNCW Dive 333; Florida, Oculina OECA, Chapman's Reef, South Mound, 60-80 m

**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 16-02.

Group/Phylum/Taxonomic Name	16-02	
	CPCe	dive notes
Biota	13.67%	X
Rhodophyta	5.54%	X
Crustose coralline	5.36%	X
Rhodophyta	0.17%	
Porifera	2.08%	X
<i>Chondrilla sp.</i>	1.73%	
Demospongiae	0.17%	X
<i>Erylus sp.</i>	0.17%	
<i>Ircinia campana</i>		X
Cnidaria	3.63%	X
Actiniaria		X
<i>Anthomastus sp.</i>		X
Antipatharia		X
<i>Elatopathes abietina</i>	0.35%	
Hydroidolina	2.77%	X
<i>Oculina varicosa</i>	0.35%	X
<i>Stichopathes lutkeni</i>	0.17%	X
<i>Tanacetipathes tanacetum</i>		X
<i>Titanideum frauenfeldii</i>		X
Arthropoda		X
Anomura		X
<i>Calappa sp.</i>		X
Decapoda		X
<i>Diogenes sp.</i>		X
Majidae		X
<i>Stenorhynchus seticornis</i>		X
Echinodermata	2.25%	X
<i>Asteropora annulata</i>		X
<i>Centrostephanus longispinus</i>	1.04%	X
Crinoidea		X
Echinoidea		X
<i>Eucidaris tribuloides</i>	1.04%	X
Gorgonocephalidae		X
Ophiuroidea	0.17%	

**Dive Site:** ROV 16-02, UNCW Dive 333; Florida, Oculina OECA, Chapman's Reef, South Mound, 60-80 m

Chordata		X
Gnathostomata		X
detritus	0.17%	
Human Debris	0.17%	X
Human debris	0.17%	X
Human debris- fish line/gear	0.17%	
Human debris- net		X
Human debris- fishing line		X
Bare Substrate	86.16%	X
Habitat	86.16%	X
dead standing Oculina	13.67%	X
Bare rock	3.63%	
Bare rubble- coral	42.39%	
Bare rubble/cobble	4.84%	
Bare soft bottom	21.63%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-02, UNCW Dive 333; Florida, Oculina OECA, Chapman's Reef, South Mound, 60-80 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-02.

Class/Species	Common Name	2016-02
Actinopterygii		
Anthiinae	anthiids	12.02
<i>Apogon pseudomaculatus</i>	twospot cardinalfish	0.48
Bothidae	flounder	0.48
<i>Canthigaster</i> sp.	puffer	0.24
<i>Centropristis ocyurus</i>	bank sea bass	1.68
<i>Centropristis striata</i>	black sea bass	0.72
<i>Chaetodon sedentarius</i>	reef butterflyfish	2.89
<i>Chromis enchrysurus</i>	yellowtail reeffish	8.18
<i>Decodon puellaris</i>	red hogfish	2.89
<i>Halichoeres bathyphilus</i>	greenband wrasse	2.16
<i>Halichoeres</i> sp.	wrasse	3.37
<i>Hemanthias vivanus</i>	red barbier	1.44
<i>Holacanthus bermudensis</i>	blue angelfish	0.72
<i>Holacanthus tricolor</i>	rock beauty	0.24
Labridae	wrasse	0.48
<i>Liopropoma eukrines</i>	wrasse bass	2.16
<i>Mycteroperca phenax</i>	scamp	3.85
<i>Ogcocephalus</i> sp.	batfish	0.24
<i>Pagrus pagrus</i>	red porgy	1.20
<i>Plectranthias garrupellus</i>	apricot bass	1.68
<i>Priacanthus arenatus</i>	bigeye	0.24
<i>Pristigenys alta</i>	short bigeye	4.33
<i>Prognathodes aya</i>	bank butterflyfish	10.82
<i>Pronotogrammus martinicensis</i>	rougtongue bass	0.24
<i>Rhomboplites aurorubens</i>	vermilion snapper	1.20
<i>Rypticus</i> sp.	soapfish	0.48
Scorpaenidae	scorpionfish	1.68
<i>Seriola dumerili</i>	greater amberjack	0.96
Serranidae	sea bass	0.48
<i>Serranus annularis</i>	orangeback bass	3.85
<i>Serranus baldwini</i>	lantern bass	2.89
<i>Serranus notospilus</i>	saddle bass	10.58
<i>Serranus phoebe</i>	tattler	12.50
<i>Serranus subligarius</i>	belted sandfish	0.24
<i>Serranus tigrinus</i>	harlequin bass	0.24

**Dive Site:** ROV 16-02, UNCW Dive 333; Florida, Oculina OECA, Chapman's Reef, South Mound, 60-80 m

<i>Sparisoma atomarium</i>	greenblotch parrotfish	0.48
<i>Synodus</i> sp.	lizardfish	2.40
unknown	unknown	7.21

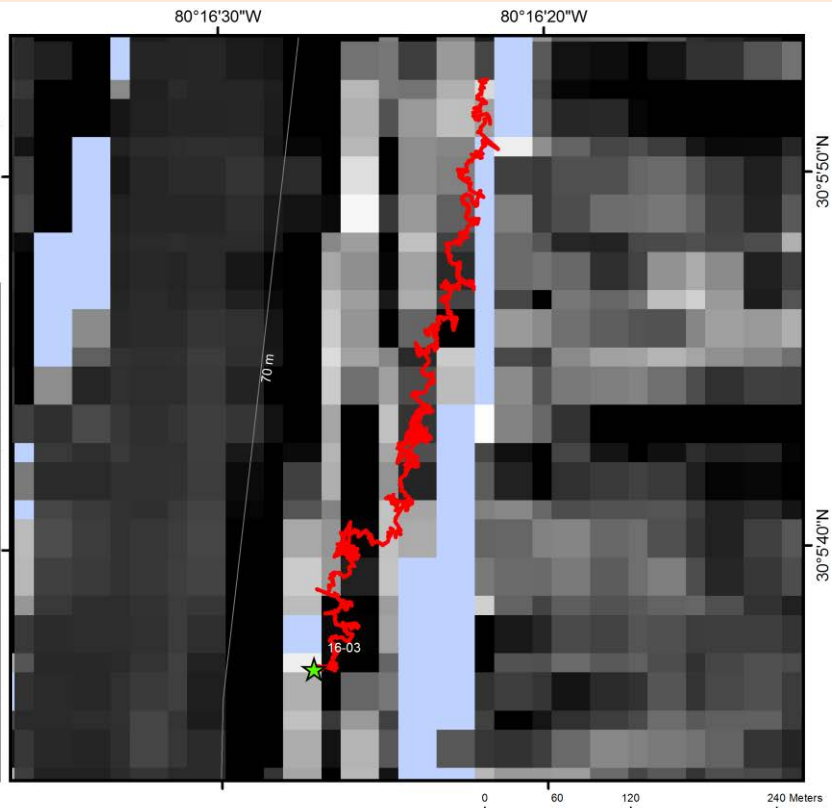
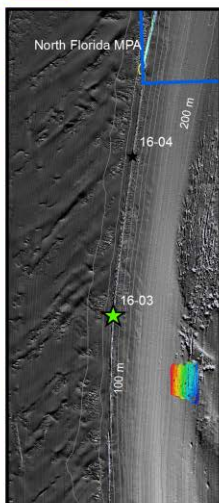
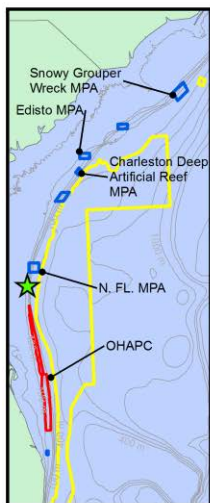


**Dive Site:** ROV 16-03, UNCW Dive 334; Florida, Outside N Florida MPA, 60 m

### General Location and Dive Track:

#### ROV 16-03; Florida, Outside N Florida MPA, 60 m; 12-VI-16-1

- ★ 16-03
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



#### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andy David, John Reed, Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

#### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Pisces\_2016\_ExploratoryOECA

**Purpose:** Survey and monitor Shelf-Edge MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/12/2016

**Specimens:** 0

**Digital Photos:** 165

**DVD:** 2

**Hard Drive:** 1

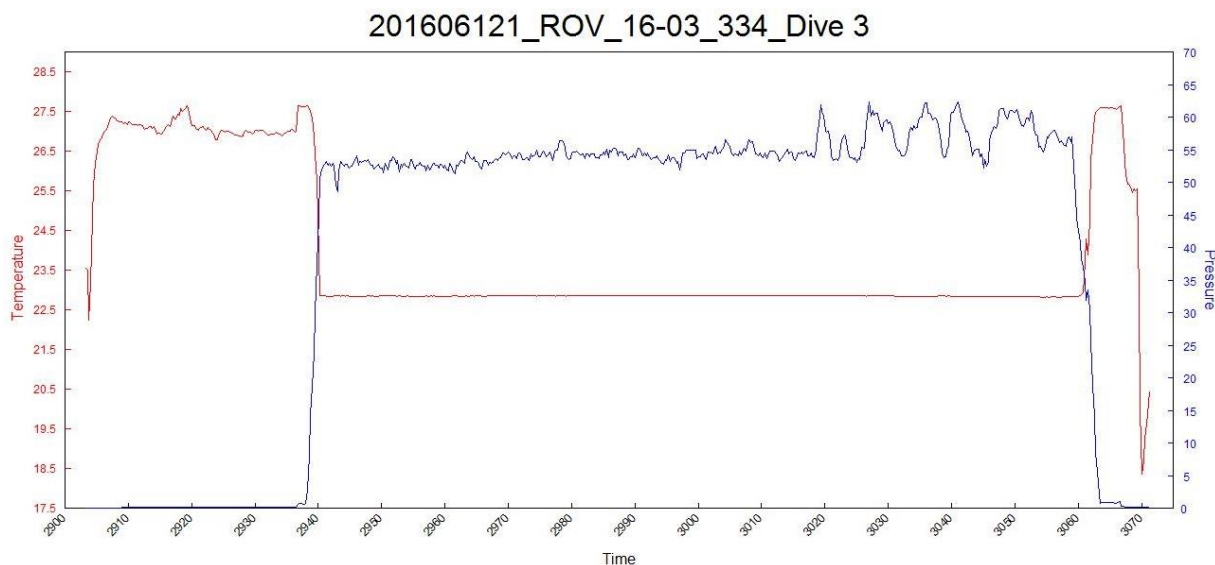
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-03, UNCW Dive 334; Florida, Outside N Florida MPA, 60 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	48	<b>Total Transect Length (km):</b>	0.730
<b>Maximum Bottom Depth (m):</b>	62	<b>Surface Current (kn):</b>	0.3
<b>On Bottom (Time- EDST):</b>	8:34	<b>On Bottom (Lat/Long):</b>	30.09°N; -80.27°W
<b>Off Bottom (Time- EDST):</b>	10:33	<b>Off Bottom (Lat/Long):</b>	30.1°N; -80.27°W
<b>Physical (bottom); Temp (°C):</b>	22.8	<b>Salinity:</b>	<b>Visibility (m):</b> 10 <b>Current (kn):</b> 0.25

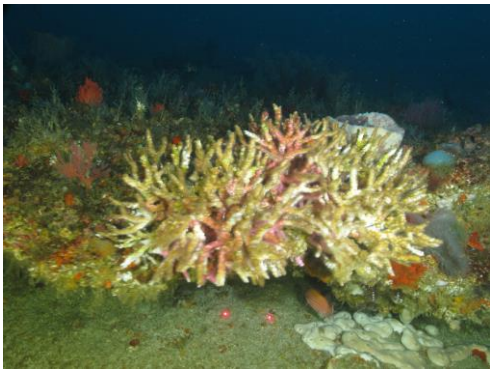
**Physical Environment:**



Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-03 are as follows: Depth Maximum: 62.3 m, Temperature: 22.8-22.9 °C.

**Dive Site:** ROV 16-03, UNCW Dive 334; Florida, Outside N Florida MPA, 60 m

**Dive Imagery:**



**Figure 1:** Depth: -54.6 m

Large colony of live *Oculina varicosa* on rock outcrop. Part of coral is light brown from zooxanthellae and the pink is common color of the skeletal.



**Figure 2:** Depth: -54.3 m

Dense biota of wire coral (*Stichopathes lutkeni*), sponges, coral, gorgonians (*Diodogorgia* sp.) and lionfish on low relief hard bottom.



**Figure 3:** Depth: -54.2 m

Large vase sponge (*Ircinia campana*) with reef butterfly fish.



**Figure 4:** Depth: -53.7 m

Bushy black coral (*Elatopathes abietina*) and gorgonian on rock boulder.

**Dive Site:** ROV 16-03, UNCW Dive 334; Florida, Outside N Florida MPA, 60 m

## **Dive Notes:**

### **Objectives, Site Description, Habitat, Fauna:**

#### Site/Objectives:

Site #- 12-VI-16-1; ROV Dive 16-03; Mohawk UNCW Dive 334. Target Site: ROV 16-03, UNCW Dive 334; Florida, Outside N Florida MPA, 55-63 m

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

#### ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale. Direction of transects were random, but generally headed N, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Difficulty transecting ship to the N; northerly current 0.3 kn from N; 6 kn wind from SW.

#### Site Description/Habitat

Depth range: 55- 63 m

MB- Linear N-S ridge, very narrow; top 55-58 m; east base 60-63 m.

Wind- 8 kn, from SW; surf current 0.3 kn to S, bottom current <1/4 kn to south; visibility- 10 m; bottom temp- 22.8°C

Transect S-N along top and east slope of ridge; top flat rock slabs, square 3-5 m size, 1/2 m relief; 100% biota cover. Hard bottom cover varied from 70% cover to 100% cover. East slope varied from moderate relief of 1-2 m slabs, to areas of high relief 1-3 m, 30° slope; rugged, jumble of rock slabs and boulders. Base reef rock pavement, sand, and small rock.

8:31- Launch

8:34- On bottom, 54.4 m; on ridge

10:34- End dive

#### *Dominant Benthic Macrobiota:*

100% cover of biota on rock. Dominated by Antipatharia- *Stichopathes*, *Tanacetipathes*; Demosponges- *Ircinia campana*, *Aplysina* fingers, Spirastrellidae; small green algae; Didemnidae; gorgonians- *Diodogorgia*, *Nicella*, Hypnogorgian; and Corals- *Oculina*.

Scleractinian Coral- *Oculina varicosa*- 10-30 cm, white, mostly under ledges; common

Antipatharia- *Stichopathes* (dense), *Tanacetipathes* (dense), *Antipathes furcata*

Gorgonacea- *Diodogorgia* (dense), *Nicella*, *Muricea* (purple), *Hypnogorgia pendula* (white)

**Dive Site:** ROV 16-03, UNCW Dive 334; Florida, Outside N Florida MPA, 60 m

Demospongia- *Ircinia campana*, *Aplysina* (wh/ps fingers), Spirastrellidae; 8--10 common species- red, orange, etc.

Hydroida- common

Bryozoa- *Schizoporella*

Asciacea- Didemnidae (abundant)

Decapoda- *Panulirus argus*

Chlorophyta- small greens

*Dominant Fish:*

Tomtate, vermillion snapper, grey snapper, gag-1, scamp- very few considering the extent of high relief, rugose habitat, but numerous fishing boats around; lionfish- common, but not abundant; blue angelfish, reef butterfly, bank butterfly, yellow tail reeffish, various reef fish

*Human Debris:*

Sparse

**Dive Site:** ROV 16-03, UNCW Dive 334; Florida, Outside N Florida MPA, 60 m

**CPCe Percent Cover Analysis:**

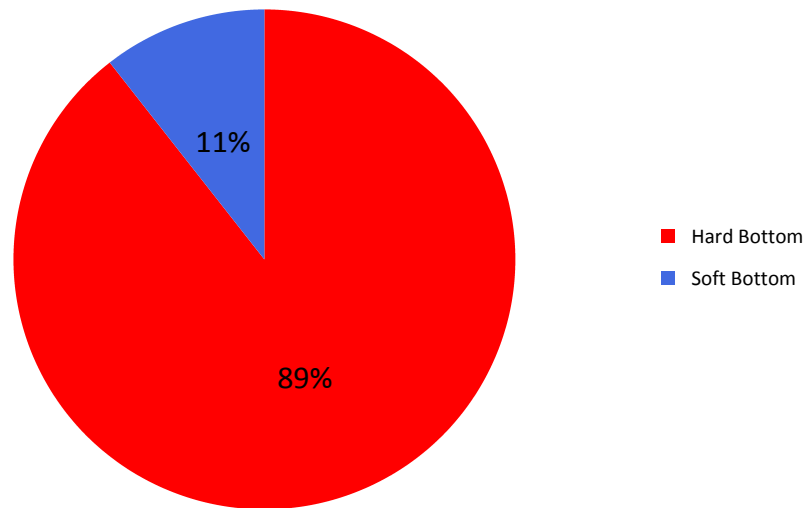
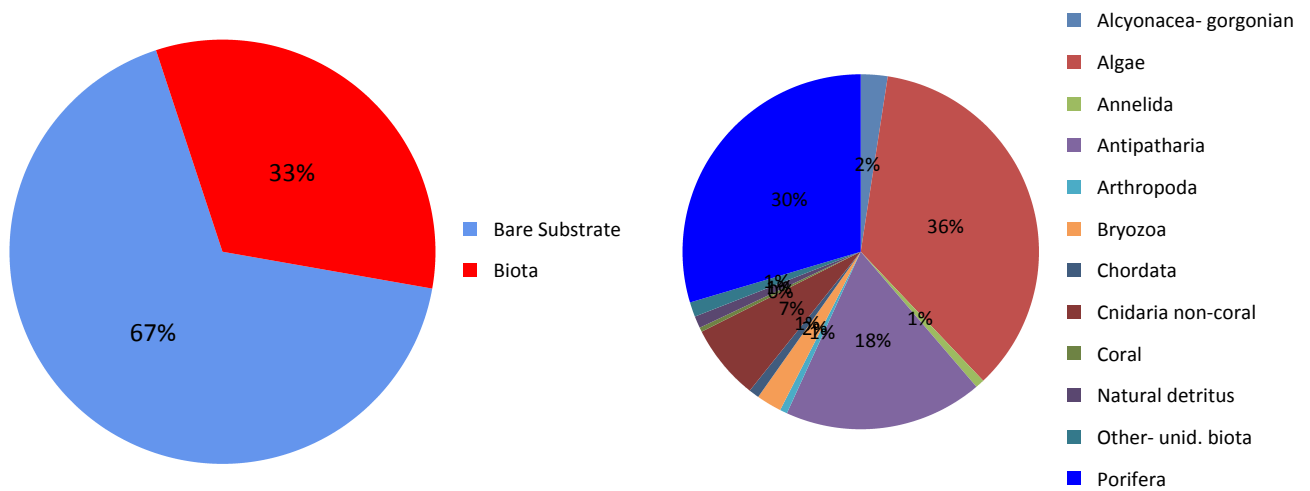


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-03. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-03.

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 16-03, UNCW Dive 334; Florida, Outside N Florida MPA, 60 m

**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 16-03.

Group/Phylum/Taxonomic Name	16-03	
	CPCe	dive notes
Biota	32.83%	X
Cyanobacteria	0.31%	
Chlorophyta		X
Ochrophyta	2.52%	X
<i>Dictyota sp.</i>	0.13%	
Ochrophyta	2.39%	X
Rhodophyta	8.84%	
Crustose coralline	3.58%	
Rhodophyta	5.26%	
Porifera	9.72%	X
<i>Agelas sp.</i>		X
<i>Aplysina sp.</i>	0.04%	X
Cinachyra/Cinachyrella		X
<i>Clathria sp.</i>	0.04%	
Demospongiae	4.73%	X
Demospongiae- tan starlet thick encrusting	0.35%	
Dictyoceratida	0.04%	
<i>Ircinia campana</i>	0.22%	X
<i>Ircinia sp.</i>	1.28%	X
<i>Ircinia strobilina</i>	0.18%	
<i>Monanchora sp.</i>	0.18%	
Poecilosclerida	0.18%	
Spirastrellidae	2.47%	X
Cnidaria	9.10%	X
Alcyonacea- gorgonian	0.09%	
Antipatharia	0.40%	X
<i>Antipathes atlantica</i>	0.09%	
<i>Antipathes furcata</i>	0.18%	X
<i>Diodogorgia sp.</i>	0.53%	X
<i>Elatopathes abietina</i>	2.65%	
Hydroidolina	2.25%	X
<i>Hypnogorgia pendula</i>		X
<i>Hypnogorgia sp.</i>		X
<i>Muricea sp.</i>	0.18%	X

**Dive Site:** ROV 16-03, UNCW Dive 334; Florida, Outside N Florida MPA, 60 m

<i>Nicella sp.</i>		X
<i>Oculina varicosa</i>	0.13%	X
<i>Stichopathes lutkeni</i>	2.47%	X
<i>Tanacetipathes tanacetum</i>	0.13%	X
Annelida	0.27%	X
<i>Filograna sp.</i>	0.22%	X
Serpulidae	0.04%	
Bryozoa	0.75%	X
Bryozoa	0.04%	
<i>Schizoporella sp.</i>	0.71%	X
Arthropoda	0.22%	X
Paguroidea	0.04%	
<i>Panulirus argus</i>	0.18%	X
Chordata	0.31%	X
Ascidacea	0.04%	
Didemnidae	0.27%	X
Gnathostomata		X
Pomacanthus sp.		X
detritus	0.35%	
UNKNOWN	0.44%	
Bare Substrate	67.17%	
Habitat	67.17%	
dead standing Oculina	0.13%	
Bare rock	54.93%	
Bare rubble/cobble	1.77%	
Bare soft bottom	10.34%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-03, UNCW Dive 334; Florida, Outside N Florida MPA, 60 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-03.

Class/Species	Common Name	2016-03
Actinopterygii		
<i>Apogon pseudomaculatus</i>	twospot cardinalfish	0.37
<i>Balistes</i> sp.	triggerfish	0.18
<i>Bodianus pulchellus</i>	spotfin hogfish	10.26
<i>Canthigaster</i> sp.	puffer	16.31
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	0.73
<i>Chaetodon sedentarius</i>	reef butterflyfish	8.61
<i>Chaetodon</i> sp.	butterflyfish	0.18
<i>Chaetodontidae</i>	butterflyfish	0.18
<i>Chromis enchrysurus</i>	yellowtail reeffish	17.96
<i>Chromis insolatus</i>	sunshinefish	3.48
<i>Chromis scotti</i>	purple reeffish	6.78
<i>Chromis</i> sp.	damsel fish	0.55
<i>Fistularia</i> sp.	cornetfish	0.18
<i>Gonioplectrus hispanus</i>	spanish flag	0.55
<i>Haemulon aurolineatum</i>	tomtate	223.89
<i>Halichoeres garnoti</i>	yellowhead wrasse	0.73
<i>Halichoeres</i> sp.	wrasse	1.83
<i>Holacanthus bermudensis</i>	blue angelfish	9.53
Holocentridae	soldierfish/squirrelfish	0.55
Holocentridae	squirrelfish	2.38
<i>Holocentrus adscensionis</i>	squirrelfish	1.47
<i>Lactophrys</i> sp.	cowfish	0.37
<i>Liopropoma eukrines</i>	wrasse bass	1.65
<i>Lutjanus buccanella</i>	blackfin snapper	0.18
<i>Lutjanus griseus</i>	grey snapper	3.11
<i>Lutjanus</i> sp.	snapper	0.18
<i>Muraena retifera</i>	reticulate moray eel	0.18
<i>Muraena robusta</i>	stout moray eel	0.18
<i>Mycteroperca microlepis</i>	gag grouper	0.18
<i>Mycteroperca phenax</i>	scamp	0.92
<i>Myripristis jacobus</i>	blackbar soldierfish	0.37
<i>Pagrus pagrus</i>	red porgy	2.20
<i>Paranthias furcifer</i>	creolefish	1.10
<i>Pareques umbrosus</i>	cubbyu	1.28
<i>Pomacanthus</i> sp.	angelfish	0.18

**Dive Site:** ROV 16-03, UNCW Dive 334; Florida, Outside N Florida MPA, 60 m

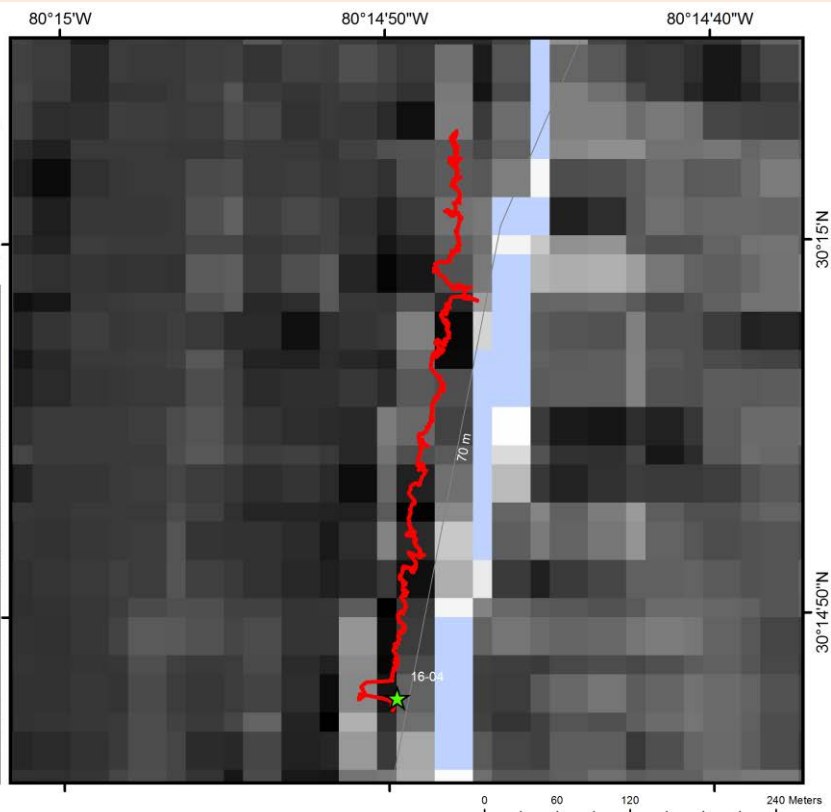
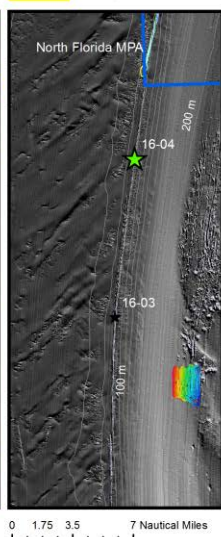
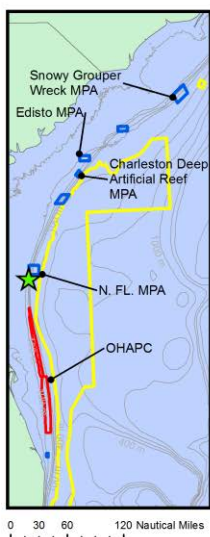
<i>Pristigenys alta</i>	short bigeye	0.55
<i>Prognathodes aya</i>	bank butterflyfish	5.50
<i>Pseudupeneus maculatus</i>	spotted goatfish	0.18
<i>Pterois volitans</i>	lionfish	4.21
<i>Rhomboplites aurorubens</i>	vermillion snapper	262.92
<i>Rypticus</i> sp.	soapfish	0.18
Scorpaenidae	scorpionfish	0.37
<i>Seriola dumerili</i>	greater amberjack	0.18
<i>Seriola rivoliana</i>	almaco jack	0.18
<i>Serranus annularis</i>	orangeback bass	1.83
<i>Serranus baldwini</i>	lantern bass	0.18
<i>Serranus phoebe</i>	tattler	0.92
<i>Sparisoma atomarium</i>	greenblotch parrotfish	0.37
unknown	unknown	1.83

**Dive Site:** ROV 16-04, UNCW Dive 335; Florida, Outside N Florida MPA, 60 m

### General Location and Dive Track:

#### ROV 16-04; Florida, Outside N Florida MPA, 60 m; 12-VI-16-2

- ★ 16-04
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andy David, John Reed, Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Pisces\_2016\_ExploratoryOECA

**Purpose:** Survey and monitor Shelf-Edge MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/12/2016

**Specimens:** 0

**Digital Photos:** 141

**DVD:** 1

**Hard Drive:** 1

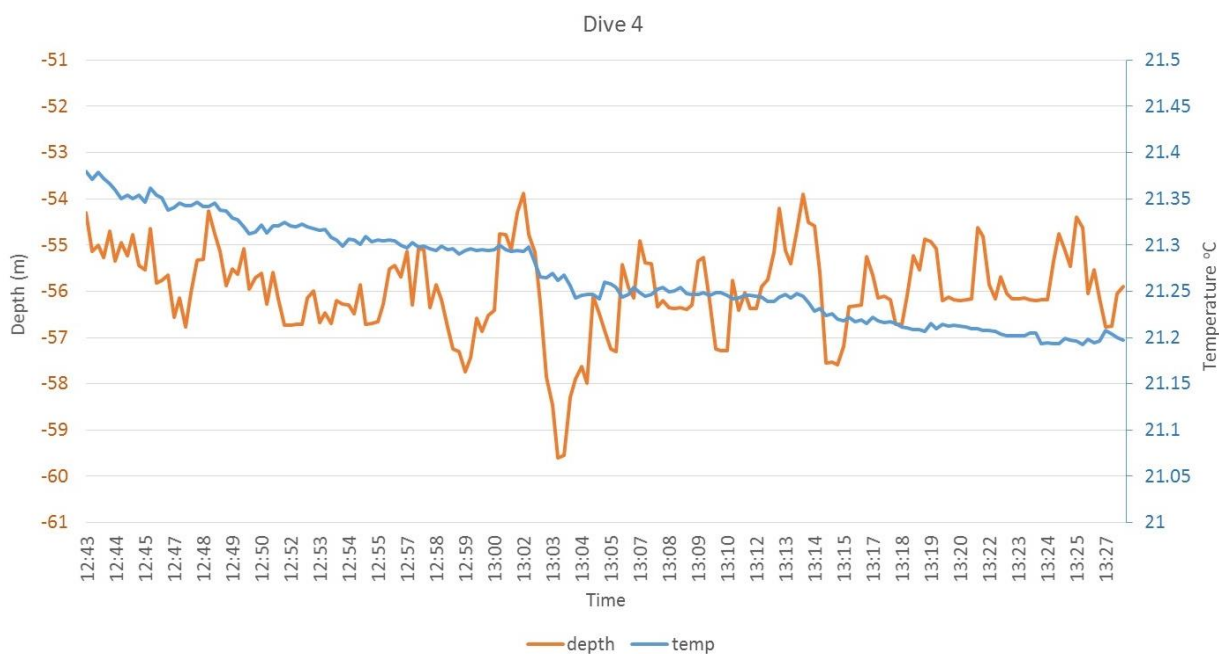
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-04, UNCW Dive 335; Florida, Outside N Florida MPA, 60 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	48	<b>Total Transect Length (km):</b>	0.520
<b>Maximum Bottom Depth (m):</b>	60	<b>Surface Current (kn):</b>	0.1
<b>On Bottom (Time- EDST):</b>	12:42	<b>On Bottom (Lat/Long):</b>	30.25°N; -80.25°W
<b>Off Bottom (Time- EDST):</b>	13:45	<b>Off Bottom (Lat/Long):</b>	30.25°N; -80.25°W
<b>Physical (bottom); Temp (°C):</b>	21.2	<b>Salinity:</b>	<b>Visibility (m):</b> 15 <b>Current (kn):</b> N/A

**Physical Environment:**



Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-04 are as follows: Depth Maximum: 59.6 m, Temperature: 21.2-21.4 °C.



**Dive Site:** ROV 16-04, UNCW Dive 335; Florida, Outside N Florida MPA, 60 m

**Dive Imagery:**



**Figure 1:** Depth: -56.5 m  
Scamp grouper with school of tomtate on low relief hard bottom.



**Figure 2:** Depth: -57.1 m  
Porcupine fish on hard bottom encrusted with sponges, hydroids, tunicates and algae.



**Figure 3:** Depth: -57.3 m  
Large gorgonian sea fan (*Muricea* sp.) with tunicate on the base.



**Figure 4:** Depth: -57.1 m  
Lobster taking refuge in low relief ledges.

**Dive Site:** ROV 16-04, UNCW Dive 335; Florida, Outside N Florida MPA, 60 m

## **Dive Notes:**

### **Objectives, Site Description, Habitat, Fauna:**

#### Site/Objectives:

Site #- 12-VI-16-2; ROV 16-04, UNCW Dive 335; Florida, Outside N Florida MPA, 55-61 m.

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

#### ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Headed transect N to S, with current 0.2 kn to S. Good station keeping

#### Site Description/Habitat

Depth range: 56-61 m

MB- Linear N-S ridge, very narrow; top 56-57 m; east base 60-61 m.

Wind- 7 kn, from SW; surf current 0.2 kn to S, bottom current <1/4 kn to south; visibility- 15 m; bottom temp- 22.35°C

Transect N to S on east slope and upper east side of ridge. Top of ridge mostly flat rock pavement, fractured, some rock slabs <1/2 m relief, sand veneer. East slope about 10-15 wide; less relief and rugosity than previous dive. Mostly low relief, 1 m, flat rock slabs, 3-5 m square, flat top. Some areas with higher rugosity, 1-2 m relief on 20° slope. East base of reef, flat sand and rock pavement.

Benthic macrobiota less dense than morning dive; fish however, were more abundant and grouper much more abundant, scamp common, several gag. Possibly less fishing pressure due to the low relief may be less targeted than the morning dive which had higher relief but less fish. Both dives outside the MPA.

12:37- Launch

12:45- On bottom, 57 m; top of ridge

13:45- End dive.

#### *Dominant Benthic Macrobiota:*

Dominant fauna were black coral- *Stichopathes*, *Tanacetipathes*; gorgonians- *Muricea*; sponges more diverse than morning dive- *Aplysina*, Demospongiae Starlet Sponge, *Clathriidae*, *Agelas*, etc.

Scleractinian Coral- None

Antipatharia- *Stichopathes* (dense), *Tanacetipathes* (common)

**Dive Site:** ROV 16-04, UNCW Dive 335; Florida, Outside N Florida MPA, 60 m

Gorgonacea- *Diodogorgia*, *Muricea* (purple), *Ellisella*

Demospongia- *Ircinia campana*, Aplysina (wh/pu fingers), Spirastrellidae, Demospongiae Starlet Sponge, Clathriidae, *Agelas*, Axinellidae; 8--10 common species- red, orange, etc.

Hydroida- abundant

Ascidacea- Didemnidae (abundant)

Decapoda- *Panularis argus*

Chlorophyta- small greens

*Dominant Fish:*

Tomtate, vermilion snapper, grey snapper, gag-few, scamp- common; lionfish- common, but not abundant, several scamp white head super male color phase; blue angelfish, reef butterfly, bank butterfly, yellow tail reeffish, various reef fish, spotfin hogfish, longsnout butterfly,

*Human Debris:*

None.

**Dive Site:** ROV 16-04, UNCW Dive 335; Florida, Outside N Florida MPA, 60 m

**CPCe Percent Cover Analysis:**

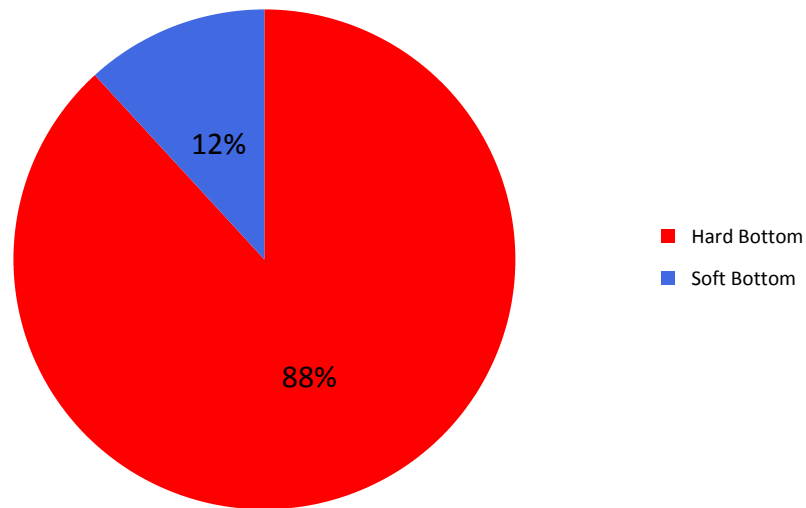
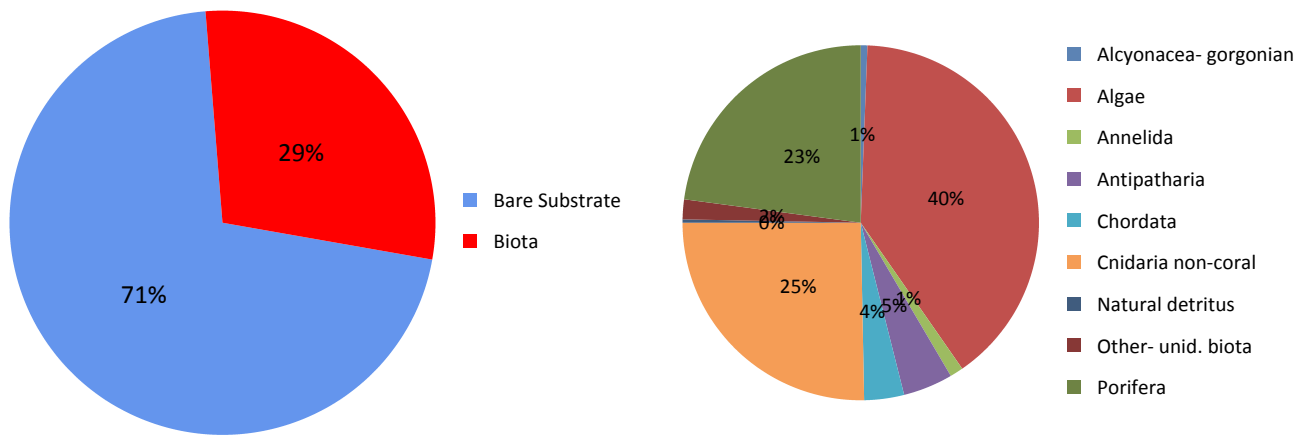


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-04. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-04.

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 16-04, UNCW Dive 335; Florida, Outside N Florida MPA, 60 m

**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 16-04.

Group/Phylum/Taxonomic Name	16-04	
	CPCe	dive notes
Biota	29.05%	X
Cyanobacteria	2.10%	
Chlorophyta	0.09%	X
Ochrophyta	1.49%	
<i>Dictyota sp.</i>	0.17%	
Ochrophyta	1.31%	
Rhodophyta	7.87%	
Crustose coralline	2.54%	
Rhodophyta	5.34%	
Porifera	6.65%	X
<i>Agelas sp.</i>		X
<i>Aplysina sp.</i>		X
Astrophorida (Tetractinellida)		X
Axinellidae		X
<i>Clathria sp.</i>	0.09%	
Clathriidae		X
<i>Cliona sp.</i>		X
Demospongiae	2.80%	X
Demospongiae- tan starlet thick encrusting	0.70%	X
<i>Ircinia campana</i>	0.61%	
<i>Ircinia sp.</i>	1.14%	X
<i>Ircinia strobilina</i>	0.61%	
<i>Neofibularia sp.</i>		X
Poecilosclerida	0.09%	
Spirastrellidae	0.52%	X
Verongida	0.09%	
Cnidaria	8.84%	X
Antipatharia	0.09%	X
<i>Antipathes furcata</i>	0.26%	
<i>Carijoa riisei</i>		X
<i>Diodogorgia sp.</i>	0.17%	X
<i>Ellisella sp.</i>		X
Hydroidolina	7.35%	X
<i>Muricea sp.</i>		X

**Dive Site:** ROV 16-04, UNCW Dive 335; Florida, Outside N Florida MPA, 60 m

<i>Stichopathes lutkeni</i>	0.96%	X
<i>Tanacetipathes tanacetum</i>		X
Annelida	0.35%	X
Annelida	0.09%	
<i>Filograna sp.</i>	0.26%	X
Arthropoda		X
<i>Panulirus argus</i>		X
Mollusca		X
<i>Spondylus sp.</i>		X
Chordata	1.05%	X
Ascidacea	0.26%	
Didemnidae	0.79%	X
<i>Eudistoma sp.</i>		X
Gnathostomata		X
detritus	0.09%	
UNKNOWN	0.52%	
Bare Substrate	70.95%	
Habitat	70.95%	
dead standing Oculina	0.44%	
Bare rock	45.84%	
Bare rubble- coral	0.09%	
Bare rubble/cobble	2.89%	
Bare soft bottom	21.70%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>



**Dive Site:** ROV 16-04, UNCW Dive 335; Florida, Outside N Florida MPA, 60 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-04.

Class/Species	Common Name	2016-04
Actinopterygii		
<i>Apogon pseudomaculatus</i>	twospot cardinalfish	0.81
<i>Bodianus pulchellus</i>	spotfin hogfish	25.82
<i>Cantherhines pullus</i>	orangespotted filefish	0.40
<i>Canthigaster</i> sp.	puffer	19.36
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	0.40
<i>Chaetodon sedentarius</i>	reef butterflyfish	29.04
<i>Chromis enchrysurus</i>	yellowtail reeffish	81.08
<i>Chromis insolatus</i>	sunshinefish	14.52
<i>Chromis scotti</i>	purple reeffish	34.69
<i>Chromis</i> sp.	damsel fish	9.28
<i>Diodon hystrix</i>	porcupinefish	0.81
<i>Equetus lanceolatus</i>	jackknife-fish	0.40
<i>Haemulon aurolineatum</i>	tomtate	1068.98
<i>Haemulon striatum</i>	striped grunt	20.17
<i>Halichoeres garnoti</i>	yellowhead wrasse	12.10
<i>Halichoeres</i> sp.	wrasse	20.17
<i>Holacanthus bermudensis</i>	blue angelfish	10.49
<i>Holacanthus tricolor</i>	rock beauty	1.21
Holocentridae	soldierfish	0.40
Holocentridae	squirrelfish	5.24
<i>Holocentrus adscensionis</i>	squirrelfish	33.48
<i>Lachnolaimus maximus</i>	hogfish	0.40
<i>Liopropoma eukrines</i>	wrasse bass	2.82
<i>Lutjanus griseus</i>	grey snapper	2.42
<i>Lutjanus</i> sp.	snapper	0.40
<i>Mycteroperca microlepis</i>	gag grouper	1.21
<i>Mycteroperca phenax</i>	scamp	5.24
<i>Myripristis jacobus</i>	blackbar soldierfish	39.13
<i>Paranthias furcifer</i>	creolefish	3.63
<i>Pareques umbrosus</i>	cubbyu	13.31
<i>Priacanthus arenatus</i>	bigeye	1.21
<i>Prognathodes aculeatus</i>	longsnout butterflyfish	0.81
<i>Prognathodes aya</i>	bank butterflyfish	1.21
<i>Pseudupeneus maculatus</i>	spotted goatfish	0.81
<i>Pterois volitans</i>	lionfish	19.36

**Dive Site:** ROV 16-04, UNCW Dive 335; Florida, Outside N Florida MPA, 60 m

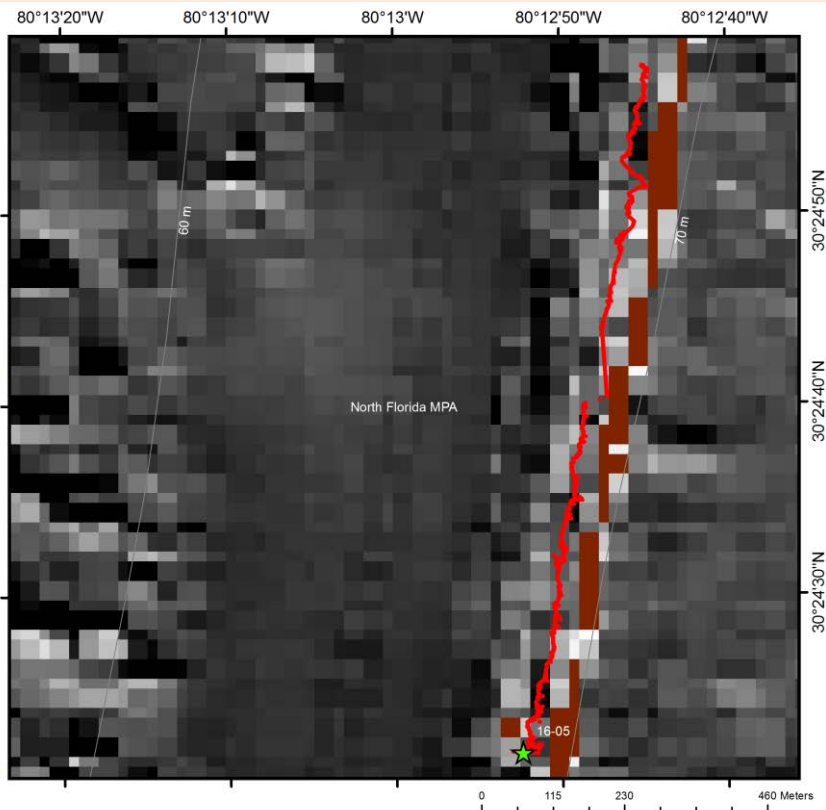
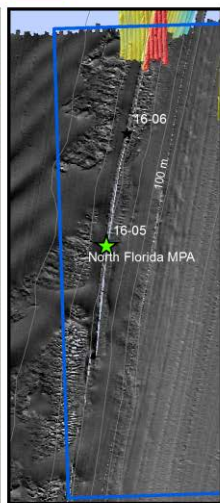
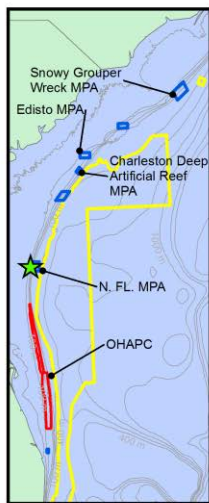
<i>Rhomboplites aurorubens</i>	vermilion snapper	1038.73
<i>Rypticus saponaceus</i>	greater soapfish	1.61
Scorpaenidae	scorpionfish	0.40
<i>Seriola dumerili</i>	greater amberjack	0.40
<i>Seriola rivoliana</i>	almaco jack	1.61
<i>Seriola</i> sp.	amberjack	2.42
<i>Serranus annularis</i>	orangeback bass	2.02
<i>Serranus baldwini</i>	lantern bass	3.23
<i>Serranus phoebe</i>	tattler	0.81
<i>Serranus</i> sp.	sea bass	0.81
<i>Serranus tigrinus</i>	harlequin bass	0.40
unknown	unknown	1.21

**Dive Site:** ROV 16-05, UNCW Dive 336; Florida, Inside N Florida MPA, 60 m

### General Location and Dive Track:

**ROV 16-05; Florida,  
Inside N Florida MPA,  
60 m; 12-Vil-16-3**

- ★ 16-05
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andy David, John Reed, Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Pisces\_2016\_ExploratoryOECA

**Purpose:** Survey and monitor Shelf-Edge MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/12/2016

**Specimens:** 0

**Digital Photos:** 132

**DVD:** 2

**Hard Drive:** 1

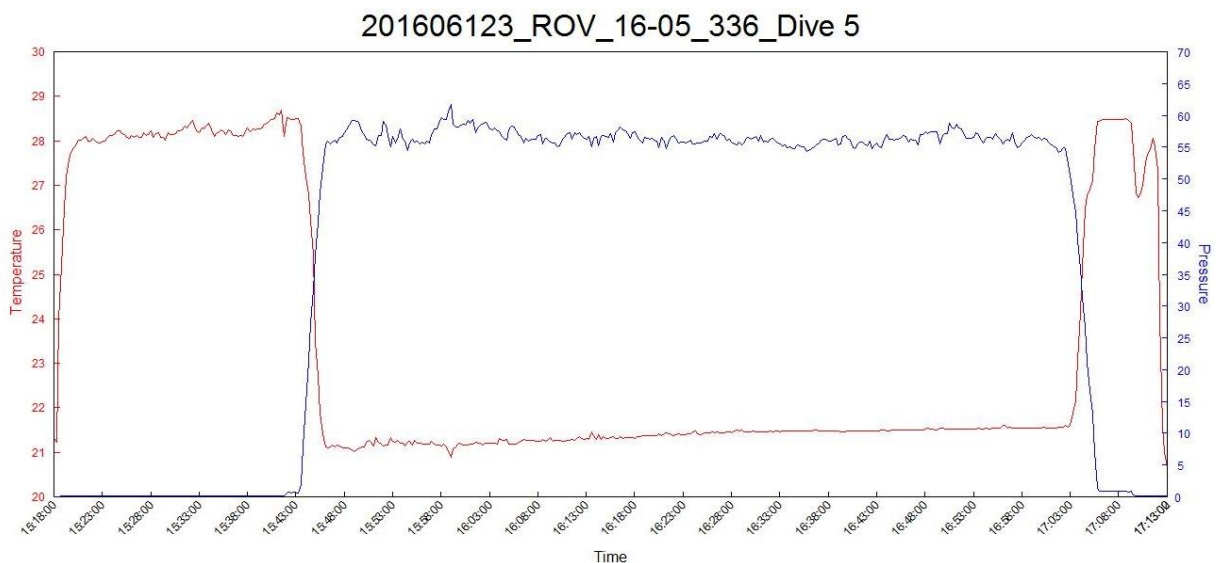
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-05, UNCW Dive 336; Florida, Inside N Florida MPA, 60 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	56	<b>Total Transect Length (km):</b>	1.100
<b>Maximum Bottom Depth (m):</b>	64	<b>Surface Current (kn):</b>	0.3
<b>On Bottom (Time- EDST):</b>	15:36	<b>On Bottom (Lat/Long):</b>	30.42°N; -80.21°W
<b>Off Bottom (Time- EDST):</b>	17:00	<b>Off Bottom (Lat/Long):</b>	30.41°N; -80.21°W
<b>Physical (bottom); Temp (°C):</b>	20.9	<b>Salinity:</b>	<b>Visibility (m):</b> 15 <b>Current (kn):</b> N/A

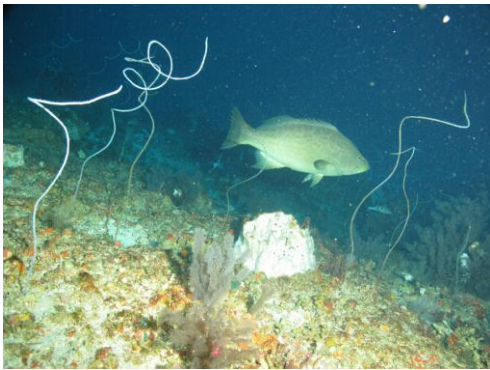
**Physical Environment:**



Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-05 are as follows: Depth Maximum: 61.7 m, Temperature: 20.9-21.6 °C.

**Dive Site:** ROV 16-05, UNCW Dive 336; Florida, Inside N Florida MPA, 60 m

**Dive Imagery:**



**Figure 1:** Depth: -58.1 m  
Scamp on hard bottom with black coral (*Stichopathes lutkeni*, *Elatopathes abietina*) and cake sponge (*Ircinia* sp.).



**Figure 2:** Depth: -56.2 m  
School of grey snapper on high relief rock bottom.



**Figure 3:** Depth: -56.9 m  
Large rock boulders and slabs with bushy black coral (*Elatopathes abietina*), wire coral (*Stichopathes lutkeni*), and various demosponges.



**Figure 4:** Depth: -57.8 m  
Bushes of the gorgonian *Carijoa riisei* are common along the reef edge.

**Dive Site:** ROV 16-05, UNCW Dive 336; Florida, Inside N Florida MPA, 60 m

**Dive Notes:**

**Objectives, Site Description, Habitat, Fauna:**

Site/Objectives:

Site #- 12-VI-16-3; ROV 16-05, UNCW Dive 336; Florida, Inside N Florida MPA, 56-64 m

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect HD S along east slope of ridge; very good station keeping.

Site Description/Habitat

Depth range: 56 to 64 m

MB- N-S oriented ridge, 200 m wide; 73 nmi off Jacksonville inlet. Transect N to S along east slope and upper east edge of ridge.

Top of ridge, 56 m; rock pavement, fractured, some rock slabs, 1/2 m relief; few fish on top

East slope- 15-20+ m wide slope, 10-30° slope; rock slabs, flat top, square flat top boulders, 1-2 m relief, 3-4 m relief over all slope, high rugosity.

Dense biota dominating slope; black coral- *Stichopathes*, *Tanacetipathes*; gorgonians- *Muricea*; sponges- dense and diverse. Very similar habitat as Dive 3; more rugose than dive 4.

15:41- Launch

15:46- On bottom, 58 m, on east slope.

17:00- End dive.

Dominant Benthic Macrobiota:

Scleractinia- 1 *Oculina varicosa*, 15 cm white

Antipatharia- *Stichopathes*, *Tanacetipathes*, *Antipathes atlantica*

Gorgonacea- *Diodogorgia*, *Muricea* (purple), *Carijoa*

Demospongia- *Ircinia campana*, *Aplysina* (wh/pu fingers), *Spirastrellidae*, *Demospongiae* Starlet Sponge, *Clathriidae*, *Agelas*, *Axinellidae*, *Cinachyra*; 8--10 common species- red, orange, etc.

