

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

**NOAA Ship *Pisces* Cruise 19-02
UNCW *Mohawk* ROV
June 7-20, 2019**

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Stacey Harter, Andrew David, Principal Investigators
NMFS/Southeast Fisheries Science Center (SEFSC), Panama City, FL
Email: stacey.harter@noaa.gov

John Reed (Co-PI) and Stephanie Farrington (Co-PI)
Cooperative Institute of Ocean Research, Exploration and Technology
Harbor Branch Oceanographic Institute, Florida Atlantic University
Fort Pierce, FL



HARBOR BRANCH

FLORIDA ATLANTIC UNIVERSITY

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EXECUTIVE SUMMARY

A 15-day research cruise was conducted June 7-20, 2019 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 (UNCW), and College of Charleston.

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 2019 Cruise Report provides detailed quantitative characterization of the benthic habitat, benthic macro-biota, and fish populations for each of the 33 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

Thirty-three ROV dives were conducted including three failed dives, resulting in a total bottom time of 59 hours, covering 30.7 km, at depths from 24 to 190 m. A total of 5,773 in situ digital images were taken which included quantitative transect images (2,805), general habitat (117), video screen grabs (2,528), species documentation (152), and lab images of specimens (171). Forty-nine benthic invertebrates were collected for genetic analysis or taxonomy. Ten shipboard CTD casts were made and a temperature/depth sensor recorded each ROV dive. The multibeam sonar (ME-70) was used to map nine areas including inside the *Oculina* HAPC, MPAs, Special Management Zones (SMZs) and covering a total area of 169 km².

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 #: FNA17NMF4410271). 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 Jason White and Eric Glidden, 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-FAU CIOERT 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 7-20, 2019) 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
Science	ROV dive track polygons	ArcGIS Geodatabase
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, Katherine Overly), NOAA CIOERT at HBOI-FAU (John Reed, Stephanie Farrington), College of Charleston (Alessandra DiTommaso), and UNCW (Jason White, Eric Glidden, Noah Wicker).

SCIENTIFIC PARTICIPANTS

Stacey Harter	Chief Scientist, Principal Investigator	NMFS/PC Lab
Andrew David	Co-Principal Investigator	NMFS/PC Lab
John Reed	Co-Principal Investigator	HBOI/FAU
Stephanie Farrington	Co-Principal Investigator	HBOI/FAU
Katherine Overly	Biologist	NMFS/PC Lab
Jason White	Chief ROV Pilot	UNCW/UVP
Eric Glidden	ROV Pilot	UNCW/UVP
Alessandra DiTommaso	Biologist	College of Charleston
Noah Wicker	Biologist	UNCW

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 of 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 (*Hyporhodus 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, June 2015, June 2016, June 2017, and May 2018. 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 OECA/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/sponge 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 side-scan sonar mapping and groundtruthing, habitat characterization, and monitoring of such areas.

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 OECA/OHAPC. These data may then be compared to previous and future research cruises and to areas adjacent to the protected areas to better understand the long-term health and status of these important deepwater coral/sponge ecosystems. These data will be

of value to the SAFMC, NOAA Fisheries, NOAA DSCRTP, NOAA CRCP, NOAA Mesophotic Reef Ecosystem Program, and NOAA Sanctuaries for management decisions on these habitats and managed key species.

OBJECTIVES

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

Specific objectives include:

- conduct ROV surveys of habitat and fish assemblages
- collect bathymetric data with the ME-70 multibeam mapping system on the ship to locate hard-bottom features and potential ROV dive sites
- conduct total water column Conductivity-Temperature-Depth (CTD) profiles
- collect sponges, corals and other benthic taxa for genomic studies and taxonomic verification of species, and live specimens for the Smithsonian Ecosystem and Aquarium Exhibit in Fort Pierce, Florida

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 digital still camera, and a temperature/depth recorder. The ROV was outfitted with a collection skid and manipulator on some dives for collections of benthic species.