Hydroida- abundant

Ascidacea- *Didemnidae* (abundant)

Decapoda- *Panularis argus*



**Dive Site:** ROV 16-05, UNCW Dive 336; Florida, Inside N Florida MPA, 60 m

*Dominant Fish:*

Huge schools of small fish- vermilion snapper, yellow goatfish, tomtate; grey snapper, gag-several, scamp-common; lionfish- not abundant, several scamp white head super male color phase; blue angelfish, reef butterfly, bank butterfly, yellow tail reeffish, various reef fish, spotfin hogfish, longsnout butterfly, porcupine fish, flying gurnard, graysby

*Human Debris:*

fishing line

**Dive Site:** ROV 16-05, UNCW Dive 336; Florida, Inside N Florida MPA, 60 m

**CPCe Percent Cover Analysis:**

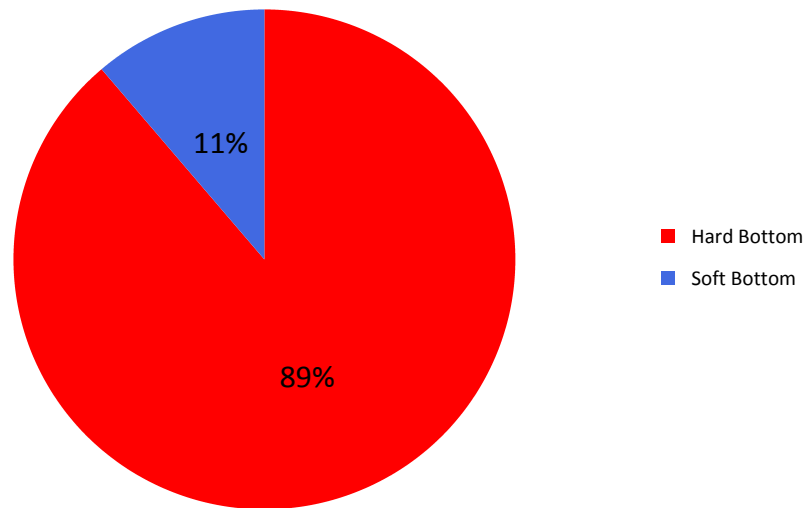
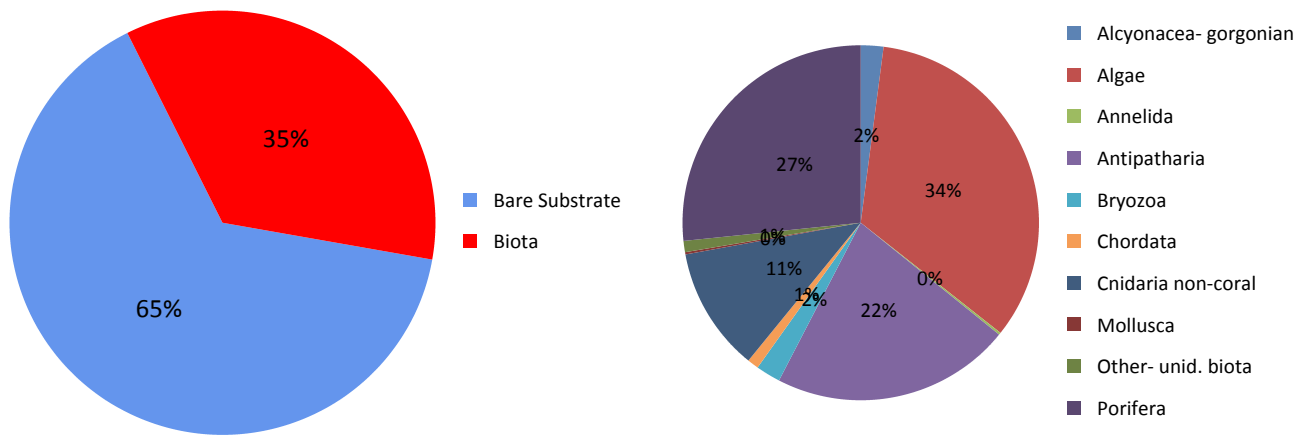


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-05. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-05.

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 16-05, UNCW Dive 336; Florida, Inside N Florida MPA, 60 m

**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 16-05.

Group/Phylum/Taxonomic Name	16-05	
	CPCe	dive notes
Biota	35.16%	X
Cyanobacteria	0.29%	
Ochrophyta	1.15%	
Rhodophyta	10.37%	
Crustose coralline	6.56%	
Rhodophyta	3.82%	
Porifera	9.37%	X
<i>Agelas sp.</i>		X
<i>Aiolochoira crassa</i>	0.07%	
<i>Aplysina sp.</i>		X
Axinellidae	0.14%	X
<i>Chondrilla sp.</i>	0.07%	
Cinachyra/Cinachyrella		X
Clathriidae		X
Demospongiae	4.76%	X
Demospongiae- tan starlet thick encrusting	0.14%	X
<i>Erylus sp.</i>	0.22%	
<i>Ircinia campana</i>	0.07%	X
<i>Ircinia sp.</i>	0.65%	X
<i>Ircinia strobilina</i>	0.14%	
<i>Placospongia sp.</i>	0.22%	
Spirastrellidae	2.88%	X
Cnidaria	12.32%	X
Alcyonacea- gorgonian	0.14%	
Antipatharia	1.59%	X
<i>Antipathes atlantica</i>		X
<i>Antipathes furcata</i>	1.01%	
<i>Carijoa riisei</i>	0.07%	X
<i>Diodogorgia sp.</i>	0.22%	X
<i>Elatopathes abietina</i>	2.23%	
Hydroidolina	3.96%	X
<i>Iciligorgia schrammi</i>	0.14%	
<i>Muricea sp.</i>	0.14%	X
<i>Oculina varicosa</i>		X

**Dive Site:** ROV 16-05, UNCW Dive 336; Florida, Inside N Florida MPA, 60 m

Scleractinia- unid colonial		X
<i>Stichopathes lutkeni</i>	2.81%	X
<i>Tanacetipathes tanacetum</i>		X
Annelida	0.07%	X
Annelida	0.07%	
<i>Filograna sp.</i>		X
Bryozoa	0.79%	
Bryozoa	0.07%	
<i>Schizoporella sp.</i>	0.72%	
Arthropoda		X
<i>Panulirus argus</i>		X
Mollusca	0.07%	
Bivalvia	0.07%	
Chordata	0.36%	X
Ascidiacea	0.07%	
Didemnidae	0.29%	X
Gnathostomata		X
UNKNOWN	0.36%	
Human Debris		X
Human debris		X
Human debris- fish line/gear		X
Bare Substrate	64.84%	
Habitat	64.84%	
dead standing Oculina	0.14%	
Bare rock	45.97%	
Bare rubble- coral	0.43%	
Bare rubble/cobble	5.55%	
Bare soft bottom	12.75%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-05, UNCW Dive 336; Florida, Inside N Florida MPA, 60 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-05.

Class/Species	Common Name	2016-05
Actinopterygii		
<i>Acanthurus</i> sp.	doctorfish	1.01
<i>Aulostomus maculatus</i>	trumpetfish	0.34
<i>Balistes capriscus</i>	grey triggerfish	0.17
<i>Balistes vetula</i>	queen triggerfish	0.17
<i>Bodianus pulchellus</i>	spotfin hogfish	15.54
<i>Calamus</i> sp.	porgy	0.51
<i>Cantherhines pullus</i>	orangespotted filefish	0.17
<i>Canthigaster</i> sp.	puffer	10.47
<i>Cephalopholis cruentatus</i>	graysby	0.68
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	0.84
<i>Chaetodon sedentarius</i>	reef butterflyfish	17.23
<i>Chromis enchrysurus</i>	yellowtail reeffish	4.90
<i>Chromis insolatus</i>	sunshinefish	5.58
<i>Chromis scotti</i>	purple reeffish	19.77
<i>Chromis</i> sp.	damselfish	8.79
<i>Clepticus parrai</i>	creole wrasse	9.12
<i>Dactylopterus volitans</i>	flying gurnard	0.34
<i>Fistularia tabacaria</i>	bluespotted cornetfish	0.84
<i>Haemulon aurolineatum</i>	tomtate	1402.26
<i>Haemulon plumieri</i>	white grunt	0.17
<i>Haemulon striatum</i>	striped grunt	50.68
<i>Halichoeres garnoti</i>	yellowhead wrasse	11.83
<i>Halichoeres</i> sp.	wrasse	4.22
<i>Holacanthus bermudensis</i>	blue angelfish	13.68
<i>Holacanthus tricolor</i>	rock beauty	1.01
Holocentridae	soldierfish	0.17
Holocentridae	squirrelfish	2.87
<i>Holocentrus adscensionis</i>	squirrelfish	11.66
<i>Liopropoma eukrines</i>	wrasse bass	1.35
<i>Lutjanus cyanopterus</i>	cupera snapper	2.03
<i>Lutjanus griseus</i>	grey snapper	29.57
<i>Lutjanus</i> sp.	snapper	0.68
<i>Mulloidichthys martinicus</i>	yellow goatfish	12.33
<i>Muraena robusta</i>	stout moray eel	0.17
<i>Mycteroperca microlepis</i>	gag grouper	1.01

**Dive Site:** ROV 16-05, UNCW Dive 336; Florida, Inside N Florida MPA, 60 m

<i>Mycteroperca phenax</i>	scamp	2.20
<i>Myripristis jacobus</i>	blackbar soldierfish	16.22
<i>Pareques umbrosus</i>	cubbyu	5.41
<i>Pomacanthus paru</i>	french angelfish	0.17
<i>Pomacanthus</i> sp.	angelfish	0.17
<i>Prognathodes aculeatus</i>	longsnout butterflyfish	0.84
<i>Prognathodes aya</i>	bank butterflyfish	7.26
<i>Pseudupeneus maculatus</i>	spotted goatfish	1.86
<i>Pterois volitans</i>	lionfish	10.98
<i>Rhomboplites aurorubens</i>	vermillion snapper	1267.11
<i>Rypticus maculatus</i>	whitespotted soapfish	0.17
<i>Rypticus saponaceus</i>	greater soapfish	0.17
Scorpaenidae	scorpionfish	0.34
<i>Seriola dumerili</i>	greater amberjack	0.68
<i>Seriola rivoliana</i>	almaco jack	3.55
<i>Serranus baldwini</i>	lantern bass	0.34
<i>Serranus phoebe</i>	tattler	0.17
<i>Serranus tigrinus</i>	harlequin bass	0.17
<i>Sparisoma aurofrenatum</i>	redband parrotfish	0.51
<i>Sparisoma</i> sp.	parrotfish	0.34
<i>Stegastes partitus</i>	bicolor damselfish	2.20
unknown	unknown	2.53

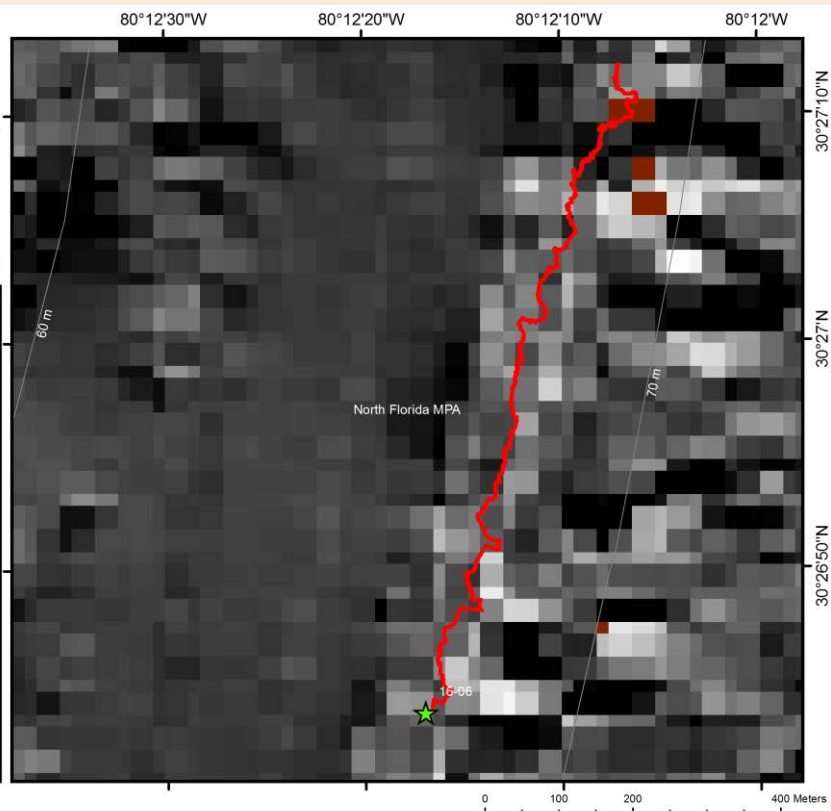
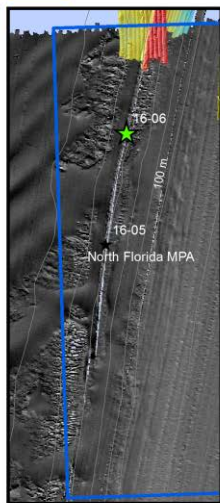
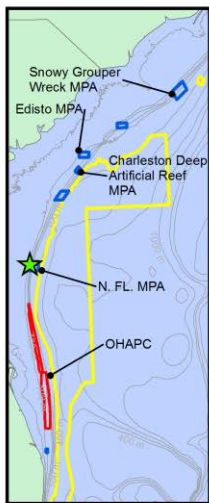


**Dive Site:** ROV 16-06, UNCW Dive 337; Florida, Inside N Florida MPA, 60 m

### General Location and Dive Track:

#### ROV 16-06; Florida, Inside N Florida MPA, 60 m; 12-VI-16-4

- ★ 16-06
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andrew W. David, John Reed,  
Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Pisces\_2016\_ExploratoryOECA

**Purpose:** Survey and monitor Shelf-Edge  
MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/12/2016

**Specimens:** 0

**Digital Photos:** 107

**DVD:** 1

**Hard Drive:** 1

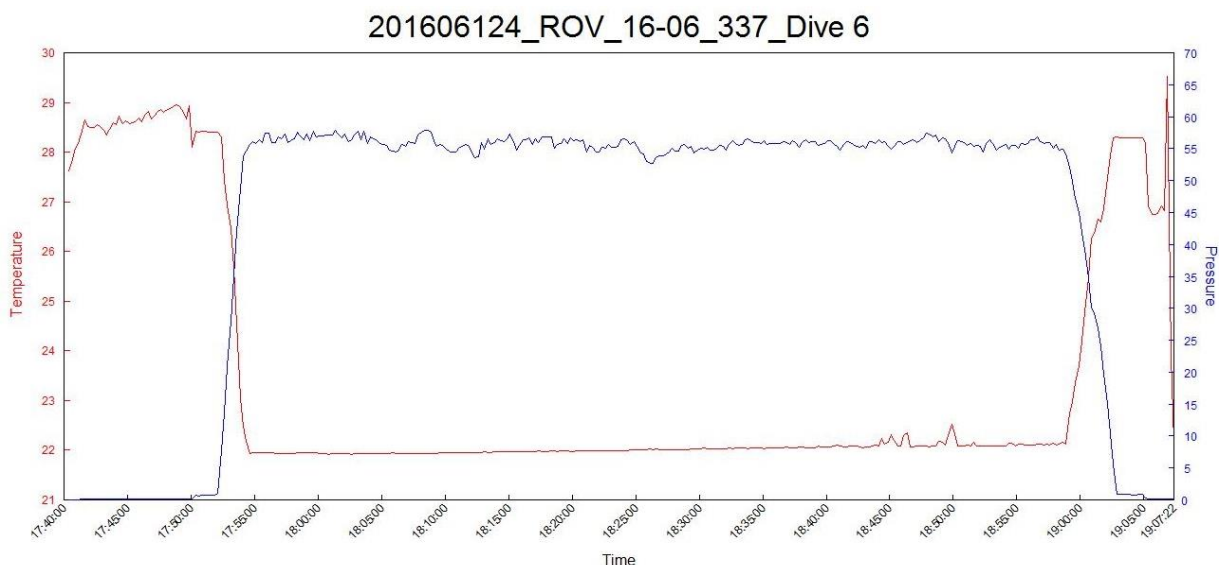
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-06, UNCW Dive 337; Florida, Inside N Florida MPA, 60 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	52	<b>Total Transect Length (km):</b>	0.970
<b>Maximum Bottom Depth (m):</b>	59	<b>Surface Current (kn):</b>	0.1
<b>On Bottom (Time- EDST):</b>	17:53	<b>On Bottom (Lat/Long):</b>	30.45°N; -80.2°W
<b>Off Bottom (Time- EDST):</b>	18:58	<b>Off Bottom (Lat/Long):</b>	30.45°N; -80.2°W
<b>Physical (bottom); Temp (°C):</b>	21.9	<b>Salinity:</b>	<b>Visibility (m):</b> 15 <b>Current (kn):</b> 0

**Physical Environment:**



Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-06 are as follows: Depth Maximum: 57.9 m, Temperature: 21.9-22.5 °C.

**Dive Site:** ROV 16-06, UNCW Dive 337; Florida, Inside N Florida MPA, 60 m

**Dive Imagery:**



**Figure 1:** Depth: -56.1 m  
Large male scamp (white head color phase) on reef edge.



**Figure 2:** Depth: -58.2 m  
Lizardfish with sponges and black coral.



**Figure 3:** Depth: -57.2 m  
Lobster under rock ledge that is heavily encrusted with various sponges (Spirastrellidae, Axinellidae, *Ircinia* spp.), black coral, hydroids and algae.



**Figure 4:** Depth: -57.5 m  
Jackknife fish with gorgonians (*Diodogorgia* sp.).

**Dive Site:** ROV 16-06, UNCW Dive 337; Florida, Inside N Florida MPA, 60 m

## **Dive Notes:**

### **Objectives, Site Description, Habitat, Fauna:**

#### Site/Objectives:

Site #- 12-VI-16-4; ROV 16-06, UNCW Dive 337; Florida, Inside N Florida MPA, 56-68 m

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

#### ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect HD S along east slope of ridge; very good station keeping.

#### Site Description/Habitat

Depth range: 56 to 58 m

MB- shows narrow N-S ridge like Dives 3, 4,5, but with broad terrace on the east side, total width 700 m.

Transect N to S along the narrow ridge top and east slope. Compared to Dive 5, this site had low relief, low rugosity and much fewer fish.

Most of the habitat was low relief, flat square boulders, <1/2 m relief, flat bottom, low rugosity. Top of ridge, 56 m, base 57-58 m. Very few fish in these areas. Some areas with slight Slope 5-10°, 1-2 m relief overall, top 56 m with flat slabs and boulders with <1 m relief; these regions had dense schools of tomtate; but fish were sparse overall.

17:49- Launch

17:52- On bottom, 58 m on ridge; 50% hard bottom, 1-2 m flat top boulders, 1/2 m relief.

18:57- End dive.

#### Dominant Benthic Macrobiota:

Scleractinia- none

Antipatharia- *Stichopathes*, *Tanacetipathes*, *Antipathes atlantica*

Gorgonacea- *Diodogorgia*, *Muricea* (purple), *Carijoa*

Demospongia- Diverse and dense; *Ircinia campana*, *Aplysina* (wh/pu fingers), *Spirastrellidae*, *Demospongiae* Starlet Sponge, *Clathriidae*, *Agelas*, *Axinellidae*, *Cinachyra*; 8--10 common species- red, orange, etc.

Hydroida- abundant

Ascidacea- *Didemnidae*

Decapoda- *Panularis argus*

**Dive Site:** ROV 16-06, UNCW Dive 337; Florida, Inside N Florida MPA, 60 m

Rhodophyta- sparse, thin branching

*Dominant Fish:*

Tomtate, few scamp, hogfish, blue angelfish, reef butterfly, squirrelfish, rock beauty, mutton snapper, jackknife fish, flying gurnard, lionfish- few

*Human Debris:*

longline

**Dive Site:** ROV 16-06, UNCW Dive 337; Florida, Inside N Florida MPA, 60 m

**CPCe Percent Cover Analysis:**

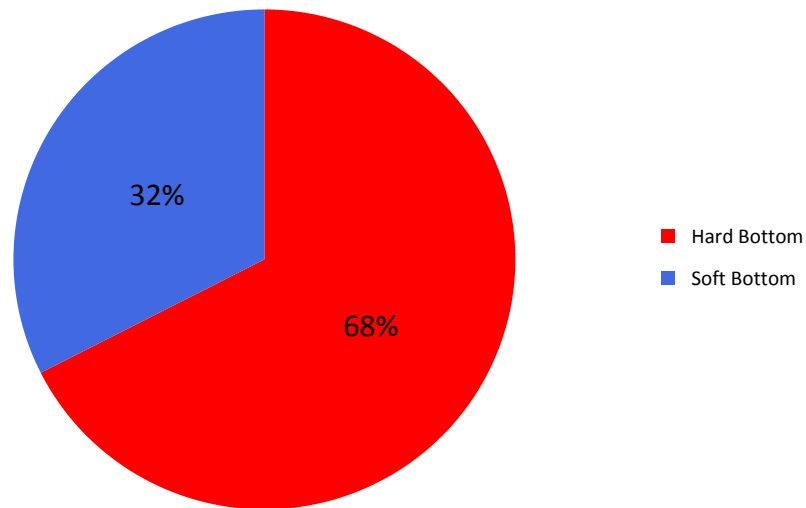
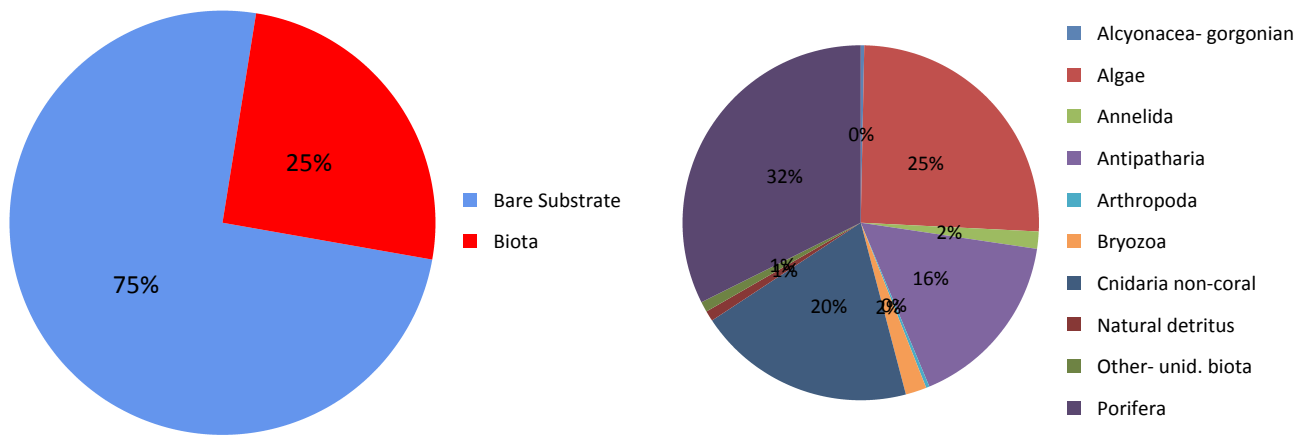


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-06. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-06.

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 16-05, UNCW Dive 336; Florida, Inside N Florida MPA, 60 m

**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 16-06.

Group/Phylum/Taxonomic Name	16-06	
	CPCe	dive notes
Biota	25.26%	X
Cyanobacteria	0.79%	
Chlorophyta	0.24%	
Ochrophyta	0.40%	
<i>Dictyota sp.</i>	0.08%	
Ochrophyta	0.32%	
Rhodophyta	5.00%	X
Crustose coralline	2.70%	
Rhodophyta	2.30%	X
Porifera	8.18%	X
<i>Agelas sp.</i>		X
<i>Aplysina sp.</i>	0.48%	X
Axinellidae		X
Cinachyra/Cinachyrella		X
<i>Clathria sp.</i>	0.16%	
Clathriidae		X
Demospongiae	3.89%	X
Demospongiae- tan starlet thick encrusting	0.56%	X
<i>Geodia neptuni complex</i>	0.16%	
<i>Ircinia campana</i>	0.32%	
<i>Ircinia sp.</i>	0.64%	X
<i>Ircinia strobilina</i>	0.16%	
Poecilosclerida	0.24%	
<i>Siphonodictyon coralliphagum</i>	0.08%	
Spirastrellidae	1.51%	X
Cnidaria	9.21%	X
Alcyonacea- gorgonian		X
Antipatharia	0.56%	
<i>Antipathes atlantica</i>		X
<i>Antipathes furcata</i>	0.95%	
<i>Diodogorgia sp.</i>	0.08%	X
<i>Elatopathes abietina</i>	1.91%	
Hydroidolina	5.00%	X
<i>Muricea sp.</i>		X

**Dive Site:** ROV 16-05, UNCW Dive 336; Florida, Inside N Florida MPA, 60 m

Plexauridae		X
<i>Stichopathes lutkeni</i>	0.71%	X
<i>Tanacetipathes tanacetum</i>		X
Carijoa sp.		X
Annelida	0.40%	X
<i>Filograna sp.</i>	0.32%	X
Serpulidae	0.08%	
Bryozoa	0.48%	
Bryozoa	0.16%	
<i>Schizoporella sp.</i>	0.32%	
Arthropoda	0.08%	X
<i>Panulirus argus</i>	0.08%	X
Chordata		X
Didemnidae		X
Gnathostomata		X
detritus	0.24%	
UNKNOWN	0.24%	
Human Debris		X
Human debris		X
Human debris- long line		X
Bare Substrate	74.74%	
Habitat	74.74%	
dead standing Oculina	0.08%	
Bare rock	36.14%	
Bare rubble- coral	0.56%	
Bare rubble/cobble	3.97%	
Bare soft bottom	34.00%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-05, UNCW Dive 336; Florida, Inside N Florida MPA, 60 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-06.

Class/Species	Common Name	2016-06
Actinopterygii		
<i>Acanthostracion polygonia</i>	honeycomb cowfish	0.25
<i>Acanthurus</i> sp.	doctorfish	0.25
<i>Balistes capriscus</i>	grey triggerfish	0.49
<i>Bodianus pulchellus</i>	spotfin hogfish	11.53
<i>Calamus</i> sp.	porgy	0.49
<i>Canthigaster</i> sp.	puffer	17.17
<i>Cephalopholis cruentatus</i>	graysby	0.49
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	1.47
<i>Chaetodon sedentarius</i>	reef butterflyfish	21.58
<i>Chilomycterus schoepfi</i>	striped burrfish	0.25
<i>Chromis enchrysurus</i>	yellowtail reeffish	64.26
<i>Chromis insolatus</i>	sunshinefish	17.66
<i>Chromis scotti</i>	purple reeffish	14.96
<i>Chromis</i> sp.	damselfish	13.00
<i>Clepticus parrai</i>	creole wrasse	0.25
<i>Dactylopterus volitans</i>	flying gurnard	0.98
<i>Equetus lanceolatus</i>	jackknife-fish	2.21
<i>Gymnothorax moringa</i>	spotted moray eel	0.49
<i>Haemulon aurolineatum</i>	tomtate	310.28
<i>Haemulon</i> sp.	grunt	36.79
<i>Haemulon striatum</i>	striped grunt	17.17
<i>Halichoeres garnoti</i>	yellowhead wrasse	15.94
<i>Halichoeres</i> sp.	wrasse	5.64
<i>Holacanthus bermudensis</i>	blue angelfish	14.72
<i>Holacanthus tricolor</i>	rock beauty	0.25
Holocentridae	squirrelfish	4.17
<i>Holocentrus adscensionis</i>	squirrelfish	5.40
<i>Lachnolaimus maximus</i>	hogfish	0.49
<i>Liopropoma eukrines</i>	wrasse bass	0.98
<i>Lutjanus analis</i>	mutton snapper	0.49
<i>Lutjanus griseus</i>	grey snapper	1.23
<i>Lutjanus</i> sp.	snapper	0.98
<i>Mycteroperca phenax</i>	scamp	1.47
<i>Myripristis jacobus</i>	blackbar soldierfish	14.23
<i>Pagrus pagrus</i>	red porgy	0.25

**Dive Site:** ROV 16-05, UNCW Dive 336; Florida, Inside N Florida MPA, 60 m

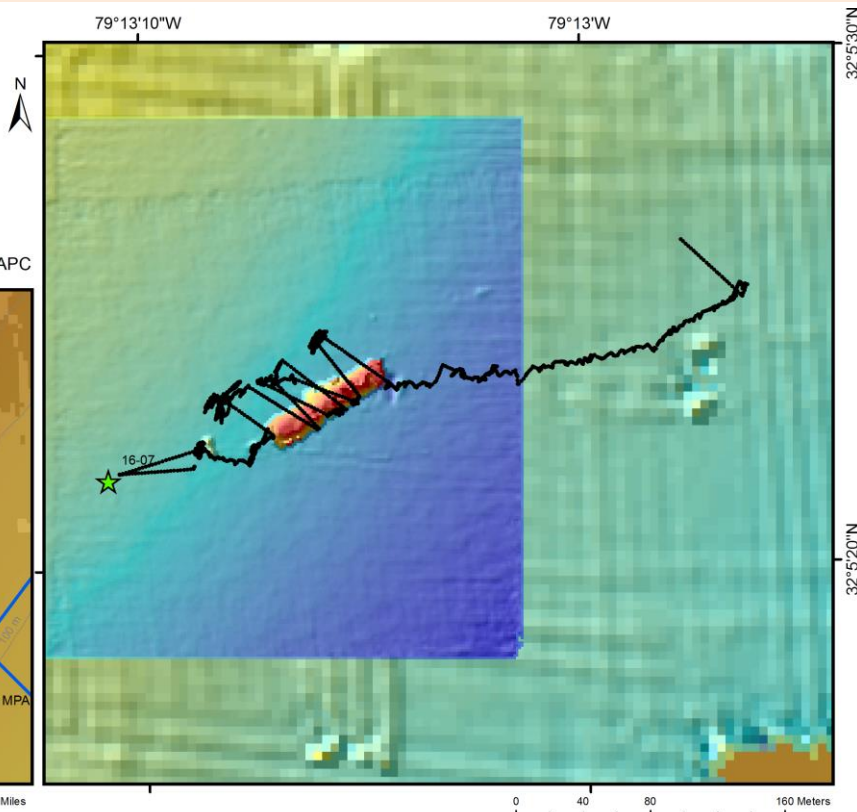
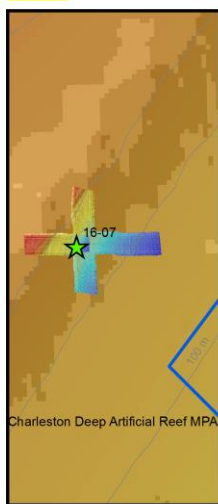
<i>Pareques umbrosus</i>	cubbyu	9.08
<i>Pomacanthus paru</i>	french angelfish	0.25
<i>Pomacanthus</i> sp.	angelfish	0.25
<i>Priacanthus arenatus</i>	bigeye	2.70
<i>Prognathodes aya</i>	bank butterflyfish	2.21
<i>Pseudupeneus maculatus</i>	spotted goatfish	1.47
<i>Pterois volitans</i>	lionfish	6.38
<i>Rhomboplites aurorubens</i>	vermillion snapper	13.00
<i>Rypticus saponaceus</i>	greater soapfish	0.98
<i>Rypticus</i> sp.	soapfish	0.25
Scorpaenidae	scorpionfish	0.74
<i>Seriola dumerili</i>	greater amberjack	0.25
<i>Seriola rivoliana</i>	almaco jack	0.74
Serranidae	sea bass	0.25
<i>Serranus annularis</i>	orangeback bass	1.23
<i>Serranus baldwini</i>	lantern bass	2.21
<i>Serranus phoebe</i>	tattler	2.94
<i>Sparisoma atomarium</i>	greenblotch parrotfish	3.43
<i>Sparisoma aurofrenatum</i>	redband parrotfish	0.25
<i>Stegastes partitus</i>	bicolor damselfish	1.47
<i>Synodus intermedius</i>	sand diver	0.25
<i>Synodus</i> sp.	lizardfish	0.25
<i>Synodus synodus</i>	red lizardfish	0.25
unknown	snapper/porgy	0.49
unknown	unknown	138.83

**Dive Site:** ROV 16-07, UNCW Dive 338; S. Carolina, Deep Artificial Reef MPA, Barge 1

### General Location and Dive Track:

#### ROV 16-07; S. Carolina, Deep Artificial Reef MPA, Barge 1; 13-VI-16-1

- ★ 16-07
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



#### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andrew W. David, John Reed,  
Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

#### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Pisces\_2016\_Southern\_Barge

**Purpose:** Survey and monitor Shelf-Edge  
MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/13/2016

**Specimens:** 0

**Digital Photos:** 174

**DVD:** 2

**Hard Drive:** 1

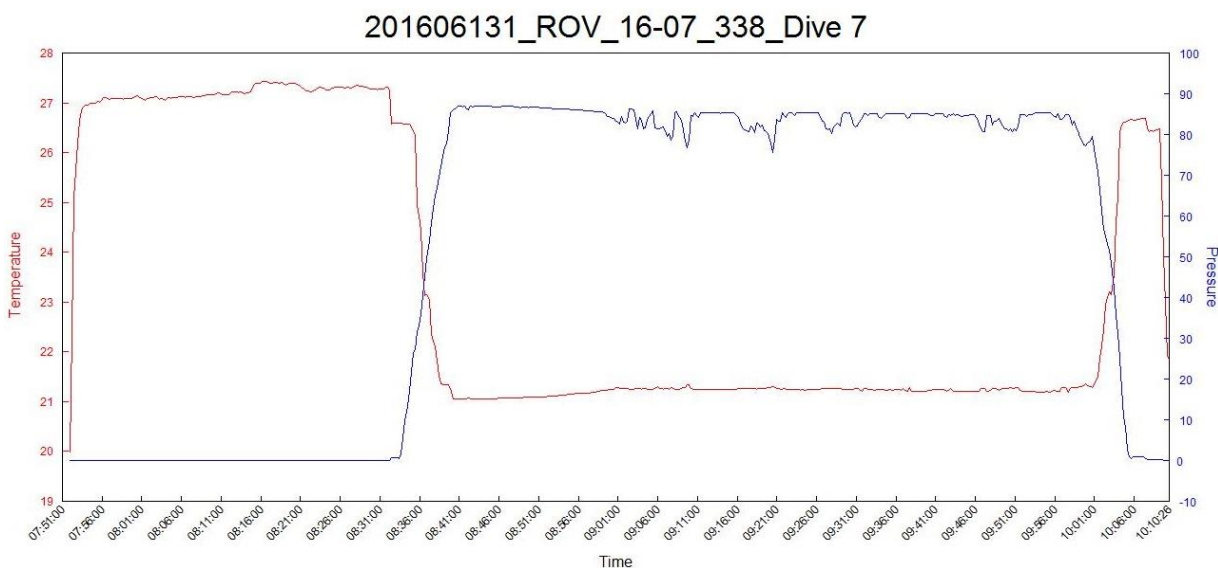
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-07, UNCW Dive 338; S. Carolina, Deep Artificial Reef MPA, Barge 1

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	76	<b>Total Transect Length (km):</b>	0.660
<b>Maximum Bottom Depth (m):</b>	88	<b>Surface Current (kn):</b>	N/A
<b>On Bottom (Time- EDST):</b>	8:39	<b>On Bottom (Lat/Long):</b>	32.09°N; -79.22°W
<b>Off Bottom (Time- EDST):</b>	9:51	<b>Off Bottom (Lat/Long):</b>	32.09°N; -79.22°W
<b>Physical (bottom); Temp (°C):</b>	21.2	<b>Salinity:</b>	<b>Visibility (m):</b> 5 <b>Current (kn):</b> 0

**Physical Environment:**



Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-07 are as follows: Depth Maximum: 86.9 m, Temperature: 21.1-21.3 °C.



**Dive Site:** ROV 16-07, UNCW Dive 338; S. Carolina, Deep Artificial Reef MPA, Barge 1

**Dive Imagery:**



**Figure 1:** Depth: -83.2 m  
Lionfish have found their way to the newly settled artificial reef barge deployed in April 2014.



**Figure 2:** Depth: -85.5 m  
Yellow edge grouper on artificial reef barge.



**Figure 3:** Depth: -82.2 m  
Artificial reef barge with scamp grouper.



**Figure 4:** Depth: -78.4 m  
In addition to the barge the artificial reef includes a pile of containers.

**Dive Site:** ROV 16-07, UNCW Dive 338; S. Carolina, Deep Artificial Reef MPA, Barge 1

## **Dive Notes:**

### **Objectives, Site Description, Habitat, Fauna:**

#### Site/Objectives:

Site #- 13-VI-16-1; ROV 16-07, UNCW Dive 338; S. Carolina, Deep Artificial Reef MPA, Barge 1, 85 m.

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

#### ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect along south side of barge, from SE corner to SW corner, then about 50 m to loose container on bottom. Good station keeping. XS Photos haphazard when looking horizontal at vertical structure. Rest non-XS photos.

#### Site Description/Habitat

Depth range: 85.5 to 88 m

Wind 12 from NW, seas 2-4', ship drift test- 1.5 m to East.

MB- Shows Barge 1 laying NE to SW, with 2 containers loose on bottom to the west. Surrounded by flat featureless bottom.

8:31- Launch

8:39- On bottom, 180 m West of barge; 88 m depth, flat sand/shell hash. Few sea pens, hermit crabs, arrow crab, Stichopathes.

Transected along south side of barge and top for SE end to SW end. Sides vertical metal, about 5 m tall, covered nearly 100% w small dead bivalve shells (oysters?), *Arbacia punctulata* common. Fairly barren on top. AJ common, quite a few scamp, lionfish common but not abundant. Base of south side - 85.5 m.

Then traveled W 50 m to loose container on bottom. Sides were missing sheet metal, just the vertical struts present, ends open; top with sheet metal. Fairly barren but some dead oyster (?) shells and *Arbacia*. AJ and few scamp and lionfish.

9:51- End dive.

#### *Dominant Benthic Macrobiota:*

Antipatharia- *Stichopathes*

Mollusca- dead oyster? Shells on side of barge

Echinoidea- *Arbacia punctulata* (dense), *Coelopleurus* (one)

**Dive Site:** ROV 16-07, UNCW Dive 338; S. Carolina, Deep Artificial Reef MPA, Barge 1

Pennatulacea- *Virgularia presbytes*

Decapoda- *Stenorhynchus seticornis*, Anomura

*Dominant Fish:*

Amberjack, almaco jack, scamp (common, not abundant), yellowedge grouper (one), cubbyu, red snapper (one), graysby, anthiids, lionfish (common, not abundant), bank seabass (1).

*Human Debris:*

fishing line- common

**Dive Site:** ROV 16-07, UNCW Dive 338; S. Carolina, Deep Artificial Reef MPA, Barge 1

**CPCe Percent Cover Analysis:**

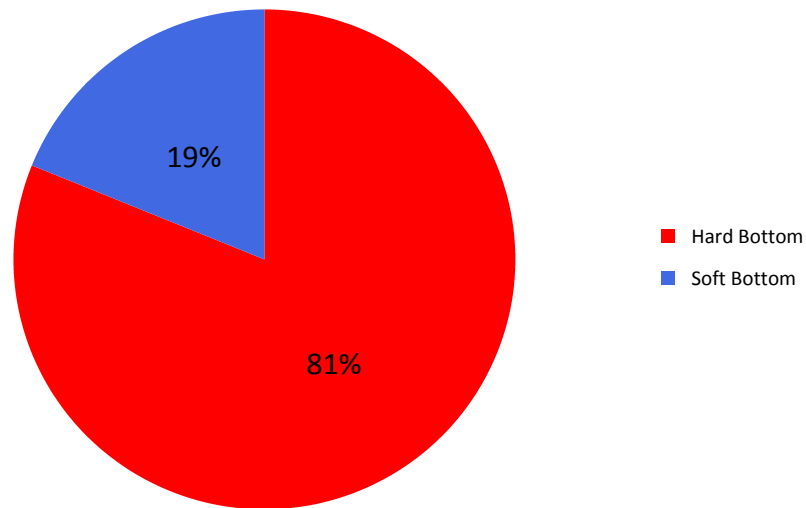
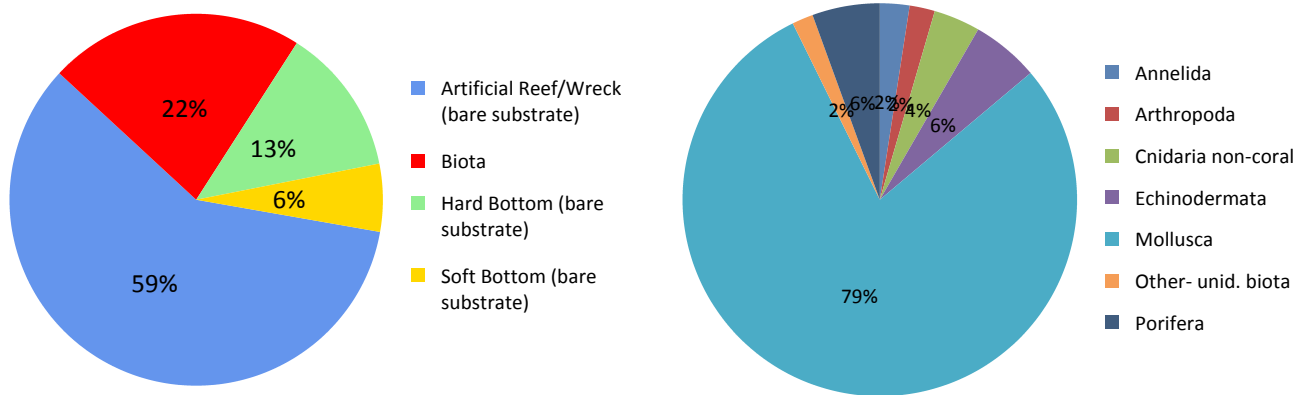


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-07. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-07.

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 16-07, UNCW Dive 338; S. Carolina, Deep Artificial Reef MPA, Barge 1

**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 16-07.

Group/Phylum/Taxonomic Name	16-07	
	CPCE	dive notes
Biota	22.16%	X
Porifera	1.23%	
Demospongiae	1.23%	
Cnidaria	0.84%	X
Hydroidolina	0.84%	
Pennatulacea		X
<i>Stichopathes lutkeni</i>		X
<i>Virgularia presbytes</i>		X
Annelida	0.54%	
<i>Hermodice carunculata</i>	0.15%	
Serpulidae	0.38%	
Bryozoa		X
Bryozoa		X
Arthropoda	0.46%	X
Anomura		X
Cirripedia	0.46%	
Scyllaridae		X
<i>Stenorhynchus seticornis</i>		X
Mollusca	17.48%	X
Bivalvia	17.48%	
Ostreidae		X
Echinodermata	1.23%	X
<i>Arbacia punctulata</i>	1.07%	X
<i>Coelopleurus floridanus</i>	0.15%	X
<i>Luidia sp.</i>		X
Chordata		X
Gnathostomata		X
UNKNOWN	0.38%	
Human Debris		X
Human debris		X
Human debris- fishing line		X
Bare Substrate	77.84%	
Habitat	77.84%	
Bare rubble/cobble	12.81%	
Bare soft bottom	5.90%	

**Dive Site:** ROV 16-07, UNCW Dive 338; S. Carolina, Deep Artificial Reef MPA, Barge 1

Artificial Reef/Wreck	59.13%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-07, UNCW Dive 338; S. Carolina, Deep Artificial Reef MPA, Barge 1

**Density of Fish:**

Fish Analysis not completed.

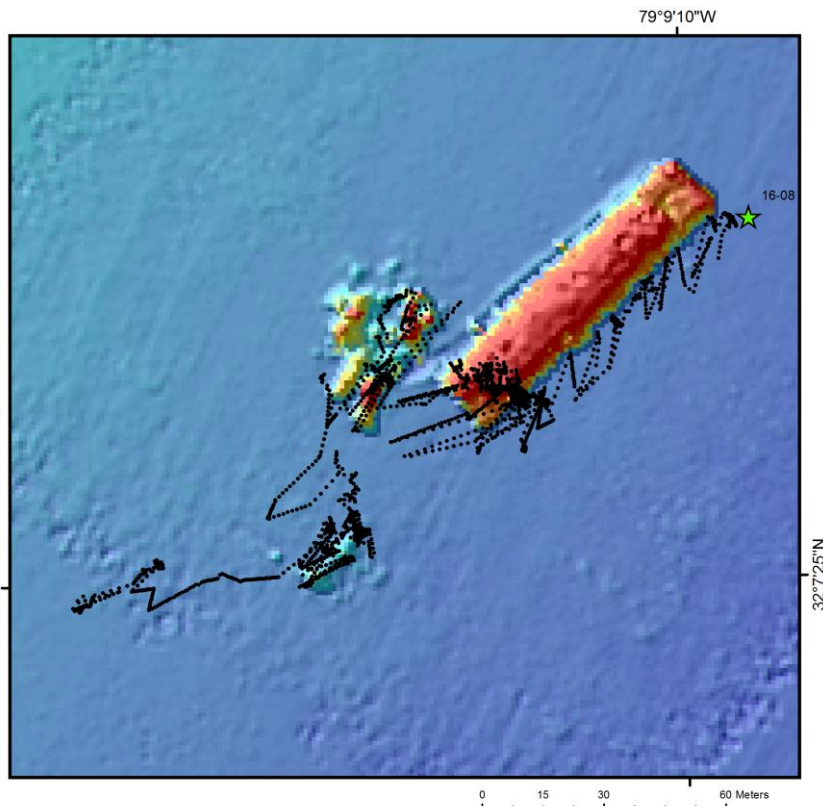
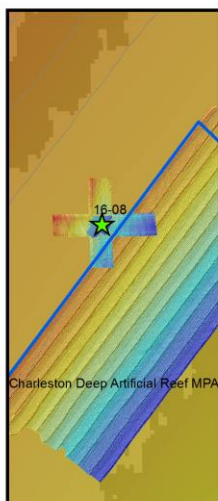
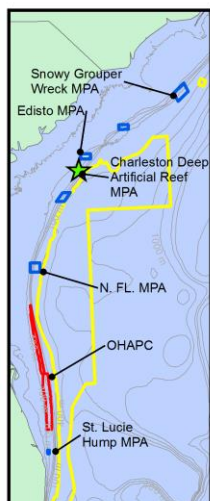


**Dive Site:** ROV 16-08, UNCW Dive 339; S. Carolina, Deep Artificial Reef MPA, Barge 2

### General Location and Dive Track:

#### ROV 16-08; S. Carolina, Deep Artificial Reef MPA, Barge 2; 13-VI-16-2

- ★ 16-08
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



#### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andrew W. David, John Reed,  
Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

#### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Pisces\_2016\_Northern\_Barge

**Purpose:** Survey and monitor Shelf-Edge  
MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/13/2016

**Specimens:** 0

**Digital Photos:** 213

**DVD:** 3

**Hard Drive:** 1

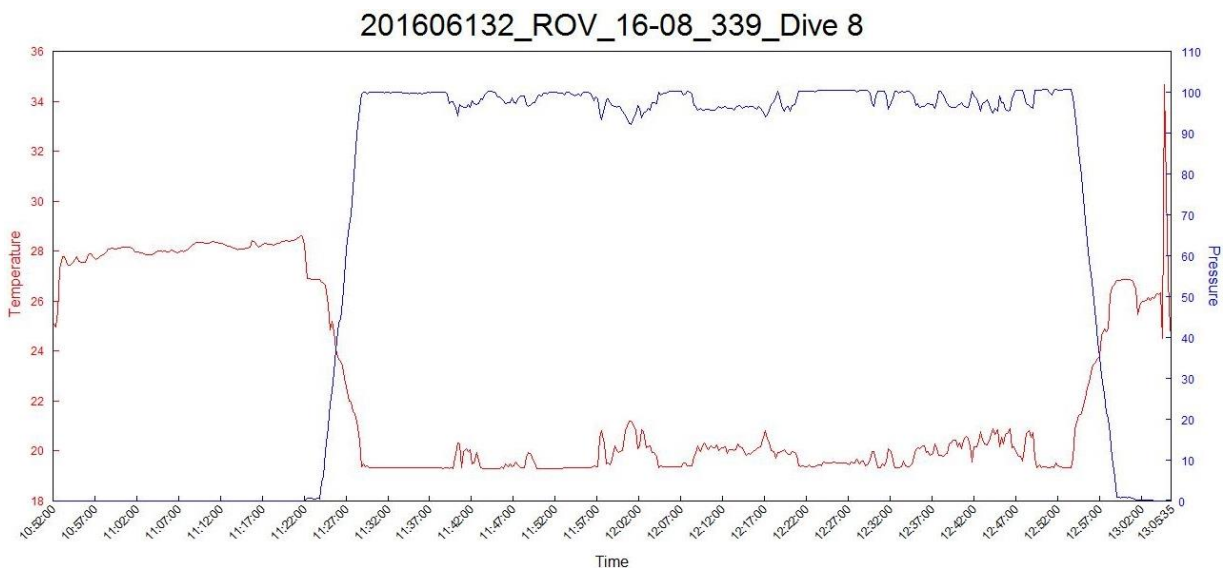
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-08, UNCW Dive 339; S. Carolina, Deep Artificial Reef MPA, Barge 2

**Dive Data:**

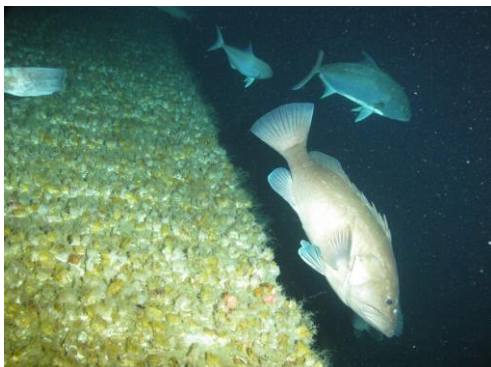
<b>Minimum Bottom Depth (m):</b>	91	<b>Total Transect Length (km):</b>	0.420
<b>Maximum Bottom Depth (m):</b>	101	<b>Surface Current (kn):</b>	0.7
<b>On Bottom (Time- EDST):</b>	11:28	<b>On Bottom (Lat/Long):</b>	32.12°N; -79.15°W
<b>Off Bottom (Time- EDST):</b>	12:44	<b>Off Bottom (Lat/Long):</b>	32.13°N; -79.15°W
<b>Physical (bottom); Temp (°C):</b>	19.3	<b>Salinity:</b>	<b>Visibility (m):</b> 10 <b>Current (kn):</b> 0.75

**Physical Environment:**



Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-08 are as follows: Depth Maximum: 100.5 m, Temperature: 19.3-21.5 °C.

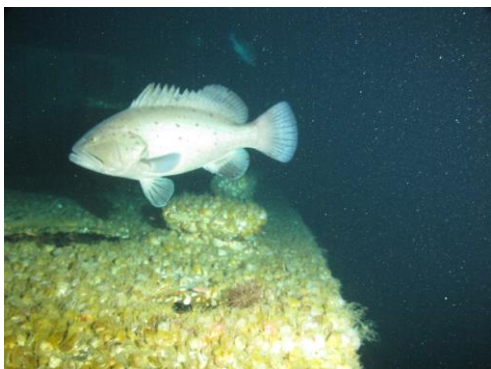
**Dive Imagery:**



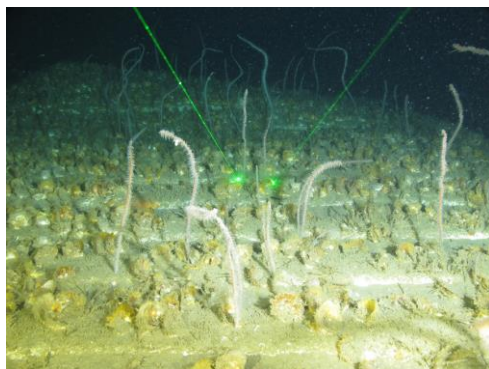
**Figure 1:** Depth: -97.6 m  
Schools of amberjack and snowy grouper are common on the barge.



**Figure 2:** Depth: -96 m  
Snowy grouper takes refuge in the crannies of the barge.



**Figure 3:** Depth: -96.9 m  
Warsaw grouper are also present on the barge.



**Figure 4:** Depth: -99.4 m  
Wire coral (*Stichopathes lutkeni*) have settled and grown up to 30 cm since the barge was deployed in April 2014.



**Figure 5:** Depth: -98.2 m  
Snowy grouper on artificial reef barge.



**Figure 6:** Depth: -100.6 m  
Snowy grouper at the base of the artificial reef barge.



**Dive Site:** ROV 16-08, UNCW Dive 339; S. Carolina, Deep Artificial Reef MPA, Barge 2

## **Dive Notes:**

### **Objectives, Site Description, Habitat, Fauna:**

#### Site/Objectives:

Site #- 13-VI-16-2; ROV 16-08, UNCW Dive 339; S. Carolina, Deep Artificial Reef MPA, Barge 2, 100 m.

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

#### ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect starting at debris field of ~12 containers at SW end of barge, then along south side of barge from SW to NE. Good station keeping. XS Photos haphazard when looking horizontal at vertical structure. Rest non-XS photos.

#### Site Description/Habitat

Depth range: 100 to 101 m

Wind 15 from NE, seas 2-3', ship drift test- 0.3 m to NE.

MB- Shows Barge 2 laying NE to SW, with 1 container loose on bottom to the west about 50 m west of barge, and a large debris field of ~12 containers at SW end of barge. Transect along south side and top of barge from SW end to NE end.

11:21- Launch

11:28- On bottom, 101 m, 50 m west of barge, flat muddy sand. Bottom current ~1/2 kn from NW.

11:34- At single container, 50 west of barge, 100.5 m. Container fairly barren, small encrusts, oysters. Population of Stichopathes wire coral on top; photos with laser to measure growth rate (~30 cm tall; barge 2 years old). Lots of fish- 2-3 warsaw (50+ cm), 1 juv warsaw, lionfish, 1 red snapper, almaco jack, AJ, 4 snowy, black bar drum.

11:51- Debris field NW end of barge, jumble of maybe 6-12 containers. Sides covered with large vertical oysters (live), large spider crab. Large school AJ, warsaw, lionfish (some, not abundant), few scamp, few snowy. Top of containers 91 m; sand base, 100 m.

12:03- SW end of barge, 100 m at base, 96 m at top. 100% cover on side of small shells, possibly barnacle, small oysters. Few Stichopathes. Not the large oysters like on Container. Dense fish- dense schools of AJ in water column, numerous snowy, some 50+ cm; some scamp, 1 large gray head; several warsaw, one measured 50+ cm; lionfish present but not abundant; yellowedge grouper (2), small misty grouper (1), black

**Dive Site:** ROV 16-08, UNCW Dive 339; S. Carolina, Deep Artificial Reef MPA, Barge 2

bar drum, black seabass (1), AJ schools, graysby.

12:37- Transect along south side and top of barge from SW end to NE end. Base 100 m, top main deck- 96 m. Grey head scamp, lots snowy, AJ schools.

12:44- End dive.

Barge 2 was only 20 m deeper than Barge 1, but had many more snowy grouper, and warsaw. Also had no fishing line and much more fish. Is this site not on website?

*Dominant Benthic Macrobiota:*

Antipatharia- *Stichopathes*

Hydroida

Mollusca- oysters, on side and top of barge and containers

Echinoidea- *Arbacia punctulata* (few)

Decapoda- *Anomura*, *Mithrax*

Annelida- *Hermodice* bristle worm

*Dominant Fish:*

Amberjack (large schools), almaco jack, scamp (common, not abundant), yellowedge grouper (2), black bar drum, red snapper (one), graysby, anthiids, lionfish (common, not abundant), bank seabass, warsaw several, snowy grouper- very common, some 50 cm, misty (1).

*Human Debris:*

fishing line- none.

**Dive Site:** ROV 16-08, UNCW Dive 339; S. Carolina, Deep Artificial Reef MPA, Barge 2

**CPCe Percent Cover Analysis:**

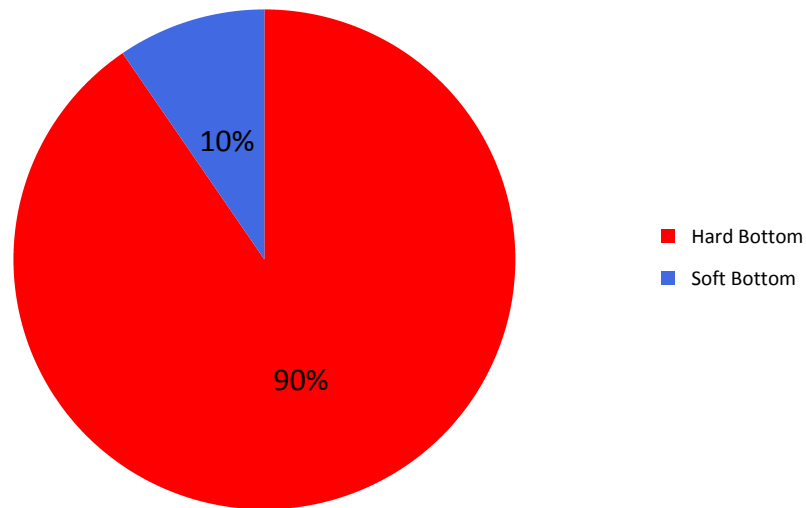
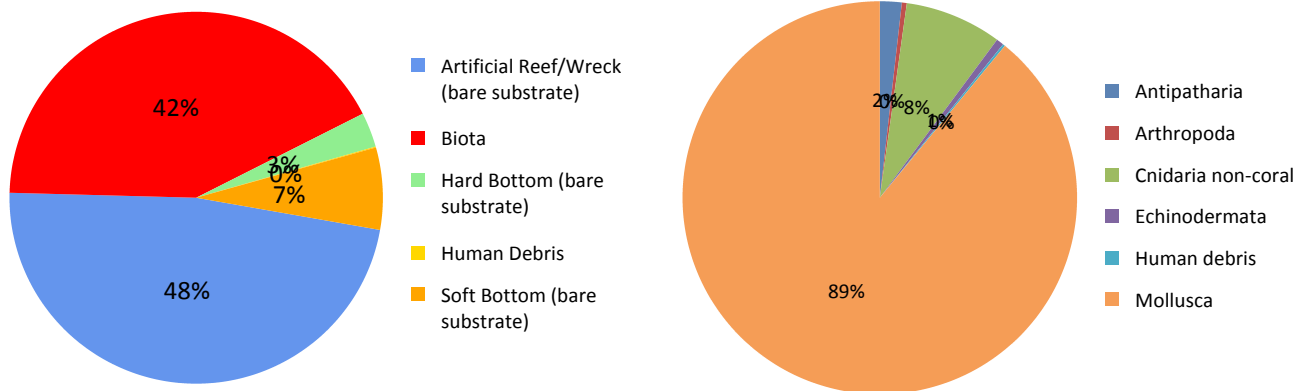


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-08. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-08.

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 16-08, UNCW Dive 339; S. Carolina, Deep Artificial Reef MPA, Barge 2

**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 16-08.

Group/Phylum/Taxonomic Name	16-08	
	CPCe	dive notes
Biota	42.11%	X
Ochrophyta		X
Cnidaria	4.11%	X
Actiniaria	2.77%	
<i>Ellisella sp.</i>		X
Hydroidolina	0.59%	X
<i>Stichopathes lutkeni</i>	0.76%	X
Annelida		X
<i>Hermodice carunculata</i>		X
Arthropoda	0.17%	X
Anomura		X
Decapoda		X
Majidae	0.08%	X
<i>Mithrax sp.</i>		X
<i>Parthenope sp.</i>	0.08%	
Mollusca	37.58%	X
Bivalvia	37.58%	X
Echinodermata	0.25%	X
<i>Arbacia punctulata</i>	0.25%	X
Chordata		X
Gnathostomata		X
Human Debris	0.08%	
Human debris	0.08%	
Human debris- fish line/gear	0.08%	
Bare Substrate	57.80%	
Habitat	57.80%	
Bare rubble/cobble	3.02%	
Bare soft bottom	7.13%	
Artificial Reef/Wreck	47.65%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>



**Dive Site:** ROV 16-08, UNCW Dive 339; S. Carolina, Deep Artificial Reef MPA, Barge 2

**Density of Fish:**

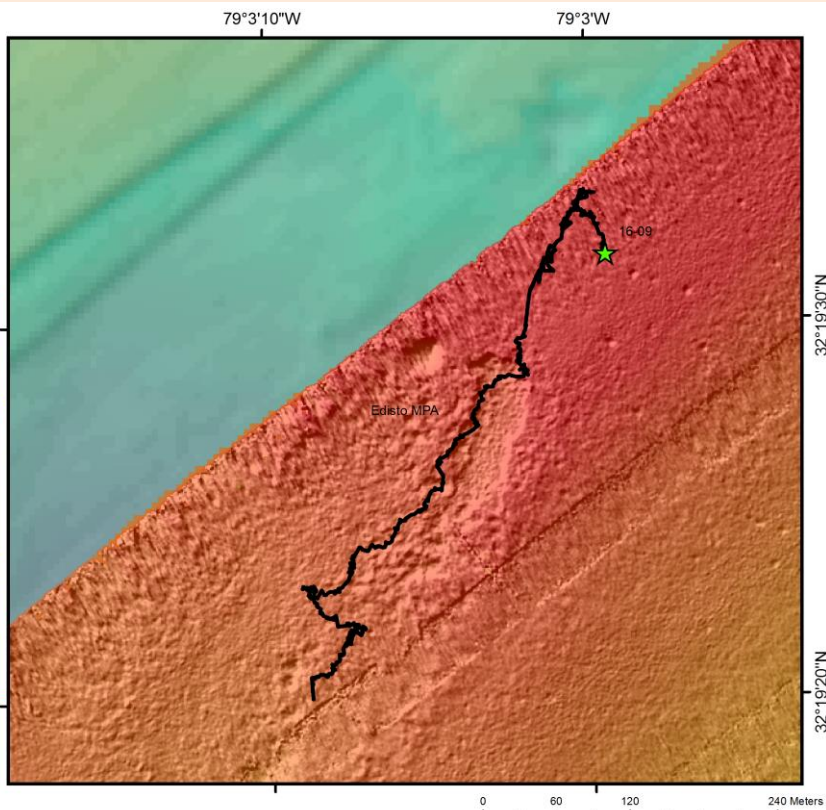
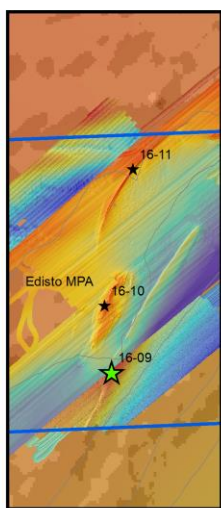
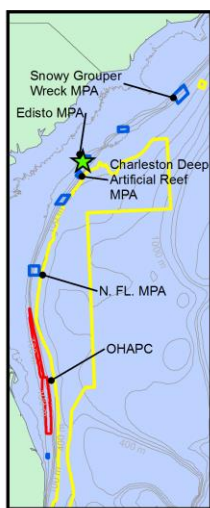
Fish Analysis not completed.

**Dive Site:** ROV 16-09, UNCW Dive 340; S. Carolina, Edisto MPA, 65 m

### General Location and Dive Track:

#### ROV 16-09; S. Carolina, Edisto MPA, 65 m; 13-VI-16-3

- ★ 16-09
  - ★ Mohawk ROV
  - ROV Dive Tracks
- MPA
  - OECA
  - OHAPC
  - Deep Coral HAPC



#### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andy David, John Reed, Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

#### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Pisces\_2012\_EdistoMPA\_MB\_Grid

**Purpose:** Survey and monitor Shelf-Edge MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/13/2016

**Specimens:** 0

**Digital Photos:** 103

**DVD:** 1

**Hard Drive:** 2

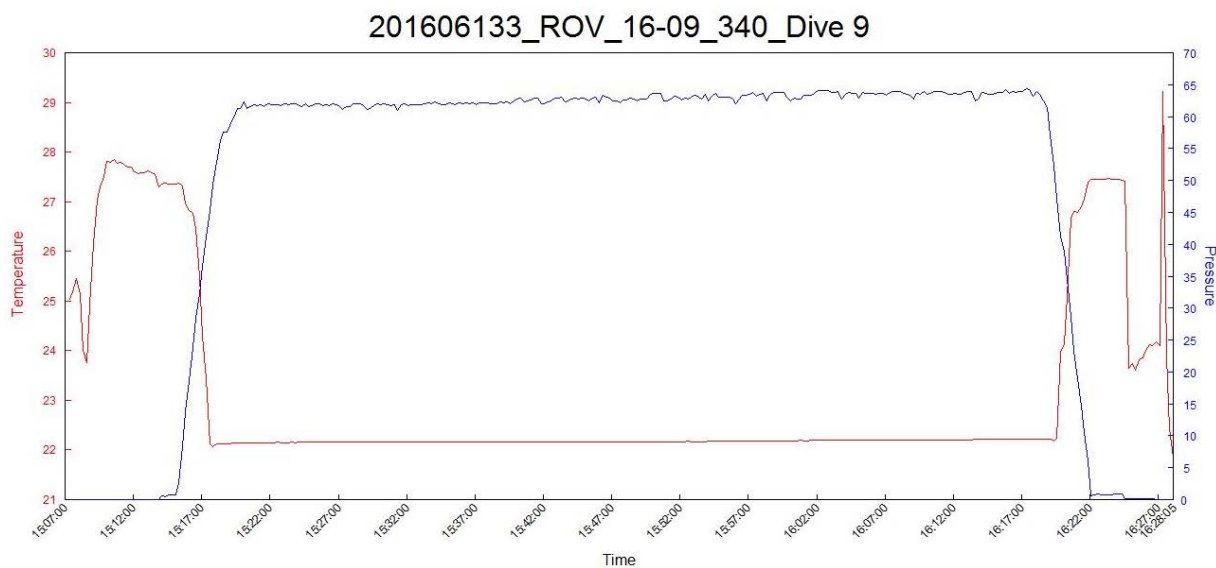
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-09, UNCW Dive 340; S. Carolina, Edisto MPA, 65 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	61	<b>Total Transect Length (km):</b>	0.550
<b>Maximum Bottom Depth (m):</b>	64	<b>Surface Current (kn):</b>	0.9
<b>On Bottom (Time- EDST):</b>	15:19	<b>On Bottom (Lat/Long):</b>	32.33°N; -79.05°W
<b>Off Bottom (Time- EDST):</b>	16:17	<b>Off Bottom (Lat/Long):</b>	32.32°N; -79.05°W
<b>Physical (bottom); Temp (°C):</b>	22.1	<b>Salinity:</b>	<b>Visibility (m):</b> 15 <b>Current (kn):</b> 0.25

**Physical Environment:**



Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-09 are as follows: Depth Maximum: 64.2 m, Temperature: 22.1-22.2 °C.

**Dive Site:** ROV 16-09, UNCW Dive 340; S. Carolina, Edisto MPA, 65 m

**Dive Imagery:**



**Figure 1:** Depth: -63.2 m

Spotted moray under ledge encrusted with various sponges (Axinellidae- red and yellow, Spirastrellidae- orange encrusting).



**Figure 2:** Depth: -63.3 m

Critically endangered species speckled hind hiding on the reef.



**Figure 3:** Depth: -63.5 m

Octocoral gorgonians (*Muricea* sp., *Diodogorgia* sp., and *Swiftia exserta*- orange) are common on the hard bottom pavement and boulders.



**Figure 4:** Depth: -63 m

School of red porgy on hard bottom reef.



**Figure 5:** Depth: -64 m

Short bigeye are common on the reefs.



**Figure 6:** Depth: -64.2 m

Rough-tail stingray browsing on critters in the sediment.



**Dive Site:** ROV 16-09, UNCW Dive 340; S. Carolina, Edisto MPA, 65 m

## **Dive Notes:**

### **Objectives, Site Description, Habitat, Fauna:**

#### Site/Objectives:

Site #- 13-VI-16-3; ROV 16-09, UNCW Dive 340; S. Carolina, Edisto MPA, 63-65 m.

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

#### ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect N-S along west slope of ridge, but difficult station keeping; unable to go south very well. Conducted normal photo XS at 2 minute intervals.

#### Site Description/Habitat

Depth range: 63-64.5 m

15 kn from NE, seas 3-4', drift 0.8.

MB- shows low broad ledge N-S, with steeper defined slope on west side. Transect N to S.

All low relief, no slope, low rugosity; rock pavement with sediment veneer, and areas of low relief (1'), flat rock slabs (1-2 m diam), but fairly dense biota dominated by dense *Ellisella*, *Stichopathes*, *Muricea*, *Diodorgorgia*, areas of common *Swiftia exerta*, *Filograna*, and diverse sponges- *Aiolochoirea*, *Aplysina*, *Spirastrellidae*. Areas with low ledges with abundant fish- *Calumnus* porgy, scamp, blue angelfish, Lionfish present (not abundant), red snapper.

15:13- Launch

15:18- On bottom, 63.5 m, current 1/4 kn fr NE, pavement with sediment veneer.

1617- End dive

#### Dominant Macrobiota:

Antipatharia- *Stichopathes*

Octocorallia- *Ellisella*, *Bebryce*, *Diodogorgia*, *Swiftia exerta* (orange and yellow morphs; common in one area), *Muricea*

Hydroida

Porifera- *Aiolochoirea*, Demo Starlet cake sponge, *Aplysina*, *Spirastrellidae*, *Xestospongia*, *Axinellidae*, *Cinachyra*; common and diverse

**Dive Site:** ROV 16-09, UNCW Dive 340; S. Carolina, Edisto MPA, 65 m

Annelida- *Filograna*

Bryozoa- *Shizoporella*

Holothuroidea- *Holothuria lentigenosa enodis*

Asteroidea- *Trigonaria*

Algae- CCA

*Dominant Fish:*

Calamus porgy, scamp, blue angelfish, lionfish (not common), spotfin butterfly, m red snapper (few), grey trigger, speckled hind (1), short bigeye, tatler, 2 m Dasyatis stingray.

*Human debris:*

1 beer can

**Dive Site:** ROV 16-09, UNCW Dive 340; S. Carolina, Edisto MPA, 65 m

**CPCe Percent Cover Analysis:**

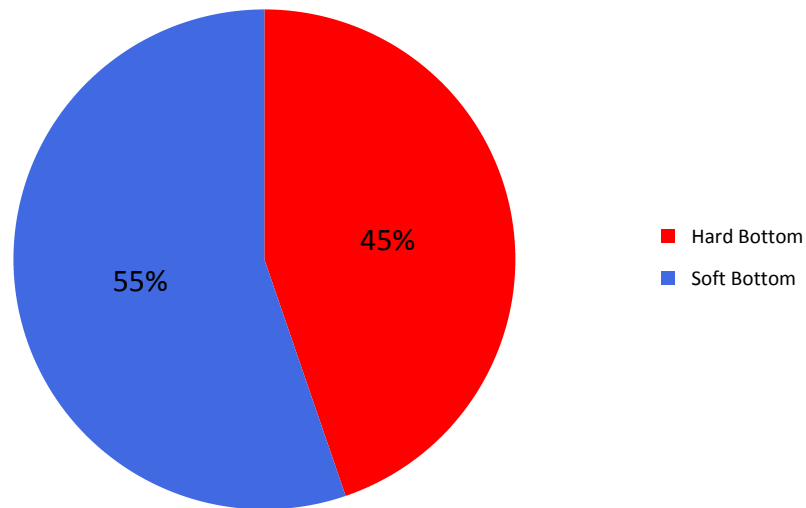
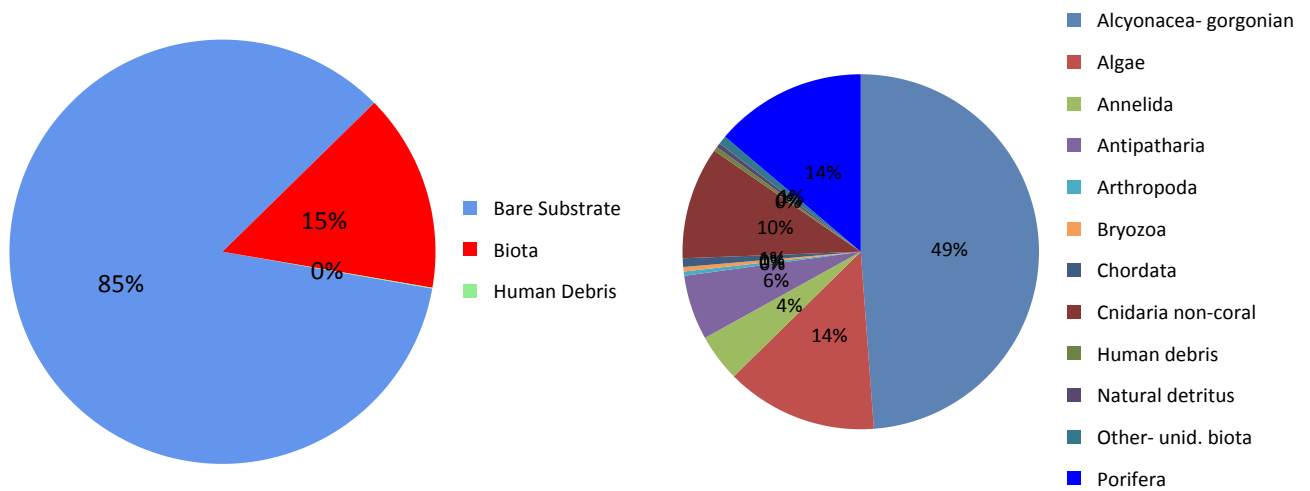


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-09. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-09.

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 16-09, UNCW Dive 340; S. Carolina, Edisto MPA, 65 m

**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 16-09.

Group/Phylum/Taxonomic Name	16-09	
	CPCe	dive notes
Biota	15.10%	X
Chlorophyta	0.18%	
Rhodophyta	1.91%	X
Crustose coralline	1.73%	X
Rhodophyta	0.18%	
Corallinales		X
Porifera	2.09%	X
<i>Aiolochoira crassa</i>		X
<i>Aplysina sp.</i>		X
Axinellidae		X
Cinachyra/Cinachyrella		X
Demospongiae	1.49%	X
Demospongiae- tan starlet thick encrusting	0.12%	X
<i>Hymeniacidon sp.</i>	0.12%	
<i>Ircinia campana</i>	0.06%	X
<i>Ircinia sp.</i>		X
Poecilosclerida	0.06%	
Spirastrellidae	0.24%	X
<i>Xestospongia sp.</i>		X
Cnidaria	9.84%	X
Alcyonacea- gorgonian	0.66%	
Antipatharia		X
<i>Antipathes furcata</i>	0.30%	X
<i>Bebryce sp.</i>		X
<i>Carijoa riisei</i>	0.06%	
<i>Diodogorgia sp.</i>	1.85%	X
<i>Ellisella sp.</i>	3.58%	X
Ellisellidae	0.30%	
Hydroidolina	1.55%	X
<i>Muricea sp.</i>	0.48%	X
Plexauridae		X
<i>Stichopathes lutkeni</i>	0.60%	X
<i>Swiftia exserta</i>	0.42%	X
<i>Titanideum frauenfeldii</i>	0.06%	

**Dive Site:** ROV 16-09, UNCW Dive 340; S. Carolina, Edisto MPA, 65 m

Annelida	0.66%	X
<i>Filograna sp.</i>	0.66%	X
Bryozoa	0.06%	X
<i>Schizoporella sp.</i>	0.06%	X
Arthropoda	0.06%	
<i>Stenorhynchus seticornis</i>	0.06%	
Echinodermata		X
<i>Holothuria lentiginosa enodis</i>		X
<i>Narcissia trigonaria</i>		X
Chordata	0.12%	X
Ascidacea	0.12%	
Gnathostomata		X
detritus	0.06%	
UNKNOWN	0.12%	
Human Debris	0.06%	X
Human debris	0.06%	X
Human debris- fish line/gear	0.06%	
Human debris- cans/bottles		X
Bare Substrate	84.84%	
Habitat	84.84%	
dead standing Oculina	0.18%	
Bare rock	17.18%	
Bare rubble/cobble	1.01%	
Bare soft bottom	66.47%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-09, UNCW Dive 340; S. Carolina, Edisto MPA, 65 m

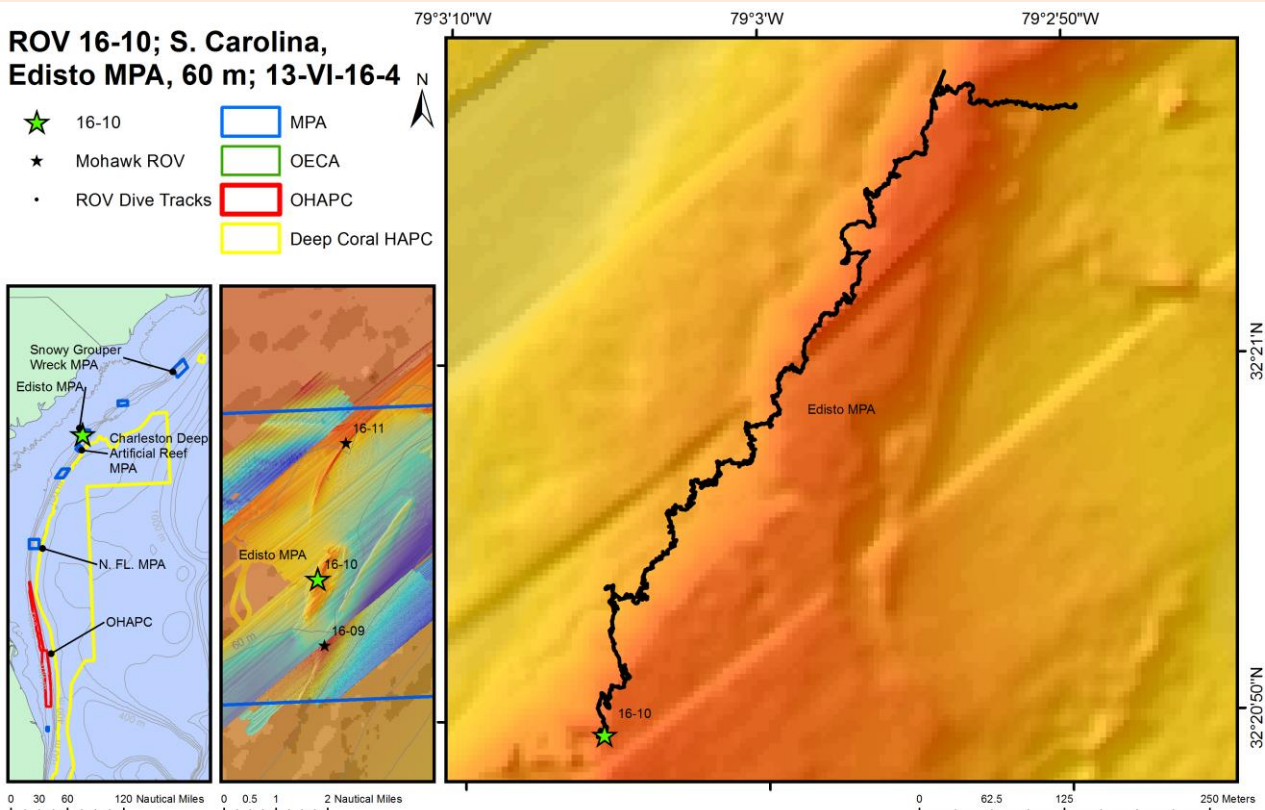
**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-09.

Class/Species	Common Name	2016-09
Actinopterygii		
<i>Balistes capriscus</i>	grey triggerfish	2.60
<i>Balistes</i> sp.	triggerfish	0.52
<i>Bodianus pulchellus</i>	spotfin hogfish	0.52
<i>Calamus</i> sp.	porgy	1.56
<i>Canthigaster</i> sp.	puffer	7.80
<i>Chaetodon sedentarius</i>	reef butterflyfish	7.28
<i>Chromis enchrysurus</i>	yellowtail reeffish	30.70
<i>Epinephelus adscensionis</i>	speckled hind	1.04
<i>Gymnothorax moringa</i>	spotted moray eel	0.52
<i>Halichoeres bathyphilus</i>	greenband wrasse	0.52
<i>Halichoeres</i> sp.	wrasse	22.37
<i>Holacanthus bermudensis</i>	blue angelfish	3.64
<i>Lactophrys</i> sp.	cowfish	1.56
<i>Liopropoma eukrines</i>	wrasse bass	2.08
<i>Lutjanus campechanus</i>	red snapper	1.56
<i>Mycteroperca phenax</i>	scamp	3.64
<i>Pagrus pagrus</i>	red porgy	15.09
<i>Pareques umbrosus</i>	cubbyu	6.24
<i>Pristigenys alta</i>	short bigeye	14.05
<i>Pseudupeneus maculatus</i>	spotted goatfish	0.52
<i>Pterois volitans</i>	lionfish	6.76
Scorpaenidae	scorpionfish	0.52
<i>Seriola rivoliana</i>	almaco jack	0.52
<i>Serranus phoebe</i>	tattler	31.74
unknown	unknown	3.12
Elasmobranchii		
<i>Dasyatis centroura</i>	rougtail stingray	0.52

**Dive Site:** ROV 16-10, UNCW Dive 341; S. Carolina, Edisto MPA, 60 m

### General Location and Dive Track:



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andy David, John Reed, Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Sedberry\_OEBlock345\_5m\_UTM  
17N\_MB\_Grid

**Purpose:** Survey and monitor Shelf-Edge  
MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/13/2016

**Specimens:** 0

**Digital Photos:** 172

**DVD:** 2

**Hard Drive:** 2

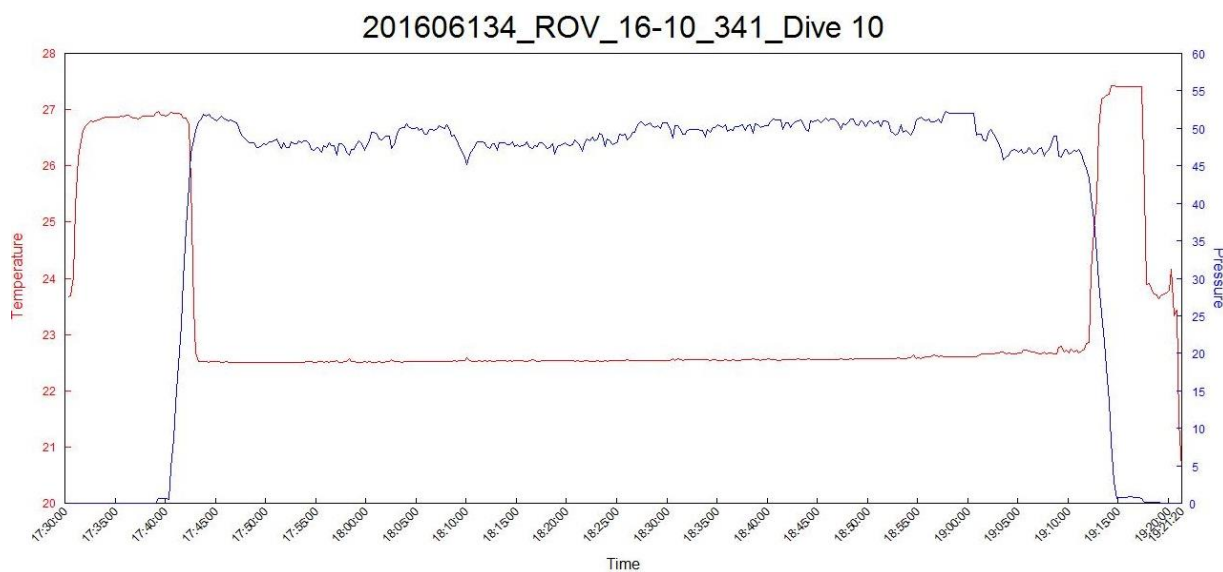
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-10, UNCW Dive 341; S. Carolina, Edisto MPA, 60 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	43	<b>Total Transect Length (km):</b>	0.810
<b>Maximum Bottom Depth (m):</b>	52	<b>Surface Current (kn):</b>	0.5
<b>On Bottom (Time- EDST):</b>	17:42	<b>On Bottom (Lat/Long):</b>	32.35°N; -79.03°W
<b>Off Bottom (Time- EDST):</b>	19:11	<b>Off Bottom (Lat/Long):</b>	32.35°N; -79.05°W
<b>Physical (bottom); Temp (°C):</b>	22.5	<b>Salinity:</b>	<b>Visibility (m):</b> 15 <b>Current (kn):</b> 0.5

**Physical Environment:**



Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-10 are as follows: Depth Maximum: 52.2 m, Temperature: 22.5-22.8 °C.

**Dive Site:** ROV 16-10, UNCW Dive 341; S. Carolina, Edisto MPA, 60 m

**Dive Imagery:**



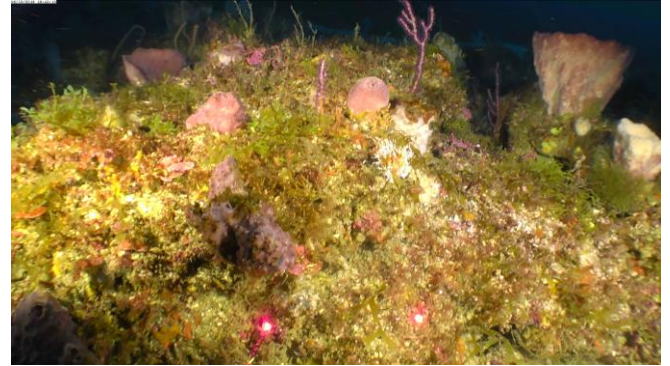
**Figure 1:** Depth: -52.4 m  
Gag grouper and scamp take shelter on rocky crevices of reef drop-off.



**Figure 2:** Depth: -52.4 m  
Scamp grouper on steep drop-off.



**Figure 3:** Depth: -46.5 m  
Dusky shark on steep drop-off.



**Figure 4:** Depth: -51.3 m  
Dense macrobiota covers much of the hard bottom, dominated by numerous species of demosponges, gorgonians (purple- *Diodogorgia* sp), and algae (*Dictyota* spp.).



**Dive Site:** ROV 16-10, UNCW Dive 341; S. Carolina, Edisto MPA, 60 m

## **Dive Notes:**

### **Objectives, Site Description, Habitat, Fauna:**

#### Site/Objectives:

Site #- Site #- 13-VI-16-4; ROV 16-10, UNCW Dive 341; S. Carolina, Edisto MPA, 48-52 m.

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

#### ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N or S, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect N-S along west slope of ridge. Conducted normal photo XS at 2 minute intervals.

#### Site Description/Habitat

Depth range: 48-52 m

MB- shows N-S oriented oval high relief ridge, 1.6 nmi long N-S, 0.4 m wide. Transect along west slope and top.

10 kn from E, 2-3' seas.

Top of ridge, 48-49 m, mostly flat pavement, low relief ledges, but 80-100% HB and 100% cover of dense macrobiota. West slope on first half of the dive was 10-30° slope, moderate relief 1-3 m, high rugosity. Base of west slope, 51-52 m, flattened out to low relief 1 m ledges, rock boulders, 80% hard bottom. Near the end of the dive was west slope with very rugged topography, 3-4 m relief, very eroded rock, undercut ledges 1-2 m deep, large 3-4 m outcrops. All regions with nearly 100% cover of dense biota: dominated by green Dictyota (appears as Chlorophyta from distance), dense and diverse sponges, gorgonians and black coral. Fish were very dense: huge schools of small fish in water column, tomtate, areas with numerous scamp grouper, couple gag, usual reef fish, grey snapper; 1 large great hammerhead (9'?), several other sharks unid., heavy body. Areas in high relief with dense Lionfish. Beautiful site. One of the best shelfedge MPA sites for diversity and density of all biota and fish.

17:38- Launch

17:42-On bottom, east side of ridge; 1/2 kn from W; 53 m; flat 80% HB, pavement, low relief rock mounds, dense macrobiota. Head W to transect line along W slope.

49.5 m- top of ridge; 100% HB, dense biota, pavement, <1 m relief ledges; Hd W.

49.5 m- top of west slope; west slope high rugosity, 1-3 m relief, 20° slope, mostly rock boulders, fractured slabs, undercut ledges. Very dense biota and schools of fish.



**Dive Site:** ROV 16-10, UNCW Dive 341; S. Carolina, Edisto MPA, 60 m

17:56- Large hammerhead (8-9').

51.1 m- base of slope; flat low relief ledges, 80% HB, still dense biota, 100% cover. Fewer fish on top and bottom where low rugosity. More shark sightings.

47.5 m- top of reef again; flat low relief.

Back on reef slope- very rugged, high relief, 3-4 m, large boulders 3-4 m; high rugosity; dense fish; dense lionfish.

19:10- End of dive.

*Dominant Benthic Macrobiota:*

Scleractinia- none

Gorgonacea- *Diodogorgia*, *Swiftia exerta*, *Ellisella*, *Bebryce*

Antipatharia- *Stichopathes lutkeni*, *Tanacetipathes*, *Antipathes atlantica* (common), *Antipathes furcata*

Hydroida

Annelida- *Filograna*

Decapoda- *Panularis argus* lobster

Porifera- dense and diverse; *Cinachyra*, *Callyspongia vaginalis*, *Spirastrellidae*, *Agelas clathrodes*, *Axinellidae*, *Ircinia campana* (abundant), *Xestospongia*,

Algae- *Dictyota* (abundant; green, appear as Chlorophyta); Rhodophyta (thin flat branched), CCA

*Dominant Fish:*

Tomtate, huge schools of small fish in water column, greater hammerhead (8-9'), unid sharks (several, heavy body), gag (few), scamp (common), grey head scamp, blue angelfish, soapfish, reef butterfly, spotfin butterfly, graysby, spanish hogfish, cornette fish, scorpionfish, rock beauty, baracuda, schools of AJ, patches with dense lionfish. 8 scamp at end.

*Human debirs:*

fishing line (not much)

**Dive Site:** ROV 16-10, UNCW Dive 341; S. Carolina, Edisto MPA, 60 m

**CPCe Percent Cover Analysis:**

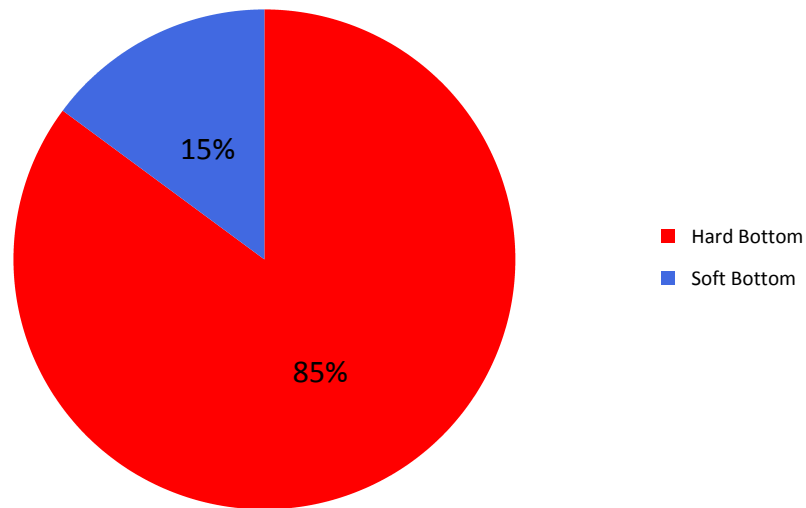


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-10. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

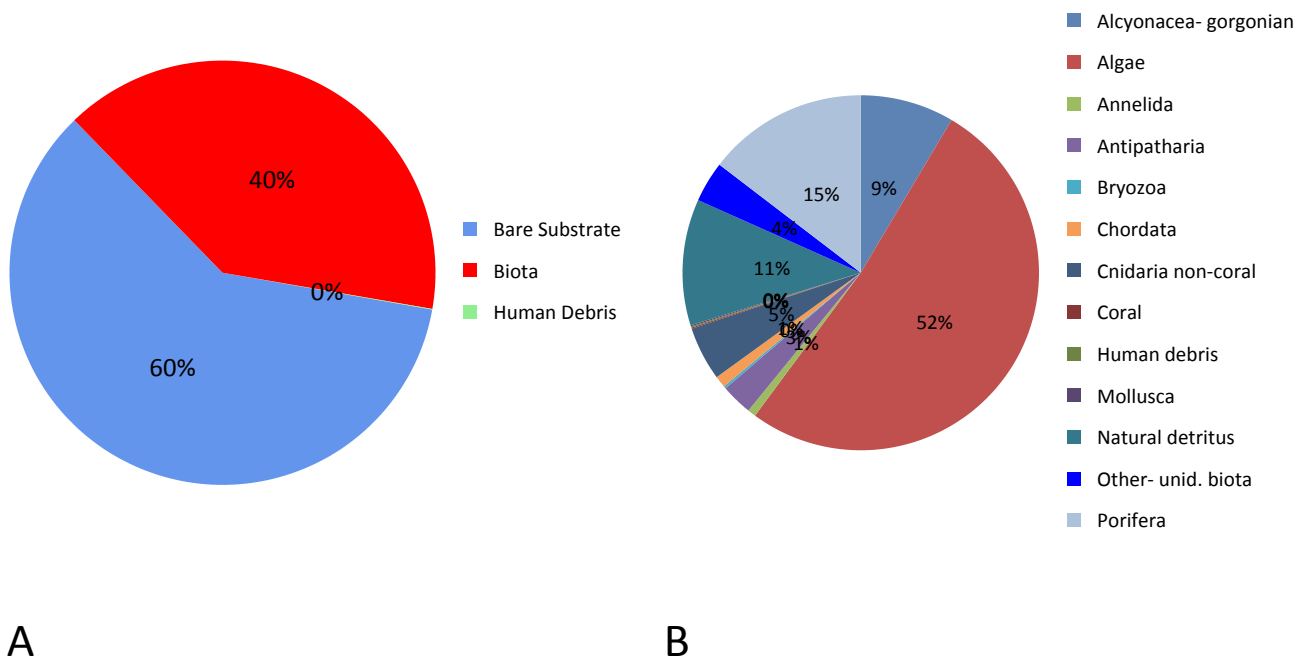


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-10.

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 16-10, UNCW Dive 341; S. Carolina, Edisto MPA, 60 m

**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 16-10.

Group/Phylum/Taxonomic Name	16-10 CPCe	dive notes
Biota	39.97%	X
Cyanobacteria	0.21%	
Chlorophyta		X
Ochrophyta	11.88%	X
<i>Dictyota sp.</i>	7.36%	X
Ochrophyta	4.51%	
Rhodophyta	8.56%	X
Crustose coralline	3.92%	X
Rhodophyta	4.64%	X
Porifera	5.83%	X
<i>Agelas clathrodes</i>		X
<i>Agelas sp.</i>	0.09%	X
<i>Aplysina sp.</i>	0.04%	
Axinellidae		X
<i>Callyspongia sp.</i>		X
<i>Callyspongia vaginalis</i>		X
Cinachyra/Cinachyrella		X
<i>Cliona sp.</i>	0.04%	
Demospongiae	3.11%	X
Demospongiae- tan starlet thick encrusting	0.21%	
<i>Ircinia campana</i>	1.02%	X
<i>Ircinia sp.</i>	0.64%	X
Poecilosclerida	0.04%	
Spirastrellidae	0.55%	X
<i>Xestospongia sp.</i>	0.09%	X
Cnidaria	6.56%	X
Alcyonacea- gorgonian	0.43%	X
Antipatharia	0.38%	
<i>Antipathes atlantica</i>	0.13%	X
<i>Antipathes furcata</i>	0.13%	X
<i>Bebryce sp.</i>		X
<i>Diodogorgia sp.</i>	1.66%	X
<i>Elatopathes abietina</i>	0.17%	
<i>Ellisella sp.</i>	0.43%	X

**Dive Site:** ROV 16-10, UNCW Dive 341; S. Carolina, Edisto MPA, 60 m

Ellisellidae	0.72%	
Hydroidolina	1.96%	X
<i>Muricea sp.</i>	0.17%	X
<i>Oculina varicosa</i>	0.04%	
<i>Stichopathes lutkeni</i>	0.30%	X
<i>Swiftia exserta</i>		X
<i>Tanacetipathes tanacetum</i>	0.04%	X
Annelida	0.30%	X
<i>Filograna sp.</i>	0.30%	X
Bryozoa	0.09%	
<i>Schizoporella sp.</i>	0.09%	
Arthropoda		X
<i>Panulirus argus</i>		X
Mollusca	0.04%	
Bivalvia	0.04%	
Chordata	0.43%	X
Ascidacea	0.17%	
Didemnidae	0.26%	X
Gnathostomata		X
detritus	4.60%	
UNKNOWN	1.49%	
Human Debris	0.04%	X
Human debris	0.04%	X
Human debris- fish line/gear	0.04%	X
Bare Substrate	59.98%	
Habitat	59.98%	
Bare rock	43.38%	
Bare rubble/cobble	2.13%	
Bare soft bottom	14.47%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-10, UNCW Dive 341; S. Carolina, Edisto MPA, 60 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-10.

Class/Species	Common Name	2016-10
Actinopterygii		
<i>Acanthurus sp.</i>	doctorfish	0.27
<i>Aulostomus maculatus</i>	trumpetfish	0.27
<i>Balistes sp.</i>	triggerfish	0.55
<i>Balistes vetula</i>	queen triggerfish	0.27
<i>Bodianus pulchellus</i>	spotfin hogfish	12.31
<i>Bodianus rufus</i>	spanish hogfish	1.37
<i>Calamus sp.</i>	porgy	1.09
<i>Canthigaster sp.</i>	puffer	23.52
Carangidae	jack	11.48
<i>Caranx bartholomaei</i>	yellow jack	2.19
<i>Caranx crysos</i>	blue runner	0.27
<i>Caranx lugubris</i>	black jack	0.55
<i>Caranx ruber</i>	bar jack	0.27
<i>Centropyge argi</i>	cherubfish	6.29
<i>Cephalopholis cruentatus</i>	graysby	1.09
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	4.10
<i>Chaetodon sedentarius</i>	reef butterflyfish	29.53
<i>Chromis enchrysurus</i>	yellowtail reeffish	1.09
<i>Chromis insolatus</i>	sunshinefish	13.40
<i>Chromis scotti</i>	purple reeffish	22.70
<i>Chromis sp.</i>	damsel fish	3.83
<i>Clepticus parrai</i>	creole wrasse	3.55
<i>Decapterus sp.</i>	scad	437.52
<i>Diplodus holbrooki</i>	spottail pinfish	0.27
<i>Fistularia tabacaria</i>	bluespotted cornetfish	0.82
<i>Haemulon aurolineatum</i>	tomtate	1665.03
<i>Haemulon striatum</i>	striped grunt	216.84
<i>Halichoeres garnoti</i>	yellowhead wrasse	7.38
<i>Halichoeres sp.</i>	wrasse	4.38
<i>Holacanthus bermudensis</i>	blue angelfish	13.40
<i>Holacanthus tricolor</i>	rock beauty	2.46
Holocentridae	squirrelfish	3.28
<i>Holocentrus adscensionis</i>	squirrelfish	14.77
<i>Liopropoma eukrines</i>	wrasse bass	1.64
<i>Lutjanus sp.</i>	snapper	0.27

**Dive Site:** ROV 16-10, UNCW Dive 341; S. Carolina, Edisto MPA, 60 m

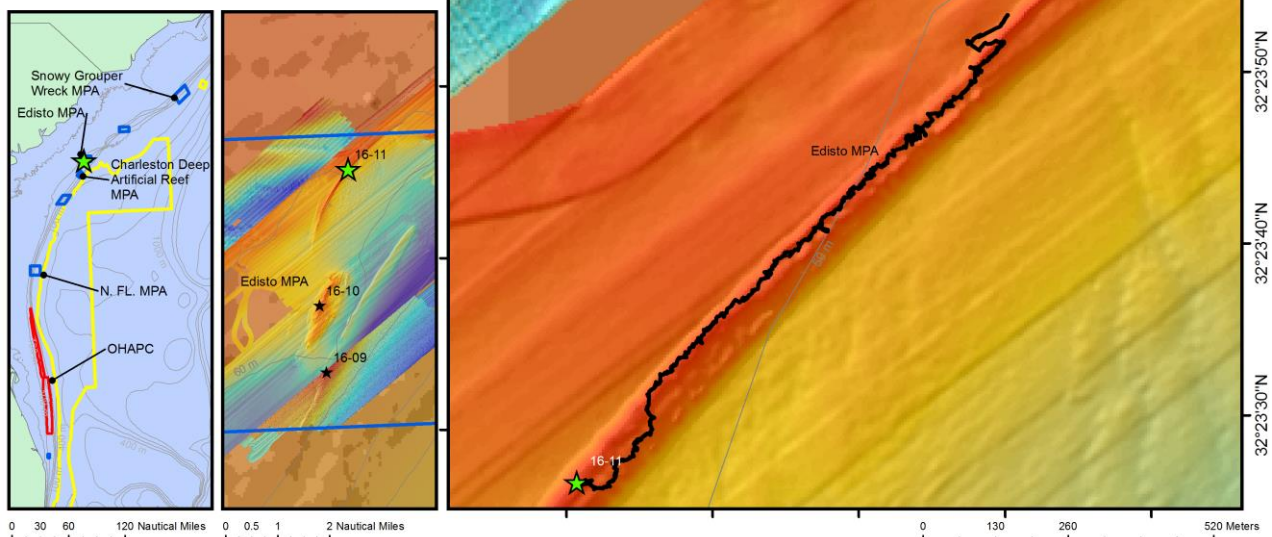
<i>Mulloidichthys martinicus</i>	yellow goatfish	2.19
Muraenidae	moray eel	0.55
<i>Mycteroperca microlepis</i>	gag grouper	1.09
<i>Mycteroperca phenax</i>	scamp	9.84
<i>Mycteroperca</i> sp.	grouper	0.27
<i>Myripristis jacobus</i>	blackbar soldierfish	0.82
<i>Pagrus pagrus</i>	red porgy	0.55
<i>Paranthias furcifer</i>	creolefish	2.19
<i>Pareques umbrosus</i>	cubbyu	5.47
<i>Plectrypops retrospinis</i>	cardinal soldierfish	0.55
<i>Pomacanthus paru</i>	french angelfish	0.55
<i>Priacanthus arenatus</i>	bigeye	0.82
<i>Pristigenys alta</i>	short bigeye	0.27
<i>Prognathodes aculeatus</i>	longsnout butterflyfish	1.09
<i>Prognathodes aya</i>	bank butterflyfish	1.91
<i>Pseudupeneus maculatus</i>	spotted goatfish	8.48
<i>Pterois volitans</i>	lionfish	78.21
<i>Rhomboplites aurorubens</i>	vermillion snapper	1044.03
<i>Rypticus saponaceus</i>	greater soapfish	0.27
Scorpaenidae	scorpionfish	1.64
<i>Seriola dumerili</i>	greater amberjack	0.27
<i>Seriola rivoliana</i>	almaco jack	11.76
<i>Serranus annularis</i>	orangeback bass	4.65
<i>Serranus baldwini</i>	lantern bass	0.27
<i>Serranus chionaraia</i>	snow bass	0.55
<i>Serranus phoebe</i>	tattler	0.55
<i>Serranus tigrinus</i>	harlequin bass	0.27
Sparidae	porgy	0.27
<i>Sparisoma atomarium</i>	greenblotch parrotfish	3.28
<i>Sphoeroides spengleri</i>	bandtail puffer	0.27
<i>Sphyraena barracuda</i>	barracuda	2.73
<i>Stegastes partitus</i>	bicolor damselfish	1.91
<i>Synodus</i> sp.	lizardfish	0.55
unknown	unknown	3.28
<b>Elasmobranchii</b>		
Carcharhinidae	shark	0.82
<i>Carcharhinus plumbeus</i>	sandbar shark	0.27

**Dive Site:** ROV 16-11, UNCW Dive 342; S. Carolina, Edisto MPA, 50 m

### General Location and Dive Track:

#### ROV 16-11; S. Carolina, Edisto MPA, 50 m; 14-VI-16-1

- ★ 16-11
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



#### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andy David, John Reed, Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

#### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Sedberry\_OEBlock345\_5m\_UTM  
17N\_MB\_Grid

**Purpose:** Survey and monitor Shelf-Edge  
MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/14/2016

**Specimens:** 0

**Digital Photos:** 245

**DVD:** 2

**Hard Drive:** 1

**Date Compiled:** 3/22/2017

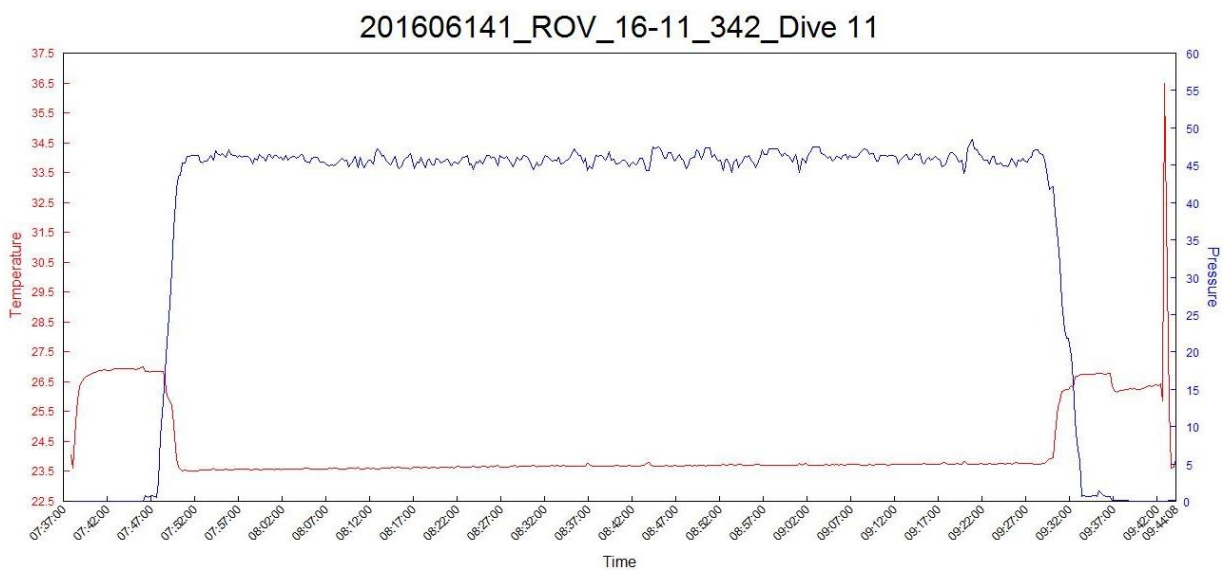


**Dive Site:** ROV 16-11, UNCW Dive 342; S. Carolina, Edisto MPA, 50 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	46	<b>Total Transect Length (km):</b>	1.310
<b>Maximum Bottom Depth (m):</b>	49	<b>Surface Current (kn):</b>	N/A
<b>On Bottom (Time- EDST):</b>	7:49	<b>On Bottom (Lat/Long):</b>	32.39°N; -79.04°W
<b>Off Bottom (Time- EDST):</b>	21:29	<b>Off Bottom (Lat/Long):</b>	32.4°N; -79.03°W
<b>Physical (bottom); Temp (°C):</b>	23.6	<b>Salinity:</b>	<b>Visibility (m):</b> 15 <b>Current (kn):</b> 0.25

**Physical Environment:**



Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-11 are as follows: Depth Maximum: 48.4 m, Temperature: 23.5-24 °C.