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 2,380,000 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. Video frame grabs also were taken for additional photo transect images (especially on vertical structures or when the digital still camera failed), and to document fish and benthic biota. 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 HBOI-FAU CIOERT At-Sea Database, a Microsoft Access database.

ROV Digital Still Camera

Still images were taken to document habitat and benthic macrobiota with a Kongsberg OE14-408 (Canon G11) high-definition digital still camera (10 megapixels). For quantitative photo transects the camera was pointed 90° down from horizontal and used two 10-cm parallel lasers for scale. Still images were captured every 2 minutes throughout the dive at a height of ~1.3 m to provide relatively consistent area for each image. Each photo filename was coded with corresponding EDST time and date code (using Stamp 2.8 by Tempest Solutions[®]) which was imported into MS Access and linked to the ROV navigation data for site specific data of coordinates and depth and then imported into ArcGIS[™] 10.3. On some dives, frame grabs from the video camera were taken for the photo transects, such as on vertical surfaces.

ROV Navigation

The *Mohawk* ROV uses an integrated navigation system consisting of Hypack 2017 software (Windows 7, 64-bit, 3.4 GHz computer), LinkQuest TrackLink 1500HA USBL Underwater Acoustic Tracking System, LinkQuest TN1505b transponder, and POSMV GPS (ship provided) provides the ROV operator and the support vessel's bridge with real time tracking display of the ROV and ship for navigation. ROV personnel install the TrackLink Ultra Short BaseLine (USBL) acoustic hydrophone on the vessels centerboard and survey its positions with respect to a reference point at the center of the vessel. POSMV and hydrophone offsets, as well as ship dimensions, are entered into Hypack software. The TrackLink 1500HA acoustically interrogates the LinkQuest TN1505b transponder on the ROV, which responds to the hydrophone to determine slant range, bearing, and depth. The real-time Hypack navigation screen accurately displays the ship (to scale) with proper position and heading, and the position and heading of the ROV. Ship and ROV positions, in addition to the ROV depth, heading and altimeter reading, are logged and processed for each dive and provided to the scientist in an Excel file. Geo-referenced TIFF files obtained with multibeam or side scan sonar were entered into Hypack as background files to display target sites and features of interest to aid in ROV and support vessel navigation. Hypack can also export ROV data via RS232 communication protocol in real time as a NMEA data string which contains ROV position only. The TrackLink 1500HA acoustic tracking system can track up to 16 targets at one time. We carry an additional LinkQuest TN1505b transponder for a spare on all missions. 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. In general, the precision of the ROV position is 1-5 m, but also depends on depth, water column backscatter, and thermoclines.

ROV Collection Skid

The *Mohawk* ROV was equipped with a collection skid that consisted of a 5-function manipulator, five suction buckets (2 L each), and a bin with removable partitions (61cm x 23 cm x 17 cm). Benthic invertebrates were collected on some dives.

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 attempted to keep the ROV as close to the bottom as possible ($< \frac{1}{2}$ - 1 m) with a speed over ground of $\sim \frac{1}{4}$ - $\frac{1}{2}$ knot.
2. Digital still images perpendicular to the bottom were captured every 2 minutes throughout the dive during which the ROV hovered at a height of ~ 1.3 m off the bottom to provide similar field of view area for each image (~ 1.5 m²). When the ROV was on a steep or vertical substrate, video screengrabs were taken to substitute the usable transect photos.
3. Still images captured from the photo transects were analyzed using CPCe[®] software to determine relative percent cover of benthic biota and habitat types. Non-transect photos, such as to record a specific species, were not included in the quantitative analyses. Poor and unusable photos (blurred, black, off bottom) or overlapping photos were removed from the quantitative analyses.
4. Underwater video was viewed in real time on the support vessel by PIs familiar with the local deep-water fauna; audio annotations describing habitat, benthic biota, and fish were recorded onto the video and transcribed at the same time into the HBOI-FAU CIOERT At-Sea 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.

Specimen Collections

Benthic macrobiota were collected with the ROV. Benthic invertebrates were collected on some dives and will be used for museum specimens, taxonomic identification, genetic analysis, and coral health studies.