**Dive Site:** ROV 16-11, UNCW Dive 342; S. Carolina, Edisto MPA, 50 m

**Dive Imagery:**



**Figure 1:** Depth: -46.1 m

Graysby and squirrel fish along with various gorgonians (*Diodogorgia* sp.), and Axinellid sponges (yellow and orange).



**Figure 2:** Depth: -45.7 m

Unfortunately large populations of lionfish have taken residence on these deep reefs.



**Figure 3:** Depth: -46.1 m

Thickets of the orange gorgonian (*Swiftia exserta*) are abundant at this site.



**Figure 4:** Depth: -46.4 m

Large flute sponge (*Callyspongia vaginalis*) with lionfish.

**Dive Site:** ROV 16-11, UNCW Dive 342; S. Carolina, Edisto MPA, 50 m

## **Dive Notes:**

### **Objectives, Site Description, Habitat, Fauna:**

#### Site/Objectives:

Site #- 14-VI-16-1; ROV 16-11, UNCW Dive 342; S. Carolina, Edisto MPA, 46-49 m.

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

#### ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N or S, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect S to N along west slope of ridge. Conducted normal photo XS at 2 minute intervals. Excellent station keeping.

#### Site Description/Habitat

Depth range: 46.4 to 48.7 m

10 kn from SW, seas 2-3', sunny; bottom current 1/4 kn from N.

MB- Shows narrow crescent shaped ridge, oriented NE-SW. Transect mostly along west slope and west top of ridge. Completed entire transect, 1000 m.

East slope of ridge had pavement and 1-2 m ledges; appeared more distinct in MB; may have filled in.

Top of ridge, 46-47 m; mostly flat pavement, fractured rock, some low relief ledges < 1m, 100% HB; dense cover of biota.

West slope, 46 m top, 48.7 m base flat sand. West slope more abrupt and distinct than east slope. Mostly moderate relief (1-2, some 3 m) ledges, undercut 1-2 m, rock slabs broken from edge. Slope very narrow, 10 m wide, and sand at base. Same biota overall, dominated by gorgonians- *Diodorgorgia*, 1 m *Muricea*, *Ellisella*, *Swiftia exerta* (common); black coral- *Stichopathes*, some white fan *Antipathes*; Hydroids- abundant (4-6 spp common); sponges- *Ircinia campana*, *Xestospongia*, Spirastrellidae, Axinellidae, *Callyspongia vaginalis*.

Dense schools of fish in high rugose areas of wall- big schools of small fish (scad?), tomtate, scamp (common), several gag, lionfish- abundant.

Very nice site.

7:45- Launch

7:49- On bottom

9:27- End dive.

**Dive Site:** ROV 16-11, UNCW Dive 342; S. Carolina, Edisto MPA, 50 m

*Dominant Benthic Macrobiota:*

Scleractinia- none

Octocorallia- *Diodogorgia* (dense), *Muricea* (1-3; common), *Carijoa* (abundant), *Swiftia exerta* (common; counted every one with x-keyboard)

Hydroida- 4-6 spp abundant (see Moura's sp list)

Corallimorpharia

Antipatharia- *Stichopathes lutkeni*, *Antipathes* white fan (not atlantica)

Porifera- *Ircinia campana*, *Callyspongia vaginalis*, Axinellidae, *Xestospongia* (erect branching), *Niphates*, Spirastrellidae, Demo starlet; diverse spp.

Holothuroidea- chocolate chip

*Dominant Fish:*

Scamp (18), gag (6), Lionfish (338), cornette fish, tomtate (huge schools), Calamus porgy, reef butterfly, AJ, blue angelfish, short bigeye, baracuda, graysby, white grunt, french angelfish, goatfish, rock hind, sharpnose puffer. Several large clusters of lionfish found on west slope (mating?).

*Human debris:*

Anchor line?, no fishing gear

**Dive Site:** ROV 16-11, UNCW Dive 342; S. Carolina, Edisto MPA, 50 m

**CPCe Percent Cover Analysis:**

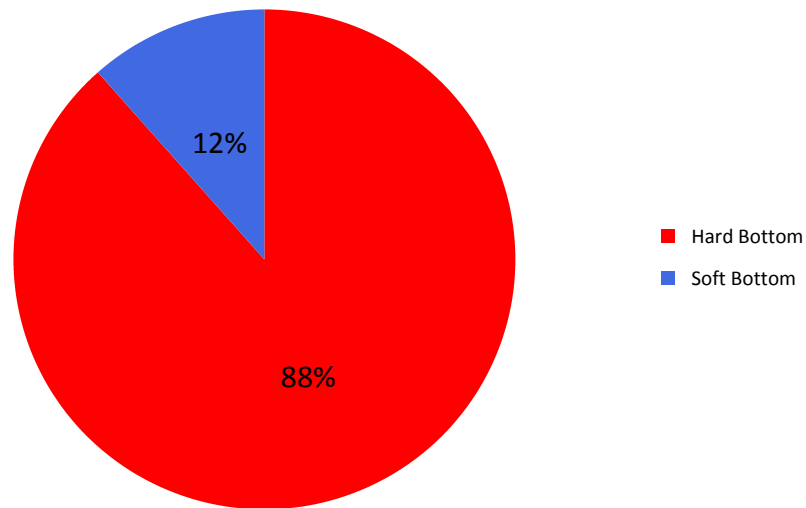
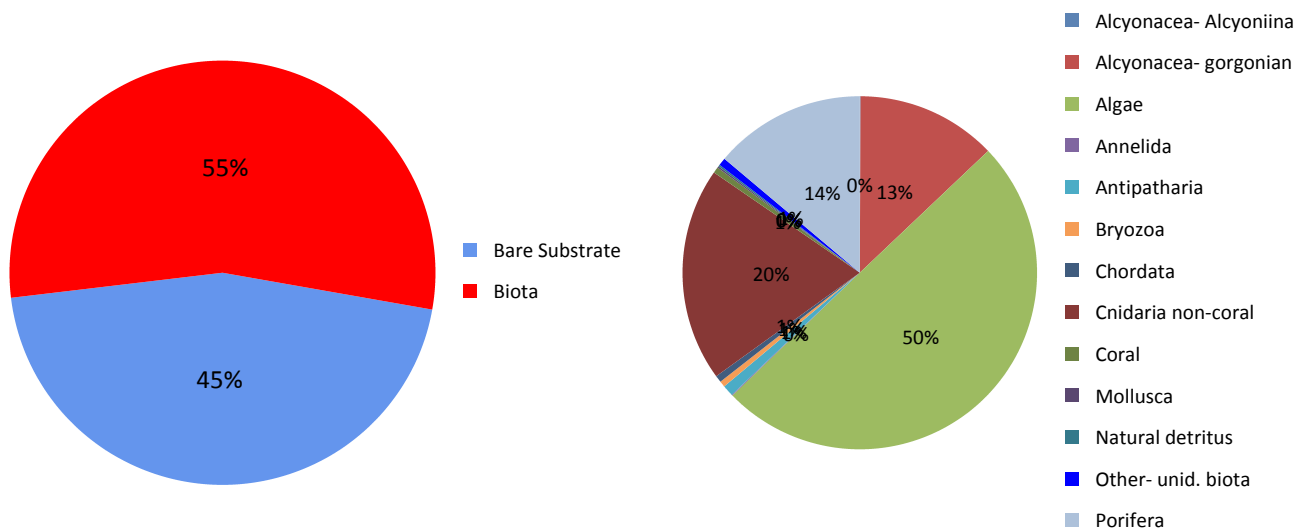


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-11. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-11.

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 16-11, UNCW Dive 342; S. Carolina, Edisto MPA, 50 m

**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 16-11.

Group/Phylum/Taxonomic Name	16-11	
	CPCe	dive notes
Biota	54.66%	X
Cyanobacteria	1.25%	
Chlorophyta	0.04%	
Ochrophyta	18.12%	X
<i>Dictyota sp.</i>	17.86%	X
Ochrophyta	0.26%	
Rhodophyta	7.86%	
Crustose coralline	2.28%	
Rhodophyta	5.58%	
Porifera	7.56%	X
<i>Aiolochoira crassa</i>	0.04%	
<i>Aplysina sp.</i>	0.17%	
Axinellidae		X
<i>Callyspongia sp.</i>		X
<i>Callyspongia vaginalis</i>	0.17%	X
<i>Clathria sp.</i>	0.04%	
Demospongiae	3.78%	X
Demospongiae- tan starlet thick encrusting	0.52%	X
<i>Geodia neptuni complex</i>	0.13%	
<i>Ircinia campana</i>	0.26%	
<i>Ircinia sp.</i>	0.60%	X
<i>Niphates sp.</i>		X
Poecilosclerida	0.09%	
Spirastrellidae	1.76%	X
<i>Xestospongia sp.</i>		X
Cnidaria	18.59%	X
Alcyonacea- gorgonian	0.09%	
Antipatharia	0.04%	X
<i>Antipathes atlantica</i>	0.13%	
<i>Antipathes furcata</i>	0.09%	
<i>Antipathes sp.</i>		X
<i>Carijoa riisei</i>	2.53%	X
Corallimorpharia		X
<i>Diodogorgia sp.</i>	3.78%	X

**Dive Site:** ROV 16-11, UNCW Dive 342; S. Carolina, Edisto MPA, 50 m

<i>Ellisella</i> sp.		X
Hydroidolina	10.69%	X
<i>Muricea</i> sp.		X
<i>Nicella</i> sp.	0.09%	
<i>Nidalia occidentalis</i>	0.04%	
<i>Phyllangia americana</i>	0.21%	
Scleractinia- unid cup	0.09%	
<i>Stichopathes lutkeni</i>	0.30%	X
<i>Swiftia exserta</i>	0.52%	X
Annelida	0.04%	
<i>Filograna</i> sp.	0.04%	
Bryozoa	0.30%	X
Bryozoa	0.09%	
<i>Schizoporella</i> sp.	0.21%	X
Mollusca	0.09%	
Bivalvia	0.04%	
Gastropoda	0.04%	
Echinodermata		X
Holothuroidea		X
Chordata	0.34%	X
Asciacea	0.09%	
Didemnidae	0.26%	X
Gnathostomata		X
detritus	0.09%	
UNKNOWN	0.39%	
Human Debris		X
Human debris		X
Human debris- anchor line		X
Bare Substrate	45.34%	
Habitat	45.34%	
Bare rock	27.26%	
Bare rubble- coral	0.17%	
Bare rubble/cobble	1.42%	
Bare soft bottom	16.49%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>



**Dive Site:** ROV 16-11, UNCW Dive 342; S. Carolina, Edisto MPA, 50 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-11.

Class/Species	Common Name	2016-11
<b>Actinopterygii</b>		
<i>Acanthurus</i> sp.	doctorfish	1.43
<i>Aulostomus maculatus</i>	trumpetfish	0.41
<i>Balistes</i> sp.	triggerfish	0.20
<i>Bodianus pulchellus</i>	spotfin hogfish	27.36
<i>Calamus</i> sp.	porgy	2.65
<i>Canthigaster</i> sp.	puffer	34.10
<i>Centropristis ocyurus</i>	bank sea bass	0.61
<i>Cephalopholis cruentatus</i>	graysby	4.90
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	4.70
<i>Chaetodon sedentarius</i>	reef butterflyfish	23.07
<i>Chromis enchrysurus</i>	yellowtail reeffish	10.00
<i>Chromis insolatus</i>	sunshinefish	10.00
<i>Chromis scotti</i>	purple reeffish	24.30
<i>Chromis</i> sp.	damsel fish	6.12
<i>Clepticus parrai</i>	creole wrasse	1.84
<i>Diplodus holbrooki</i>	spottail pinfish	9.19
<i>Epinephelus guttatus</i>	red hind	0.20
<i>Fistularia tabacaria</i>	bluespotted cornetfish	0.20
<i>Haemulon aurolineatum</i>	tomtate	1443.45
<i>Haemulon plumieri</i>	white grunt	0.41
<i>Haemulon</i> sp.	grunt	1014.70
<i>Haemulon striatum</i>	striped grunt	128.01
<i>Halichoeres garnoti</i>	yellowhead wrasse	6.74
<i>Halichoeres</i> sp.	wrasse	4.49
<i>Holacanthus bermudensis</i>	blue angelfish	18.99
<i>Holacanthus tricolor</i>	rock beauty	0.20
Holocentridae	soldierfish	0.20
Holocentridae	squirrelfish	0.20
<i>Holocentrus adscensionis</i>	squirrelfish	12.05
<i>Lactophrys</i> sp.	cowfish	0.41
<i>Liopropoma eukrines</i>	wrasse bass	0.41
<i>Lutjanus griseus</i>	grey snapper	0.41
<i>Mycteroperca microlepis</i>	gag grouper	1.43
<i>Mycteroperca phenax</i>	scamp	4.08
<i>Myripristis jacobus</i>	blackbar soldierfish	9.39

**Dive Site:** ROV 16-11, UNCW Dive 342; S. Carolina, Edisto MPA, 50 m

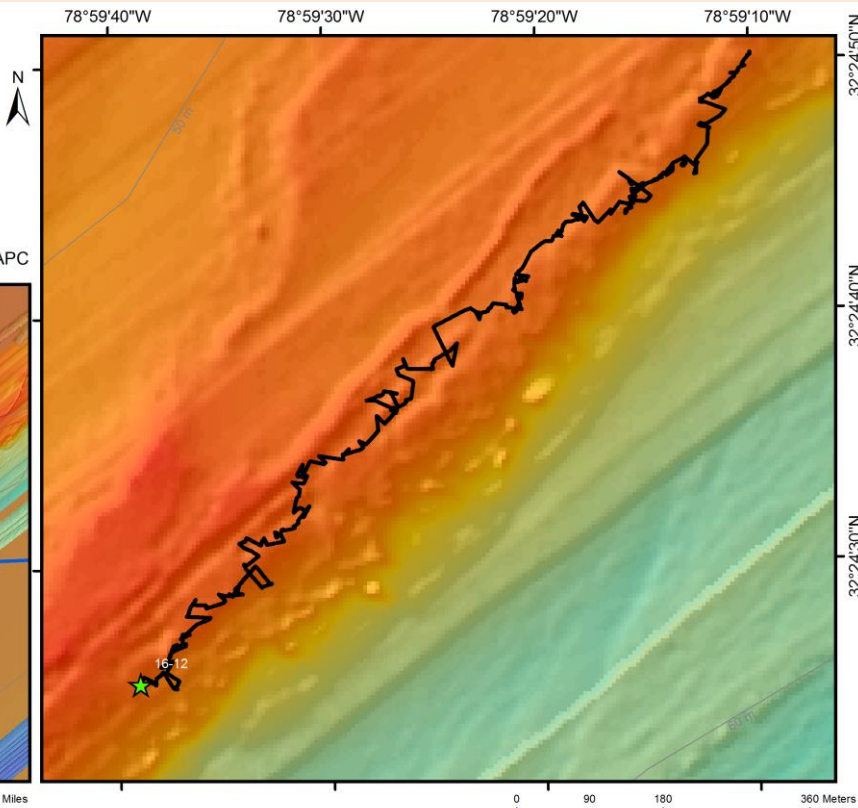
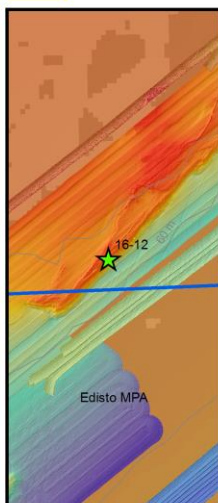
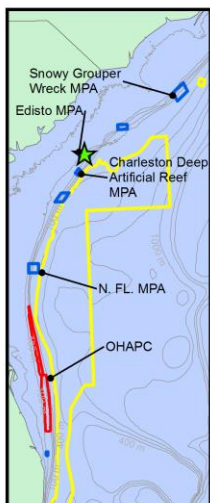
<i>Pagrus pagrus</i>	red porgy	0.41
<i>Paranthias furcifer</i>	creolefish	0.61
<i>Pareques umbrosus</i>	cubbyu	8.57
<i>Pomacanthus paru</i>	french angelfish	0.61
<i>Pomacanthus</i> sp.	angelfish	0.41
<i>Priacanthus arenatus</i>	bigeye	0.61
<i>Pristigenys alta</i>	short bigeye	5.51
<i>Prognathodes aya</i>	bank butterflyfish	1.63
<i>Pseudupeneus maculatus</i>	spotted goatfish	11.64
<i>Pterois volitans</i>	lionfish	92.08
<i>Rhomboplites aurorubens</i>	vermilion snapper	210.09
<i>Rypticus maculatus</i>	whitespotted soapfish	0.20
<i>Rypticus</i> sp.	soapfish	0.41
Scaridae	parrotfish	0.20
Scorpaenidae	scorpionfish	0.20
<i>Seriola dumerili</i>	greater amberjack	1.63
<i>Seriola rivoliana</i>	almaco jack	10.41
Serranidae	grouper	0.20
<i>Serranus annularis</i>	orangeback bass	0.20
<i>Serranus phoebe</i>	tattler	1.22
<i>Serranus</i> sp.	sea bass	0.82
<i>Serranus tigrinus</i>	harlequin bass	0.20
<i>Sparisoma atomarium</i>	greenblotch parrotfish	1.22
<i>Spheeroides spengleri</i>	bandtail puffer	1.43
<i>Sphyræna barracuda</i>	barracuda	0.41
<i>Stegastes partitus</i>	bicolor damselfish	1.22
<i>Thalassoma bifasciatum</i>	bluehead wrasse	0.20
unknown	unknown	2.86
Elasmobranchii		
<i>Dasyatis</i> sp.	stingray	0.20

**Dive Site:** ROV 16-12, UNCW Dive 343; S. Carolina, outside Edisto MPA, 50 m

### General Location and Dive Track:

#### ROV 16-12; S. Carolina, Outside Edisto MPA, 50 m; 14-VI-16-2

- ★ 16-12
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andrew W. David, John Reed,  
Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Sedberry\_OEBlock345\_5m\_UTM  
17N\_MB\_Grid

**Purpose:** Survey and monitor Shelf-Edge  
MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/14/2016

**Specimens:** 0

**Digital Photos:** 136

**DVD:** 2

**Hard Drive:** 1

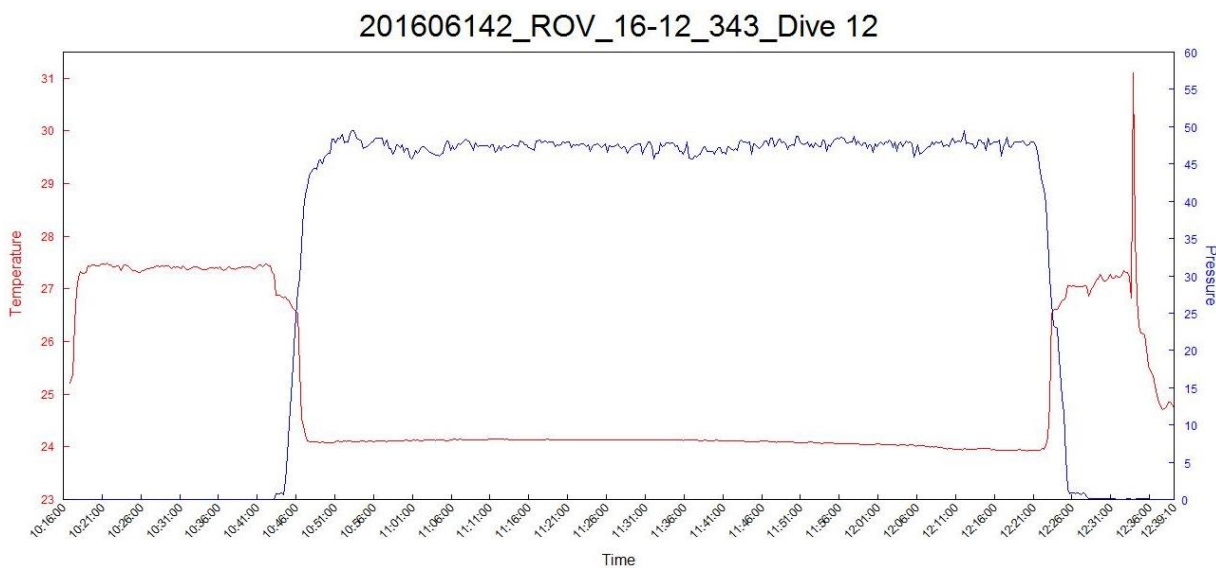
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-12, UNCW Dive 343; S. Carolina, outside Edisto MPA, 50 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	45	<b>Total Transect Length (km):</b>	1.240
<b>Maximum Bottom Depth (m):</b>	50	<b>Surface Current (kn):</b>	N/A
<b>On Bottom (Time- EDST):</b>	10:49	<b>On Bottom (Lat/Long):</b>	32.41°N; -78.99°W
<b>Off Bottom (Time- EDST):</b>	12:20	<b>Off Bottom (Lat/Long):</b>	32.41°N; -79°W
<b>Physical (bottom); Temp (°C):</b>	23.9	<b>Salinity:</b>	<b>Visibility (m):</b> 15 <b>Current (kn):</b> 0.25

**Physical Environment:**



Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-12 are as follows: Depth Maximum: 49.5 m, Temperature: 23.9-24.1 °C.

**Dive Site:** ROV 16-12, UNCW Dive 343; S. Carolina, outside Edisto MPA, 50 m

**Dive Imagery:**



**Figure 1:** Depth: -48.1 m  
Blue angelfish on rock with gorgonians (*Diodogorgia* sp.), and various algae (*Dictyota* spp., Rhodophyta).



**Figure 2:** Depth: -48.5 m  
Low relief boulders are covered with various gorgonians (purple- *Diodogorgia* sp.), demosponges, wire coral (*Stichopathes lutkeni*), and algae.



**Figure 3:** Depth: -48.8 m  
Sharptail eel on low relief hard bottom.



**Figure 4:** Depth: -48.1 m  
Lobsters check out the ROV.



**Dive Site:** ROV 16-12, UNCW Dive 343; S. Carolina, outside Edisto MPA, 50 m

## **Dive Notes:**

### **Objectives, Site Description, Habitat, Fauna:**

#### Site/Objectives:

Site #- 14-VI-16-2: ROV 16-12, UNCW Dive 343; S. Carolina, outside Edisto MPA, 48-49 m

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

#### ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N or S, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect S to N along west and east slope of ridge. Conducted normal photo XS at 2 minute intervals. Excellent station keeping.

#### Site Description/Habitat

Depth range: 48-49 m

MB- 9 nmi linear ridge, oriented NE to SW; north of Edisto MPA. Transect along ridge S to N, east slope and west slope.

10 kn from SW, seas 1-2' SW; drift 0.2 to E

Bottom was much different than the MB. MB showed moderate relief, distinct ledge. Visual mostly low relief rock ledges and flat pavement.

East slope- pavement, <1 m relief ledges, flat; 50% HB; no distinct ledge system; 48 m.

West slope- No distinct ledge system; mostly low relief rock <1 m and pavement; some areas of 1-2 m and high rugosity, but overall mostly low rugosity and flat.

Top of ridge- flat pavement, no ledges; some areas with low relief outcrops; 48 m; areas of low relief rock knolls without ledges.

Biota not as dense as dive 16-11; 50% cover on rock dominated by gorgonians- *Diodogorgia*, *Swiftia*, *Muricea*; sponges- Demo Starlet, *Ircinia campana*, *Callyspongia vaginalis*; black coral- *Stichopathes*; algae- *Dictyota*.

Fish were low density and diversity compared to dive 16-11. Only 2 scamp.

10:42- Launch

10:49- On bottom, 49 m, flat pavement, dense biota

12:20- End dive

**Dive Site:** ROV 16-12, UNCW Dive 343; S. Carolina, outside Edisto MPA, 50 m

*Dominant Benthic Macrobiota:*

Scleractinia- none

Octocorallia- *Diodogorgia*, *Muricea* (1 m), *Swiftia exerta* (87- actual count)

Antipatharia- *Stichopathes lutkeni*

Hydroida

Porifera- Demo Starlet, *Callyspongia vaginalis*, Axinellida, Spirastrellidae, *Ircinia campana*, *Aplysina*, one 50 cm *Geodia neptuni*

Arthropoda- *Panularis argus* (2 lobster)

Algae- *Dictyota* (green), *sargassum* (attached)

*Dominant Fish:*

1 gag, 2 scamp, 25 lionfish; tomtate, Calamus porgy, yellow tail reeffish, spotted eel, squirreelfish, reef butterfly, honeycomb cowfish, sand tilefish, rock beauty, grey snapper, hogfish

*Human debris:*

none



**Dive Site:** ROV 16-12, UNCW Dive 343; S. Carolina, outside Edisto MPA, 50 m

**CPCe Percent Cover Analysis:**

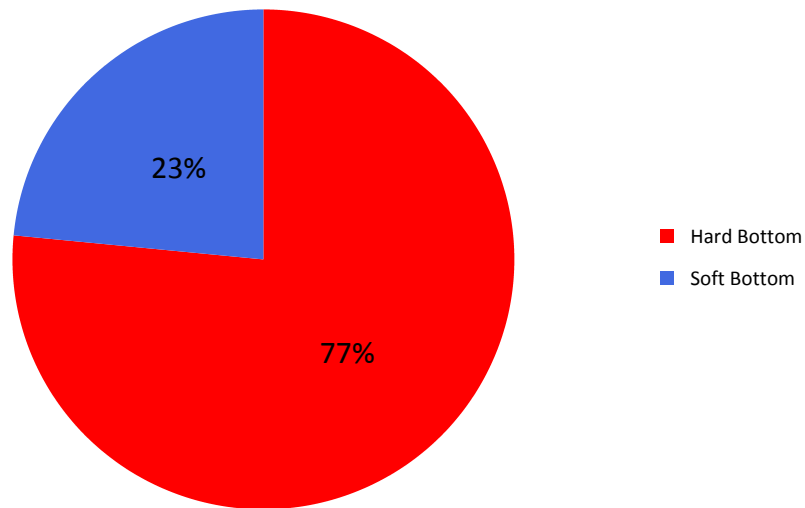
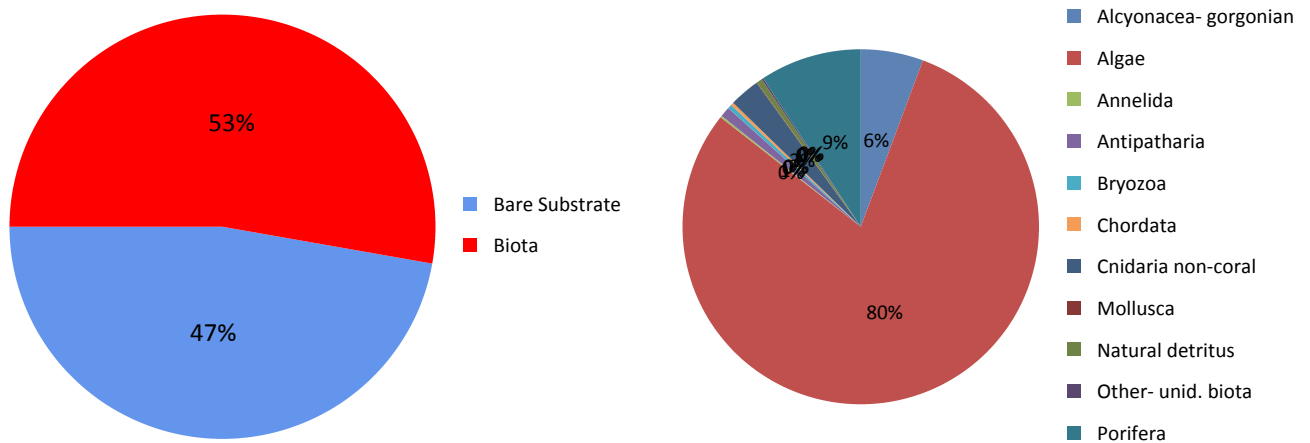


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-12. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-12.

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 16-12, UNCW Dive 343; S. Carolina, outside Edisto MPA, 50 m

**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 16-12.

Group/Phylum/Taxonomic Name	16-12	dive notes
	CPCe	
Biota	52.78%	X
Cyanobacteria	2.65%	
Ochrophyta	27.01%	X
<i>Dictyota sp.</i>	24.87%	X
Ochrophyta	1.41%	
<i>Sargassum sp.</i>	0.73%	X
Rhodophyta	12.52%	
Crustose coralline	2.31%	
Rhodophyta	10.21%	
Porifera	4.87%	X
<i>Aplysina sp.</i>	0.17%	X
Axinellidae		X
<i>Callyspongia vaginalis</i>		X
Cinachyra/Cinachyrella		X
<i>Clathria sp.</i>	0.04%	
Demospongiae	3.16%	
Demospongiae- tan starlet thick encrusting	0.30%	X
<i>Geodia gibberosa complex</i>	0.09%	X
<i>Geodia neptuni complex</i>	0.17%	
<i>Ircinia campana</i>	0.26%	
<i>Ircinia sp.</i>	0.17%	X
<i>Ircinia strobilina</i>	0.04%	
Poecilosclerida	0.04%	
Spirastrellidae	0.43%	X
<i>Geodia neptuni</i>		X
Cnidaria	4.91%	X
Alcyonacea- gorgonian	0.30%	
<i>Antipathes atlantica</i>	0.09%	
<i>Carijoa riisei</i>	0.21%	
<i>Diodogorgia sp.</i>	2.09%	X
<i>Elatopathes abietina</i>	0.04%	
<i>Ellisella sp.</i>	0.04%	X
Hydroidolina	1.45%	X
<i>Muricea sp.</i>	0.21%	X

**Dive Site:** ROV 16-12, UNCW Dive 343; S. Carolina, outside Edisto MPA, 50 m

<i>Stichopathes lutkeni</i>	0.30%	X
<i>Swiftia exserta</i>	0.04%	X
<i>Tanacetipathes tanacetum</i>	0.04%	
<i>Titanideum frauenfeldii</i>	0.09%	
Annelida	0.09%	X
Annelida	0.04%	
<i>Filograna sp.</i>	0.04%	X
Bryozoa	0.21%	
Bryozoa	0.13%	
<i>Schizoporella sp.</i>	0.09%	
Arthropoda		X
<i>Panulirus argus</i>		X
Mollusca	0.04%	
Bivalvia	0.04%	
Chordata	0.13%	X
Ascidacea	0.09%	
Didemnidae	0.04%	
Gnathostomata		X
detritus	0.26%	
UNKNOWN	0.09%	
Bare Substrate	47.22%	
Habitat	47.22%	
Bare rock	23.42%	
Bare rubble- coral	0.13%	
Bare rubble/cobble	1.15%	
Bare soft bottom	22.52%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-12, UNCW Dive 343; S. Carolina, outside Edisto MPA, 50 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-12.

Class/Species	Common Name	2016-12
Actinopterygii		
<i>Acanthostracion polygonia</i>	honeycomb cowfish	0.50
<i>Acanthurus</i> sp.	doctorfish	1.50
<i>Aulostomus maculatus</i>	trumpetfish	0.25
<i>Balistes capriscus</i>	grey triggerfish	0.25
<i>Balistes</i> sp.	triggerfish	0.25
<i>Bodianus pulchellus</i>	spotfin hogfish	7.38
<i>Calamus</i> sp.	porgy	1.38
<i>Cantherhines pullus</i>	orangespotted filefish	0.13
<i>Canthigaster</i> sp.	puffer	10.25
<i>Cephalopholis cruentatus</i>	graysby	0.38
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	1.75
<i>Chaetodon sedentarius</i>	reef butterflyfish	11.88
<i>Chromis enchrysurus</i>	yellowtail reeffish	14.38
<i>Chromis insolatus</i>	sunshinefish	26.88
<i>Chromis scotti</i>	purple reeffish	11.50
<i>Chromis</i> sp.	damsel fish	20.88
<i>Clepticus parrai</i>	creole wrasse	16.00
<i>Haemulon aurolineatum</i>	tomtate	123.28
<i>Haemulon</i> sp.	grunt	2.50
<i>Haemulon striatum</i>	striped grunt	86.02
<i>Halichoeres bathyphilus</i>	greenband wrasse	0.25
<i>Halichoeres cyanocephalus</i>	yellowcheek wrasse	0.88
<i>Halichoeres garnoti</i>	yellowhead wrasse	3.00
<i>Halichoeres</i> sp.	wrasse	3.50
<i>Holacanthus bermudensis</i>	blue angelfish	6.13
<i>Holacanthus tricolor</i>	rock beauty	0.50
Holocentridae	soldierfish/squirrelfish	0.13
Holocentridae	squirrelfish	0.50
<i>Holocentrus adscensionis</i>	squirrelfish	2.25
<i>Lachnolaimus maximus</i>	hogfish	0.25
<i>Lactophrys</i> sp.	cowfish	0.25
<i>Liopropoma eukrines</i>	wrasse bass	0.75
<i>Lutjanus griseus</i>	grey snapper	0.25
<i>Malacanthus plumieri</i>	sand tilefish	0.13
<i>Mycteroperca microlepis</i>	gag grouper	0.13

**Dive Site:** ROV 16-12, UNCW Dive 343; S. Carolina, outside Edisto MPA, 50 m

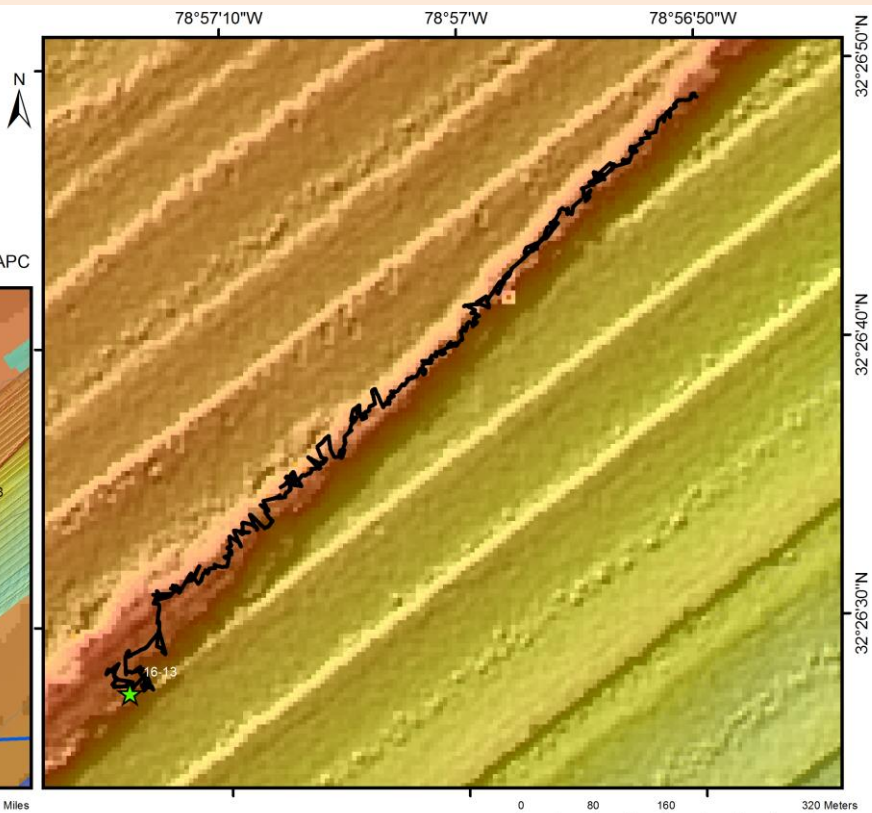
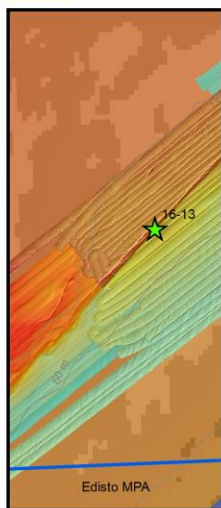
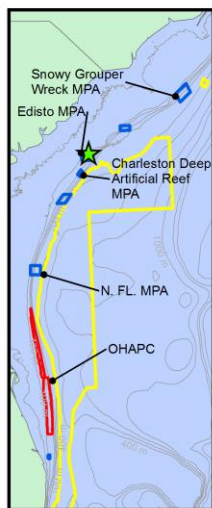
<i>Mycteroperca phenax</i>	scamp	0.25
<i>Myrichthys breviceps</i>	sharptail eel	0.13
<i>Myripristis jacobus</i>	blackbar soldierfish	0.25
<i>Pagrus pagrus</i>	red porgy	0.50
<i>Pareques umbrosus</i>	cubbyu	4.75
<i>Plectrypops retrospinis</i>	cardinal soldierfish	0.13
<i>Pomacanthus paru</i>	french angelfish	0.13
<i>Pomacanthus sp.</i>	angelfish	0.13
<i>Priacanthus arenatus</i>	bigeye	3.00
<i>Pristigenys alta</i>	short bigeye	0.63
<i>Prognathodes aya</i>	bank butterflyfish	0.88
<i>Pseudupeneus maculatus</i>	spotted goatfish	2.25
<i>Pterois volitans</i>	lionfish	3.50
<i>Rhomboplites aurorubens</i>	vermillion snapper	21.38
<i>Rypticus maculatus</i>	whitespotted soapfish	0.13
<i>Seriola dumerili</i>	greater amberjack	0.13
<i>Seriola rivoliana</i>	almaco jack	0.88
<i>Seriola sp.</i>	amberjack	0.25
<i>Serranus annularis</i>	orangeback bass	0.75
<i>Serranus baldwini</i>	lantern bass	0.25
<i>Serranus phoebe</i>	tattler	1.88
<i>Sparisoma atomarium</i>	greenblotch parrotfish	0.50
<i>Sparisoma aurofrenatum</i>	redband parrotfish	0.13
<i>Sphoeroides spengleri</i>	bandtail puffer	0.13
<i>Stegastes partitus</i>	bicolor damselfish	0.13
<i>Synodus sp.</i>	lizardfish	0.13
unknown	unknown	1.50

**Dive Site:** ROV 16-13, UNCW Dive 344; S. Carolina, outside Edisto MPA, 50 m

### General Location and Dive Track:

#### ROV 16-13; S. Carolina, Outside Edisto MPA, 50 m; 14-VI-16-3

- ★ 16-13
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andy David, John Reed, Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Pisces\_2012\_EdistoMPA\_MB\_Grid

**Purpose:** Survey and monitor Shelf-Edge MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/14/2016

**Specimens:** 0

**Digital Photos:** 210

**DVD:** 2

**Hard Drive:** 1

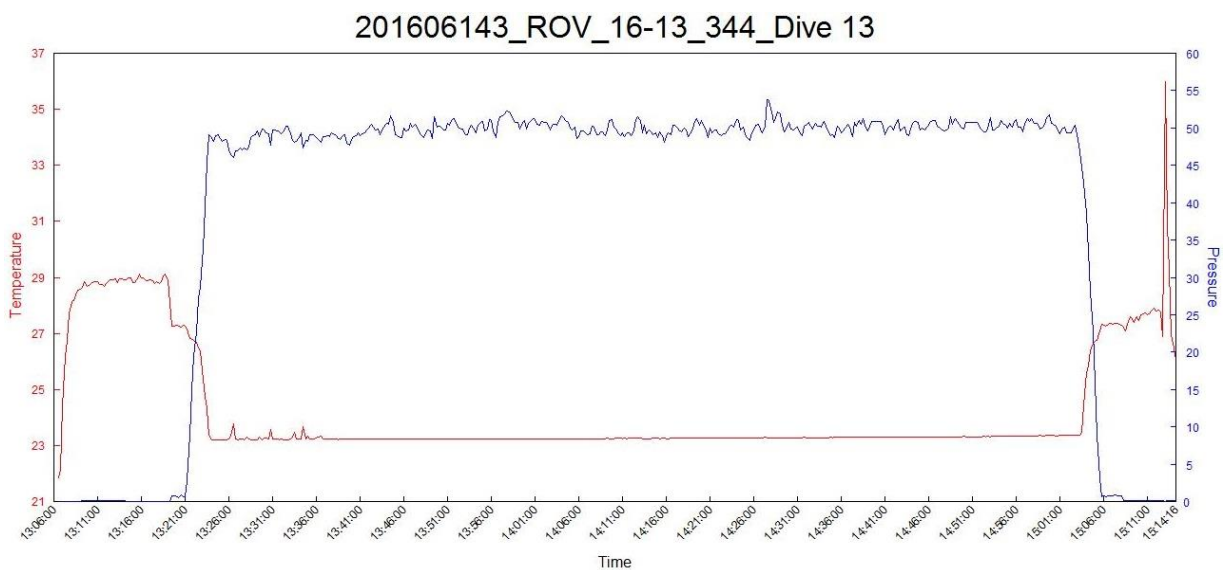
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-13, UNCW Dive 344; S. Carolina, outside Edisto MPA, 50 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	46	<b>Total Transect Length (km):</b>	1.000
<b>Maximum Bottom Depth (m):</b>	54	<b>Surface Current (kn):</b>	N/A
<b>On Bottom (Time- EDST):</b>	13:23	<b>On Bottom (Lat/Long):</b>	32.44°N; -78.95°W
<b>Off Bottom (Time- EDST):</b>	15:01	<b>Off Bottom (Lat/Long):</b>	32.45°N; -78.95°W
<b>Physical (bottom); Temp (°C):</b>	23.2	<b>Salinity:</b>	<b>Visibility (m):</b> 15 <b>Current (kn):</b> 0.25

**Physical Environment:**

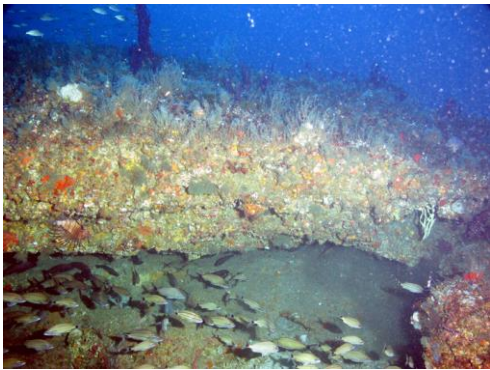


Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-13 are as follows: Depth Maximum: 53.8 m, Temperature: 23.2-23.8 °C.



**Dive Site:** ROV 16-13, UNCW Dive 344; S. Carolina, outside Edisto MPA, 50 m

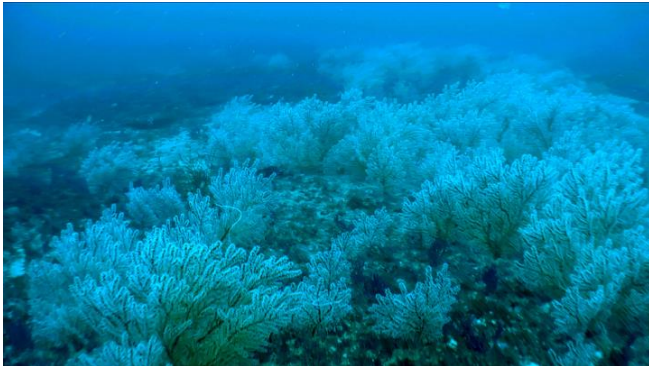
**Dive Imagery:**



**Figure 1:** Depth: -50.6 m  
Moderate to high relief ledges provide habitat for large schools of tomtate.



**Figure 2:** Depth: -49.1 m  
Scamp cruises along the reef drop-off.



**Figure 3:** Depth: -49 m  
Dense fields of the gorgonian *Swiftia exserta* are abundant at this reef site.



**Figure 4:** Depth: -50 m  
The rock boulders are covered with various gorgonians (orange- *Swiftia exserta*, purple- *Muricea* sp.), algae and sponges.



**Figure 5:** Depth: -50.7 m  
Graysby are common along the reef ledges.



**Figure 6:** Depth: -51.2 m  
Scrawled filefish with lionfish on ledge.

**Dive Site:** ROV 16-13, UNCW Dive 344; S. Carolina, outside Edisto MPA, 50 m

**Dive Notes:**

**Objectives, Site Description, Habitat, Fauna:**

Site/Objectives:

Site #- 14-VI-16-3; ROV 16-13, UNCW Dive 344; S. Carolina, outside Edisto MPA, 49-54 m

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N or S, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect S to N along west slope of ridge. Conducted normal photo XS at 2 minute intervals. Excellent station keeping.

Site Description/Habitat

Depth range: 49.5- 53.8 m

MB- 9 nmi linear ridge, oriented NE to SW; north of Edisto MPA. Transect along ridge S to N, north or previous dive, west slope.

11 kn from S, seas 1', drift 0.2 to NE

Excellent site. West escarpment of ridge, a definite ledge; pavement on top, slope 30° over 10-20 m width, moderate relief overall; top of ridge 49-50 m, base 52-53 m. Rock ledges, undercut 1-2 m; jumble of flat rock slabs and boulders, 1-2 m relief. Top mostly flat pavement and low relief ledges.

Dense cover dominated by gorgonians- *Diodogorgia*, *Swiftia* (abundant), *Muricea*; sponges- *Ircinia*; algae- *Dictyota*.

Fish dominated by schools of small fish, tomtates, scamp and reef fish; some lionfish but not dense.

13:18- Launch

13:25- On bottom

13:34- Dense population of *Swiftia* (50+)

15:01- End dive.

Dominant Benthic Macrobiota:

Scleractinia- none

Octocorallia- *Diodogorgia*, *Swiftia exerta* (156 individual count + many were multiple counts of 12-24), *Muricea*, *Carijoa*

**Dive Site:** ROV 16-13, UNCW Dive 344; S. Carolina, outside Edisto MPA, 50 m

Hydroida

Antipatharia- *Antipathes atlantica* (abundant), *Tanacetipathes*, *Stichopathes*, *Antipatharia* (some 1 m),  
*Antipathes furcata*

Corallimorpharia

Porifera- *Ircinia campana*, *Callyspongia vaginalis*, Spirastrellidae, Axinellidae

Algae- *Dictyota*

*Dominant Fish:*

5 gag, 12 scamp, 82 lionfish; tomtate, graysby, scrawled filefish, greyhead scamp, sandbar shark, blue angel, cornet fish

*Human debris:*

sparse

**Dive Site:** ROV 16-13, UNCW Dive 344; S. Carolina, outside Edisto MPA, 50 m

**CPCe Percent Cover Analysis:**

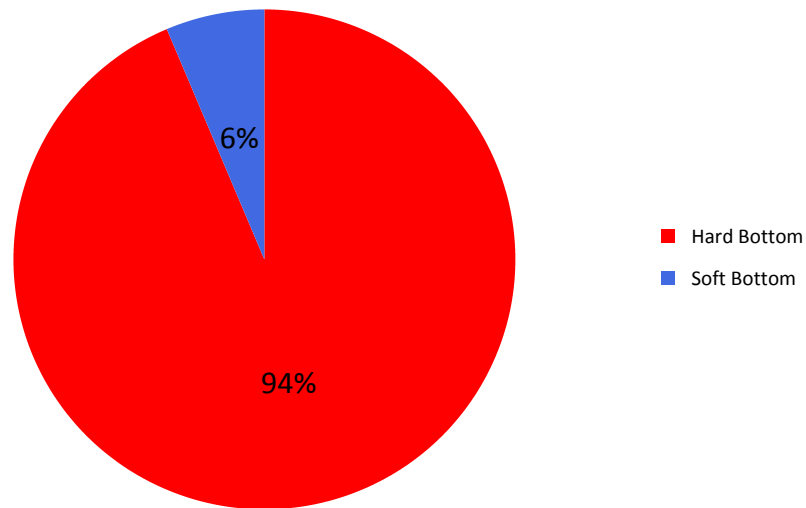
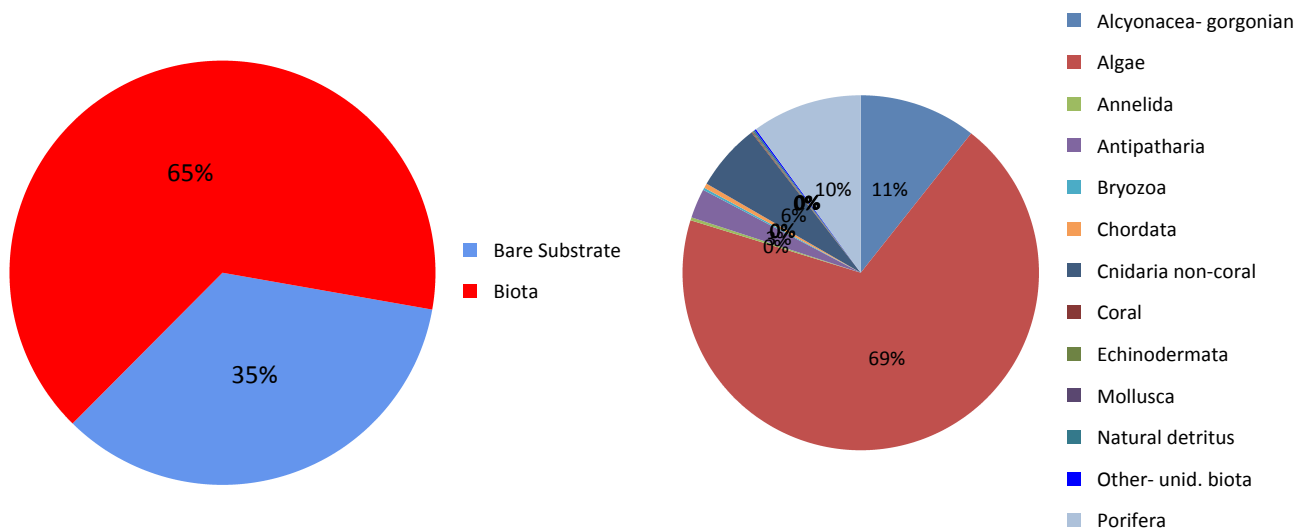


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-13. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-13.

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 16-13, UNCW Dive 344; S. Carolina, outside Edisto MPA, 50 m

**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 16-13.

Group/Phylum/Taxonomic Name	16-13 CPCe	dive notes
Biota	65.36%	X
Cyanobacteria	5.02%	
Chlorophyta	0.09%	
Ochrophyta	29.16%	X
<i>Dictyota sp.</i>	24.55%	X
Ochrophyta	4.61%	
Rhodophyta	10.92%	
Crustose coralline	3.22%	
Rhodophyta	7.69%	
Porifera	6.54%	X
<i>Aiolochoira crassa</i>	0.14%	
<i>Aplysina sp.</i>	0.09%	X
Astrophorida (Tetractinellida)	0.05%	
Axinellidae		X
<i>Callyspongia vaginalis</i>	0.05%	X
Demospongiae	4.47%	
Demospongiae- tan starlet thick encrusting	0.46%	X
<i>Ircinia sp.</i>	0.37%	X
Poecilosclerida	0.05%	
Spirastrellidae	0.88%	X
Cnidaria	12.76%	X
Alcyonacea- gorgonian	0.18%	
Antipatharia	0.09%	X
<i>Antipathes atlantica</i>	0.83%	X
<i>Antipathes furcata</i>	0.14%	X
<i>Carijoa riisei</i>	0.51%	X
Corallimorpharia	0.23%	X
<i>Diodogorgia sp.</i>	2.53%	X
<i>Elatopathes abietina</i>	0.14%	
<i>Ellisella sp.</i>		X
Hydroidolina	3.78%	X
<i>Muricea sp.</i>	0.05%	X
<i>Nicella sp.</i>	0.05%	
<i>Phyllangia americana</i>	0.05%	

**Dive Site:** ROV 16-13, UNCW Dive 344; S. Carolina, outside Edisto MPA, 50 m

<i>Stichopathes lutkeni</i>	0.55%	X
<i>Swiftia exserta</i>	3.64%	X
<i>Tanacetipathes tanacetum</i>		X
Annelida	0.18%	X
Annelida	0.05%	
<i>Filograna sp.</i>	0.09%	X
Sabellidae	0.05%	
Bryozoa	0.14%	
Bryozoa	0.09%	
<i>Schizoporella sp.</i>	0.05%	
Mollusca	0.05%	
Bivalvia	0.05%	
Echinodermata	0.05%	
Crinoidea	0.05%	
Chordata	0.28%	X
Ascidiacea	0.09%	
Didemnidae	0.18%	
Gnathostomata		X
detritus	0.09%	
UNKNOWN	0.09%	
Bare Substrate	34.64%	
Habitat	34.64%	
Bare rock	27.36%	
Bare rubble- coral	0.05%	
Bare rubble/cobble	1.06%	
Bare soft bottom	6.17%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>



**Dive Site:** ROV 16-13, UNCW Dive 344; S. Carolina, outside Edisto MPA, 50 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-13.

Class/Species	Common Name	2016-13
Actinopterygii		
<i>Acanthostracion polygonia</i>	honeycomb cowfish	0.34
<i>Acanthurus</i> sp.	doctorfish	0.17
<i>Aluterus scriptus</i>	scrawled filefish	0.51
<i>Apogon</i> sp.	cardinalfish	2.91
<i>Aulostomus maculatus</i>	trumpetfish	0.51
<i>Balistes capriscus</i>	grey triggerfish	0.17
<i>Balistes vetula</i>	queen triggerfish	0.17
<i>Bodianus pulchellus</i>	spotfin hogfish	29.91
<i>Bodianus rufus</i>	spanish hogfish	0.68
<i>Calamus</i> sp.	porgy	2.39
<i>Canthigaster</i> sp.	puffer	21.37
<i>Caranx bartholomaei</i>	yellow jack	1.54
<i>Caranx ruber</i>	bar jack	0.17
<i>Cephalopholis cruentatus</i>	graysby	2.74
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	1.20
<i>Chaetodon sedentarius</i>	reef butterflyfish	20.00
<i>Chromis enchrysurus</i>	yellowtail reeffish	7.69
<i>Chromis insolatus</i>	sunshinefish	33.68
<i>Chromis scotti</i>	purple reeffish	47.52
<i>Chromis</i> sp.	damselfish	83.76
<i>Clepticus parrai</i>	creole wrasse	6.84
<i>Diplodus holbrooki</i>	spottail pinfish	0.34
<i>Fistularia</i> sp.	cornetfish	0.34
<i>Fistularia tabacaria</i>	bluespotted cornetfish	0.34
<i>Gymnothorax moringa</i>	spotted moray eel	0.17
<i>Haemulon aurolineatum</i>	tomtate	1147.01
<i>Haemulon</i> sp.	grunt	670.94
<i>Haemulon striatum</i>	striped grunt	328.72
<i>Halichoeres garnoti</i>	yellowhead wrasse	4.44
<i>Halichoeres</i> sp.	wrasse	3.08
<i>Holacanthus bermudensis</i>	blue angelfish	15.56
Holocentridae	soldierfish	0.51
Holocentridae	squirrelfish	1.37
<i>Holocentrus adscensionis</i>	squirrelfish	3.59
<i>Lachnolaimus maximus</i>	hogfish	0.17



**Dive Site:** ROV 16-13, UNCW Dive 344; S. Carolina, outside Edisto MPA, 50 m

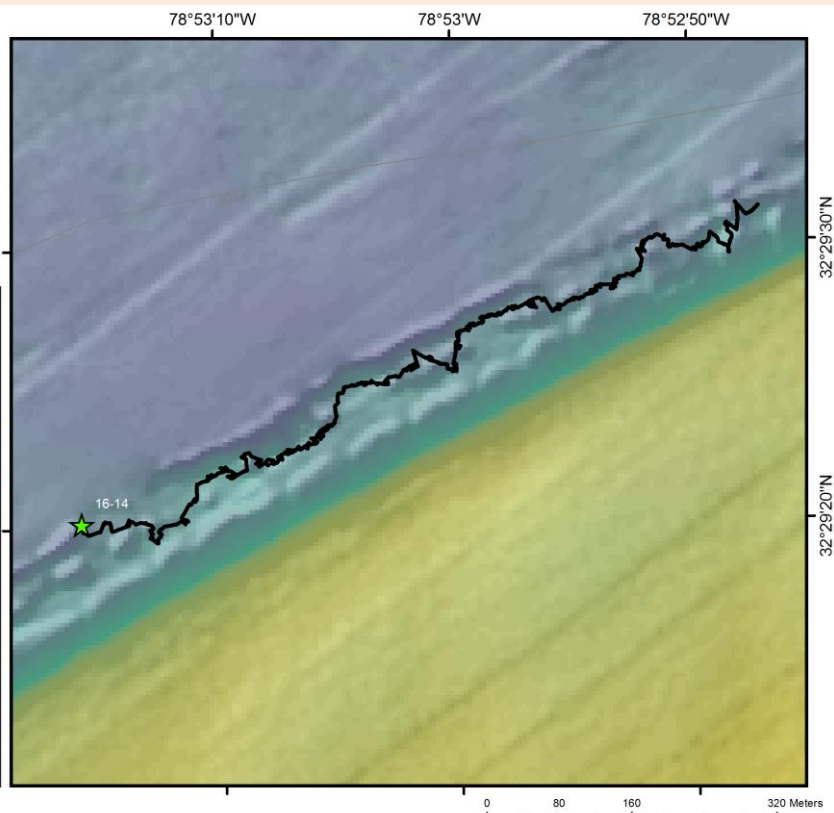
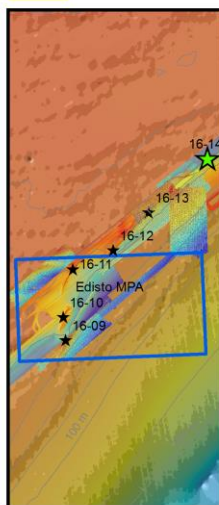
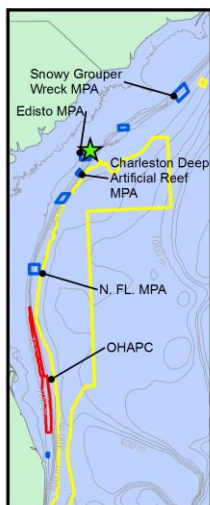
<i>Lactophrys</i> sp.	cowfish	0.51
<i>Liopropoma eukrines</i>	wrasse bass	0.34
<i>Lutjanus</i> sp.	snapper	0.17
<i>Mulloidichthys martinicus</i>	yellow goatfish	0.34
<i>Mycteroperca microlepis</i>	gag grouper	0.85
<i>Mycteroperca phenax</i>	scamp	2.05
<i>Myripristis jacobus</i>	blackbar soldierfish	0.85
<i>Pagrus pagrus</i>	red porgy	1.88
<i>Pareques umbrosus</i>	cubbyu	2.39
<i>Pomacanthus paru</i>	french angelfish	0.17
<i>Priacanthus arenatus</i>	bigeye	0.34
<i>Pristigenys alta</i>	short bigeye	2.05
<i>Prognathodes aculeatus</i>	longsnout butterflyfish	0.34
<i>Prognathodes aya</i>	bank butterflyfish	1.03
<i>Pseudupeneus maculatus</i>	spotted goatfish	2.56
<i>Pterois volitans</i>	lionfish	21.88
<i>Rhomboplites aurorubens</i>	vermillion snapper	283.08
<i>Rypticus</i> sp.	soapfish	0.17
Scaridae	parrotfish	0.17
Scorpaenidae	scorpionfish	0.34
<i>Seriola dumerili</i>	greater amberjack	0.34
<i>Seriola rivoliana</i>	almaco jack	0.85
<i>Serranus annularis</i>	orangeback bass	0.51
<i>Serranus phoebe</i>	tattler	0.51
<i>Serranus tigrinus</i>	harlequin bass	0.34
<i>Sphoeroides spengleri</i>	bandtail puffer	0.34
<i>Stegastes partitus</i>	bicolor damselfish	0.34
unknown	unknown	8.21
Elasmobranchii		
Carcharhinidae	shark	0.17

**Dive Site:** ROV 16-14, UNCW Dive 345; S. Carolina, outside Edisto MPA, 50 m

### General Location and Dive Track:

#### ROV 16-14; S. Carolina, Outside Edisto MPA, 50 m; 14-VI-16-4

- ★ 16-14
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andrew W. David, John Reed,  
Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Sedberry\_OEBlock10\_5m\_UTM1  
7N\_MB\_Grid

**Purpose:** Survey and monitor Shelf-Edge  
MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/14/2016

**Specimens:** 0

**Digital Photos:** 124

**DVD:** 1

**Hard Drive:** 0

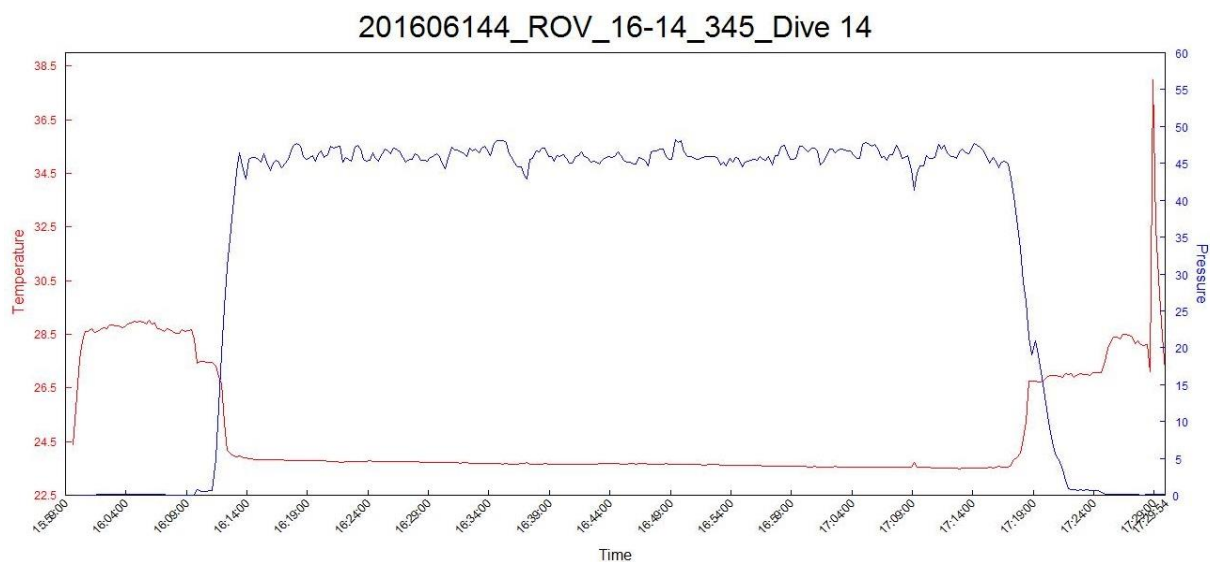
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-14, UNCW Dive 345; S. Carolina, outside Edisto MPA, 50 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	41	<b>Total Transect Length (km):</b>	0.880
<b>Maximum Bottom Depth (m):</b>	49	<b>Surface Current (kn):</b>	N/A
<b>On Bottom (Time- EDST):</b>	16:13	<b>On Bottom (Lat/Long):</b>	32.49°N; -78.89°W
<b>Off Bottom (Time- EDST):</b>	17:16	<b>Off Bottom (Lat/Long):</b>	32.49°N; -78.88°W
<b>Physical (bottom); Temp (°C):</b>	23.5	<b>Salinity:</b>	<b>Visibility (m):</b> 15 <b>Current (kn):</b> N/A

**Physical Environment:**



Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-14 are as follows: Depth Maximum: 48.2 m, Temperature: 23.5-24.1 °C.

**Dive Site:** ROV 16-14, UNCW Dive 345; S. Carolina, outside Edisto MPA, 50 m

**Dive Imagery:**



**Figure 1:** Depth: -48 m  
Low relief rock slabs provide habitat for cubbyu and dense cover of hydroids, sponges, and tunicates.



**Figure 2:** Depth: -47.2 m  
Moderate relief ledges and rock slabs with spotfin hogfish and lionfish.



**Figure 3:** Depth: -46.6 m  
Cobia and roughtail stingray along the reef edge.



**Figure 4:** Depth: -48.3 m  
Rock hind are common under the ledges.

**Dive Site:** ROV 16-14, UNCW Dive 345; S. Carolina, outside Edisto MPA, 50 m

**Dive Notes:**

**Objectives, Site Description, Habitat, Fauna:**

Site/Objectives:

Site #- 14-VI-16-4; ROV 16-14, UNCW Dive 345; S. Carolina, outside Edisto MPA, 49-54 m

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N or S, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect S to N along west slope of ridge. Conducted normal photo XS at 2 minute intervals. Excellent station keeping.

Site Description/Habitat

Depth range: 49.5- 53.8 m

MB- north end of 9 nmi narrow ridge of previous 2 dives. Transect along top and west side of ridge, heading N.

11 Kn from S, seas 1', sunny; drift 0.2 kn to 70°.

Most of dive did not find any definitive ridge or escarpment. Mostly flat sand bottom with 50% cover of low relief, 1 m, boulders. Dense benthic macrofauna on boulders, and dense fish in some areas. Short areas of apparent ledge and slabs of 1-2 m.

16:08- Launch

16:12- On bottom, 48 m. On MB was on west escarpment. No ledge apparent; only flat sand and 1 m boulders, but fairly rugose. Good video of 2 m ray with 2 cobia. Some areas with 1-2 m relief and short ledge system facing west.

16:25- Start 2 minute interval photo transect.

MB showing top middle of ridge. Habitat is same, flat sand, with 50% cover of <1 m rock boulders with dense biota.

16:35- Sandbar shark, ray with cobia; patches of all sand habitat.

17:17- End dive.

Dominant biota is dense hydroids, Octocorals- *Diodogorgia*, *Muricea*, *Swiftia*, sponges.

**Dive Site:** ROV 16-14, UNCW Dive 345; S. Carolina, outside Edisto MPA, 50 m

*Dominant Benthic Biota:*

Scleractinia- *Madracis myriaster* (white 1 ft diam)

Octocorallia- *Diodogorgia*, *Swiftia exerta* (18 actual count), *Muricea*

Hydroida

Antipatharia- *Stichopathes lutkeni*

Porifera- *Ircinia campana*, Demo Starlet

Ascidiacea- Didemnidae

Annelida- *Filograna*

Algae- *Dictyota* (green)

*Dominant Fish:*

Video counts- 4 gag, 13 graysby, 3 rock hind, 1 scamp (maybe 3 others), 110 lionfish.

Tomtate, 2 m stingray, cobia (2), sandbar shark (2 m), graysby, Calanus porgy, school of mackeral, gag, lots of lionfish in areas, reef butterfly, white grunt, rock hind, cornete fish, bigeye, goatfish, blue angelfish, cowfish, cubbyu, stripped grunt

*Human debris:*

cable

**Dive Site:** ROV 16-14, UNCW Dive 345; S. Carolina, outside Edisto MPA, 50 m

**CPCe Percent Cover Analysis:**

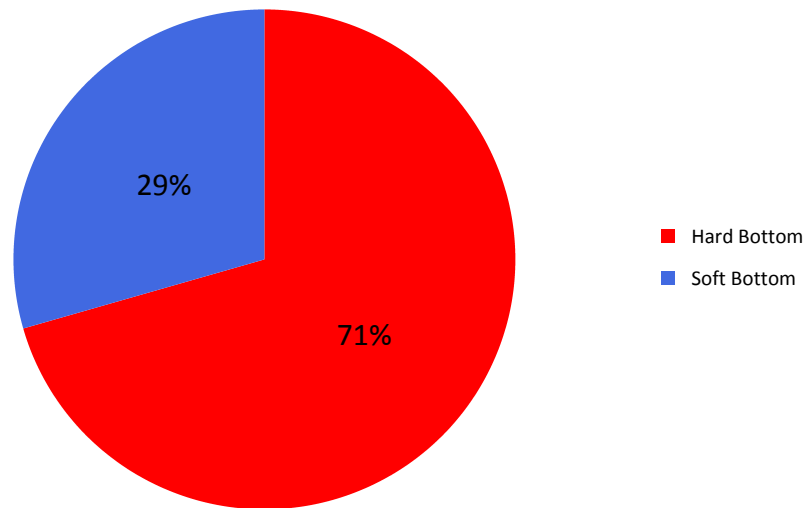
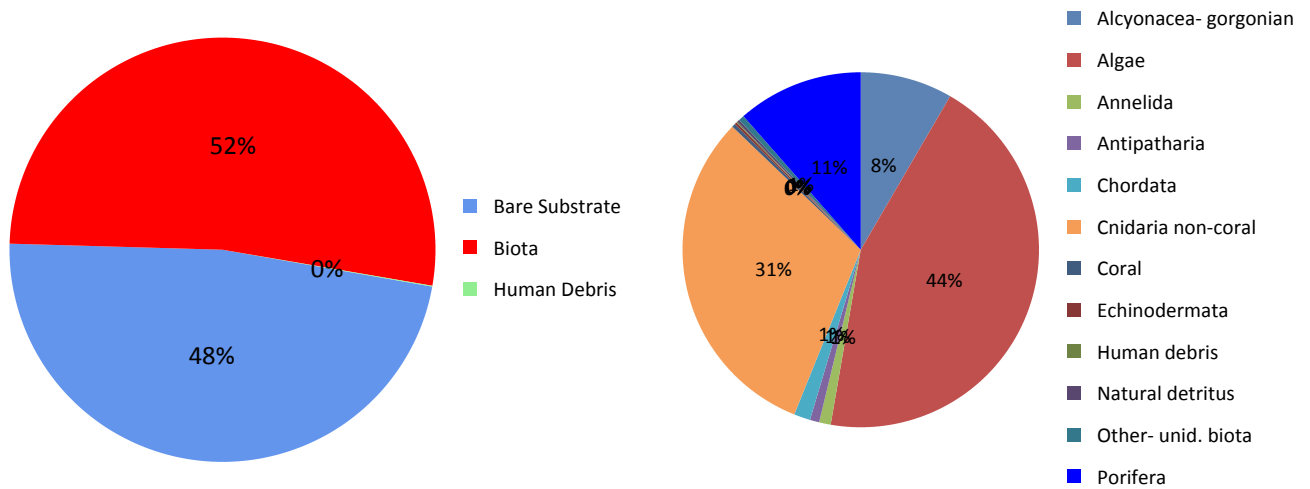


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-14. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-14.

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 16-14, UNCW Dive 345; S. Carolina, outside Edisto MPA, 50 m

**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 16-14.

Group/Phylum/Taxonomic Name	16-14	
	CPCe	dive notes
Biota	52.27%	X
Cyanobacteria	2.88%	
Chlorophyta	0.17%	
Ochrophyta	14.29%	X
<i>Dictyota sp.</i>	12.90%	X
Ochrophyta	1.11%	
<i>Sargassum sp.</i>	0.28%	
Rhodophyta	5.87%	
Crustose coralline	0.61%	
Rhodophyta	5.26%	
Porifera	5.98%	X
<i>Agelas clathrodes</i>	0.06%	
<i>Aiolochoira crassa</i>	0.06%	
Astrophorida (Tetractinellida)	0.06%	
Demospongiae	2.99%	X
Demospongiae- tan starlet thick encrusting	0.89%	X
<i>Ircinia sp.</i>	0.66%	X
<i>Monanchora sp.</i>	0.11%	
<i>Placospongia sp.</i>	0.11%	
Poecilosclerida	0.06%	
Spirastrellidae	1.00%	
Cnidaria	21.26%	X
Alcyonacea- gorgonian	0.06%	
Antipatharia	0.11%	X
<i>Carijoa riisei</i>	1.88%	X
Corallimorpharia	0.06%	
<i>Diodogorgia sp.</i>	1.38%	X
<i>Elatopathes abietina</i>	0.11%	
Hydroidolina	16.17%	X
<i>Madracis myriaster</i>	0.11%	X
<i>Muricea sp.</i>	0.55%	X
Plexauridae	0.06%	
Scleractinia- unid cup	0.06%	
<i>Solanderia gracilis</i>	0.06%	

**Dive Site:** ROV 16-14, UNCW Dive 345; S. Carolina, outside Edisto MPA, 50 m

<i>Stichopathes lutkeni</i>	0.22%	X
<i>Swiftia exserta</i>	0.44%	X
Annelida	0.55%	X
<i>Filograna sp.</i>	0.55%	X
Echinodermata	0.11%	
<i>Arbacia punctulata</i>	0.06%	
<i>Centrostephanus longispinus</i>	0.06%	
Chordata	0.78%	X
Asciacea	0.17%	
Didemnidae	0.61%	X
Gnathostomata		X
detritus	0.11%	
UNKNOWN	0.28%	
Human Debris	0.06%	X
Human debris	0.06%	X
Human debris- fish line/gear		X
Human debris- other	0.06%	
Bare Substrate	47.67%	
Habitat	47.67%	
Bare rock	17.05%	
Bare rubble/cobble	0.61%	
Bare soft bottom	30.01%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-14, UNCW Dive 345; S. Carolina, outside Edisto MPA, 50 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-14.

Class/Species	Common Name	2016-14
Actinopterygii		
<i>Acanthostracion polygonia</i>	honeycomb cowfish	0.24
<i>Acanthurus</i> sp.	doctorfish	1.91
<i>Apogon pseudomaculatus</i>	twospot cardinalfish	0.96
<i>Aulostomus maculatus</i>	trumpetfish	0.48
<i>Bodianus pulchellus</i>	spotfin hogfish	21.27
<i>Calamus</i> sp.	porgy	4.78
<i>Canthigaster</i> sp.	puffer	18.88
<i>Cephalopholis cruentatus</i>	graysby	5.02
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	2.15
<i>Chaetodon sedentarius</i>	reef butterflyfish	24.86
<i>Chromis enchrysurus</i>	yellowtail reeffish	4.30
<i>Chromis insolatus</i>	sunshinefish	46.85
<i>Chromis scotti</i>	purple reeffish	30.59
<i>Chromis</i> sp.	damsel fish	50.67
Decapterus sp.	scad	167.30
<i>Diplodus holbrooki</i>	spottail pinfish	1.20
<i>Epinephelus adscensionis</i>	rock hind	0.72
<i>Fistularia tabacaria</i>	bluespotted cornetfish	0.24
<i>Haemulon aurolineatum</i>	tomtate	320.27
<i>Haemulon plumieri</i>	white grunt	0.96
<i>Haemulon</i> sp.	grunt	9.56
<i>Haemulon striatum</i>	striped grunt	286.81
<i>Halichoeres garnoti</i>	yellowhead wrasse	20.79
<i>Halichoeres</i> sp.	wrasse	19.84
<i>Holacanthus bermudensis</i>	blue angelfish	8.60
Holocentridae	squirrelfish	0.24
<i>Holocentrus adscensionis</i>	squirrelfish	5.26
<i>Lactophrys quadricornis</i>	scrawled cowfish	0.24
<i>Lactophrys</i> sp.	cowfish	1.43
<i>Lutjanus</i> sp.	snapper	0.96
<i>Mycteroperca microlepis</i>	gag grouper	1.43
<i>Mycteroperca phenax</i>	scamp	0.24
<i>Myripristis jacobus</i>	blackbar soldierfish	6.21
<i>Pagrus pagrus</i>	red porgy	0.96
<i>Pareques umbrosus</i>	cubbyu	1.67

**Dive Site:** ROV 16-14, UNCW Dive 345; S. Carolina, outside Edisto MPA, 50 m

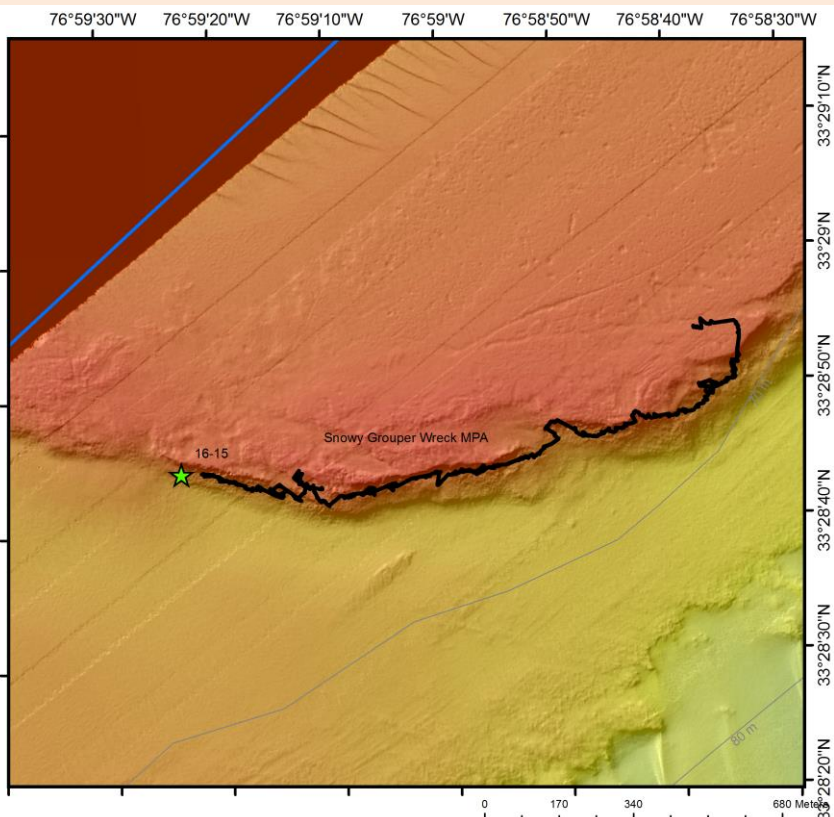
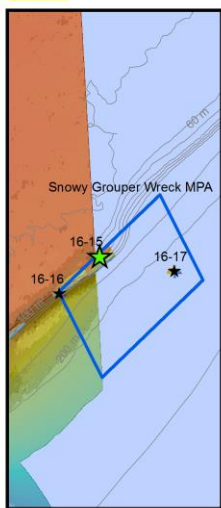
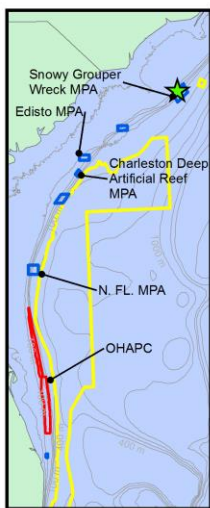
<i>Pomacanthus</i> sp.	angelfish	0.48
<i>Priacanthus arenatus</i>	bigeye	4.06
<i>Pristigenys alta</i>	short bigeye	4.30
<i>Prognathodes aculeatus</i>	longsnout butterflyfish	0.24
<i>Prognathodes aya</i>	bank butterflyfish	0.48
<i>Pseudupeneus maculatus</i>	spotted goatfish	10.99
<i>Pterois volitans</i>	lionfish	45.65
<i>Rachycentron canadum</i>	cobia	0.48
<i>Remora remora</i>	remora	0.24
<i>Rypticus maculatus</i>	whitespotted soapfish	0.72
<i>Rypticus saponaceus</i>	greater soapfish	0.24
Scaridae	parrotfish	0.24
<i>Scorpaena plumieri</i>	spotted scorpionfish	0.24
Scorpaenidae	scorpionfish	0.24
<i>Seriola dumerili</i>	greater amberjack	0.24
<i>Seriola rivoliana</i>	almaco jack	4.54
<i>Seriola</i> sp.	amberjack	17.93
<i>Serranus annularis</i>	orangeback bass	0.24
<i>Serranus baldwini</i>	lantern bass	0.24
<i>Serranus phoebe</i>	tattler	0.72
<i>Sparisoma atomarium</i>	greenblotch parrotfish	1.20
<i>Sphoeroides spengleri</i>	bandtail puffer	0.24
<i>Stegastes partitus</i>	bicolor damselfish	4.54
<i>Synodus</i> sp.	lizardfish	0.24
<i>Thalassoma bifasciatum</i>	bluehead wrasse	1.20
unknown	unknown	435.71
Elasmobranchii		
Carcharhinidae	shark	0.48
<i>Dasyatis</i> sp.	stingray	0.24

**Dive Site:** ROV 16-15, UNCW Dive 346; N. Carolina, Snowy Wreck MPA reef, 65 m

### General Location and Dive Track:

#### ROV 16-15; N. Carolina, Snowy Wreck MPA Reef, 65 m; 15-VI-16-1

- ★ 16-15
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andy David, John Reed, Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Gebco\_SE\_Coast\_US

**Purpose:** Survey and monitor Shelf-Edge MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/15/2016

**Specimens:** 0

**Digital Photos:** 227

**DVD:** 2

**Hard Drive:** 1

**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-15, UNCW Dive 346; N. Carolina, Snowy Wreck MPA reef, 65 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	56	<b>Total Transect Length (km):</b>	1.710
<b>Maximum Bottom Depth (m):</b>	66	<b>Surface Current (kn):</b>	3.5
<b>On Bottom (Time- EDST):</b>	9:36	<b>On Bottom (Lat/Long):</b>	33.48°N; -76.98°W
<b>Off Bottom (Time- EDST):</b>	11:31	<b>Off Bottom (Lat/Long):</b>	33.48°N; -76.99°W
<b>Physical (bottom); Temp (°C):</b>	N/A	<b>Salinity:</b>	<b>Visibility (m):</b> 15 <b>Current (kn):</b> 0.75

**Physical Environment:**



**Dive Site:** ROV 16-15, UNCW Dive 346; N. Carolina, Snowy Wreck MPA reef, 65 m

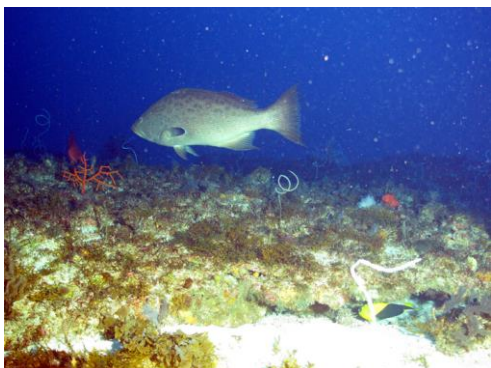
**Dive Imagery:**



**Figure 1:** Depth: -62.9 m  
Scattered heads of the deepwater form of azooxanthellate coral *Oculina varicosa*.



**Figure 2:** Depth: -64.3 m  
Low relief rocks with large sponges (orange- *Agelas clathrodes*), gorgonians (*Iciligorgia schrammi*), and lionfish.



**Figure 3:** Depth: -60.9 m  
Scamp grouper swims over the rock bottom.



**Figure 4:** Depth: -64.3 m  
Graysby are found along the rock ledges.



**Figure 5:** Depth: -62.6 m  
Stout moray hiding under a ledge.



**Figure 6:** Depth: -63.8 m  
Creole fish are common over the reefs.



**Dive Site:** ROV 16-15, UNCW Dive 346; N. Carolina, Snowy Wreck MPA reef, 65 m

## **Dive Notes:**

### **Objectives, Site Description, Habitat, Fauna:**

#### Site/Objectives:

Site #- 15-VI-16-1; ROV 16-15, UNCW Dive 346; N. Carolina, Snowy Wreck MPA reef, 60-65 m

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

#### ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N or S, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect N to SW along east and south slope of escarpment. Conducted normal photo XS at 2 minute intervals. Excellent station keeping.

#### Site Description/Habitat

Depth range: 60-65 m

MB- large flat topped plateau with escarpment on east side and south side. Transect along east and south slope and top edge.

14 kn from 220°, seas 2-4'; drift 1.5 kn to SW. Bottom current- 3/4 kn from N.

East slope and top edge: MB shows steep escarpment. Top of plateau was 60-62 m, flat sand and flat rock pavement. Slope was barely perceptible in ROV. East slope was <5°, 50% hard bottom, pavement and low relief, flat rock 1' relief, white sand between.

SE corner of escarpment had the highest relief and rugosity: Upper slope 10-30°, rock boulders 1-2 m relief in some areas, high rugosity.

South facing slope, heading WNW: mostly 50-80% hard bottom, slope 0-20°, low relief flat rock and rock outcrops, 1' to 1 m; occasional areas with 1-2 m relief.

Biota dominated by *Diodogorgia*, *Iciligorgia schrammi* (some may have been misidentified as *Diodogorgia* in dive notes), *Swiftia exerta*; sponges- large *Agelas clathrodes* abundant (1-3'); black coral- *Antipathes* spp, *Stichopathes*, *Tanacetipathes*; algae- mostly green Dictyota (some mis identified as Chlorophyta in notes)

9:30- Launch

9:36- On bottom, 62 m; on top of plateau, east side. 100% soft bottom sand. As approached top of east slope, rock pavement with sediment.

9:47- Start photo transect at 2 minute intervals; 62 m top edge of slope. 50% hard bottom; sand and 1'-1/2 m flat rock boulders. Dominated by *Diodogorgia* (some may be *Iciligorgia schrammi*), *Stichopathes*, *Agelas*

**Dive Site:** ROV 16-15, UNCW Dive 346; N. Carolina, Snowy Wreck MPA reef, 65 m

*clathrodes*, hydroids, and green Dictyota, *Swiftia exerta* common.

63 m- east slope half way down escarpment on MB; ROV found 5° slope, same habitat. Large patches of *Swiftia*- all open.

10:13- South slope of plateau; top edge- 60.5 m. SE corner of plateau. Heading W along face of slope. Areas with 1 m relief, high rugosity and lots of fish; dense tomtate; areas of 1-2 m relief, 10-20° slope on upper part of escarpment. *Antipatharia* spp. common, several species.

11:13- Heading WNW along face of south slope. 64 m on lower part of escarpment. 50-80% hard bottom, mostly <1 m flat rock and boulders.

11:30- End of dive.

*Dominant Benthic Macrobiofa:*

Scleractinia- *Oculina varicosa*, three colonies, 15 cm, white; solitary cup coral

Octocorallia-*Diodigorgia*, *Iciligorgia schrammi*, *Swiftia exerta* (53- actual counts), *Ellisella*

Antipatharia- *Stichopathes lutkeni*, *Antipathes atlantica*, *Antipathes* sp (large to 1 m), *Tanacetipathes*, large white bushy *Antipathes*

Zoantharia (on dead *Antipathes*)

Porifera- *Agelas clathrodes* (abundant, 1-3'), *Oceanapia?*, *Geodia neptuni*

Algae- *Dictyota* (Green color)

*Dominant Fish:*

Counts- 121 lionfish, 2 gag, 8 graysby, 10 scamp, 2 rock hind.

*Human Debris:*

Several fishing lines

**Dive Site:** ROV 16-15, UNCW Dive 346; N. Carolina, Snowy Wreck MPA reef, 65 m

**CPCe Percent Cover Analysis:**

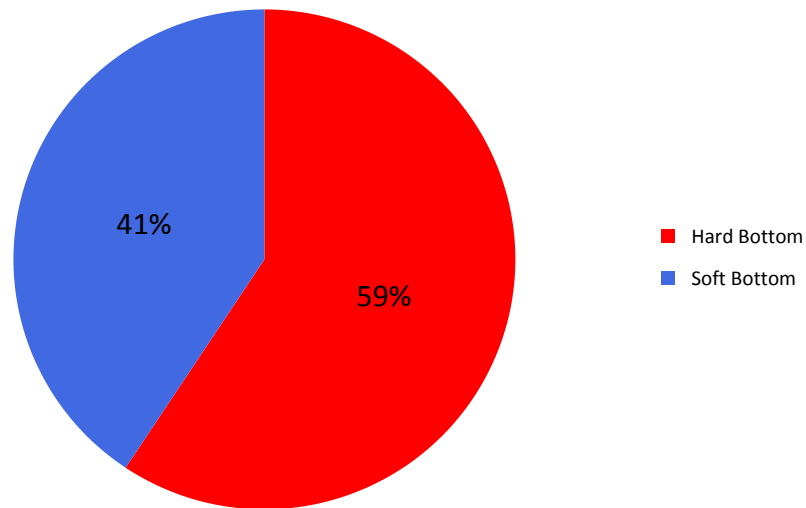
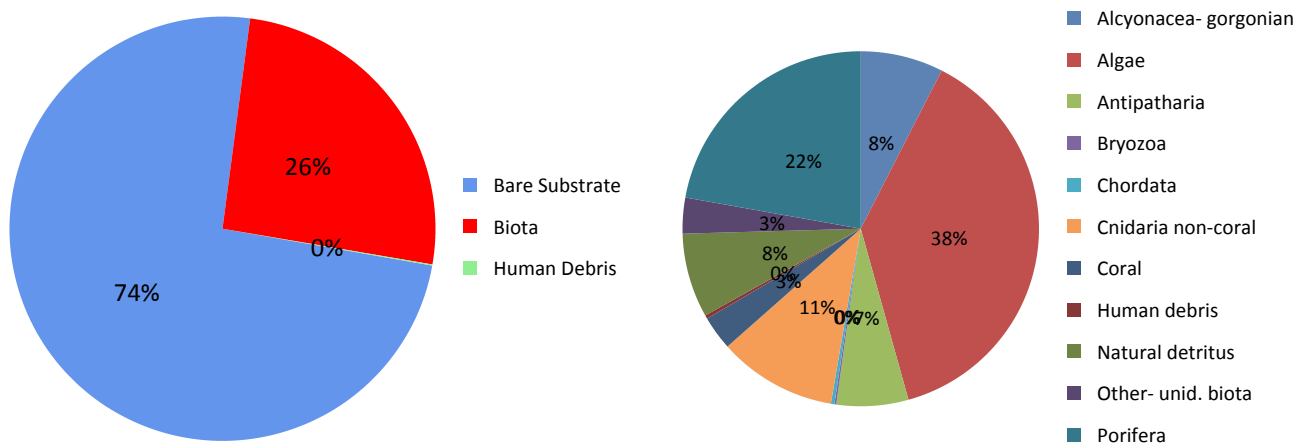


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-15. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-15.

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 16-15, UNCW Dive 346; N. Carolina, Snowy Wreck MPA reef, 65 m

**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 16-15.

Group/Phylum/Taxonomic Name	16-15	
	CPCe	dive notes
Biota	25.62%	X
Cyanobacteria	0.46%	
Chlorophyta	0.04%	X
Ochrophyta	7.13%	X
<i>Dictyota sp.</i>	4.99%	X
Ochrophyta	1.89%	
<i>Padina sp.</i>	0.25%	
Rhodophyta	2.18%	
Crustose coralline	0.63%	
Rhodophyta	1.55%	
Porifera	5.70%	X
<i>Agelas clathrodes</i>	1.76%	X
<i>Agelas sp.</i>	0.25%	X
<i>Aiolochoira crassa</i>	0.04%	X
Demospongiae	2.60%	X
<i>Geodia gibberosa complex</i>		X
<i>Geodia neptuni complex</i>	0.42%	
<i>Niphates sp.</i>	0.17%	
<i>Oceanapia sp.</i>		X
Spirastrellidae	0.46%	X
<i>Geodia neptuni</i>		X
Cnidaria	7.17%	X
Alcyonacea- gorgonian	0.71%	
Antipatharia	0.17%	X
<i>Antipathes atlantica</i>	0.21%	X
<i>Antipathes sp.</i>		X
<i>Diodogorgia sp.</i>		X
<i>Elatopathes abietina</i>	0.46%	
<i>Ellisella sp.</i>		X
Hydroidolina	2.77%	X
<i>Iciligorgia schrammi</i>	0.96%	X
<i>Nicella sp.</i>	0.17%	X
<i>Oculina varicosa</i>	0.46%	X
<i>Phyllangia americana</i>	0.25%	

**Dive Site:** ROV 16-15, UNCW Dive 346; N. Carolina, Snowy Wreck MPA reef, 65 m

Scleractinia- unid colonial		X
Scleractinia- unid cup	0.04%	
<i>Siderastrea radians</i>	0.04%	
<i>Stichopathes lutkeni</i>	0.84%	X
<i>Swiftia exserta</i>	0.08%	X
<i>Tanacetipathes tanacetum</i>		X
Zoanthidae		X
Bryozoa	0.04%	
<i>Schizoporella sp.</i>	0.04%	
Arthropoda		X
<i>Panulirus argus</i>		X
Chordata	0.08%	X
Didemnidae	0.08%	
Gnathostomata		X
detritus	1.97%	
UNKNOWN	0.84%	
Human Debris	0.08%	X
Human debris	0.08%	X
Human debris- fish line/gear	0.08%	
Human debris- fishing line		X
Bare Substrate	74.30%	
Habitat	74.30%	
dead standing Oculina	0.13%	
Bare rock	31.61%	
Bare rubble/cobble	1.05%	
Bare soft bottom	41.51%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-15, UNCW Dive 346; N. Carolina, Snowy Wreck MPA reef, 65 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-15.

Class/Species	Common Name	2016-15
Actinopterygii		
<i>Acanthurus</i> sp.	doctorfish	6.47
<i>Aluterus monoceros</i>	unicorn filefish	0.96
<i>Apogon</i> sp.	cardinalfish	0.14
<i>Balistes capriscus</i>	grey triggerfish	0.14
<i>Bodianus pulchellus</i>	spotfin hogfish	11.29
<i>Calamus</i> sp.	porgy	2.34
<i>Cantherhines macrocerus</i>	whitespotted filefish	0.14
<i>Canthidermis sufflamen</i>	ocean triggerfish	0.14
<i>Canthigaster</i> sp.	puffer	13.50
<i>Centropyge argi</i>	cherubfish	1.79
<i>Cephalopholis cruentatus</i>	graysby	2.62
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	0.96
<i>Chaetodon sedentarius</i>	reef butterflyfish	22.31
<i>Chromis enchrysurus</i>	yellowtail reeffish	0.69
<i>Chromis insolatus</i>	sunshinefish	83.18
<i>Chromis scotti</i>	purple reeffish	4.41
<i>Chromis</i> sp.	damsel fish	15.15
<i>Clepticus parrai</i>	creole wrasse	8.13
<i>Epinephelus adscensionis</i>	rock hind	0.28
<i>Gymnothorax moringa</i>	spotted moray eel	0.28
<i>Haemulon aurolineatum</i>	tomtate	48.48
<i>Haemulon</i> sp.	grunt	10.33
<i>Halichoeres bathyphilus</i>	greenband wrasse	1.10
<i>Halichoeres garnoti</i>	yellowhead wrasse	17.08
<i>Halichoeres</i> sp.	wrasse	28.10
<i>Holacanthus bermudensis</i>	blue angelfish	2.34
<i>Holacanthus tricolor</i>	rock beauty	3.99
Holocentridae	squirrelfish	14.19
<i>Holocentrus adscensionis</i>	squirrelfish	7.16
<i>Lachnolaimus maximus</i>	hogfish	0.14
<i>Liopropoma eukrines</i>	wrasse bass	0.69
mixed school	mixed school	17.22
<i>Muraena robusta</i>	stout moray eel	0.14
<i>Mycteroperca microlepis</i>	gag grouper	0.41
<i>Mycteroperca phenax</i>	scamp	1.93

**Dive Site:** ROV 16-15, UNCW Dive 346; N. Carolina, Snowy Wreck MPA reef, 65 m

<i>Myripristis jacobus</i>	blackbar soldierfish	2.20
<i>Paranthias furcifer</i>	creolefish	47.51
<i>Pareques umbrosus</i>	cubbyu	9.23
<i>Pomacanthus paru</i>	french angelfish	0.14
<i>Priacanthus arenatus</i>	bigeye	30.85
<i>Prognathodes aculeatus</i>	longsnout butterflyfish	0.28
<i>Pseudupeneus maculatus</i>	spotted goatfish	1.38
<i>Pterois volitans</i>	lionfish	22.86
<i>Rypticus saponaceus</i>	greater soapfish	1.51
<i>Seriola dumerili</i>	greater amberjack	1.24
<i>Seriola rivoliana</i>	almaco jack	0.14
<i>Seriola</i> sp.	amberjack	0.41
<i>Serranus annularis</i>	orangeback bass	0.41
<i>Serranus phoebe</i>	tattler	1.10
<i>Sparisoma atomarium</i>	greenblotch parrotfish	0.28
<i>Sphyræna barracuda</i>	barracuda	0.14
<i>Stegastes partitus</i>	bicolor damselfish	0.41
unknown	unknown	100.40
<i>Xanthichthys ringens</i>	sargassum triggerfish	2.20

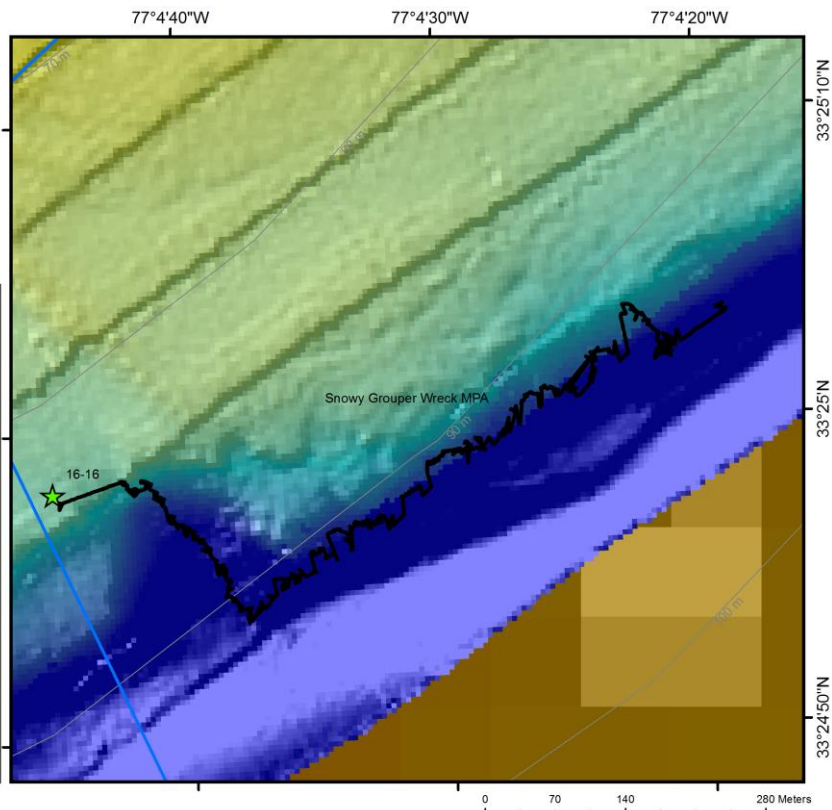
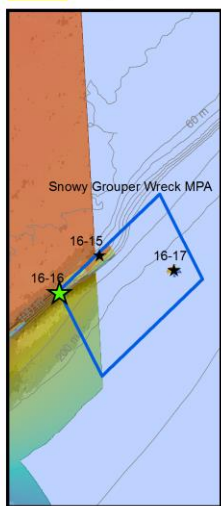
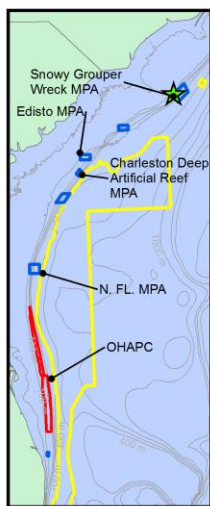


**Dive Site:** ROV 16-16, UNCW Dive 347; N. Carolina, Snowy Wreck MPA reef, 80 m

## General Location and Dive Track:

### ROV 16-16; N. Carolina, Snowy Wreck MPA Reef, 80 m; 15-VI-16-2

- ★ 16-16
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



## Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andrew W. David, John Reed,  
Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

## Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Pisces\_2012\_SnowyWreckMPA\_ MB\_Grid

**Purpose:** Survey and monitor Shelf-Edge MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/15/2016

**Specimens:** 0

**Digital Photos:** 167

**DVD:** 2

**Hard Drive:** 2

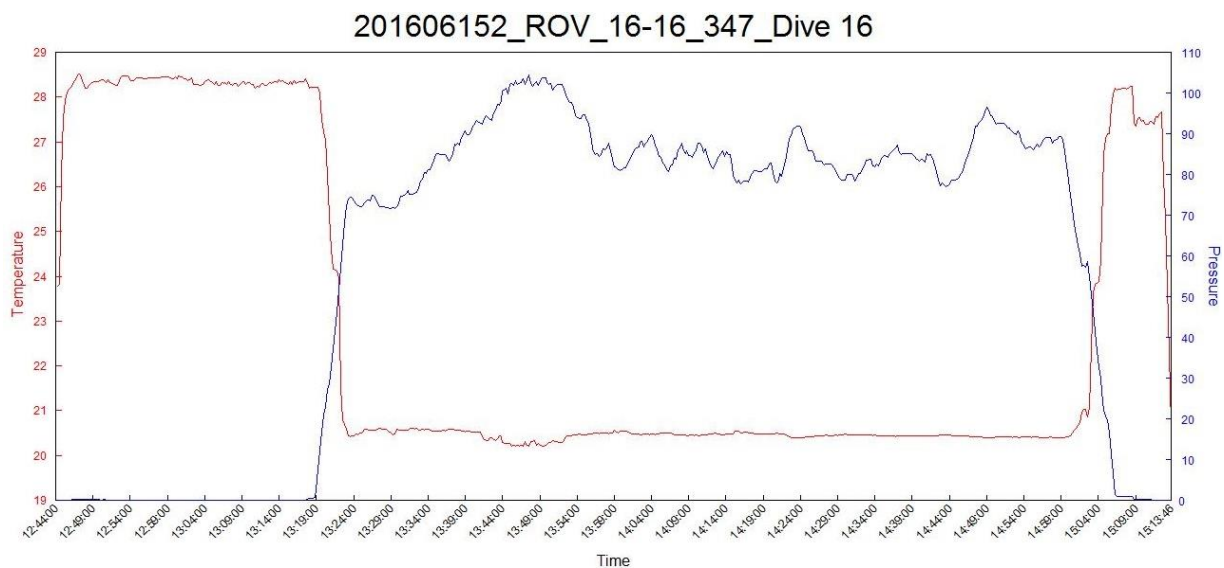
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-16, UNCW Dive 347; N. Carolina, Snowy Wreck MPA reef, 80 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	75	<b>Total Transect Length (km):</b>	0.800
<b>Maximum Bottom Depth (m):</b>	105	<b>Surface Current (kn):</b>	0.2
<b>On Bottom (Time- EDST):</b>	13:30	<b>On Bottom (Lat/Long):</b>	33.42°N; -77.08°W
<b>Off Bottom (Time- EDST):</b>	14:57	<b>Off Bottom (Lat/Long):</b>	33.42°N; -77.07°W
<b>Physical (bottom); Temp (°C):</b>	20.2	<b>Salinity:</b>	<b>Visibility (m):</b> 15 <b>Current (kn):</b> 0.1

**Physical Environment:**



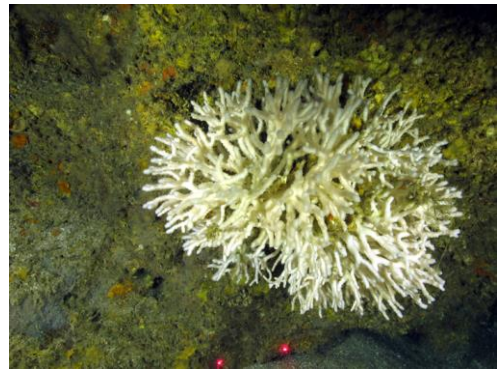
Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-16 are as follows: Depth Maximum: 104.3 m, Temperature: 20.2-20.6 °C.

**Dive Site:** ROV 16-16, UNCW Dive 347; N. Carolina, Snowy Wreck MPA reef, 80 m

**Dive Imagery:**



**Figure 1:** Depth: -102.6 m  
Danforth anchor lost on a rock ledge with a colony of *Oculina varicosa*.



**Figure 2:** Depth: -104 m  
Colony of the deepwater form of *Oculina varicosa* (white due to the lack of zooxanthellae).



**Figure 3:** Depth: -101 m  
Scamp grouper school along the rocky escarpment.



**Figure 4:** Depth: -99 m  
Scorpion fish.

**Dive Site:** ROV 16-16, UNCW Dive 347; N. Carolina, Snowy Wreck MPA reef, 80 m

## **Dive Notes:**

### **Objectives, Site Description, Habitat, Fauna:**

#### Site/Objectives:

Site #- 15-VI-16-2; ROV 16-16, UNCW Dive 347; N. Carolina, Snowy Wreck MPA reef, 75-104 m.

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

#### ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N or S, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect S to NE along east slope of escarpment. Conducted normal photo XS at 2 minute intervals. Excellent station keeping.

#### Site Description/Habitat

Depth range: 75- 104.2 m

MB- shows cove and steep escarpment on east slope of plateau. Transect starting in cove, then heading NE along face of escarpment from top to bottom.

Top edge of plateau, 75 m, mostly low relief rock pavement and sediment, low density of biota. Upper slope, 75-80 m also mostly pavement, sediment and low relief rock. Highest relief is between 90 and 100 m; 30-45° slope in some areas, 1 m rock outcrops, high rugosity with schools of anthiids, and scamp are common.

13:16- Launch

13:22- On bottom, top of plateau, 76 m, 100% soft bottom, sand. Edge of plateau- 75 m, pavement and sand; sparse biota, Hydroids, *Stichopathes*.

88 m- upper slope of east escarpment; 50% hard bottom, 1/2 m rock boulders, outcrops, 20° slope, boulder field, moderate rugosity. Some *Oculina*.

93.5 m- near bottom of cove; 1-2' rock boulders, 50% cover, 10° slope.

13:42- SE corner of cove, 100 m; 80% cover 1-2' rock boulders; head NE along face of NE-SW oriented wall.

104.2 m- Maximum depth of dive; near base of escarpment on MB.

101 m- dozens of *Madracis myriaster*, 10-20 cm, white on boulders (appear as *Oculina* from distance; have to see calyces to tell apart).

13:54- Manta ray at top of escarpment in video.

82-85 m- back on upper slope; 30° slope,

**Dive Site:** ROV 16-16, UNCW Dive 347; N. Carolina, Snowy Wreck MPA reef, 80 m

78 m- Upper edge of escarpment; mostly pavement, sand; looks like sand dunes.

14:57- End of dive, 90 m.

Benthic macrobiota were sparse and low diversity; mostly *Stichopathes*, hydroids, *Spirastrellidae*, *Antipathes atlantica*, and *Madracis*. Dominant fish- anthiids, scamp, usual small fish.

*Dominant Benthic Macrobiota:*

Scleractinia- *Oculina varicosa*, 88 m, 10 cm white; *Madracis myriaster*, 85-101 m, 10-20 cm (count-26+); solitary cup corals

Antipatharia- *Stichopathes lutkeni*, *Antipathes atlantica*, *Antipathes* sp. (black fan), *Tanacetipathes*

Octocorallia- 10 cm orange gorgonians

Porifera- encrusting spp., *Spirastrellidae*

Decapoda- *Panularis*

Phaeophyta- flat blade (*Sypopodium?*)

*Dominant Fish:*

Counts- 123 lionfish, 36 scamp, 1 gag, 5 graysby

Wrasse bass, french butterfly, rough tongue bass (abundant), black jack, amberjack, manta ray, bigeye, one site with 13 scamp, eels, scorpionfish, cubbyu

*Human Debris:*

lots of fishing line

anchor with line

**Dive Site:** ROV 16-16, UNCW Dive 347; N. Carolina, Snowy Wreck MPA reef, 80 m

**CPCe Percent Cover Analysis:**

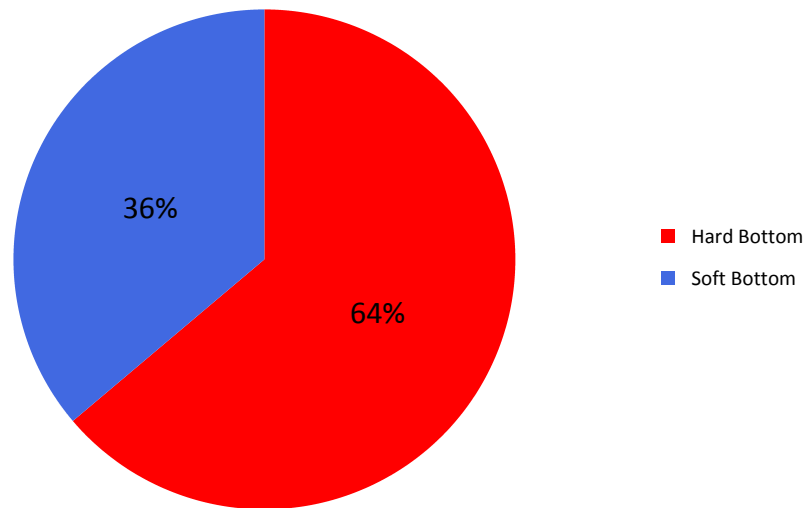
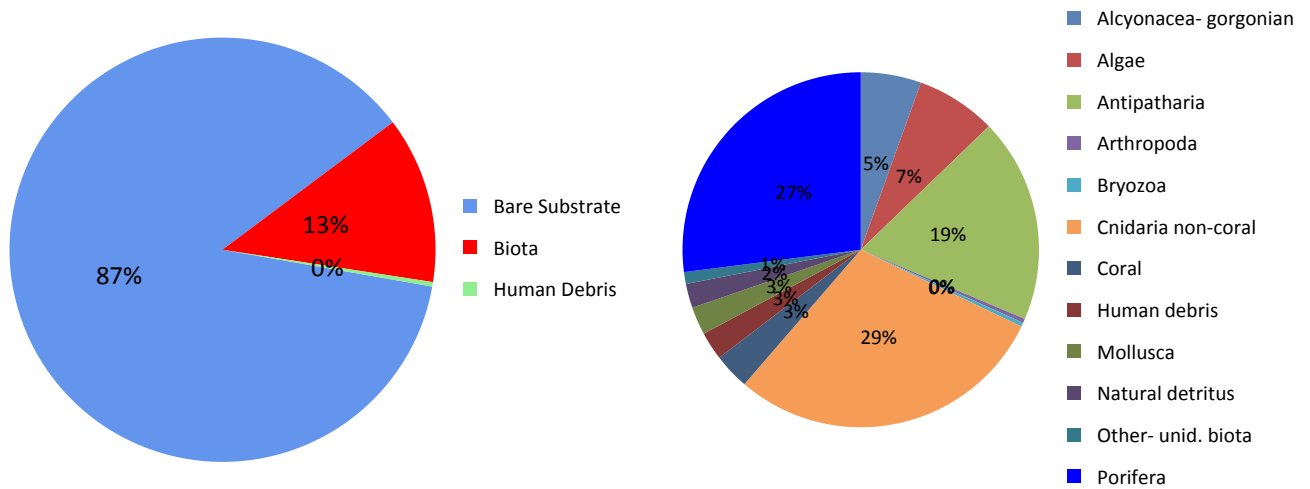


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-16. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-16.

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 16-16, UNCW Dive 347; N. Carolina, Snowy Wreck MPA reef, 80 m

**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 16-16.

Group/Phylum/Taxonomic Name	16-16	
	CPCe	dive notes
Biota	12.70%	X
Ochrophyta	0.52%	X
<i>Dictyota sp.</i>	0.10%	X
Ochrophyta	0.14%	
<i>Spatoglossum sp.</i>	0.29%	X
Rhodophyta	0.43%	
Crustose coralline	0.05%	
Rhodophyta	0.38%	
Porifera	3.52%	X
Axinellidae		X
Demospongiae	2.90%	X
<i>Erylus sp.</i>	0.05%	
Spirastrellidae	0.52%	X
<i>Spongisorites siliquaria</i>	0.05%	X
Cnidaria	7.37%	X
Alcyonacea- gorgonian	0.67%	X
Alcyoniina		X
Antipatharia	0.38%	X
<i>Antipathes atlantica</i>	0.38%	X
<i>Antipathes furcata</i>	0.19%	
<i>Antipathes sp.</i>		X
<i>Elatopathes abietina</i>	0.05%	
Hydroidolina	3.80%	X
<i>Madracis myriaster</i>	0.29%	X
<i>Muricea sp.</i>	0.05%	
<i>Oculina varicosa</i>	0.14%	X
Scleractinia- unid colonial		X
<i>Stichopathes lutkeni</i>	1.24%	X
<i>Tanacetipathes tanacetum</i>	0.19%	X
Bryozoa	0.05%	
Bryozoa	0.05%	
Arthropoda	0.05%	X
Paguroidea	0.05%	
<i>Panulirus argus</i>		X



**Dive Site:** ROV 16-16, UNCW Dive 347; N. Carolina, Snowy Wreck MPA reef, 80 m

Mollusca	0.33%	
<i>Pycnodonte sp.</i>	0.33%	
Chordata		X
Gnathostomata		X
detritus	0.29%	
UNKNOWN	0.14%	
Human Debris	0.33%	X
Human debris	0.33%	X
Human debris- anchor line	0.24%	X
Human debris- fish line/gear	0.05%	
Human debris- other	0.05%	
Human debris- fishing line		X
Bare Substrate	86.97%	
Habitat	86.97%	
Bare rock	43.94%	
Bare rubble/cobble	2.52%	
Bare soft bottom	40.51%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-16, UNCW Dive 347; N. Carolina, Snowy Wreck MPA reef, 80 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-16.

Class/Species	Common Name	2016-16
Actinopterygii		
<i>Acanthurus sp.</i>	doctorfish	0.59
Anthiinae	anthiids	817.55
<i>Bodianus pulchellus</i>	spotfin hogfish	7.69
<i>Bodianus rufus</i>	spanish hogfish	0.79
<i>Calamus sp.</i>	porgy	1.38
<i>Canthigaster sp.</i>	puffer	2.76
<i>Caranx lugubris</i>	black jack	0.59
<i>Cephalopholis cruentatus</i>	graysby	2.37
<i>Chaetodon ocellatus</i>	spotfin butterflyfish	0.79
<i>Chaetodon sedentarius</i>	reef butterflyfish	11.24
<i>Chilomycterus atringa</i>	spotted burrfish	0.39
<i>Chromis enchrysurus</i>	yellowtail reeffish	1.18
<i>Chromis insolatus</i>	sunshinefish	1.78
<i>Chromis scotti</i>	purple reeffish	0.79
<i>Chromis sp.</i>	damsel fish	0.79
<i>Decodon puellaris</i>	red hogfish	0.20
<i>Haemulon aurolineatum</i>	tomtate	5.92
<i>Haemulon sp.</i>	grunt	3.35
<i>Halichoeres bathyphilus</i>	greenband wrasse	0.59
<i>Halichoeres sp.</i>	wrasse	9.86
<i>Hemanthias vivanus</i>	red barbier	38.07
<i>Holacanthus bermudensis</i>	blue angelfish	0.59
<i>Holacanthus tricolor</i>	rock beauty	0.59
Holocentridae	soldierfish	0.39
Holocentridae	soldierfish/squirrelfish	0.20
Holocentridae	squirrelfish	3.75
<i>Holocentrus adscensionis</i>	squirrelfish	0.20
<i>Liopropoma eukrines</i>	wrasse bass	4.93
mixed school	mixed school	167.65
<i>Muraena retifera</i>	reticulate moray eel	0.20
Muraenidae	moray eel	0.59
<i>Mycteroperca interstitialis</i>	yellowmouth grouper	0.20
<i>Mycteroperca microlepis</i>	gag grouper	0.59
<i>Mycteroperca phenax</i>	scamp	7.30
<i>Myripristis jacobus</i>	blackbar soldierfish	0.20

**Dive Site:** ROV 16-16, UNCW Dive 347; N. Carolina, Snowy Wreck MPA reef, 80 m

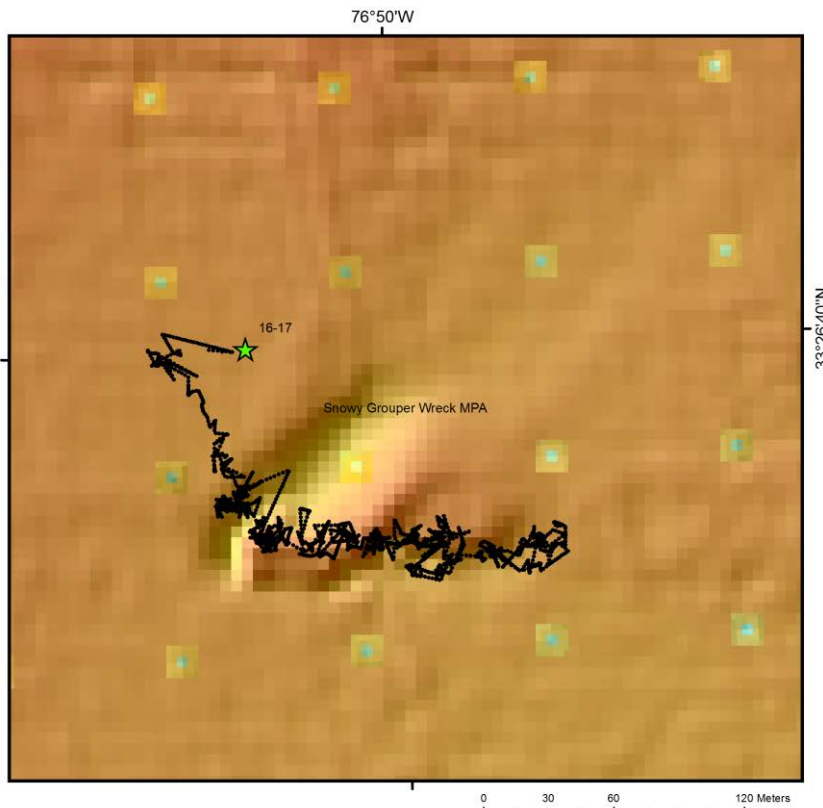
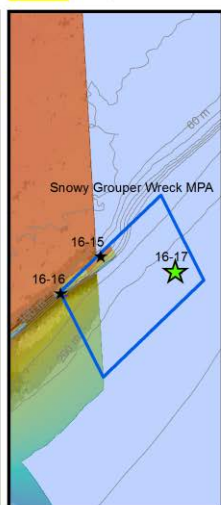
<i>Paranthias furcifer</i>	creolefish	0.20
<i>Pareques umbrosus</i>	cubbyu	15.98
<i>Plectrypops retrospinis</i>	cardinal soldierfish	2.17
<i>Priacanthus arenatus</i>	bigeye	8.48
<i>Pristigenys alta</i>	short bigeye	3.75
<i>Prognathodes aya</i>	bank butterflyfish	1.38
<i>Prognathodes guyanensis</i>	french butterflyfish	0.20
<i>Pronotogrammus martinicensis</i>	rougtongue bass	161.74
<i>Pseudupeneus maculatus</i>	spotted goatfish	8.09
<i>Pterois volitans</i>	lionfish	27.81
<i>Rhomboplites aurorubens</i>	vermilion snapper	7.89
<i>Rypticus saponaceus</i>	greater soapfish	1.18
<i>Rypticus</i> sp.	soapfish	0.59
<i>Rypticus subbifrenatus</i>	spotted soapfish	0.39
Scorpaenidae	scorpionfish	1.38
<i>Seriola dumerili</i>	greater amberjack	0.39
<i>Seriola rivoliana</i>	almaco jack	6.71
<i>Seriola</i> sp.	amberjack	0.79
<i>Serranus annularis</i>	orangeback bass	2.76
<i>Serranus phoebe</i>	tattler	7.50
<i>Sphoeroides spengleri</i>	bandtail puffer	0.20
unknown	unknown	2.56
Elasmobranchii		
Manta birostris	manta ray	0.20

**Dive Site:** ROV 16-17, UNCW Dive 348; N. Carolina, Snowy Wreck MPA shipwreck, 250 m

### General Location and Dive Track:

#### ROV 16-17; N. Carolina, Snowy Wreck MPA Shipwreck, 250 m; 15-VI-16-3

- ★ 16-17
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andy David, John Reed, Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Pisces\_2016\_Wreck\_Point

**Purpose:** Survey and monitor Shelf-Edge MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/15/2016

**Specimens:** 0

**Digital Photos:** 314

**DVD:** 2

**Hard Drive:** 2

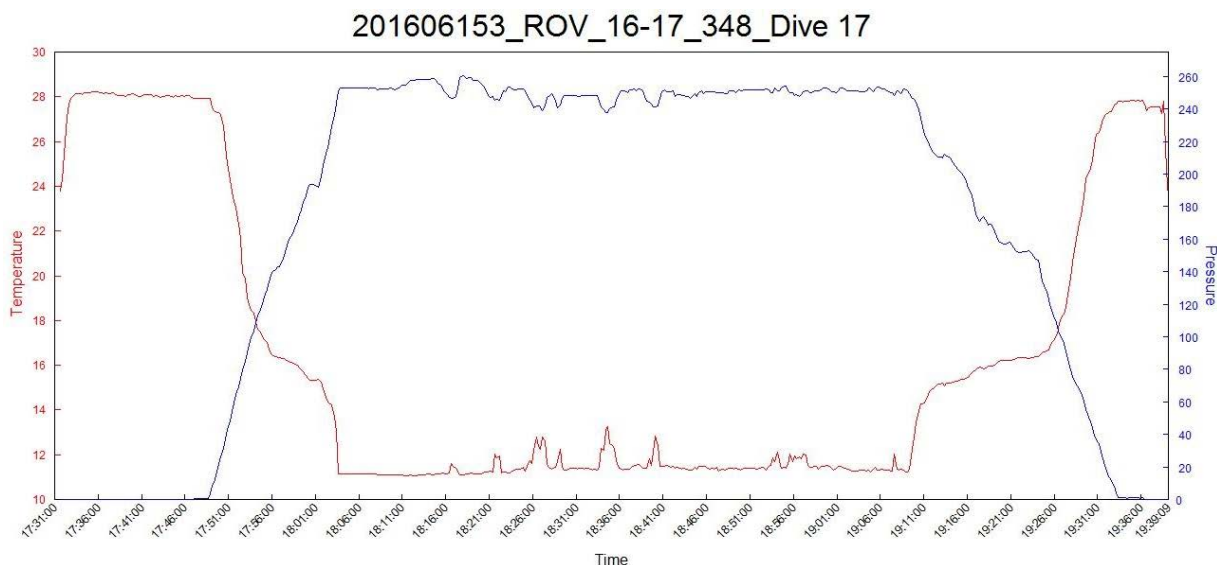
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-17, UNCW Dive 348; N. Carolina, Snowy Wreck MPA shipwreck, 250 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	238	<b>Total Transect Length (km):</b>	0.380
<b>Maximum Bottom Depth (m):</b>	260	<b>Surface Current (kn):</b>	0.5
<b>On Bottom (Time- EDST):</b>	18:02	<b>On Bottom (Lat/Long):</b>	33.44°N; -76.83°W
<b>Off Bottom (Time- EDST):</b>	19:08	<b>Off Bottom (Lat/Long):</b>	33.44°N; -76.83°W
<b>Physical (bottom); Temp (°C):</b>	11.1	<b>Salinity:</b>	<b>Visibility (m):</b> 20 <b>Current (kn):</b> 0.1

**Physical Environment:**



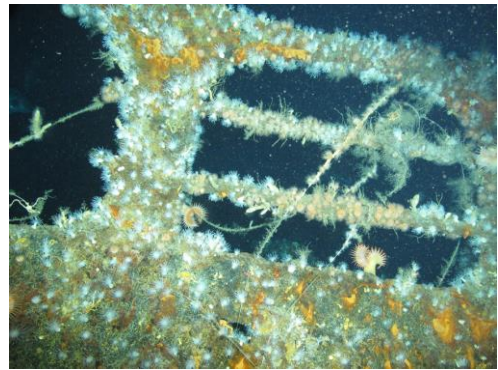
Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-17 are as follows: Depth Maximum: 260.3 m, Temperature: 11.1-13.3 °C.

**Dive Site:** ROV 16-17, UNCW Dive 348; N. Carolina, Snowy Wreck MPA shipwreck, 250 m

**Dive Imagery:**



**Figure 1:** Depth: -247 m  
Upper edge of Snowy Wreck with large schools of snowy grouper.



**Figure 2:** Depth: -247.7 m  
Lost fishing line is common all over the wreck which is encrusted with anemones.



**Figure 3:** Depth: -252.5 m  
School of snowy grouper on the wreck.



**Figure 4:** Depth: -252.3 m  
Large snowy grouper at the base of the wreck.



**Dive Site:** ROV 16-17, UNCW Dive 348; N. Carolina, Snowy Wreck MPA shipwreck, 250 m

## **Dive Notes:**

### **Objectives, Site Description, Habitat, Fauna:**

#### Site/Objectives:

Site #- 15-VI-16-3; ROV 16-17, UNCW Dive 348; N. Carolina, Snowy Wreck MPA shipwreck, 240-260 m

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

#### ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N or S, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect from West end of wreck, along the north hull, to east end. Not sure which end was bow. Lance thought he saw an anchor on the west end when we first landed (check the video to confirm). Excellent station keeping.

#### Site Description/Habitat

Depth range: 240-260 m

New MB shows wreck lying almost due E-W, approx 130 m long; large scour at north side, west end. Transect from scour to west end, along north side to east end. Then followed large poly anchor line (1" fairly new) that was wrapped on the ship, and strung out due east. MB shows a small mound about 50 m east of the wreck but we found a series of apparent scour holes but with no structure near by to cause the scour. Never found the end of the anchor line.

20 kn from SW, seas 3', drift slight; bottom current 0.1 from N.

17:45- Launch

18:02- On bottom, 253 m, 100 m NW of west end of wreck, north of scour. 100% soft bottom, silty sand, asymmetrical sand waves. *Coelopleurus floridanus* sea urchins common. MB- base of scour 268 m.

18:07- at west end of wreck; huge schools of large snowy grouper (some >70 cm; some small juveniles); all along the north side dozens in field of view; maybe hundreds on the wreck.

Wreck- west end base in sand, 260 m; deck level at railing- 253 m. Superstructure- 240 m. 1/2 way along hull- base 252 m, deck level 242 m. East end- 252 m at base, see inside broken open. No anchor seen or prop- not sure which end is which.

#### Dominant Benthic Macrofauna:

Sides covered with venus fly trap anemone, *Actinoscyphia*, small white anemones, serpulids. Some 10-15 cm



**Dive Site:** ROV 16-17, UNCW Dive 348; N. Carolina, Snowy Wreck MPA shipwreck, 250 m

*Lophelia* on vertical strut and railing, 240 m.

Scleractinia- *Lophelia pertusa* (10-15 cm; few)

Octocorallia- 15 cm grey fan Plexauridae

Hydroida

Decapoda- Anomura with anemone

Annelida- Serpulidae

Echinoidea- *Coelopleurus floridana*

*Dominant Fish:*

Snowy grouper- estimates of several hundred to 500, 2 yellowedge, 1 laemone, few anthiids.

*Human debris:*

Lots of fishing line; polypro anchor line (fairly new)

**Dive Site:** ROV 16-17, UNCW Dive 348; N. Carolina, Snowy Wreck MPA shipwreck, 250 m

**CPCe Percent Cover Analysis:**

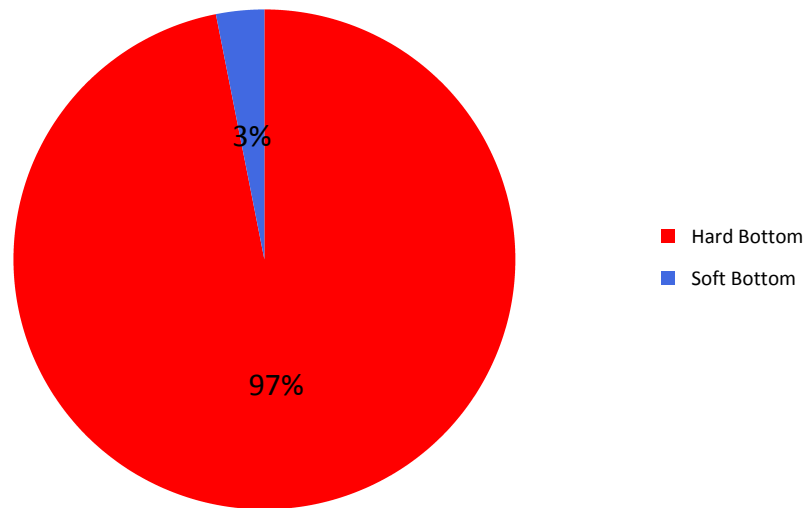


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-17. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

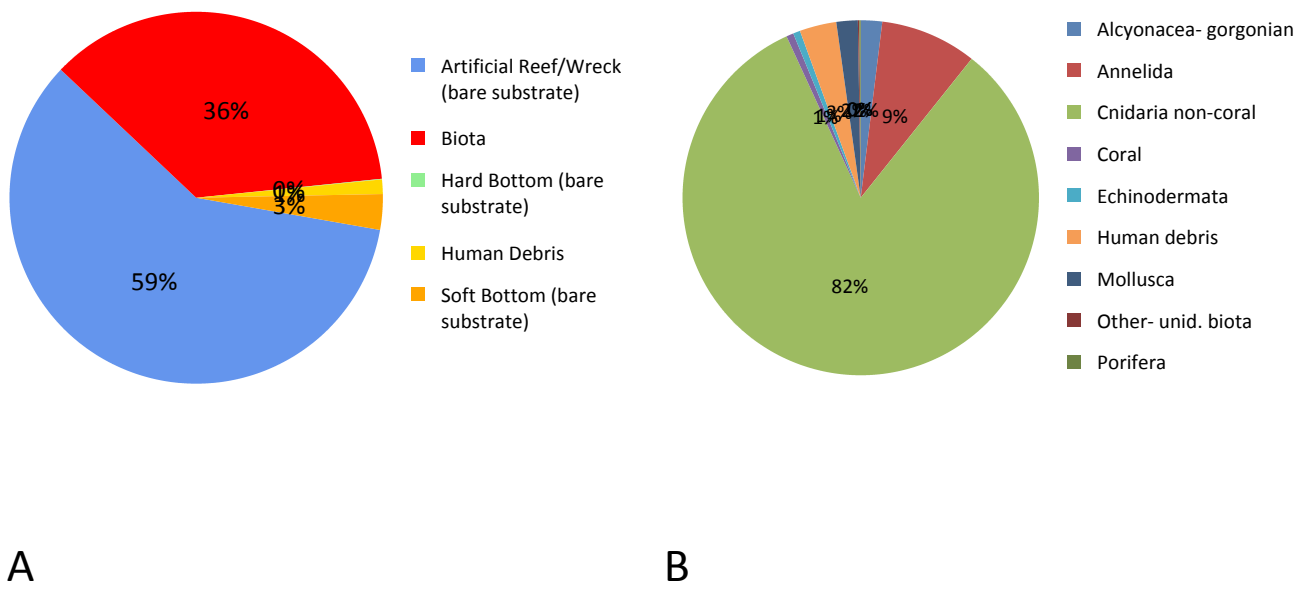


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-17.

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 16-17, UNCW Dive 348; N. Carolina, Snowy Wreck MPA shipwreck, 250 m

**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 16-17.

Group/Phylum/Taxonomic Name	16-17	
	CPCe	dive notes
Biota	36.28%	X
Porifera	0.05%	
Demospongiae	0.05%	
Cnidaria	31.93%	X
Actiniaria	25.45%	X
Actinoscyphiidae/Hormathiidae	4.31%	X
Alcyonacea- gorgonian	0.73%	X
Hydroidolina	1.16%	X
<i>Lophelia pertusa</i>	0.24%	X
Plexauridae		X
Zoanthidae	0.05%	
Annelida	3.29%	X
Annelida	0.29%	
Serpulidae	3.00%	X
Arthropoda		X
Anomura		X
Mollusca	0.73%	
Bivalvia	0.73%	
Echinodermata	0.24%	X
<i>Coelopleurus floridanus</i>	0.15%	X
Ophiuroidea	0.10%	
Chordata		X
Gnathostomata		X
Laemonema sp.		X
UNKNOWN	0.05%	
Human Debris	1.26%	X
Human debris	1.26%	X
Human debris- anchor line		X
Human debris- fish line/gear	1.26%	
Human debris- fishing line		X
Bare Substrate	62.46%	
Habitat	62.46%	
Bare rubble/cobble	0.05%	
Bare soft bottom	3.10%	

**Dive Site:** ROV 16-17, UNCW Dive 348; N. Carolina, Snowy Wreck MPA shipwreck, 250 m

Artificial Reef/Wreck	59.31%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-17, UNCW Dive 348; N. Carolina, Snowy Wreck MPA shipwreck, 250 m

**Density of Fish:**

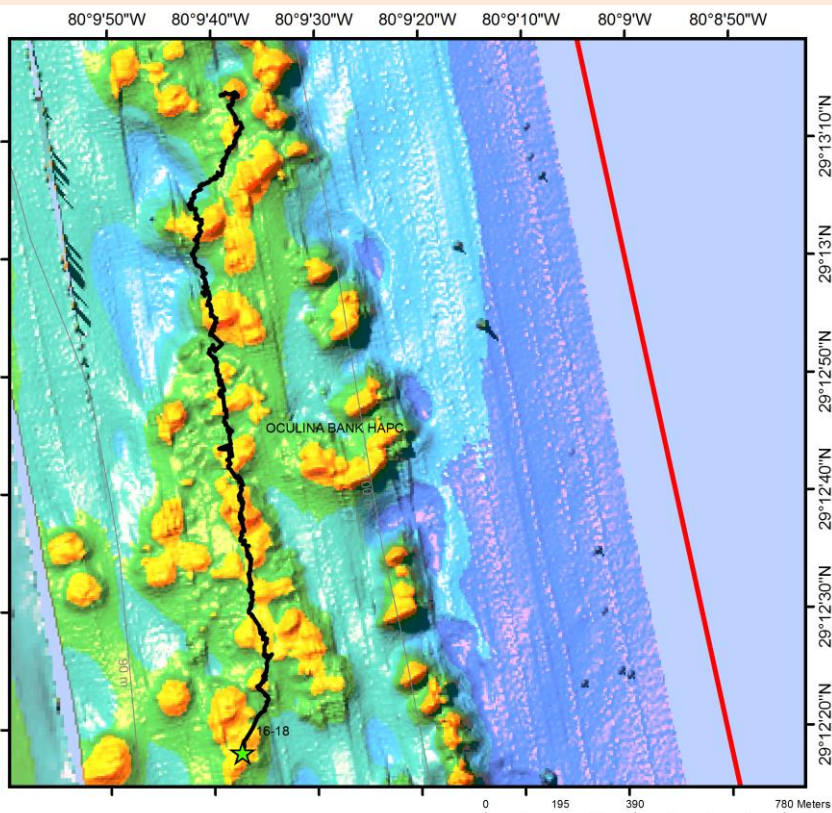
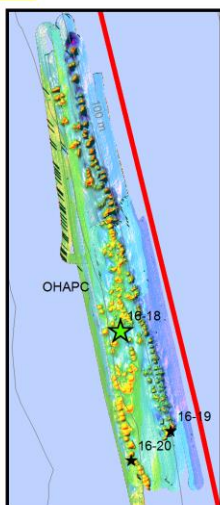
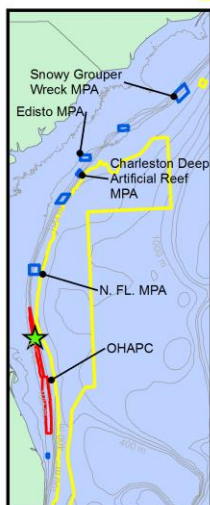
Fish Analysis not completed.

**Dive Site:** ROV 16-18, UNCW Dive 349; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 70-80 m

### General Location and Dive Track:

**ROV 16-18; Oculina HAPC, North Extension, Daytona, Moderate Relief Mounds, 70-80 m; 18-VI-16-1**

- ★ 16-18
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andy David, John Reed, Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Gebco\_SE\_Coast\_US

**Purpose:** Survey and monitor Shelf-Edge MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/18/2016

**Specimens:** 0

**Digital Photos:** 198

**DVD:** 2

**Hard Drive:** 1

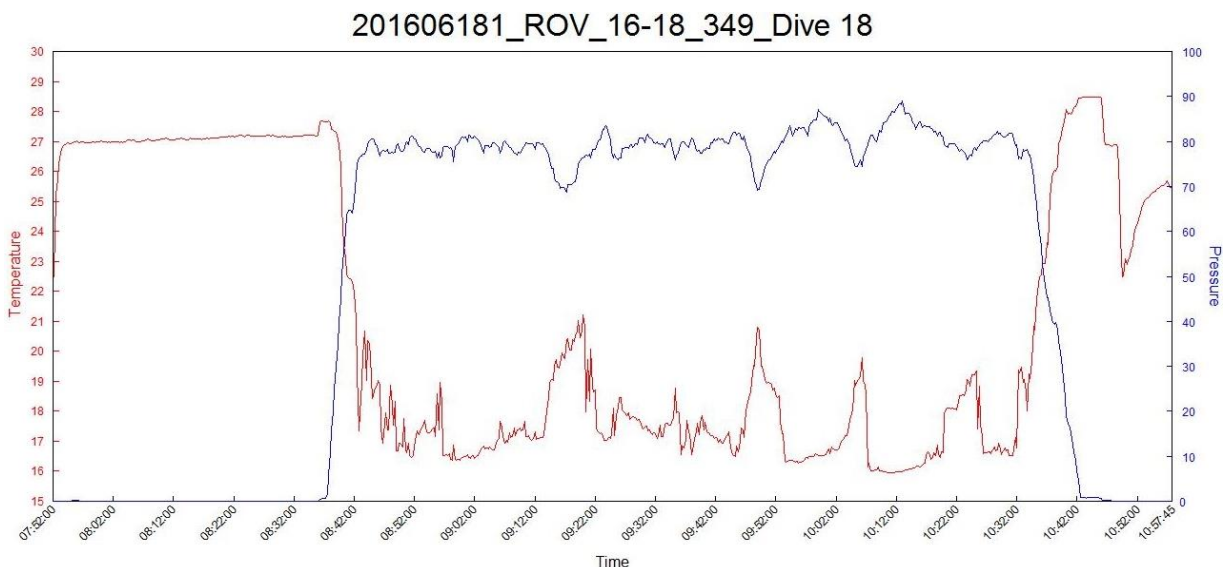
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-18, UNCW Dive 349; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 70-80 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	54	<b>Total Transect Length (km):</b>	1.800
<b>Maximum Bottom Depth (m):</b>	89	<b>Surface Current (kn):</b>	2
<b>On Bottom (Time- EDST):</b>	8:41	<b>On Bottom (Lat/Long):</b>	29.21°N; -80.16°W
<b>Off Bottom (Time- EDST):</b>	10:35	<b>Off Bottom (Lat/Long):</b>	29.22°N; -80.16°W
<b>Physical (bottom); Temp (°C):</b>	15.9	<b>Salinity:</b>	<b>Visibility (m):</b> 5 <b>Current (kn):</b> 0.5

**Physical Environment:**

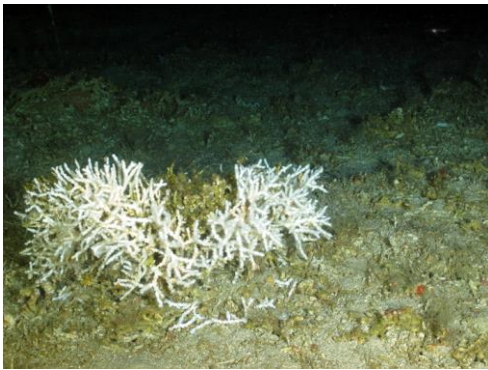


Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-18 are as follows: Depth Maximum: 89.1 m, Temperature: 15.9-22.4 °C.



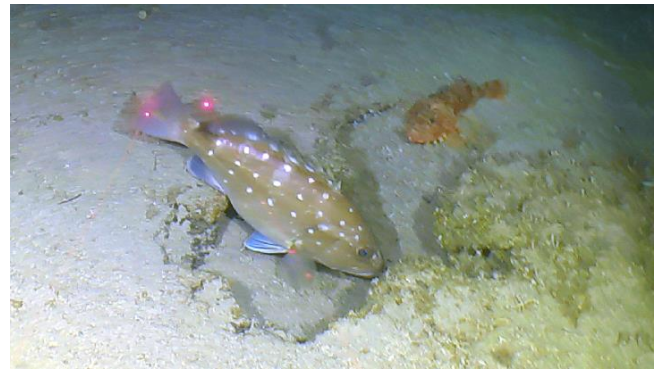
**Dive Site:** ROV 16-18, UNCW Dive 349; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 70-80 m

**Dive Imagery:**



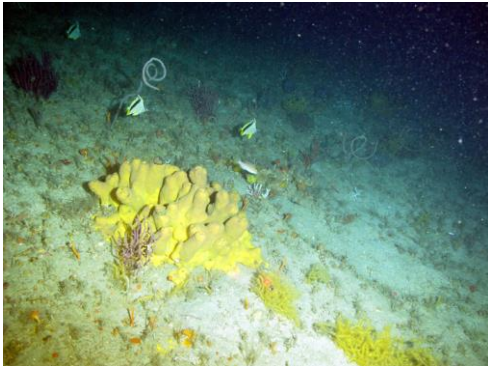
**Figure 1:** Depth: -82.1 m

Live azooxanthellate colony of *Oculina varicosa* on slope of coral mound.



**Figure 2:** Depth: -80.2 m

Snowy grouper finds a small rock outcrop to hid.



**Figure 3:** Depth: -79.6 m

Large yellow sponges (*Aplysina* sp.) and bank butterfly fish.



**Figure 4:** Depth: -77.7 m

Bank butterfly fish and anthiids on rock ledges at the base of the coral mound.

**Dive Site:** ROV 16-18, UNCW Dive 349; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 70-80 m

**Dive Notes:**

**Objectives, Site Description, Habitat, Fauna:**

Site/Objectives:

Site #- 18-VI-16-1; ROV 16-18, UNCW Dive 349; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 70-90 m.

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N or S, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect along series of moderate relief mounds and knolls, west of the high relief Oculina mounds; heading N. The end of the transect was a ring of moderate relief mounds with a central scour zone- this had the nice 1-3 m ledges, but ended dive then. Good station keeping.

Site Description/Habitat

Depth range: 70.5-90 m

MB- Oculina North Extension off Daytona; east side of MB series of high relief mounds, west of those are series of moderate mounds and hard bottom.

11 kn from SW, seas 1-2', 2 kn surface current; bottom current 1/4 kn; visibility 5-10 m.

Most of the mounds are 3-4 m relief, and series of rock knolls. Valleys between the mounds are series of low relief pavement and coral rubble. South slopes of mounds and peaks mostly 100% coral rubble, standing dead coral and occasional live coral. Base of north slope of some of the mounds have 1-3 m relief rock ledges, rock pavement, coral rubble with dense black coral, live Oculina, most 10-15 cm, some 30 cm. End of transect was in a scour surrounded by moderate relief mounds. Had very nice 1-3 m ledges, hard bottom with dense coral, black coral and fish.

08:35- Launch

8:41- On bottom, 80 m, MB- series of moderate relief knolls and mounds

Mound 1- 82 m base, 79 m top; pavement, sand, coral rubble

Mound 2- same habitat, mostly pavement, coral rubble; 78-82 m

82 m- between mounds on MB; flat sand shell hash, sea pens

Mound 3- 81 m base; rock pavement, 1'-2' ledges, snowy grouper

Mound 4- 78 m top, smooth mound, Oculina coral rubble, standing dead coral, live Oculina; Eucidaris urchins

**Dive Site:** ROV 16-18, UNCW Dive 349; *Oculina* HAPC, North Extension, Daytona, *Oculina* coral mounds, 70-80 m

Mound 5- 80 m base, 75 m top; coral rubble on top, hydroids, purple zoanthids encrusting the coral, 20° slope; north slope- 1-2' ledges, rock pavement, bushy black coral, numerous reef fish- rough tongue bass, bank butterfly, blue angelfish, scorpion fish

83.8 m- MB- valley between mounds, 2 live *Oculina*

Mound 6- live *Oculina* 10-20 cm, *Diodogorgia*, dense *Antipathes* several spp, yellow Plexaurida common

81 m- north base of Mound 6 and series of moderate relief mounds, large yellow demosponge

79 m- pavement, 1-2' ledges, live *Oculina*, vermilion snapper, anthiids

Mound 7- 83 m base, 70.5 m top; coral rubble, standing dead coral; north slope- pavement, 1 m ledges, 2-3 m ledge, scamp

88 m- scour on north side; *Oculina* live

Mound 8- 75 m top, 90 m scour at north base

10:18- transect over ring of moderate relief mounds surrounding a scour area.

79.6 m- dozens of live *Oculina*; rock pavement, 1-2' ledges,

78 m- inside scour of ring of mounds; 1-2 m ledges, rock pavement, dense black coral, lots of fish.

10:34- ended dive as soon as we were on this live bottom area.

#### *Dominant Benthic Macrobiota:*

Dominated by *Oculina* coral rubble, standing dead coral and sparse live coral; black coral- several species, dominated by purple fan *Antipathes*, *Antipathes atlantica*, *A. furcata* and *Stichopathes*; octocorals- *Diodogorgia*, yellow Plexauridae.

Scleractinia- *Oculina varicosa*, live white, 10-20 cm, one 30 cm (count 24); *Phyllangia americana*

Octocoral- *Diodogorgia*, yellow Plexauridae, *Titanideum*, *Nidalia occidentalis*

Zoanthidae- purple clusters on top of mounds

Antipatharia- *Stichopathes lutkeni*, *Antipathes atlantica*, *A. furcata*, *Antipathes* purple fan (abundant), *Tanacetipathes*

Actiniaria- anemone

Cerianthidae

Pennatulacea- *Virgularia presbytes*

Porifera- 50 cm cluster yellow tube Demospongiae

Decapoda- *Diogenes*; Scyllaridae

Echinoidea- *Eucidaris tribuloides*, *Centrostephanus*

Ophiuroidea- *Ophioderma devanyi*

Ascidiacea- Didemnidae

#### *Dominant Fish:*

Counts- 1 scamp, 3 snowy, 2 lionfish

Snowy, short bigeye, porgy, puffer, black seabass, tatler, blue angelfish, scorpion fish, rough tongue bass, bank butterfly, vermilion snapper, red hogfish

#### *Human Debris:*

Large ship's hawser line; fishing line

**Dive Site:** ROV 16-18, UNCW Dive 349; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 70-80 m

**CPCe Percent Cover Analysis:**

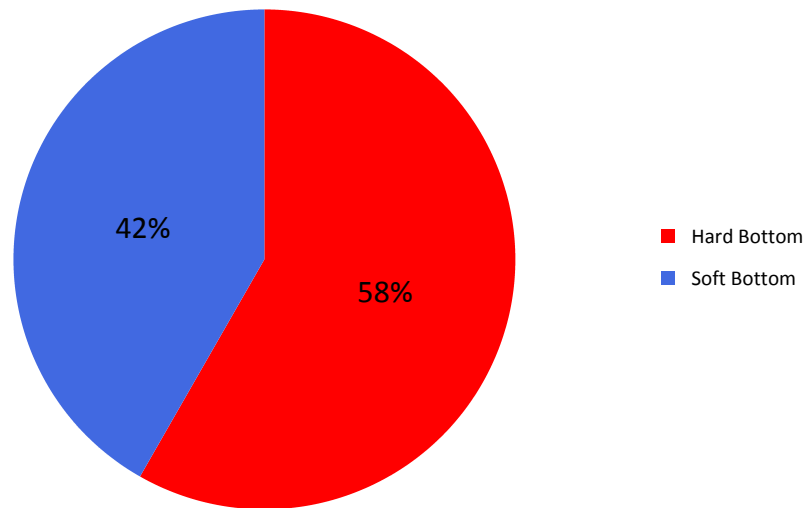


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-18. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

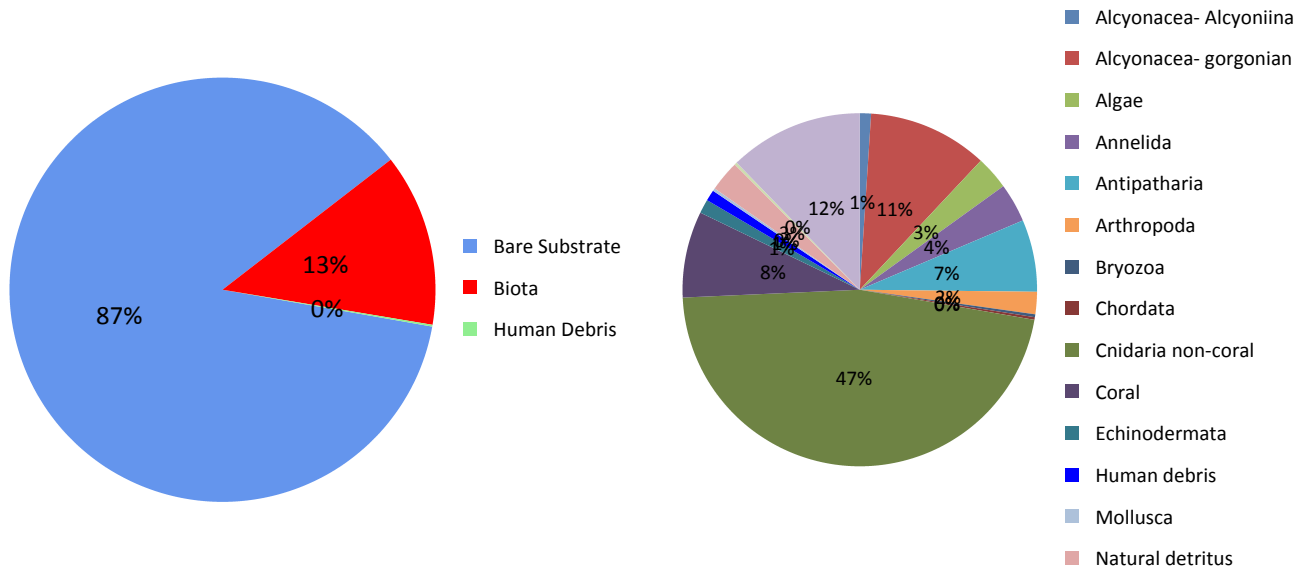


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-18.

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 16-18, UNCW Dive 349; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 70-80 m

**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 16-18.

Group/Phylum/Taxonomic Name	16-18	
	CPCe	dive notes
Biota	13.15%	X
Chlorophyta	0.03%	
Ochrophyta	0.03%	X
Ochrophyta	0.03%	
<i>Sargassum sp.</i>		X
Rhodophyta	0.34%	
Crustose coralline	0.10%	
Rhodophyta	0.24%	
Porifera	1.62%	X
<i>Aiolochoira crassa</i>	0.10%	
Demospongiae	0.78%	X
Poecilosclerida	0.14%	
<i>Scopalina sp.</i>	0.03%	
Spirastrellidae	0.30%	
<i>Spongisorites siliquaria</i>	0.27%	
Cnidaria	9.70%	X
Actiniaria		X
Alcyonacea- gorgonian	0.41%	X
Antipatharia	0.54%	X
<i>Antipathes atlantica</i>		X
<i>Antipathes furcata</i>	0.07%	X
Cerianthidae	0.07%	X
<i>Cladocora sp.</i>	0.03%	
<i>Diodogorgia sp.</i>	0.24%	X
<i>Elatopathes abietina</i>	0.03%	
Hydroidolina	5.68%	X
<i>Iciligorgia schrammi</i>	0.07%	
<i>Nidalia occidentalis</i>	0.14%	X
<i>Oculina varicosa</i>	0.98%	X
<i>Phyllangia americana</i>		X
Plexauridae		X
Plexauridae- purple	0.07%	
Plexauridae- yellow	0.68%	
Scleractinia- unid colonial	0.03%	

**Dive Site:** ROV 16-18, UNCW Dive 349; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 70-80 m

<i>Stichopathes lutkeni</i>	0.17%	X
<i>Tanacetipathes tanacetum</i>	0.07%	X
<i>Titanideum frauenfeldii</i>		X
<i>Virgularia presbytes</i>		X
Zoanthidae	0.44%	X
Annelida	0.47%	
Annelida	0.44%	
Serpulidae	0.03%	
Bryozoa	0.03%	
Bryozoa	0.03%	
Arthropoda	0.27%	X
Anomura		X
<i>Anoplodactylus lentus</i>	0.10%	
<i>Diogenes sp.</i>		X
Paguroidea	0.14%	
Scyllaridae		X
<i>Stenorhynchus seticornis</i>	0.03%	
Mollusca	0.03%	
Gastropoda	0.03%	
Echinodermata	0.17%	X
Asteroidea		X
<i>Centrostephanus longispinus</i>		X
<i>Eucidaris tribuloides</i>	0.17%	X
<i>Ophioderma devaneyi</i>		X
Chordata	0.03%	X
Didemnidae	0.03%	X
Gnathostomata		X
detritus	0.37%	
UNKNOWN	0.03%	
Human Debris	0.14%	X
Human debris	0.14%	X
Human debris- anchor line	0.14%	
Human debris- fish line/gear		X
Bare Substrate	86.71%	X
Habitat	86.71%	X
dead standing Oculina	0.64%	X
Bare rock	14.50%	
Bare rubble- coral	35.06%	
Bare rubble/cobble	4.39%	
Bare soft bottom	32.12%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-18, UNCW Dive 349; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 70-80 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-18.

Class/Species	Common Name	2016-18
Actinopterygii		
Anthiinae	anthiids	0.83
<i>Balistes capriscus</i>	grey triggerfish	0.33
<i>Centropristis ocyurus</i>	bank sea bass	4.01
<i>Chaetodon sedentarius</i>	reef butterflyfish	1.34
<i>Chromis enchrysurus</i>	yellowtail reeffish	1.34
<i>Decodon puellaris</i>	red hogfish	1.84
<i>Halichoeres bathyphilus</i>	greenband wrasse	2.00
<i>Halichoeres</i> sp.	wrasse	14.52
<i>Hemanthias vivanus</i>	red barbier	1.34
<i>Holacanthus bermudensis</i>	blue angelfish	0.67
<i>Hyporthodus niveatus</i>	snowy grouper	0.67
<i>Liopropoma eukrines</i>	wrasse bass	1.00
<i>Lutjanus campechanus</i>	red snapper	0.17
Muraenidae	moray eel	0.17
<i>Mycteroperca phenax</i>	scamp	0.17
<i>Neomerinthe hemingwayi</i>	spinycheek scorpionfish	0.17
<i>Ogcocephalus</i> sp.	batfish	0.33
<i>Pagrus pagrus</i>	red porgy	0.33
<i>Plectranthias garrupellus</i>	apricot bass	0.33
<i>Priacanthus arenatus</i>	bigeye	0.17
<i>Pristigenys alta</i>	short bigeye	12.02
<i>Prognathodes aya</i>	bank butterflyfish	7.84
<i>Pronotogrammus martinicensis</i>	rougtongue bass	2.34
<i>Pterois volitans</i>	lionfish	0.33
<i>Rhomboplites aurorubens</i>	vermilion snapper	0.33
Scorpaenidae	scorpionfish	1.34
<i>Seriola</i> sp.	amberjack	0.33
<i>Serranus annularis</i>	orangeback bass	0.17
<i>Serranus phoebe</i>	tattler	26.54
<i>Sphoeroides spengleri</i>	bandtail puffer	0.50
<i>Synodus</i> sp.	lizardfish	0.33
unknown	unknown	5.51

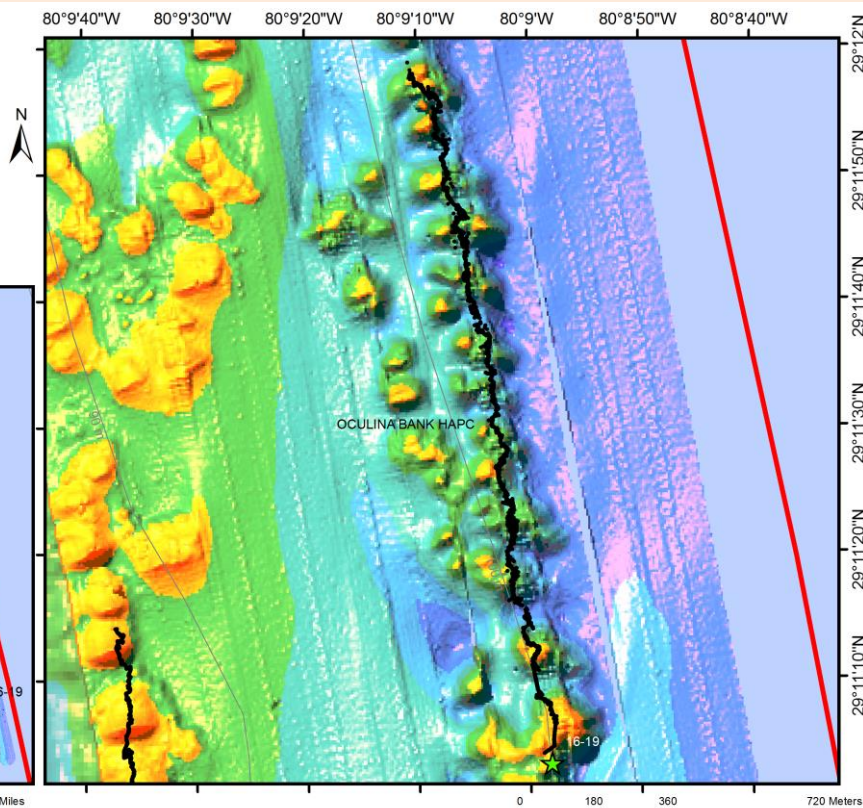
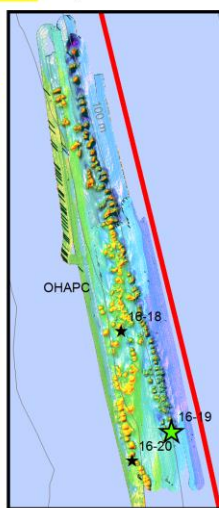
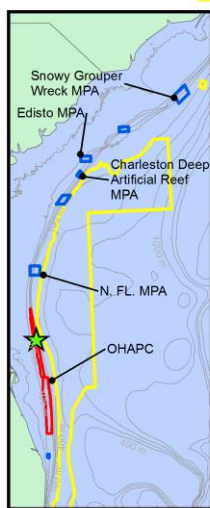


**Dive Site:** ROV 16-19, UNCW Dive 350; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 76-90 m

### General Location and Dive Track:

**ROV 16-19; Oculina HAPC, North Extension, Daytona, High Relief Mounds, 76-90 m; 18-VI-16-2**

- ★ 16-19
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

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**ROV:** Mohawk ROV

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

**Date of Dive:** 6/18/2016

**Specimens:** 0

**Digital Photos:** 194

**DVD:** 1

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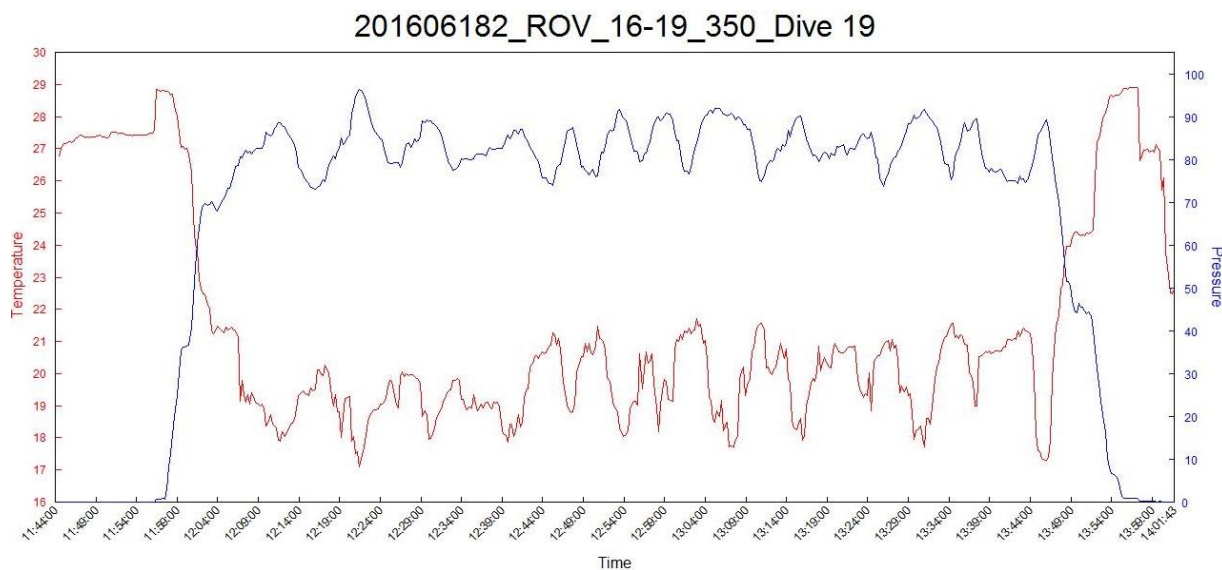
**Date Compiled:** 3/22/2017

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**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	69	<b>Total Transect Length (km):</b>	1.670
<b>Maximum Bottom Depth (m):</b>	96	<b>Surface Current (kn):</b>	2
<b>On Bottom (Time- EDST):</b>	12:01	<b>On Bottom (Lat/Long):</b>	29.18°N; -80.15°W
<b>Off Bottom (Time- EDST):</b>	13:44	<b>Off Bottom (Lat/Long):</b>	29.2°N; -80.15°W
<b>Physical (bottom); Temp (°C):</b>	17.1	<b>Salinity:</b>	<b>Visibility (m):</b> 10 <b>Current (kn):</b> 0.5

**Physical Environment:**



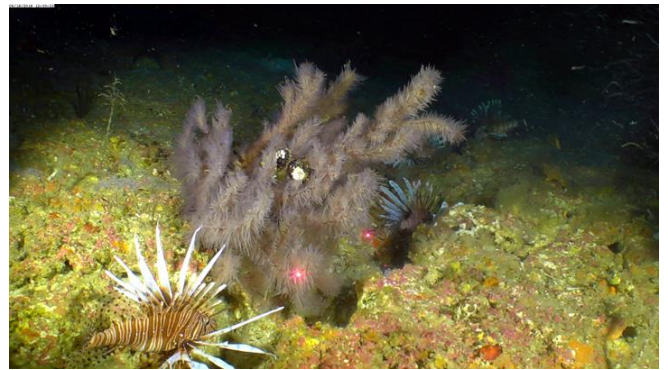
Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-19 are as follows: Depth Maximum: 96.3 m, Temperature: 17.1-24 °C.

**Dive Site:** ROV 16-19, UNCW Dive 350; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 76-90 m

**Dive Imagery:**



**Figure 1:** Depth: -86.8 m  
New growth of *Oculina varicosa* on rock outcrops.



**Figure 2:** Depth: -80.2 m  
Bushy black coral (*Elatopathes abietina*) and lionfish on rock pavement.



**Figure 3:** Depth: -88.5 m  
Large Warsaw grouper on the *Oculina* reef.



**Figure 4:** Depth: -80.4 m  
Blue angelfish, short bigeye, roughtongue bass, and bank butterfly on rock ledges at base of *Oculina* mound.



**Figure 5:** Depth: -82.3 m  
Loggerhead turtle swimming over the *Oculina* reef.



**Figure 6:** Depth: -77.3 m  
Peak of *Oculina* coral mound covered with apparent spawning aggregation of the sea urchin *Coelopleurus floridanus*.



**Dive Site:** ROV 16-19, UNCW Dive 350; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 76-90 m

**Dive Notes:**

**Objectives, Site Description, Habitat, Fauna:**

Site/Objectives:

Site #- 18-VI-16-2; ROV 16-19, UNCW Dive 350; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 75-97 m

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

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Transect along series of high relief Oculina mounds on east edge of HAPC, crossed 13 mounds; heading N. Good station keeping but could only drift north, and could not transect E-W along the north face of the mounds where the predominant rock habitat, ledges and grouper were found. So only crossed a very narrow band (5-10 m field of view of each mounds' north face).

Site Description/Habitat

Depth range: 75.5-97 m

MB- series of E-W oriented mounds forming a barrier reef along the east edge of the HAPC. Transect S to N across 13 major mounds and valleys.

8 Kn from NW, seas 1-2', current 2 kn from S; bottom current- 1/2 kn, visibility- 10-15 m.

Most of the mound peaks at 76-78 m; valley between the mounds 87-92 m. South slopes and peaks were predominately 100% Oculina coral rubble, and standing dead coral mostly near the peaks, sparse live Oculina varicosa 10-15 cm. North slopes of most were hard bottom, rock pavement with 1-3 m relief rock outcrops and ledges. Dense cover of black corals, encrusting sponges and crustose coralline algae on the rock. Most of the fish are on the north side and ledge zone. Could not transect E-W to view this zone of fish and habitat.

11:55- Launch

12:01- On bottom, at south end of MB, east ridge zone, 73 m, appear to be on slope of mound and saw numerous live Oculina varicosa coral, but no video was being recorded.

83 m- in valley between mounds, 1-2' ledges, dense *Tanacetipathes* black coral, live Oculina common, rough tongue bass, tatlers.

88 m- valley; coral rubble, Eucidaris, standing dead coral

Mound 2- 85 m, south base, 100% coral rubble, standing dead coral, *Centrostephanus*, bank butterfly, 20-30°

**Dive Site:** ROV 16-19, UNCW Dive 350; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 76-90 m

slope. Peak 74.5 m.

86 m- North slope, 2-3 m smooth rock outcrops, rock pavement.

97 m- valley between mounds.

12:21- Mound 3, 80 m south base; 100% coral rubble, standing dead coral, some live *Oculina varicosa*.

85 m- North slope, pavement, rock ledges, outcrops 1-3 m; scamp, dense black coral, reef fish.

90 m- valley, coral rubble.

12:29- Mound 4, south slope coral rubble, standing dead coral; top 78.5 m, 100% coral rubble; north slope- rock pavement, 1 m outcrops, black coral, zoanthids, crustose coralline algae on rock

81.5 m- north slope, live *Oculina*, dense *Tanacetipathes*, standing dead coral.

87 m- Valley, rubble, standing dead coral, amberjack.

Mound 5- south slope, standing dead coral, coral rubble; peak- 75.8 m, *Centrostephanus* black urchins. North slope- pavement, rock outcrops, ledges, dense black coral, rough tongue bass.

87 m- Valley, 1 m rock, 4 live *Oculina* 10-25 cm, cup coral

12:47- Mound 6, same; peak 77.5 m- spawning (?) aggregation of *Coelopleurus floridana* urchins; school vermilion snapper, *Cerianthidae anemone*

92 m- Valley, coral rubble

Mound 7 - Scamp, 82.4 m- aggregation of *Eucidaris* urchins; peak 77 m; north slope- pavement, ledges

91 m- Valley, 1-2 m rock outcrops, live *Oculina*

12:58- 90 m, aggregation of *Eucidaris*; schools of amberjack

12:59- Mound 8, same; peak 77.3 m, aggregation of *Coelopleurus floridanus*; dense school of vermilion snapper, scamp; north slope- pavement, ledges, dense black coral *Tanacetipathes*

93 m- Valley

Mound 9- *Holothuria lentigenosa*, *Holothuria* sp.; peak 76 m; north slope- pavement, ledges, dense black coral

13:11- screen grab- loggerhead, scamp, 83 m.

90 m- Valley, 100% coral rubble

Mound 10- South slope, 82 m, 1-2 m rock outcrops, dozens live *Oculina* 10-15 cm; north slope- hard bottom, pavement, 1-3 m relief, dense *Tanacetipathes*, gag grouper.

90 m- Valley

13:23- Mound 11, peak 77.5 m, 100% coral rubble, standing dead coral; Multibeam- is shifted 30 m to the north; north slope- rock pavement, ledges, dense *Tanacetipathes*, 30° slope, eel.

92 m- Valley

13:29- Mound 12, same; near top, 80 m- live *Oculina*; north slope- pavement, ledges, dense black coral, schools vermilion snapper, amberjack.

13:34- screen grab, big Warsaw grouper (5-6'), 86 m

13:37- Mound 13, peak 78.5 m, fishing line, big school amberjack; peak- 75.5 m; north slope- pavement, outcrops, dense *Tanacetipathes*, scamp

13:44- End dive, 90 m.

*Dominant Benthic Macrobiota:*

Scleractinia- *Oculina varicosa* (count- 31+ live, most 10-20 cm); cup coral

Cerianthidae

Hydroida

Ophiuroidea- *Ophioderma devanyi*

Echinoidea- *Coelopleurus floridanus* (spawning aggregations), *Eucidaris tribuloides* (spawning aggregations), *Centrostephanus*

Holothuroidea-*Holothuria lentigenosa enodis*, Holothuroidea unid sp.

Decapoda- Anomura, Galatheididae (?)

**Dive Site:** ROV 16-19, UNCW Dive 350; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 76-90 m

Antipatharia- *Stichopathes lutkeni*, *Tanacetipathes* (abundant), purple fan, other spp.

*Dominant Fish:*

Counts- 1 gag, 8 scamp, 1 warsaw (5-6' est.), 14 lionfish

Rough tongue bass, bat fish, tatler, bank butterfly, apricot bass, scamp, lionfish, wrasse, amberjack (large schools), schools vermilion snapper, red porgy

Loggerhead turtle

*Human Debris:*

Fishing line

**Dive Site:** ROV 16-19, UNCW Dive 350; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 76-90 m

**CPCe Percent Cover Analysis:**

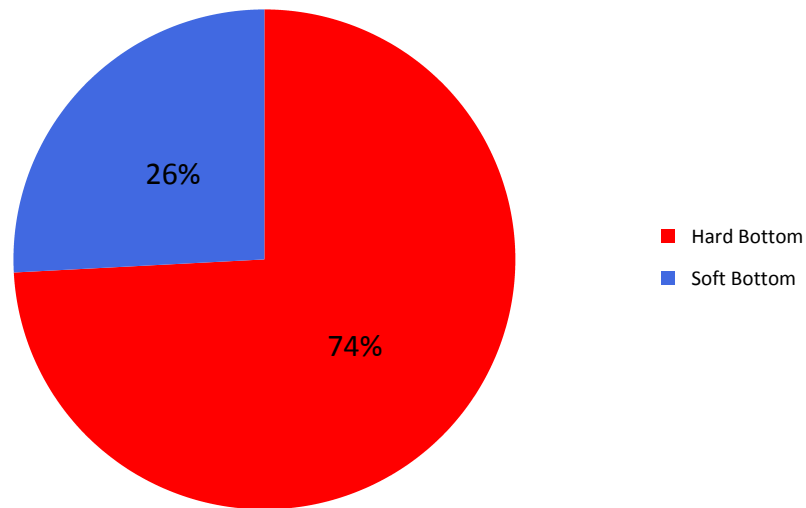


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-19. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

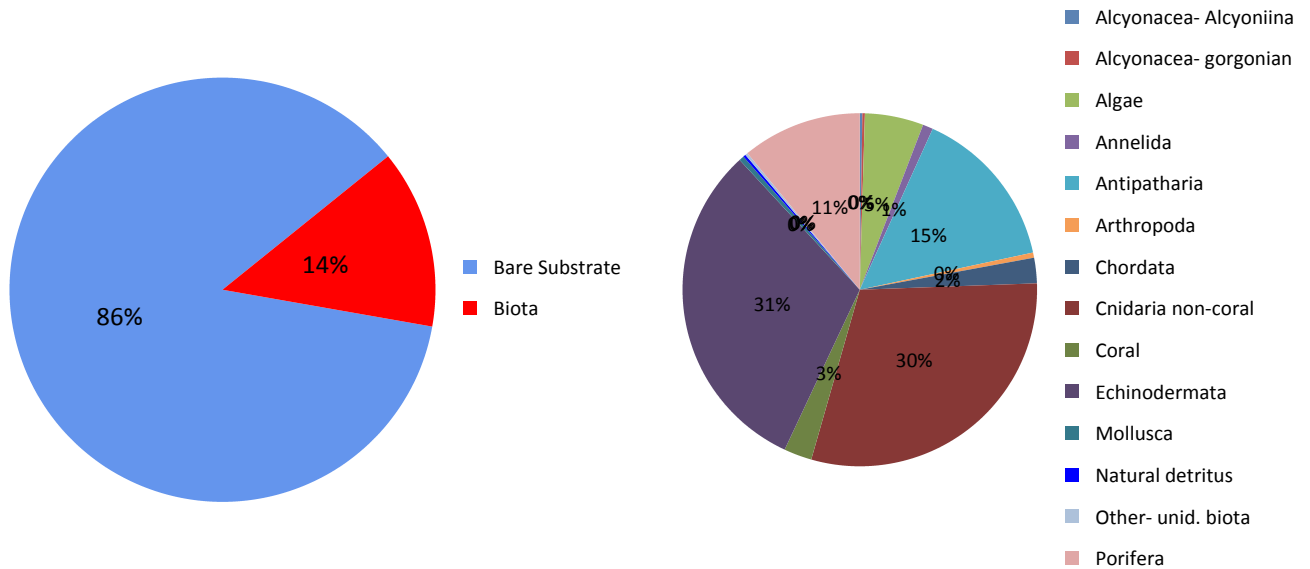


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-19. A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.



**Dive Site:** ROV 16-19, UNCW Dive 350; Oculina HAPC, North Extension, Daytona, high relief mounds, 76-90 m

**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 16-19.

	16-19	
Group/Phylum/Taxonomic Name	CPCe	dive notes
Biota	13.61%	X
Rhodophyta	0.73%	X
Crustose coralline	0.73%	X
Porifera	1.49%	X
Demospongiae	0.51%	X
<i>Erylus sp.</i>	0.06%	
<i>Ircinia sp.</i>	0.13%	
Spirastrellidae	0.79%	
Cnidaria	6.52%	X
Actiniaria	0.03%	
Alcyonacea- gorgonian	0.03%	X
Antipatharia	0.19%	X
<i>Antipathes atlantica</i>	0.09%	
<i>Antipathes furcata</i>	0.19%	
Cerianthidae	0.28%	X
Corallimorpharia	0.03%	
<i>Elatopathes abietina</i>	1.23%	
Hydroidolina	3.29%	X
<i>Nidalia occidentalis</i>	0.03%	
<i>Oculina varicosa</i>	0.32%	X
Scleractinia- unid colonial	0.03%	X
<i>Stichopathes lutkeni</i>	0.22%	X
<i>Tanacetipathes tanacetum</i>	0.09%	X
Zoanthidae	0.44%	X
Annelida	0.13%	
Annelida	0.09%	
<i>Filograna sp.</i>	0.03%	
Arthropoda	0.06%	X
Anomura		X
Galatheididae		X
<i>Stenorhynchus seticornis</i>	0.06%	
Mollusca	0.06%	
Bivalvia	0.06%	
Echinodermata	4.24%	X

**Dive Site:** ROV 16-19, UNCW Dive 350; Oculina HAPC, North Extension, Daytona, high relief mounds, 76-90 m

<i>Centrostephanus longispinus</i>	0.54%	X
<i>Coelopleurus floridanus</i>	3.01%	X
Echinoidea		X
<i>Eucidaris tribuloides</i>	0.66%	X
<i>Holothuria lentiginosa enodis</i>		X
Holothuroidea		X
<i>Ophioderma devaneyi</i>	0.03%	X
<i>Ophioderma sp.</i>		X
Chordata	0.32%	X
<i>Caretta caretta</i>	0.32%	
Gnathostomata		X
detritus	0.03%	
UNKNOWN	0.03%	
Human Debris		X
Human debris		X
Human debris- fishing line		X
Bare Substrate	86.39%	X
Habitat	86.39%	X
dead standing Oculina	3.04%	X
Bare rock	20.92%	
Bare rubble- coral	51.12%	
Bare rubble/cobble	0.57%	
Bare soft bottom	10.73%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-19, UNCW Dive 350; Oculina HAPC, North Extension, Daytona, high relief mounds, 76-90 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-19.

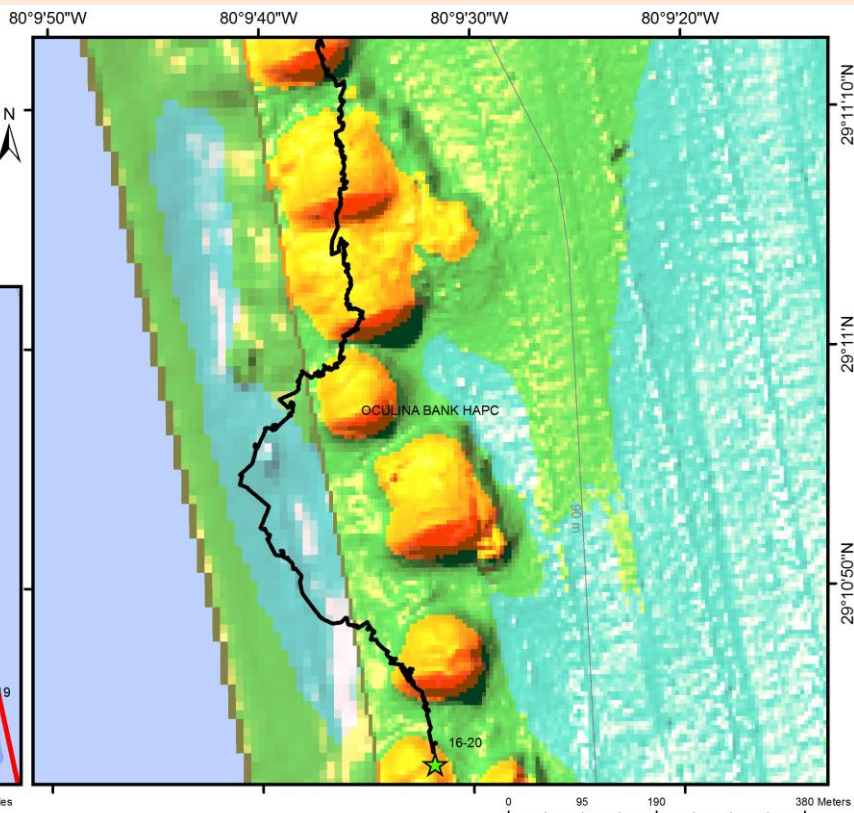
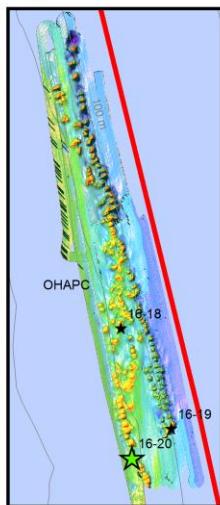
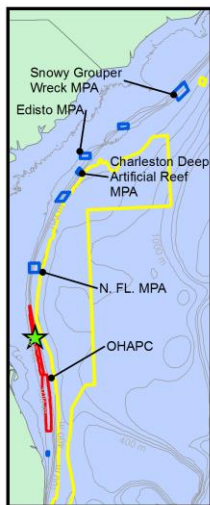
Class/Species	Common Name	2016-19
Actinopterygii		
Anthiinae	anthiids	22.22
<i>Centropristis ocyurus</i>	bank sea bass	4.79
<i>Chaetodon sedentarius</i>	reef butterflyfish	2.39
<i>Chromis enchrysurus</i>	yellowtail reeffish	10.77
<i>Decodon puellaris</i>	red hogfish	0.68
<i>Halichoeres bathyphilus</i>	greenband wrasse	1.37
<i>Halichoeres</i> sp.	wrasse	25.98
<i>Hemanthias vivanus</i>	red barbier	3.08
<i>Holacanthus bermudensis</i>	blue angelfish	0.17
<i>Hyorthodus nigrilus</i>	warsaw grouper	0.17
<i>Liopropoma eukrines</i>	wrasse bass	1.37
Muraenidae	moray eel	0.17
<i>Mycteroperca microlepis</i>	gag grouper	0.17
<i>Mycteroperca phenax</i>	scamp	1.37
<i>Ogcocephalus corniger</i>	longnose batfish	0.51
<i>Ogcocephalus</i> sp.	batfish	0.51
<i>Pagrus pagrus</i>	red porgy	0.17
<i>Plectranthias garrupellus</i>	apricot bass	2.56
<i>Pristigenys alta</i>	short bigeye	9.06
<i>Prognathodes aya</i>	bank butterflyfish	10.09
<i>Pronotogrammus martinicensis</i>	rougtongue bass	11.97
<i>Pterois volitans</i>	lionfish	2.39
<i>Rhomboplites aurorubens</i>	vermillion snapper	42.74
Scorpaenidae	scorpionfish	1.03
<i>Seriola dumerili</i>	greater amberjack	10.26
<i>Seriola rivoliana</i>	almaco jack	1.88
<i>Seriola</i> sp.	amberjack	2.74
<i>Serranus annularis</i>	orangeback bass	0.34
<i>Serranus notospilus</i>	saddle bass	0.17
<i>Serranus phoebe</i>	tattler	12.48
Sparidae	porgy	0.17
unknown	unknown	4.44

**Dive Site:** ROV 16-20, UNCW Dive 351; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 76-90 m

### General Location and Dive Track:

**ROV 16-20; Oculina HAPC, North Extension, Daytona, Moderate Relief Mounds, 76-90 m; 18-VI-16-3**

- ★ 16-20
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andrew W. David, John Reed, Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Gebco\_SE\_Coast\_US

**Purpose:** Survey and monitor Shelf-Edge MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/18/2016

**Specimens:** 0

**Digital Photos:** 120

**DVD:** 1

**Hard Drive:** 1

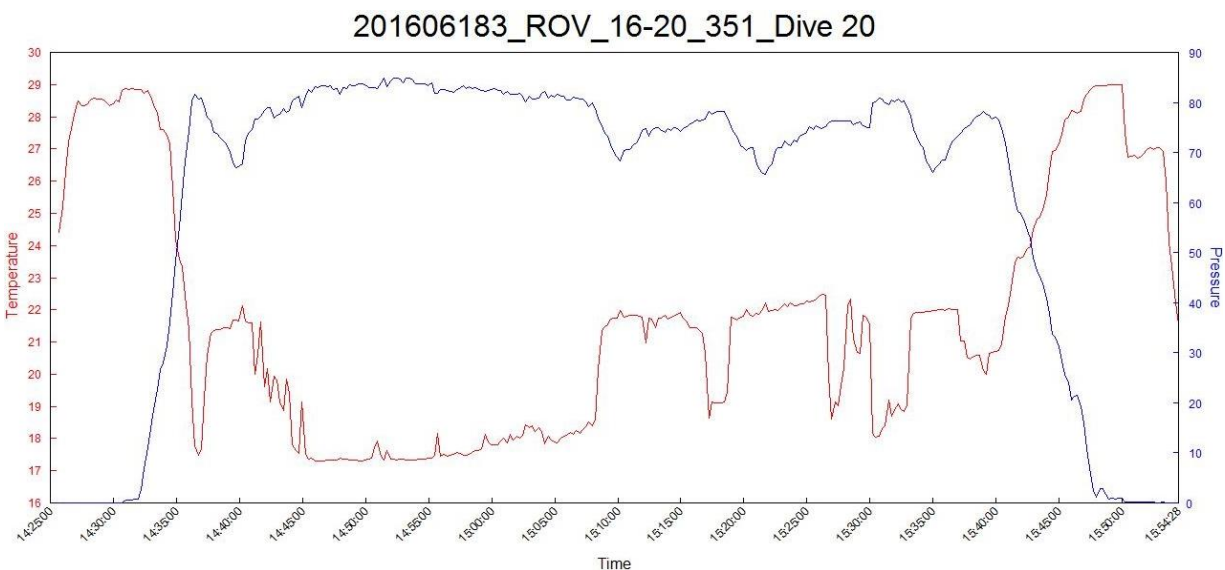
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-20, UNCW Dive 351; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 76-90 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	66	<b>Total Transect Length (km):</b>	1.050
<b>Maximum Bottom Depth (m):</b>	86	<b>Surface Current (kn):</b>	2
<b>On Bottom (Time- EDST):</b>	14:35	<b>On Bottom (Lat/Long):</b>	29.18°N; -80.16°W
<b>Off Bottom (Time- EDST):</b>	15:39	<b>Off Bottom (Lat/Long):</b>	29.19°N; -80.16°W
<b>Physical (bottom); Temp (°C):</b>	17.3	<b>Salinity:</b>	<b>Visibility (m):</b> 15 <b>Current (kn):</b> 0.25

**Physical Environment:**



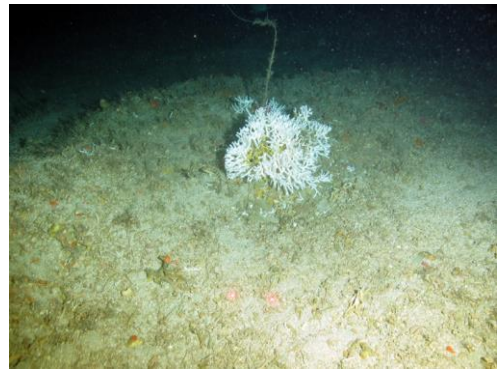
Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-20 are as follows: Depth Maximum: 84.9 m, Temperature: 17.3-23.6 °C.

**Dive Site:** ROV 16-20, UNCW Dive 351; *Oculina* HAPC, North Extension, Daytona, *Oculina* coral mounds, 76-90 m

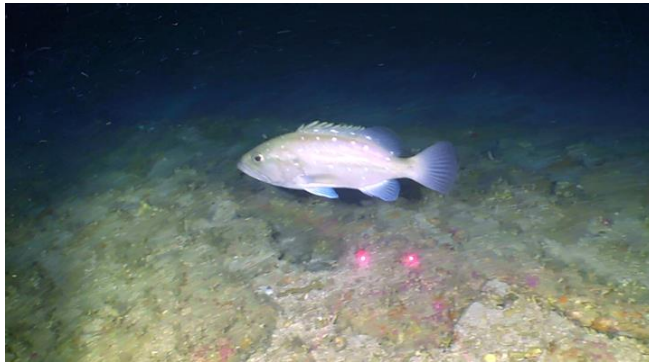
**Dive Imagery:**



**Figure 1:** Depth: -80.9 m  
Live *Oculina* coral colony with pair of bank butterfly fish.



**Figure 2:** Depth: -81.4 m  
Live *Oculina* coral colony growing on the slope of a *Oculina* mound.



**Figure 3:** Depth: -80.5 m  
Snowy grouper on the *Oculina* reef.



**Figure 4:** Depth: -76.3 m  
Basketstar (Gorgonocephalidae) spreads its arms to feed on a black coral (*Antipathes* sp.)



**Dive Site:** ROV 16-20, UNCW Dive 351; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 76-90 m

**Dive Notes:**

**Objectives, Site Description, Habitat, Fauna:**

Site/Objectives:

Site #- 8-VI-16-3; ROV 16-20, UNCW Dive 351; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 68-85 m

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N or S, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect along series of moderate relief Oculina mounds west of high relief mounds on east edge of HAPC. Difficulty station keeping, start of dive west of mounds missing them; then got online over the mounds.

Site Description/Habitat

Depth range: 68.5- 85 m.

MB- series of moderate relief mounds on west side of multibeam.

Wind 7 kn from N, seas 1-2', surface current 2 kn from S; bottom current 1/4 kn, visibility- 10 m.

Start of dive drifted west of the targeted transect, missing the mounds, but found low relief hard bottom, pavement, 1-2 rock boulders and habitat not apparent on the multibeam. Finally got back to the transect line over the mounds. Valleys between the mounds 78-82 m. Mound peaks 68-69 m; 100% coral rubble, standing dead coral and live Oculina common.

14:29- Launch

14:35- On bottom, 83 m, valley, 100% coral rubble

Mound 1- several live Oculina, 10-15 cm; peak 70 m; multibeam shifted 30 m to north. *Centrostephanus* common, standing dead coral; north slope- 100% coral rubble, fishing line.

81 m- Valley, 100% hard bottom, pavement, rock outcrops, *Tanacetipathes* black coral common

83 m- drifted off transect line, west of mounds

85 m- west of mounds; pavement, 1' ledges outcrops, 15 cm live *Oculina*. Not apparent on the multibeam which looks flat featureless.

84 m- still off mounds, 1-2' ledges, red hogfish, encrusting orange demosponges. 100 m west of mounds. 30 cm live *Oculina*, bank sea bass, tatler.

15:02- Moved east, at west base of mound; pavement, rock knolls; *Stichopathes*, Hydroids, 2 oculina 15 and



**Dive Site:** ROV 16-20, UNCW Dive 351; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 76-90 m

25 cm, bank butterfly, Eucidaris.; skirting west slopes of mounds.

79 m- west slope of mound; 100% coral rubble, standing dead coral, Zoanthids, 15 cm live *Oculina*, *Nidalia*.

69.5 m- peak of mound

15:09- Back on transect line over the mounds.; north slope- 100% coral rubble, pavement, few ledges, black coral, lionfish.

78 m- Valley; coral rubble, pavement, live *Oculina*

Mound- *Centrostephanus*, live *Oculina*, 100% coral rubble, standing dead coral, live coral.; 73 m- north slope, 7 red snapper, 100% coral rubble

76 m- Valley; 100% coral rubble, hard bottom pavement, 1-2' ledges; basketstar, Pycnogonida, snowy grouper

81 m- Valley; pavement, rubble

Mound- 100% coral rubble, standing dead coral

68.5 m- Peak, several live *Oculina*; north slope- coral rubble, standing dead coral

79 m - Valley, pavement, 1-2' ledges, purple antipatharia fans; *Tanacetipathes*, 10-15 cm live *Oculina*

15:39- End of dive; aborted early, bow thruster overheat alarm.

15:45- School of silky (?) sharks, over dozen

*Dominant Benthic Macrobiota:*

Scleractinia- *Oculina varicosa* (40 count), 15-25 cm, live, white

Octocorallia- *Nidalia occidentalis*

Antipatharia- *Stichopathes lutkeni*, *Tanacetipathes*, purple fan, Cerianthidae

Echinoidea- *Centrostephanus* black urchin

Opiuroidea- Basketstarfish Gorgonocephalidae

Demospongiae- encrusting orange, yellow

Pycnogonida- *Anolopladactylus lentus* (sea spider)

*Dominant Fish:*

Counts- 1 lionfish, 7 red snapper, 1 snowy,

Red hogfish, bank seabass, tatler, bank butterfly, grey triggerfish, short bigeye, orange back bass, silky (?) shark.

**Dive Site:** ROV 16-20, UNCW Dive 351; Oculina HAPC, North Extension, Daytona, Oculina coral mounds, 76-90 m

**CPCe Percent Cover Analysis:**

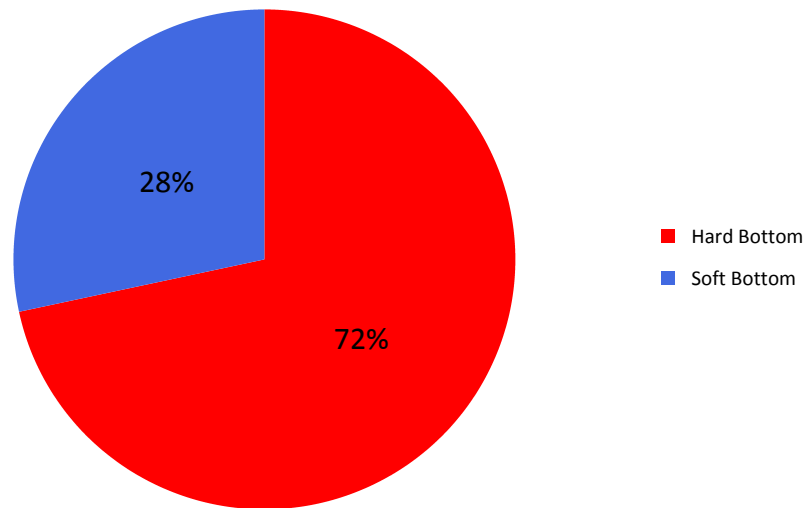


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-20. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

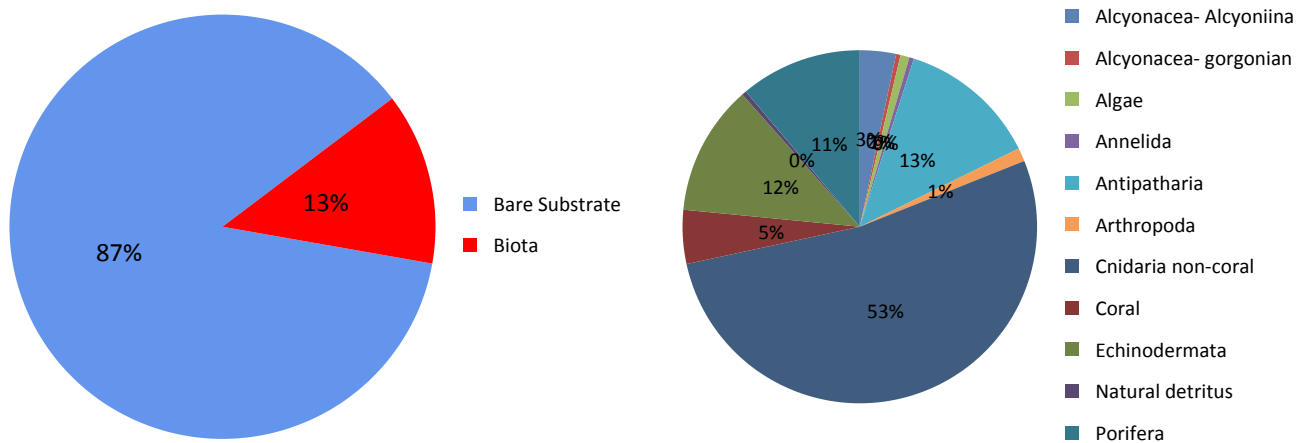


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-20. A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

**Dive Site:** ROV 16-20, UNCW Dive 351; Oculina HAPC, North Extension, Daytona, moderate relief mounds, 76-90 m

**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 16-20.

Group/Phylum/Taxonomic Name	16-20	
	CPCe	dive notes
Biota	13.10%	X
Rhodophyta	0.11%	
Crustose coralline	0.11%	
Porifera	1.46%	X
Demospongiae	0.49%	X
<i>Erylus sp.</i>	0.49%	
<i>Ircinia sp.</i>	0.16%	
Spirastrellidae	0.32%	
Cnidaria	9.70%	X
Actiniaria	0.05%	
Alcyonacea- gorgonian	0.05%	
Antipatharia	0.05%	X
<i>Antipathes atlantica</i>	0.38%	
<i>Antipathes furcata</i>	1.13%	
Cerianthidae	0.05%	X
<i>Cladocora sp.</i>	0.05%	
<i>Diodogorgia sp.</i>		X
<i>Elatopathes abietina</i>	0.05%	
Hyroidolina	6.68%	X
<i>Nidalia occidentalis</i>	0.43%	X
<i>Oculina varicosa</i>	0.59%	X
<i>Stichopathes lutkeni</i>	0.05%	X
<i>Tanacetipathes tanacetum</i>		X
<i>Titanideum frauenfeldii</i>		X
<i>Virgularia presbytes</i>		X
Zoanthidae	0.11%	X
Annelida	0.05%	
Sabellidae	0.05%	
Arthropoda	0.16%	X
<i>Anoplodactylus lentus</i>	0.11%	X
<i>Stenorhynchus seticornis</i>	0.05%	
Echinodermata	1.56%	X
<i>Centrostephanus longispinus</i>	0.38%	X
Echinoidea		X

**Dive Site:** ROV 16-20, UNCW Dive 351; Oculina HAPC, North Extension, Daytona, moderate relief mounds, 76-90 m

<i>Eucidaris tribuloides</i>	0.97%	X
Gorgonocephalidae	0.22%	X
Chordata		X
Gnathostomata		X
detritus	0.05%	
Bare Substrate	86.90%	X
Habitat	86.90%	X
dead standing Oculina	1.56%	X
Bare rock	14.18%	
Bare rubble- coral	48.03%	
Bare rubble/cobble	6.68%	
Bare soft bottom	16.44%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-20, UNCW Dive 351; Oculina HAPC, North Extension, Daytona, moderate relief mounds, 76-90 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-20.

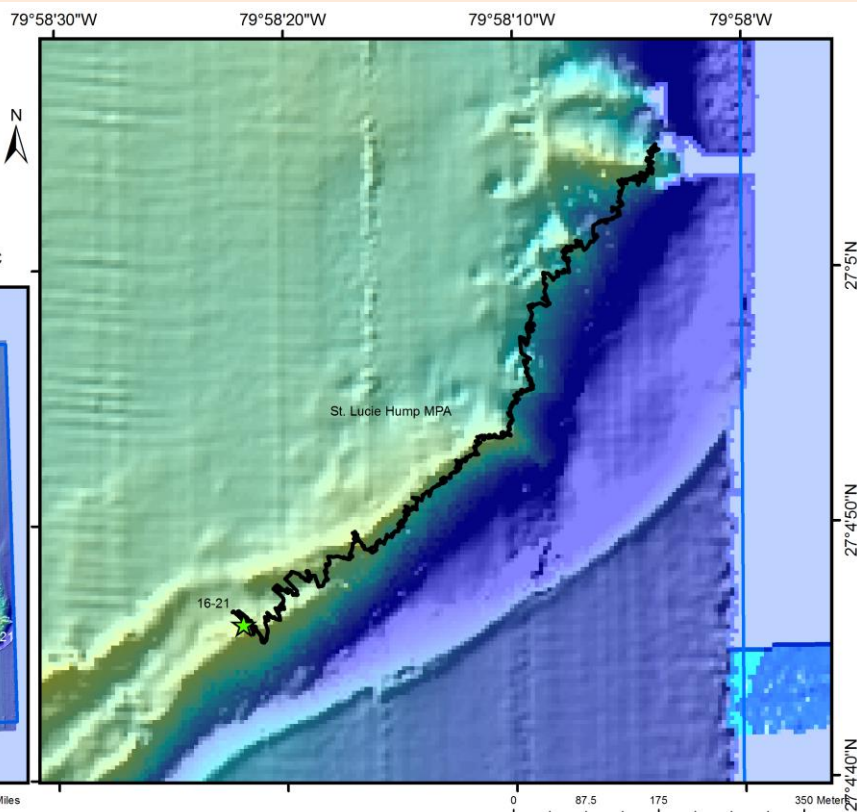
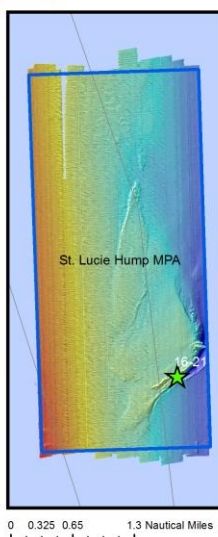
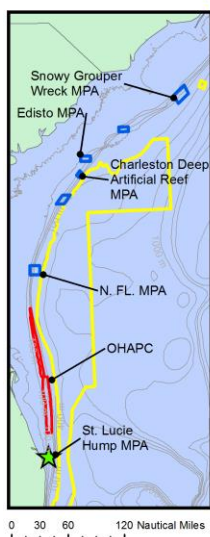
Class/Species	Common Name	2016-20
Actinopterygii		
Anthiinae	anthiids	1.22
<i>Apogon pseudomaculatus</i>	twospot cardinalfish	0.49
<i>Balistes capriscus</i>	grey triggerfish	0.24
<i>Centropristis ocyurus</i>	bank sea bass	6.84
<i>Chaetodon sedentarius</i>	reef butterflyfish	1.71
<i>Chromis enchrysurus</i>	yellowtail reeffish	11.73
<i>Decodon puellaris</i>	red hogfish	1.22
Gadiformes	hake	0.24
<i>Halichoeres</i> sp.	wrasse	21.76
<i>Hyporthodus niveatus</i>	snowy grouper	0.24
<i>Liopropoma eukrines</i>	wrasse bass	0.98
<i>Lutjanus campechanus</i>	red snapper	1.96
<i>Muraena retifera</i>	reticulate moray eel	0.24
<i>Ogcocephalus</i> sp.	batfish	0.24
<i>Pagrus pagrus</i>	red porgy	0.24
<i>Priacanthus arenatus</i>	bigeye	0.98
<i>Pristigenys alta</i>	short bigeye	11.98
<i>Prognathodes aya</i>	bank butterflyfish	5.62
<i>Pterois volitans</i>	lionfish	0.24
Scorpaenidae	scorpionfish	0.24
<i>Seriola dumerili</i>	greater amberjack	0.73
<i>Seriola</i> sp.	amberjack	0.24
Serranidae	sea bass	0.24
<i>Serranus annularis</i>	orangeback bass	1.96
<i>Serranus phoebe</i>	tattler	19.80
<i>Sphoeroides spengleri</i>	bandtail puffer	0.24
unknown	unknown	4.89

**Dive Site:** ROV 16-21, UNCW Dive 352; Florida, St Lucie Hump MPA, Oculina coral mounds, ledge, 90 m

### General Location and Dive Track:

#### ROV 16-21; Florida, St Lucie Hump MPA, Ledge, 90 m; 19-VI-16-1

- ★ 16-21
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andy David, John Reed, Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Pisces\_2016\_St\_Lucie\_MPA

**Purpose:** Survey and monitor Shelf-Edge MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/19/2016

**Specimens:** 0

**Digital Photos:** 307

**DVD:** 2

**Hard Drive:** 1

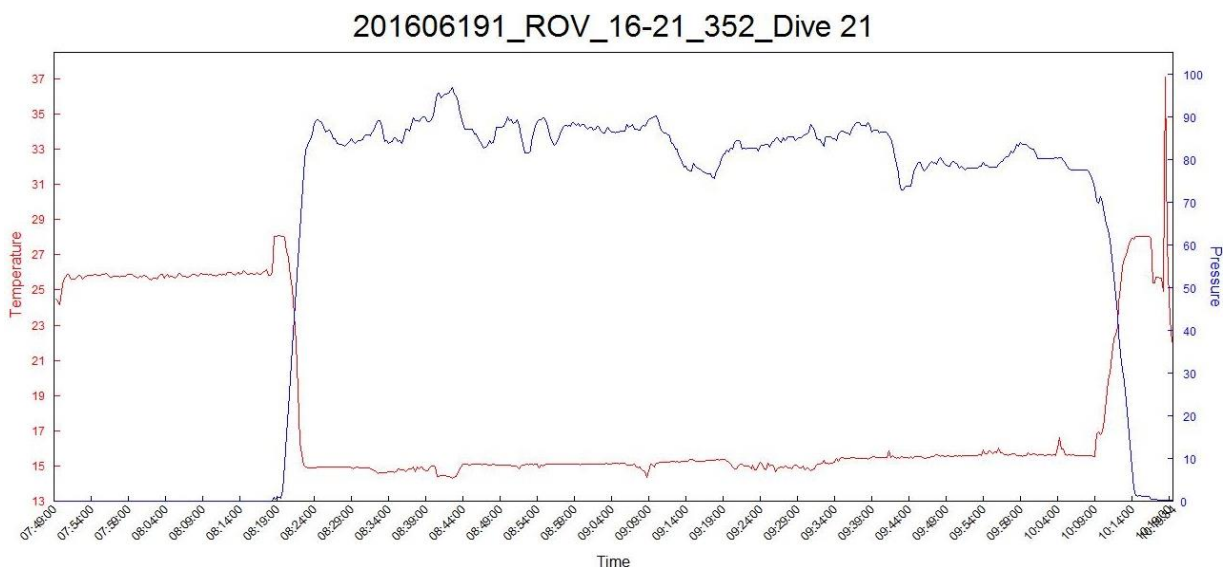
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-21, UNCW Dive 352; Florida, St Lucie Hump MPA, Oculina coral mounds, ledge, 90 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	72	<b>Total Transect Length (km):</b>	0.930
<b>Maximum Bottom Depth (m):</b>	97	<b>Surface Current (kn):</b>	0.5
<b>On Bottom (Time- EDST):</b>	8:23	<b>On Bottom (Lat/Long):</b>	27.08°N; -79.97°W
<b>Off Bottom (Time- EDST):</b>	10:08	<b>Off Bottom (Lat/Long):</b>	27.08°N; -79.97°W
<b>Physical (bottom); Temp (°C):</b>	14.3	<b>Salinity:</b>	<b>Visibility (m):</b> 15 <b>Current (kn):</b> 0.25

**Physical Environment:**



Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-21 are as follows: Depth Maximum: 96.8 m, Temperature: 14.3-16.6 °C.



**Dive Site:** ROV 16-21, UNCW Dive 352; Florida, St Lucie Hump MPA, *Oculina* coral mounds, ledge, 90 m

**Dive Imagery:**



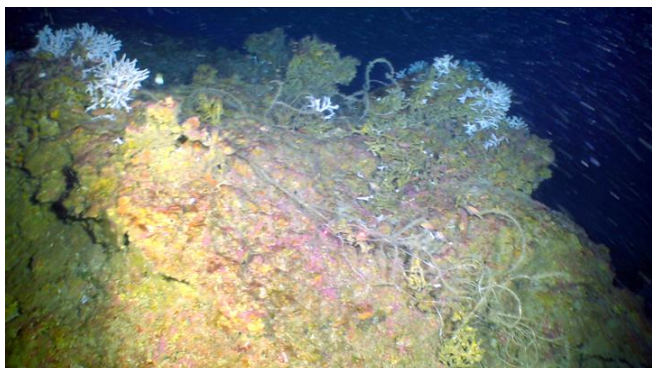
**Figure 1:** Depth: -84.4 m

Large colonies of live *Oculina varicosa* coral found for the first time off the SE US outside of the OHAPC. Scrawled cowfish.



**Figure 2:** Depth: -87 m

Many of the *Oculina* coral colonies are wrapped with fishing line.



**Figure 3:** Depth: -87.9 m

Thickets of large live *Oculina varicosa* coral wrapped in fishing line.



**Figure 4:** Depth: -90.3 m

School of amberjack on escarpment of *Oculina* mound.



**Figure 5:** Depth: -85.5 m

Ocellated moray eel on slope of *Oculina* coral mound.



**Figure 6:** Depth: -81.9 m

School of greater amberjack swim over peak of *Oculina* coral mound.

**Dive Site:** ROV 16-21, UNCW Dive 352; Florida, St Lucie Hump MPA, *Oculina* coral mounds, ledge, 90 m

**Dive Notes:**

**Objectives, Site Description, Habitat, Fauna:**

Site/Objectives:

Site #- 19-VI-16-1; ROV 16-21, UNCW Dive 352; Florida, St Lucie Hump MPA, *Oculina* coral mounds, escarpment, 84-96 m

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Digital still images were shot in Tv Mode, fixed speed at 1/250, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N or S, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect along new Multibeam inside St Lucie Hump MPA. N-S linear ledge system and series of mounds. Note- some of the quantitative 'down' photos were taken horizontally due to steep slopes.

Site Description/Habitat

Depth range: 84-96 m.

New discovery of large live *Oculina* populations, several areas with several dozen 1/2-1 m white live coral. Largest known population outside of *Oculina* HAPC and south of Jeff's Reef. Series of coral mounds along the N-S linear escarpment on new MB. Slopes 10-30°, some 45-60°. Mostly 100% coral rubble and pavement with areas of 1-3 m rock outcrops and ledges.

17 kn from NW, seas 1-2', surface current 1/2 kn. Bottom current variable- started 1/4 kn from S, then switched to >1 kn from N.

8:17- Launch

8:20- On bottom, 30° slope, depth? 90 m; 45° slope, coral rubble, pavement, dense population of live *Oculina varicosa*, 1/2 to 1 m on ledges and pavement. Fishing line, anthiids.

87 m- top of mound, pavement with coral rubble; 86 m- south slope, 100% pavement and coral rubble.

8:39- 96 m, east slope of escarpment, pavement, 1' boulders, coral rubble, Cerianthidae, CCA on rubble, 20° slope.

Mound 2- east slope, Rhodomenia, encrusting Chlorophyta on rubble, CCA, blade Rhodophyta

87 m- near peak, 100% coral rubble, hydroids, fishing line, *Centrostephanus*, *Nidalia*, *Tatler*

81.9 m- Peak of mound, 100% coral rubble, amberjack school

Mound 3- peak, narrow ridge oriented NW-SE, 84 m; 100% coral rubble

88 m- south slope, pavement, 1-2 m ledges rock outcrop; 1 m ledge with screen grab of school of cubbyu,

**Dive Site:** ROV 16-21, UNCW Dive 352; Florida, St Lucie Hump MPA, *Oculina* coral mounds, ledge, 90 m

conger eel; 1 m standing dead coral, bank butterfly, sash weight fishing weights

88 m- Head NW along 1 m ledge on slope; several 1/2 m live, white *Oculina*, 1 m standing dead *Oculina*.

87 m- Live *Oculina*, 30 cm, pavement, coral rubble, red blade Rhodophyta

9:04- 87 m, south slope of mound; screen grab- 1 m live *Oculina* wrapped with fishing line; 1-2 m ledges with dozens of live *Oculina*; *Coelopleurus* red urchins. 3 m wall with dozens of 1/2 to 1 m live white *Oculina*, many wrapped with fishing line. Still on south slope- outcrops; anthiids, rough tongue bass, red barbier,

9:11- 83 m, mound on SE point of MB; east slope, 70° steep slope, 100% coral rubble; 78.5 m, peak of mound, narrow ridge of rubble oriented NW-SE; *Holothuria lentigenosa*, zoanthids on rubble; standing dead coral, yellow demosponge.

96 m- Head SW along NE-SW oriented escarpment at southern end of plateau on MB. On south slope of escarpment, 10-30° slope, 100% coral rubble, Cerianthidae common, hydroids, *Geodia (neptuni?)*, flat sieve top), red blade Rhodophyta, scorpion fish, spotted eel, *Nidalia*, *Asteropora annulata*, cow fish, live *Oculina*, *Ellisella*, reticulated eel.

9:37- 87 m, 100% coral rubble, high fin scorpionfish.

72.9 m- Peak of mound, 100% coral rubble

9:43- south slope, zoanthids, *Nidalia*, hydroids, Rhodophyta, *Halymenia*. Current now 1+ kn from N.

78 m- Live *Oculina*; head SW along upper slope of escarpment.

78 m- Ridge of standing dead coral, 45° slope, cup coral

9:59- MB- mound at SW corner of MB; standing dead coral, coral rubble

80.6 m- Peak, two spot cardinal fish, cleaner shrimp, eel, *Ophioderma*, 100% coral rubble

78 m- Peak

10:07- End dive, 78 m.

Dives canceled 20 kn wind; predicted all day tomorrow, 6-9' seas.

*Dominant Benthic Macrobiota:*

Scleractinia- *Oculina varicosa* (1/2 to 1 m white colonies; dense populations in areas); cup corals

Octocorallia- *Ellisella*, *Nidalia occidentalis*,

Antipatharia- *Stichopathes* (rare)

Cerianthidae (abundant), white colonial on coral

Zoanthidea

Demospongiae- yellow massive, *Geodia gibberosa* (?; sieve plate)

Echinoidea- *Centrostephanus*; *Coelopleurus floridanus*

Holothuroidea- *Holothuria lentigenosa* enodis

Ophiuroidea- *Asteropora annulata*, *Ophioderma devanyi*

Decapoda- *Mithrax*, cleaner shrimp

Rhodophyta- CCA, red blade, *Halymenia*

Chlorophyta- green encrusting on rubble

*Dominant Fish:*

Anthiids, rough tongue bass, red barbier, tatler, cubbyu, eel (several spp), conger eel, bank butterfly, scorpion fish, spotted eel, 2 spot cardinal fish, NO lionfish.

**Dive Site:** ROV 16-21, UNCW Dive 352; Florida, St Lucie Hump MPA, Oculina coral mounds, ledge, 90 m

**CPCe Percent Cover Analysis:**

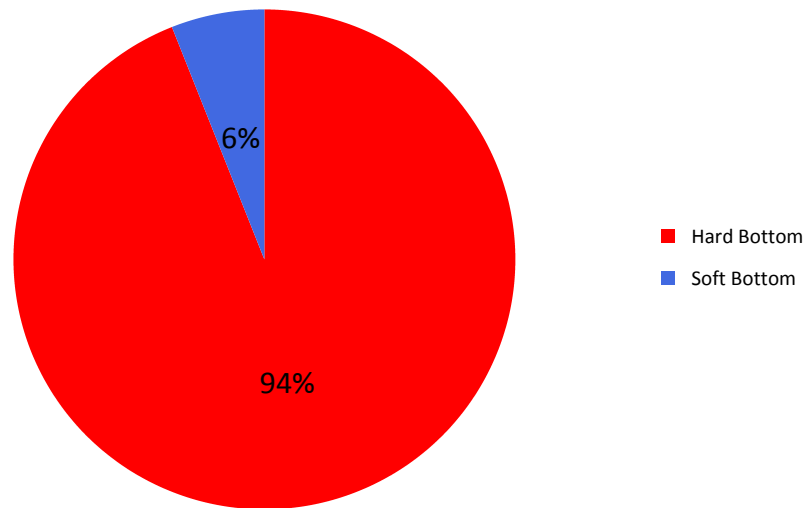
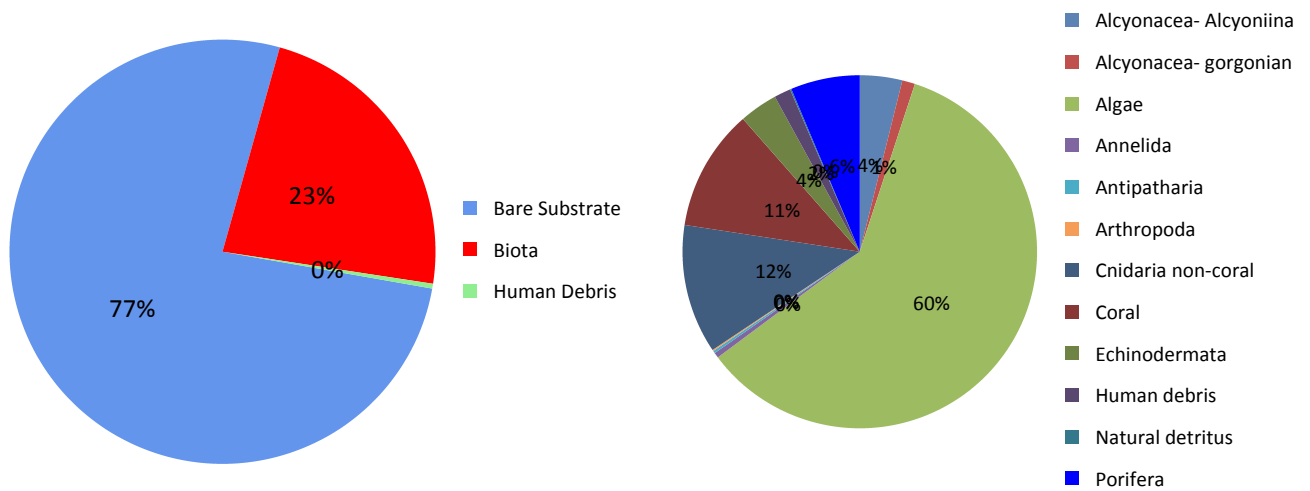


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-21. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-21.

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 16-21, UNCW Dive 352; Florida, St Lucie Hump MPA, ledge, 90 m

**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 16-21.

	16-21	
Group/Phylum/Taxonomic Name	CPCe	dive notes
Biota	23.07%	X
Cyanobacteria	0.05%	
Chlorophyta	0.05%	X
Rhodophyta	13.89%	X
Crustose coralline	12.28%	X
<i>Halymenia sp.</i>		X
Rhodophyta	1.62%	X
Porifera	1.48%	X
Demospongiae	1.32%	X
<i>Geodia gibberosa complex</i>	0.08%	X
<i>Geodia sp.</i>		X
Spirastrellidae	0.08%	
Cnidaria	6.60%	X
Actiniaria	0.03%	
Alcyonacea- gorgonian	0.14%	
<i>Antipathes furcata</i>	0.03%	
Cerianthidae	0.55%	X
<i>Ellisella sp.</i>	0.14%	X
Hydroidolina	1.40%	X
<i>Nicella sp.</i>		X
<i>Nidalia occidentalis</i>	0.90%	X
<i>Oculina varicosa</i>	2.55%	X
Scleractinia- unid colonial		X
Scleractinia- unid cup	0.05%	
<i>Stichopathes lutkeni</i>	0.03%	X
Zoanthidae	0.79%	X
Annelida	0.11%	
Annelida	0.08%	
<i>Filograna sp.</i>	0.03%	
Arthropoda	0.03%	X
<i>Mithrax sp.</i>		X
Penaeidae		X
<i>Stenorhynchus seticornis</i>	0.03%	
Echinodermata	0.82%	X



**Dive Site:** ROV 16-21, UNCW Dive 352; Florida, St Lucie Hump MPA, ledge, 90 m

<i>Arbacia punctulata</i>	0.03%	
<i>Asteroporpa annulata</i>	0.03%	X
<i>Centrostephanus longispinus</i>	0.16%	X
Cidaroida	0.03%	
<i>Coelopleurus floridanus</i>	0.36%	X
Echinoidea		X
<i>Eucidaris tribuloides</i>	0.08%	
<i>Holothuria lentiginosa enodis</i>	0.03%	X
<i>Ophioderma devaneyi</i>	0.05%	X
Ophiuroidea	0.03%	
<i>Tamaria sp.</i>	0.03%	
Chordata		X
Gnathostomata		X
detritus	0.03%	
Human Debris	0.36%	
Human debris	0.36%	
Human debris- fish line/gear	0.33%	
Human debris- other	0.03%	
Bare Substrate	76.57%	X
Habitat	76.57%	X
dead standing Oculina	4.82%	X
Bare rock	19.32%	
Bare rubble- coral	46.40%	
Bare rubble/cobble	0.47%	
Bare soft bottom	5.56%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-21, UNCW Dive 352; Florida, St Lucie Hump MPA, ledge, 90 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-21.

Class/Species	Common Name	2016-21
Actinopterygii		
<i>Anthias nicholsi</i>	yellowfin bass	0.38
Anthiinae	anthiids	227.71
<i>Apogon pseudomaculatus</i>	twospot cardinalfish	0.77
<i>Calamus</i> sp.	porgy	1.15
<i>Chaetodon sedentarius</i>	reef butterflyfish	0.77
<i>Chromis enchrysurus</i>	yellowtail reeffish	0.77
<i>Conger oceanicus</i>	conger eel	0.38
<i>Decodon puellaris</i>	red hogfish	2.68
<i>Gymnothorax moringa</i>	spotted moray eel	0.38
<i>Gymnothorax saxicola</i>	ocellated moray eel	0.77
<i>Halichoeres bathyphilus</i>	greenband wrasse	0.38
<i>Halichoeres</i> sp.	wrasse	1.53
<i>Hemanthias vivanus</i>	red barbier	11.10
<i>Lactophrys quadricornis</i>	scrawled cowfish	0.77
<i>Liopropoma eukrines</i>	wrasse bass	5.74
<i>Muraena retifera</i>	reticulate moray eel	1.15
Muraenidae	moray eel	0.38
<i>Opsanus tau</i>	oyster toadfish	0.38
<i>Pareques umbrosus</i>	cubbyu	26.79
<i>Priacanthus arenatus</i>	bigeye	0.38
<i>Pristigenys alta</i>	short bigeye	2.30
<i>Prognathodes aya</i>	bank butterflyfish	7.27
<i>Pronotogrammus martinicensis</i>	rougtongue bass	79.60
Scorpaenidae	scorpionfish	11.10
<i>Seriola dumerili</i>	greater amberjack	2.68
<i>Seriola rivoliana</i>	almaco jack	0.77
<i>Seriola</i> sp.	amberjack	16.84
<i>Serranus annularis</i>	orangeback bass	0.38
<i>Serranus notospilus</i>	saddle bass	0.38
<i>Serranus phoebe</i>	tattler	8.04
unknown	unknown	1.91

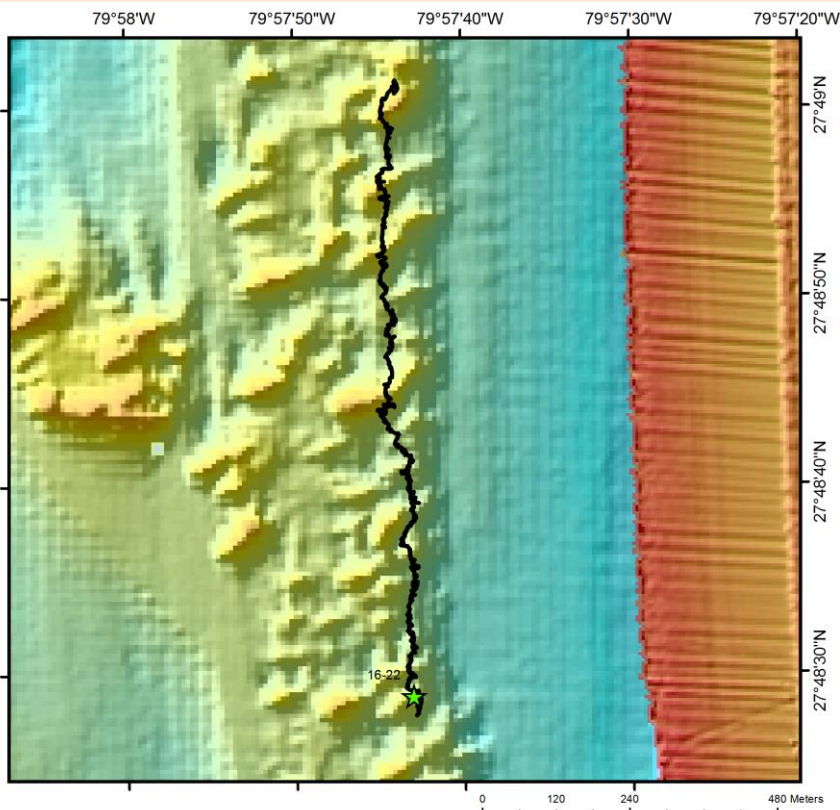
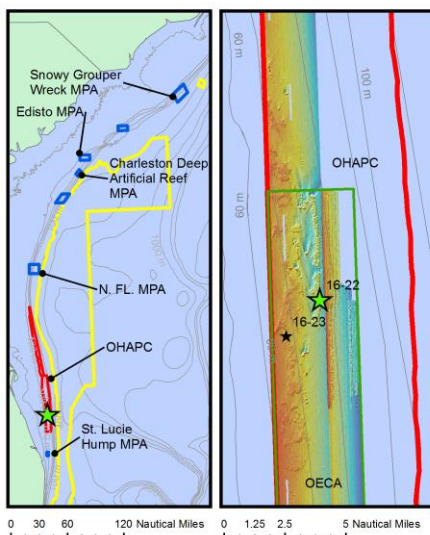


**Dive Site:** ROV 16-22, UNCW Dive 353; Florida, Oculina OECA, high relief barrier reef zone, 80 m

### General Location and Dive Track:

**ROV 16-22; Florida, Oculina OECA,  
High Relief Barrier Reef Zone,  
80 m; 21-VI-16-1**

- ★ 16-22
  - ★ Mohawk ROV
  - ROV Dive Tracks
- MPA
  - OECA
  - OHAPC
  - Deep Coral HAPC



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andy David, John Reed, Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Oculina\_MB\_UNCW\_2002\_Grid

**Purpose:** Survey and monitor Shelf-Edge MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/21/2016

**Specimens:** 0

**Digital Photos:** 206

**DVD:** 2

**Hard Drive:** 1

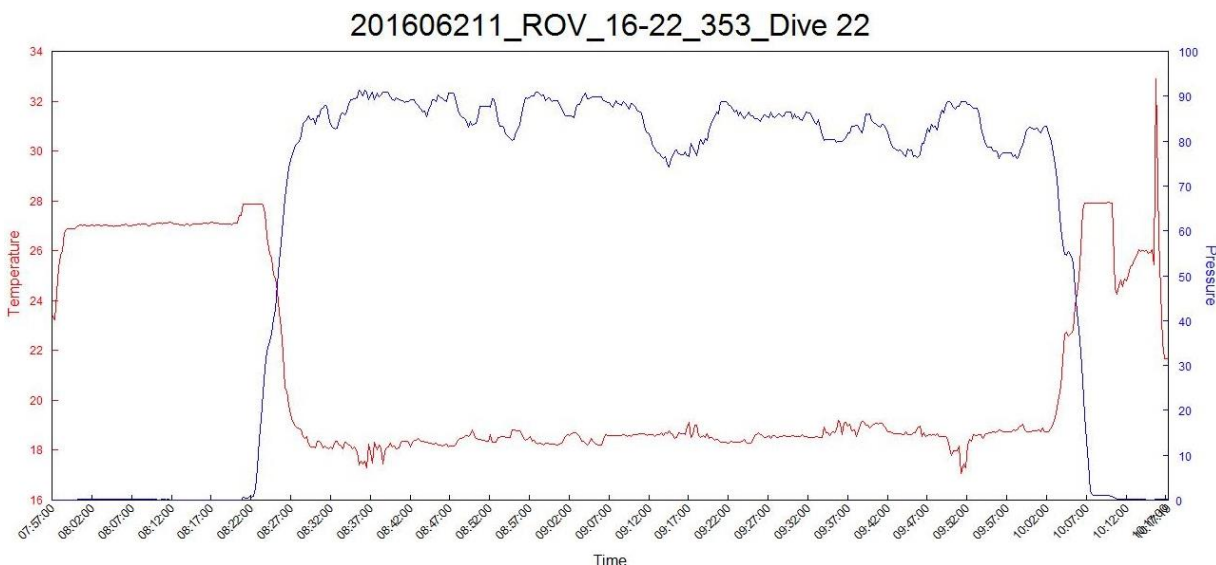
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-22, UNCW Dive 353; Florida, Oculina OECA, high relief barrier reef zone, 80 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	74	<b>Total Transect Length (km):</b>	1.160
<b>Maximum Bottom Depth (m):</b>	93	<b>Surface Current (kn):</b>	0.5-1
<b>On Bottom (Time- EDST):</b>	8:28	<b>On Bottom (Lat/Long):</b>	27.81°N; -79.96°W
<b>Off Bottom (Time- EDST):</b>	10:02	<b>Off Bottom (Lat/Long):</b>	27.82°N; -79.96°W
<b>Physical (bottom); Temp (°C):</b>	21.1	<b>Salinity:</b>	<b>Visibility (m):</b> 10 <b>Current (kn):</b> 0.5

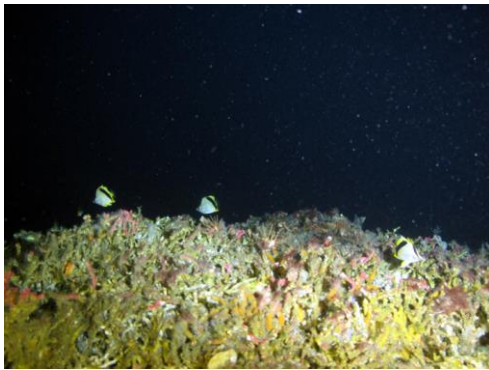
**Physical Environment:**



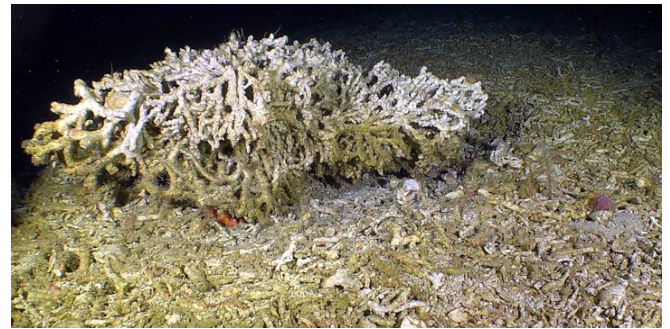
Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-22 are as follows: Depth Maximum: 91.3 m, Temperature: 17-19.2 °C.

**Dive Site:** ROV 16-22, UNCW Dive 353; Florida, Oculina OECA, high relief barrier reef zone, 80 m

**Dive Imagery:**



**Figure 1:** Depth: -78.1 m  
Peak of *Oculina* coral mound with school of bank butterfly fish.



**Figure 2:** Depth: -87.7 m  
Recently dead *Oculina* coral colony on slope of mound.



**Figure 3:** Depth: -91 m  
School of greater amberjack on slope of *Oculina* coral mound.



**Figure 4:** Depth: -89.4 m  
Burrowing anemone (Cerianthidae) in dead coral rubble.

**Dive Site:** ROV 16-22, UNCW Dive 353; Florida, Oculina OECA, high relief barrier reef zone, 80 m

## **Dive Notes:**

### **Objectives, Site Description, Habitat, Fauna:**

#### Site/Objectives:

Site #- 21-VI-16-1; ROV 16-22, UNCW Dive 353; Florida, Oculina OECA, Oculina coral mounds, 78-92 m

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

#### ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Changed Digital still image settings: were getting blurred shots using 1/250 S with ISO auto. Reset to Tv Mode, fixed speed at 1/125, ISO 200, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo-screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N or S, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect along east edge of high relief, barrier mounds; starting near the southern end of the barrier reef zone. ROV Nav multibeam was correct; Stacey's MB was shifted ~30 to the south. This may have been the data recently obtained from Andy Shepard on DVD. Check these data vs old original MB data.

#### Site Description/Habitat

Depth range: 78-92 m.

15 kn from NW, seas 3-4' from NE, current <1 kn. Bottom current <1/2 kn from N, visibility 10-15 m.

MB- Transect along east edge of high relief, barrier reef mounds; starting near the southern end of the barrier reef zone. Series of NE-SW oriented mounds, very close together forming a barrier like reef. Peaks of larger mounds 76-78 m; smaller mounds are 80 m; valleys between the mounds are 88-92 m. Entire dive was 100% coral rubble, some mound peaks with standing dead coral in ridges with 1' relief. No live coral seen. Virtually a desert. Only macrofauna are Cerianthid burrowing anemones, brittle stars, hydroids. Very few fish. This is where the rock shrimp trawling industry started in the early 1970s. Appalling and disturbing.

8:19- Launch

8:28- On bottom, 87.7 m, in valley between two mounds, 100% coral rubble.

92.6 m- Valley, coral rubble, Cerianthidae, Amberjack, *Stenorhynchus* arrow crab, *Ophioderma*, tatler

85 m- NE-SW oriented ridge, 100% dead coral rubble, with CCA.

90 m- Valley, rubble with small rock outcrop, 1' relief. Transect mostly skirting east base of mounds, missing the peaks, unable to go west much.

88 m- south base of mound; 100% coral rubble, some standing dead coral.

77 m- Peak of mound, NE-SW oriented ridge, 100% coral rubble; most mounds with 10-30° slopes.

87.8 m- 30 cm recently dead standing coral, that had been recently been flipped over, bottom half recent



**Dive Site:** ROV 16-22, UNCW Dive 353; Florida, Oculina OECA, high relief barrier reef zone, 80 m

dead.

9:54- 79 m, peak, ridge with 1/2 m standing dead coral in a ridge, 1' relief; some reef fish.

10:01- 81 m, End dive.

*Dominant Benthic Macrofauna:*

Scleractinia- all dead coral rubble, standing dead *Oculina*; no live

Gorgonacea- none

Antipatharia- none

Hydroida

Cerianthidae- burrowing anemones (2 spp- large grey, small brown)

Actiniaria- small white on standing dead coral

Zoanthidae

Decapoda- *Stenorhynchus seticornis*

Ophiuroidea- *Ophiothrix*, *Ophioderma devanyi*

Echinoidea- *Eucidaris tribuloides*

Asteroidea- red starfish, *Goniaster*

Algae- Rhodophyta, crustose coralline algae

*Dominant Fish:*

Amberjack (common), tatler, long nose batfish, bank butterfly, reef butterfly, wrasse bass, yellowtail reeffish, apricot bass, scorpion fish, scrawled cowfish

**Dive Site:** ROV 16-22, UNCW Dive 353; Florida, Oculina OECA, high relief barrier reef zone, 80 m

**CPCe Percent Cover Analysis:**

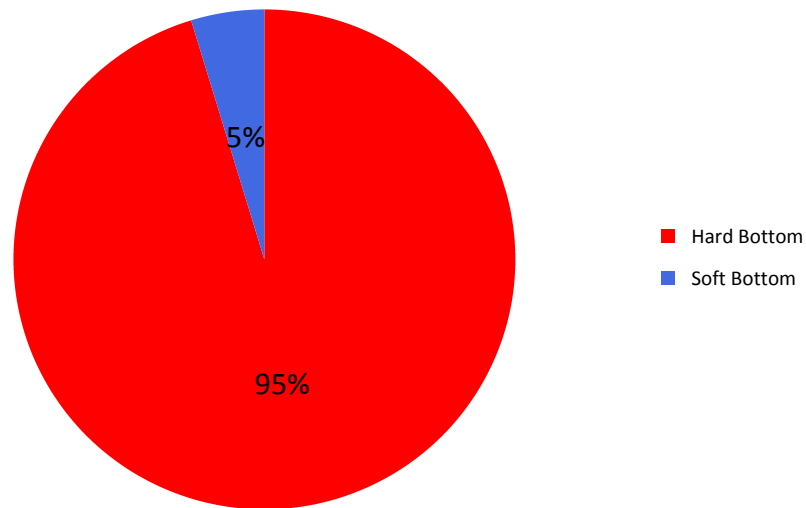
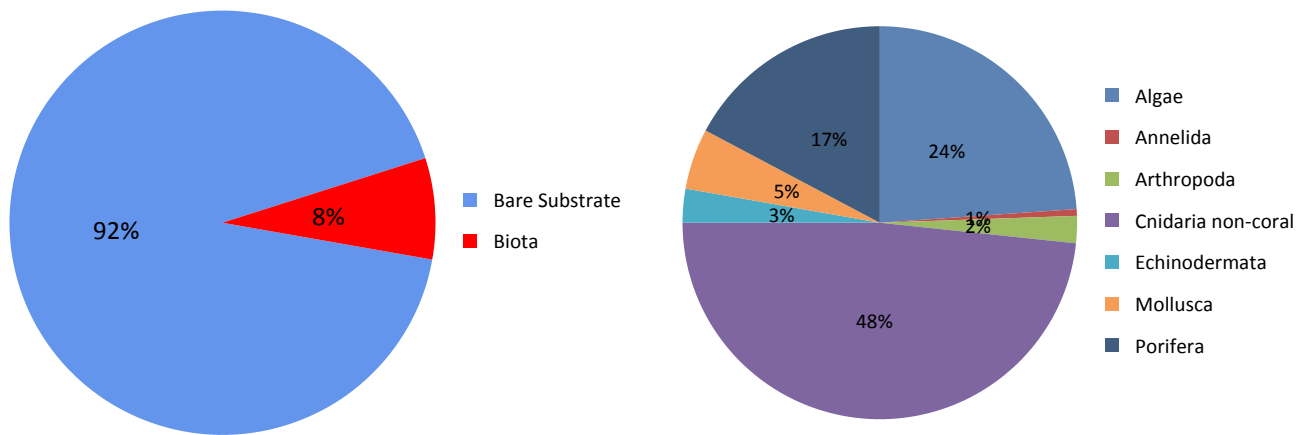


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-22. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



**A**

**B**

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-22.

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 16-22, UNCW Dive 353; Florida, Oculina OECA, high relief barrier reef zone, 80 m

**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 16-22.

Group/Phylum/Taxonomic Name	16-22	
	CPCe	dive notes
Biota	7.71%	X
Rhodophyta	1.84%	X
Crustose coralline	1.59%	X
Rhodophyta	0.26%	
Porifera	1.33%	X
<i>Chondrilla sp.</i>	1.03%	
Demospongiae	0.26%	X
<i>Ircinia sp.</i>	0.04%	
Cnidaria	3.73%	X
Actiniaria		X
Cerianthidae	0.77%	X
Hydroidolina	2.78%	X
<i>Oculina varicosa</i>		X
Zoanthidae	0.17%	X
Annelida	0.04%	
<i>Filograna sp.</i>	0.04%	
Arthropoda	0.17%	X
Paguroidea	0.04%	
<i>Stenorhynchus seticornis</i>	0.13%	X
Mollusca	0.39%	X
Gastropoda	0.39%	X
Echinodermata	0.21%	X
Asteroidea		X
Echinoidea		X
<i>Eucidaris tribuloides</i>	0.04%	X
<i>Goniaster sp.</i>		X
<i>Narcissia trigonaria</i>	0.04%	
<i>Ophioderma devaneyi</i>	0.04%	X
<i>Ophiothrix sp.</i>		X
Ophiuroidea		X
<i>Tamaria sp.</i>	0.09%	
Chordata		X
Gnathostomata		X
Bare Substrate	92.29%	X



**Dive Site:** ROV 16-22, UNCW Dive 353; Florida, Oculina OECA, high relief barrier reef zone, 80 m

Habitat	92.29%	X
dead standing Oculina	5.36%	X
Bare rock	3.00%	
Bare rubble- coral	77.29%	
Bare rubble/cobble	1.97%	
Bare soft bottom	4.67%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-22, UNCW Dive 353; Florida, Oculina OECA, high relief barrier reef zone, 80 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-22.

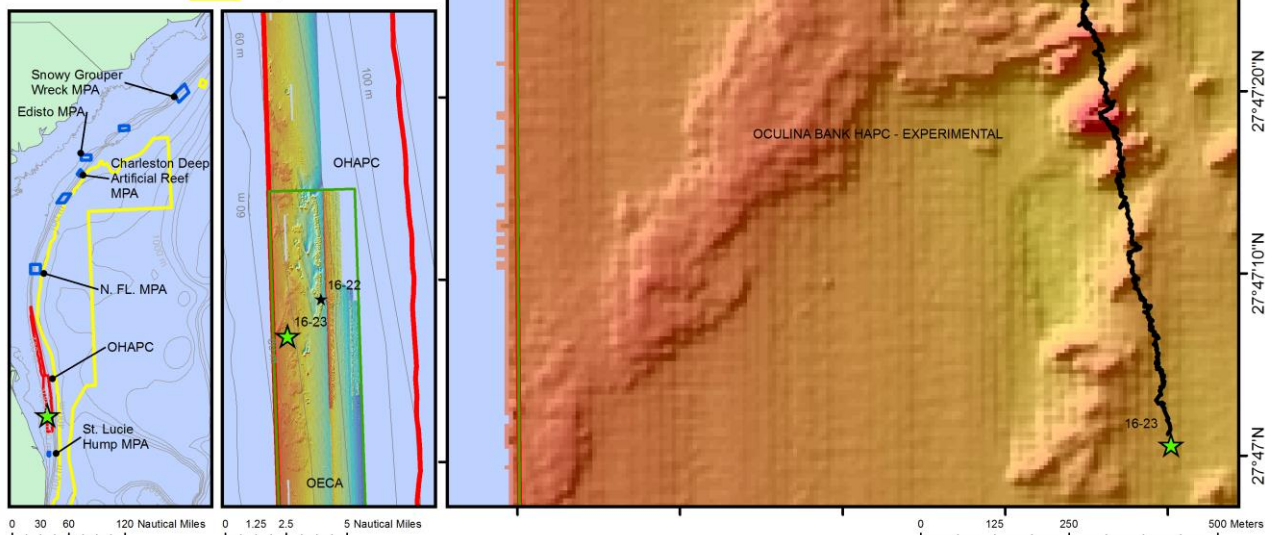
Class/Species	Common Name	2016-22
Actinopterygii		
<i>Centropristis ocyurus</i>	bank sea bass	0.97
<i>Chaetodon sedentarius</i>	reef butterflyfish	0.65
<i>Chromis enchrysurus</i>	yellowtail reeffish	0.97
<i>Decodon puellaris</i>	red hogfish	0.97
<i>Halichoeres bathyphilus</i>	greenband wrasse	0.32
<i>Halichoeres</i> sp.	wrasse	7.45
<i>Lactophrys quadricornis</i>	scrawled cowfish	0.32
<i>Ogcocephalus corniger</i>	longnose batfish	0.32
<i>Ogcocephalus</i> sp.	batfish	0.32
<i>Plectranthias garrupellus</i>	apricot bass	1.62
<i>Prognathodes aya</i>	bank butterflyfish	1.62
Scorpaenidae	scorpionfish	0.32
<i>Seriola dumerili</i>	greater amberjack	3.56
<i>Seriola rivoliana</i>	almaco jack	0.65
<i>Serranus annularis</i>	orangeback bass	0.32
<i>Serranus chionaraia</i>	snow bass	0.32
<i>Serranus notospilus</i>	saddle bass	0.32
<i>Serranus phoebe</i>	tattler	11.67
unknown	unknown	2.59

**Dive Site:** ROV 16-23, UNCW Dive 354; Florida, Oculina OECA, moderate relief live Oculina mounds, 75 m

### General Location and Dive Track:

**ROV 16-23; Florida, Oculina OECA, Moderate Relief Live Oculina Mounds, 75 m; 21-VI-16-2**

- ★ 16-23
- ★ Mohawk ROV
- ROV Dive Tracks
- MPA
- OECA
- OHAPC
- Deep Coral HAPC



### Site Overview:

**Project:** NOAA/SAFMC Shelf-Edge MPA Grant

**Principal Investigator:** Stacy Harter

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

**Website:** <http://www.noaa.gov/fisheries>

**Scientific Observers:** Andrew W. David, John Reed, Stacy Harter

**Data Management:** Access Database

**ROV Navigation Data:** Trackpoint II

**Ship Position System:** DGPS

**Report Analyst:** John Reed, Stephanie Farrington

### Dive Overview:

**Vessel:** NOAA Ship Pisces

**Sonar Data:** Oculina\_MB\_UNCW\_2002\_Grid

**Purpose:** Survey and monitor Shelf-Edge MPA sites off SE USA

**ROV:** Mohawk ROV

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

**Date of Dive:** 6/21/2016

**Specimens:** 0

**Digital Photos:** 305

**DVD:** 2

**Hard Drive:** 1

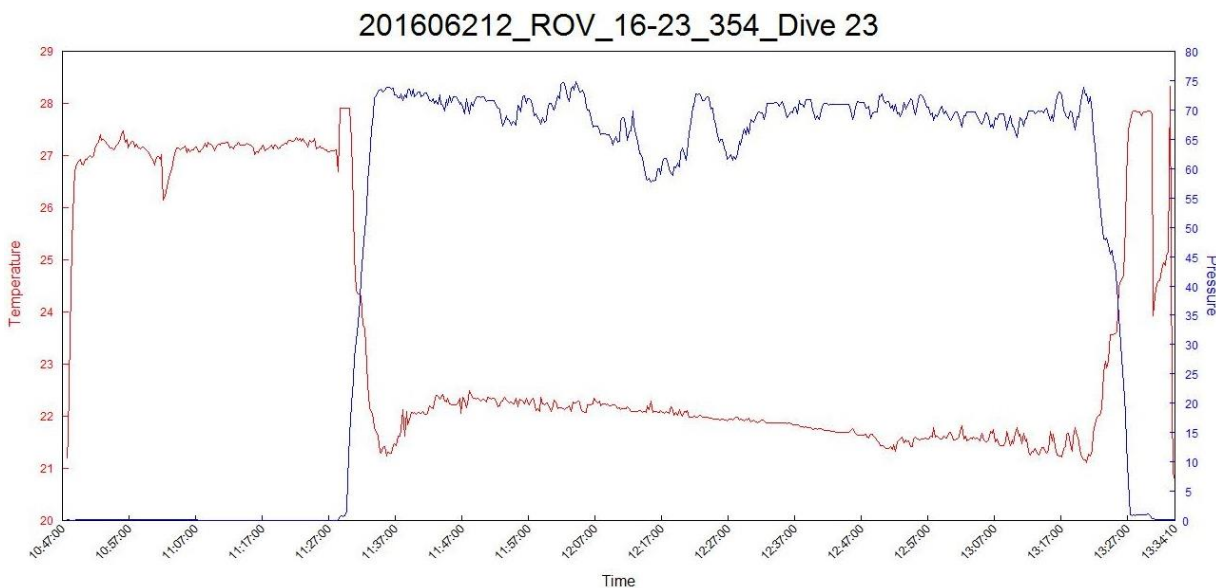
**Date Compiled:** 3/22/2017

**Dive Site:** ROV 16-23, UNCW Dive 354; Florida, Oculina OECA, moderate relief live Oculina mounds, 75 m

**Dive Data:**

<b>Minimum Bottom Depth (m):</b>	57	<b>Total Transect Length (km):</b>	1.240
<b>Maximum Bottom Depth (m):</b>	75	<b>Surface Current (kn):</b>	0.9
<b>On Bottom (Time- EDST):</b>	11:33	<b>On Bottom (Lat/Long):</b>	27.78°N; -79.99°W
<b>Off Bottom (Time- EDST):</b>	13:21	<b>Off Bottom (Lat/Long):</b>	27.79°N; -79.99°W
<b>Physical (bottom); Temp (°C):</b>	22.16	<b>Salinity:</b>	<b>Visibility (m):</b> 10 <b>Current (kn):</b> 0.25

**Physical Environment:**

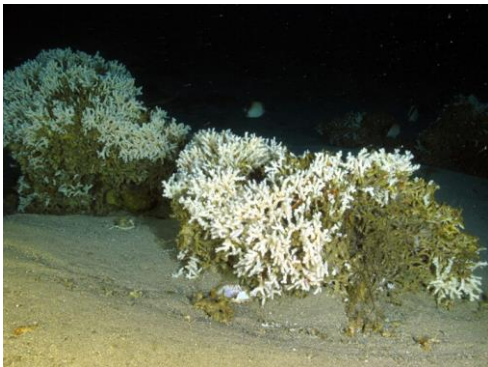


Temperature and depth (pressure) were collected with a Sea-Bird 39 Temperature Recorder attached to the ROV (recording descent, bottom data and ascent). The ranges of the bottom data recorded during 16-23 are as follows: Depth Maximum: 74.8 m, Temperature: 21.1-22.5 °C.



**Dive Site:** ROV 16-23, UNCW Dive 354; Florida, Oculina OECA, moderate relief live *Oculina* mounds, 75 m

**Dive Imagery:**



**Figure 1:** Depth: -71.7 m  
Large thickets of live *Oculina varicosa* coral discovered on low, flat, sandy bottom away from the high relief mounds.



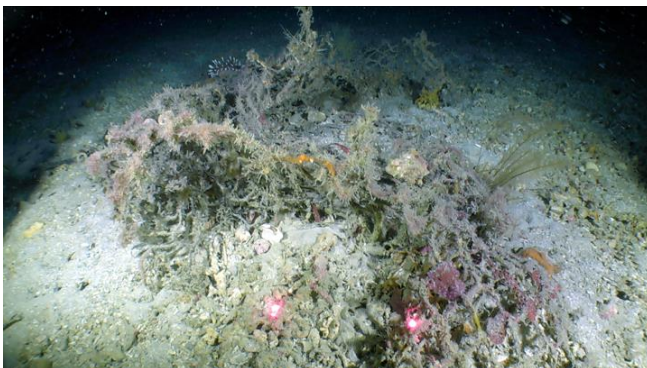
**Figure 2:** Depth: -71 m  
Large colony of the deepwater form of *Oculina varicosa* which is white due to the lack of zooxanthellae algae.



**Figure 3:** Depth: -71.1 m  
Large schools of red snapper discovered for the first time within the OECA.



**Figure 4:** Depth: -69.6 m  
Yellow tube sponge (*Aplysina* sp.) on slope of *Oculina* coral mound.



**Figure 5:** Depth: -72.9 m  
Pile of trawl net on *Oculina* coral mound within the OECA which has been prohibited since 1985.



**Figure 6:** Depth: -70.2 m  
Large piles of fishing line are not uncommon within the OECA which has been closed to fishing.

**Dive Site:** ROV 16-23, UNCW Dive 354; Florida, Oculina OECA, moderate relief live Oculina mounds, 75 m

**Dive Notes:**

**Objectives, Site Description, Habitat, Fauna:**

Site/Objectives:

Site #- 21-VI-16-2; ROV 16-23, UNCW Dive 354; Florida, Oculina OECA, moderate relief live Oculina mounds, 60-74 m

Objectives- Ground truth MB map; conduct continuous photo/video transect for fish population characterization and digital still photo transects for habitat and benthic macrobiota characterization.

ROV Setup/Dive Events:

All data (ROV navigation, video, photos, dive notes) were recorded in ESDT. Dive Notes- depth recorded as total depth (ROV altitude + ROV depth in meters); COG is ROV heading. Dive Notes were recorded by Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, and Felicia Drummond (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Changed Digital still image settings: Tv Mode, fixed speed at 1/125, ISO 200, auto f-stop, auto focus, strobe on. Quantitative photo transects used the digital still camera pointing straight down, 1.3 m off bottom; photos were taken every 2 minutes. Non-quantitative photos for habitat and species identifications were logged separately as 'Non-XS Photo'. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged as 'Non-XS Photo- screen grab'. Fish counts used the video camera pointed forward and down ~20° to view from the horizon to close up. Both cameras had 10-cm parallel lasers for scale (green- Still; red- Video). Direction of transects were random, but generally headed N or S, depending on the ship's maneuverability with the wind and current. Ship ADCP broke.

Transect along west edge MB on moderate relief mounds. Station keeping only able to transit north, so not able to video along ledges which tend to be E-W. Only see a small part of the ledges and fish habitat. ROV Nav multibeam is correct; Stacey's multibeam in Arc is shifted 30 m to south (check with Stephanie to see if Shepard data shifted from the original MB).

Site Description/Habitat

Depth range: 59.7-74 m.

17 kn from SE, seas 3-4' from SE, surface current <1 kn; bottom current variable, <1/4 kn from N, and on higher peaks 1 kn from N; visibility 10-15 m.

MB- Start of transect on flat sand west of hard bottom on multibeam. Then got to area with moderate relief Oculina mounds, similar to high relief mounds but smaller; base about 70-72 m, 20-30° slopes, and peaks 66-68 m and narrow NE-SW oriented ridge, 3-4 m relief. One mound is 12 m tall, 59.7 at peak. Several areas of live Oculina coral, some 1/2-1 m diameter, white and healthy. Most live coral discovered to date within the OECA other than Jeff's Reef and Chapman's reef west. Some corals wrapped in fishing line. One area with piles of recent fishing lines and even portion of trawl net- this in an area closed to trawling since 1984; clearly poaching going on and disregard of the OECA.

Mounds 100% coral rubble, and standing dead coral, especially at peaks where 1' ridges of standing dead coral. Valley's between mounds 70-72 m, mostly rock pavement, coral rubble, smooth rock outcrops and 1-2 m ledges. North of the mound region is area of moderate relief rocky knolls, appear as flat top hard bottom mounds on the multibeam. This area is mostly pavement, coral rubble, standing coral, areas of live Oculina, and 1-2 m ledges.

Dozen of red snapper documented along with gag grouper and scamp.

**Dive Site:** ROV 16-23, UNCW Dive 354; Florida, Oculina OECA, moderate relief live *Oculina* mounds, 75 m

11:27- Launch

11:32- On bottom, 75 m; flat sand; 100 m east of hard bottom target site.

11:40- 72.5 m, some patchy standing dead coral on sand bottom.; still east of hard bottom on MB.

11:50- 71.7 m, east edge of hard bottom on MB; numerous live, white healthy *Oculina varicosa*, some 1/2-1 m diameter.

69 m- east slope of coral mounds; pavement, coral rubble, standing dead coral with 1' relief.

69.2- Series of 3 m *Oculina* coral mounds; 100% coral rubble, standing dead coral, live *Oculina*; *Eucidaris urchins*, *Anthopodium* octocoral on coral.

74.5- Valley between mounds; sand and coral rubble.

Mound 2- south slope 30° slope, coral rubble, standing dead coral; *Centrostephanus* black urchins, Cerianthidae burrowing anemones, hydroids.

12:01- Peak of Mound 2, 66 m, peak narrow ridge oriented NE-SW; ridge of standing dead coral, 1' relief on peak.

Mound 3- Peak 59.7 m; NE-SW oriented mound.

72.5 m- Valley.

12:24- Mound 4, peak 62 m; *Erylus*, *Anthopodium*.

12:26- School of red snapper, counted at least 12; 65 m. Also gag grouper and unidentified grouper (too far).

68 m- North slope, pavement and coral rubble, 1-2 , rock outcrops and ledges; scamp, blue angelfish, grey triggerfish.

69 m- Top of ledge on North slope; another school of red snapper, 12 or more.

MB- area north of NE-SW oriented mounds; more series of rocky knolls, and flat topped mounds on MB.

72 m- Pavement, coral rubble, standing dead coral, ledges and outcrops 1 m relief. Dense biota on rocks, common and diverse demosponges.

71 m- Live white *Oculina* corals, 1/2 m and 15 cm. Series of smooth rock knolls, lots of sponges.

73 m- Valley; 2 m relief knolls, 30 cm live *Oculina*; fishing line.

71 m- Rock knoll, 1-2 m relief, demosponges common.

69 m- MB- at northern end of region of hard bottom; top of escarpment; pile of recent fishing line.

13:15- Part of trawl net, 73 m, north slope of mound.

73 m- More fishing line; ledge , 1-2 m rtom, pile of fishing line; TRAWL NET! relief with more red snapper, scamp.

13:20- End of Dive; End of Cruise

#### *Dominant Benthic Macrobiota:*

Scleractinia- *Oculina varicosa*, live white, healthy, 10 cm to 1 m, common (count 31+); *Phyllangia americana*

Antipatharia- *Stichopathes lutkeni*, *Antipathes atlantica*

Octocorallia- *Nidalia occidentalis*, *Diodogorgia*, *Callopodium rubens*

Cerianthidae

Hydroida

Actiniaria- club tentacle anemone, *Aptasia*? (white on standing dead coral)

Corallimorpharia

Demospongiae- 6-10 spp, *Erylus*, Clathriidae, *Phakellia*?, Aplysina, large yellow tubes, *Aiolochoxia crassa*

Asteroidea- Goniaster, red star, *Narcissia trigonaria*

Echinoidea- *Eucidaris tribuloides*, *Centrostephanus*

Ophiuroidea- *Asteropora annulata*

Decapoda- *Mithrax*, *Stenorhynchus seticornis*, *Anomura*

Bryozoa- Hippoporid (on hermit crab)

Gastropoda- *Fasciolaria* (w/ egg cases)

Annelida- Sabellidae, *Hermodice carunculata*



**Dive Site:** ROV 16-23, UNCW Dive 354; Florida, Oculina OECA, moderate relief live Oculina mounds, 75 m

Algae-Rhodophyta, several blade species, *Halymenia*

*Dominant Fish:*

Counts- 15-24 red snapper, 1 gag, 3 scamp, 1 unid. grouper, 1 lionfish

green band wrasse, bank butterfly, scorpion fish, tatler, short bigeye, blue angelfish, grey triggerfish

*Human Debris:*

Lots of fishing line, criss-crossed on bottom; Piece of TRAWL NET ON BOTTOM!

**Dive Site:** ROV 16-23, UNCW Dive 354; Florida, Oculina OECA, moderate relief live Oculina mounds, 75 m

**CPCe Percent Cover Analysis:**

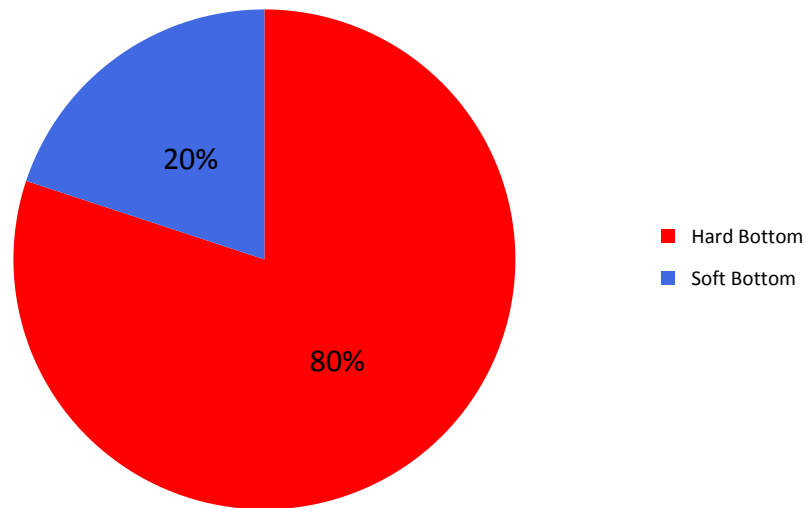


Figure 1. Percent cover of hard and soft bottom substrate at dive site 16-23. CPCe© points on organisms were scored as the underlying substrate (hard or soft).

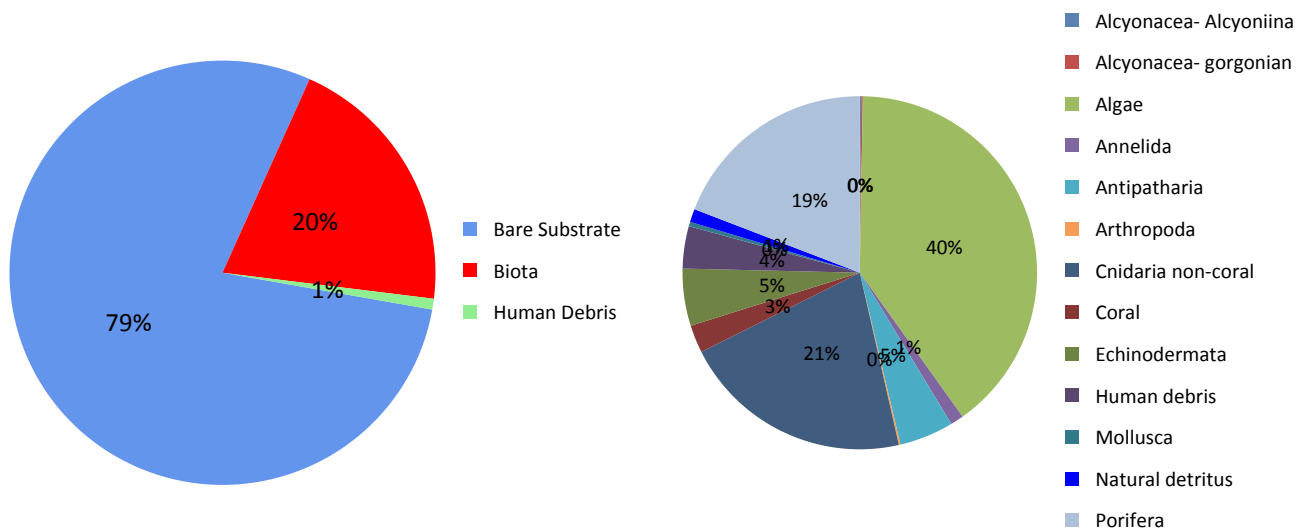


Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site 16-23.

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 16-23, UNCW Dive 354; Florida, Oculina OECA, moderate relief live Oculina mounds, 75 m

**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 16-23.

Group/Phylum/Taxonomic Name	16-23	
	CPCe	dive notes
Biota	20.25%	X
Cyanobacteria	0.03%	
Ochrophyta	0.03%	
Ochrophyta	0.03%	
Rhodophyta	8.35%	X
Crustose coralline	7.13%	X
<i>Halymenia sp.</i>		X
Rhodophyta	1.21%	X
Porifera	4.03%	X
<i>Aiolochoira crassa</i>		X
<i>Aplysina sp.</i>	0.23%	X
<i>Chondrilla sp.</i>	1.21%	
Clathiidae		X
Demospongiae	1.92%	X
<i>Erylus sp.</i>	0.31%	X
Poecilosclerida	0.28%	
Spirastrellidae	0.08%	
Phakellia sp.		X
Cnidaria	6.09%	X
Actiniaria		X
<i>Aiptasia sp.</i>		X
Alcyoniina		X
Antipatharia	0.03%	X
<i>Antipathes atlantica</i>		X
<i>Callipodium rubens</i>		X
Cerianthidae	0.06%	X
Corallimorpharia	0.11%	X
<i>Diodogorgia sp.</i>	0.03%	X
<i>Elatopathes abietina</i>	0.03%	
Hydroidolina	4.15%	X
<i>Nidalia occidentalis</i>	0.03%	X
<i>Oculina varicosa</i>	0.39%	X
<i>Phyllangia americana</i>	0.03%	X
Scleractinia- unid colonial		X

**Dive Site:** ROV 16-23, UNCW Dive 354; Florida, Oculina OECA, moderate relief live Oculina mounds, 75 m

Scleractinia- unid cup	0.11%	
<i>Stichopathes lutkeni</i>	0.93%	X
<i>Tanacetipathes tanacetum</i>	0.06%	
Zoanthidae	0.14%	
Annelida	0.25%	X
Annelida	0.08%	
<i>Filograna sp.</i>	0.08%	
<i>Hermodice carunculata</i>	0.06%	X
Sabellidae	0.03%	X
Bryozoa		X
Bryozoa		X
Hippoporida edax		X
Arthropoda	0.03%	X
Anomura		X
<i>Mithrax sp.</i>		X
<i>Stenorhynchus seticornis</i>	0.03%	X
Mollusca	0.08%	X
<i>Fasciolaria tulipa</i>	0.06%	X
Gastropoda	0.03%	
<i>Murex sp.</i>		X
Echinodermata	1.10%	X
Asteroidea		X
<i>Asteropora annulata</i>	0.03%	X
<i>Centrostephanus longispinus</i>	0.45%	X
Cidaroida		X
Echinoidea		X
<i>Eucidaris tribuloides</i>	0.54%	X
<i>Goniaster sp.</i>	0.06%	X
<i>Narcissia trigonaria</i>		X
Ophiuroidea	0.03%	
Chordata		X
Gnathostomata		X
detritus	0.25%	
Human Debris	0.82%	X
Human debris	0.82%	X
Human debris- anchor line	0.03%	
Human debris- fish line/gear	0.56%	X
Human debris- net	0.23%	
Human debris- fishing line		X
Human debris- trawl net		X
Bare Substrate	78.93%	X
Habitat	78.93%	X

**Dive Site:** ROV 16-23, UNCW Dive 354; Florida, Oculina OECA, moderate relief live Oculina mounds, 75 m

dead standing Oculina	5.72%	X
Bare rock	18.36%	
Bare rubble- coral	32.52%	
Bare rubble/cobble	7.50%	
Bare soft bottom	14.83%	
<b>Grand Total</b>	<b>100.00%</b>	<b>X</b>

**Dive Site:** ROV 16-23, UNCW Dive 354; Florida, Oculina OECA, moderate relief live Oculina mounds, 75 m

**Density of Fish:**

Table 2. Density (# individuals/1000 m<sup>2</sup>) of fish from video transects at dive site ROV 16-23.

Class/Species	Common Name	2016-23
Actinopterygii		
<i>Apogon</i> sp.	cardinalfish	0.41
<i>Balistes caprisкус</i>	grey triggerfish	2.48
<i>Canthigaster</i> sp.	puffer	0.41
<i>Centropristis ocyurus</i>	bank sea bass	0.41
<i>Chaetodon sedentarius</i>	reef butterflyfish	7.84
<i>Chromis enchrysurus</i>	yellowtail reeffish	14.86
<i>Halichoeres bathyphilus</i>	greenband wrasse	2.89
<i>Halichoeres</i> sp.	wrasse	31.78
<i>Holacanthus bermudensis</i>	blue angelfish	2.06
<i>Liopropoma eukrines</i>	wrasse bass	1.65
<i>Lutjanus campechanus</i>	red snapper	9.49
<i>Mycteroperca microlepis</i>	gag grouper	0.41
<i>Mycteroperca phenax</i>	scamp	1.65
<i>Pagrus pagrus</i>	red porgy	0.41
<i>Priacanthus arenatus</i>	bigeye	1.24
<i>Pristigenys alta</i>	short bigeye	12.79
<i>Prognathodes aya</i>	bank butterflyfish	9.49
<i>Pronotogrammus martinicensis</i>	rougtongue bass	0.41
<i>Pterois volitans</i>	lionfish	1.65
<i>Rypticus maculatus</i>	whitespotted soapfish	0.41
Scorpaenidae	scorpionfish	2.06
<i>Seriola dumerili</i>	greater amberjack	1.24
<i>Seriola rivoliana</i>	almaco jack	1.24
<i>Seriola</i> sp.	amberjack	1.24
<i>Serranus annularis</i>	orangeback bass	0.83
<i>Serranus notospilus</i>	saddle bass	1.65
<i>Serranus phoebe</i>	tattler	12.79
<i>Serranus</i> sp.	sea bass	0.83
<i>Serranus tortugarum</i>	chalk bass	0.41
unknown	unknown	5.37