Each specimen was given a unique sample number and stored in glass jars which were bar coded with chemical resistant labels. Specimens were preserved 95% ethanol. Specimens were photographed *in situ* when possible prior to collection, photographed in the lab, and data entered into the HBOI-FAU CIOERT At-Sea Access Database.

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 by multiplying transect length times transect width. Transect length was calculated from the ROV tracking and transect width was measured using paired lasers on the ROV. Fish density (# individuals/1000 m²) 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[®], (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-FAU CIOERT At-Sea Access 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).

Code	Habitat Name	Habitat Description
S	Soft Substrate	Unconsolidated sand/mud, unlithified
SR	Soft Substrate/Rubble/Rock	Soft substrate (>50% cover) with rubble and/or rock
R	Rubble	Rubble/cobble (~5-20 cm sized rock or coral)
RL	Rock/Ledges	Rocks, boulders, and/or ledges
P	Pavement	Rock pavement
HC	Hard Corals	Live and/or dead colonial scleractinian coral; standing individual colonies, bushes, or thickets
TH	Tilefish (blueline or golden; not sand tile)	Soft bottom with visually identifiable burrows

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 m²) of all species for each transect were analyzed. Density data were then averaged by location inside and outside each MPA and fourth-root transformed to reduce the effect of common species.

Similarities between samples for both fish and benthic biota (separately) were then calculated using S17 Bray-Curtis similarity. A non-metric multidimensional scaling ordination (MDS) plot and a dendrogram with group-average linking were created showing the results of a concurrently run SIMPROF ‘similarities profile’. SIMPER: ‘Similarity Percentages’ was utilized to determine which species contributed to the dissimilarities among group pairs. An ANOSIM (Analysis of Similarities) test was performed and compared by location inside and outside each MPA and the *Oculina* OECA. ANOSIM tests the null hypothesis that there are no community differences between groups or in this case MPA Status.

Additional Fish Data Analyses

Fish assemblage species diversity was also examined using the DIVERSE routine in PRIMER 6. Number of species, evenness, and species diversity were compared inside and outside each MPA. Snapper Grouper complex species were analyzed separately to determine if densities of each species were higher inside or outside the MPAs. In addition, lionfish densities were statistically compared inside and outside each MPA using one-way ANOVAs.

RESULTS

Study Areas

The cruise was on the continental shelf edge of the South Atlantic Bight from Florida to North Carolina. The ROV surveys covered nine shelf-edge MPA/HAPC/SMZ sites, including the *Oculina* HAPC, North Florida MPA, Georgia (outside MPA only), Charleston Deep Artificial Reef MPA, Edisto MPA, Northern South Carolina MPA, Devil’s Hole SMZ, Snowy Wreck MPA, and Cape Lookout SMZ (Figs. 1-6). An additional 14 dive sites were outside but adjacent to the MPAs for comparison. Devil’s Hole and Cape Lookout SMZ are two of the spawning Special Management Zones (SMZs) that were established in July 2017 to protect important areas used by snapper grouper species for reproducing. We were able to examine these two areas during this cruise because they are within the spatial extent of the MPAs.

Cruise Summary

Thirty-three ROV dives were conducted resulting in a total bottom time of 59 hours, covering 30.7 km, at depths from 24 to 190 m (Figs. 1-6, Tables 3, 4). A total of 5,773 in situ digital images were taken which included quantitative transect images (2,805), general habitat (117), video screen grabs (2,528), species documentation images (152), and lab images of specimens (171). Ten shipboard CTD casts were made. Temperature and depth data were collected during ROV dives 1-9 and a full CTD was logged during dives 10-33 (Table 5; Appendix 3). Multibeam sonar (ME-70) was used to map nine areas covering 169 km² (Table 6). Forty-nine specimens of benthic invertebrates and geology were collected (Table 7). 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 PC19-02
Oculina ROV Dives

- ★ Mohawk ROV
- OECA
- MPA
- Bathymetry
- OHAPC
- Deep Coral HAPC

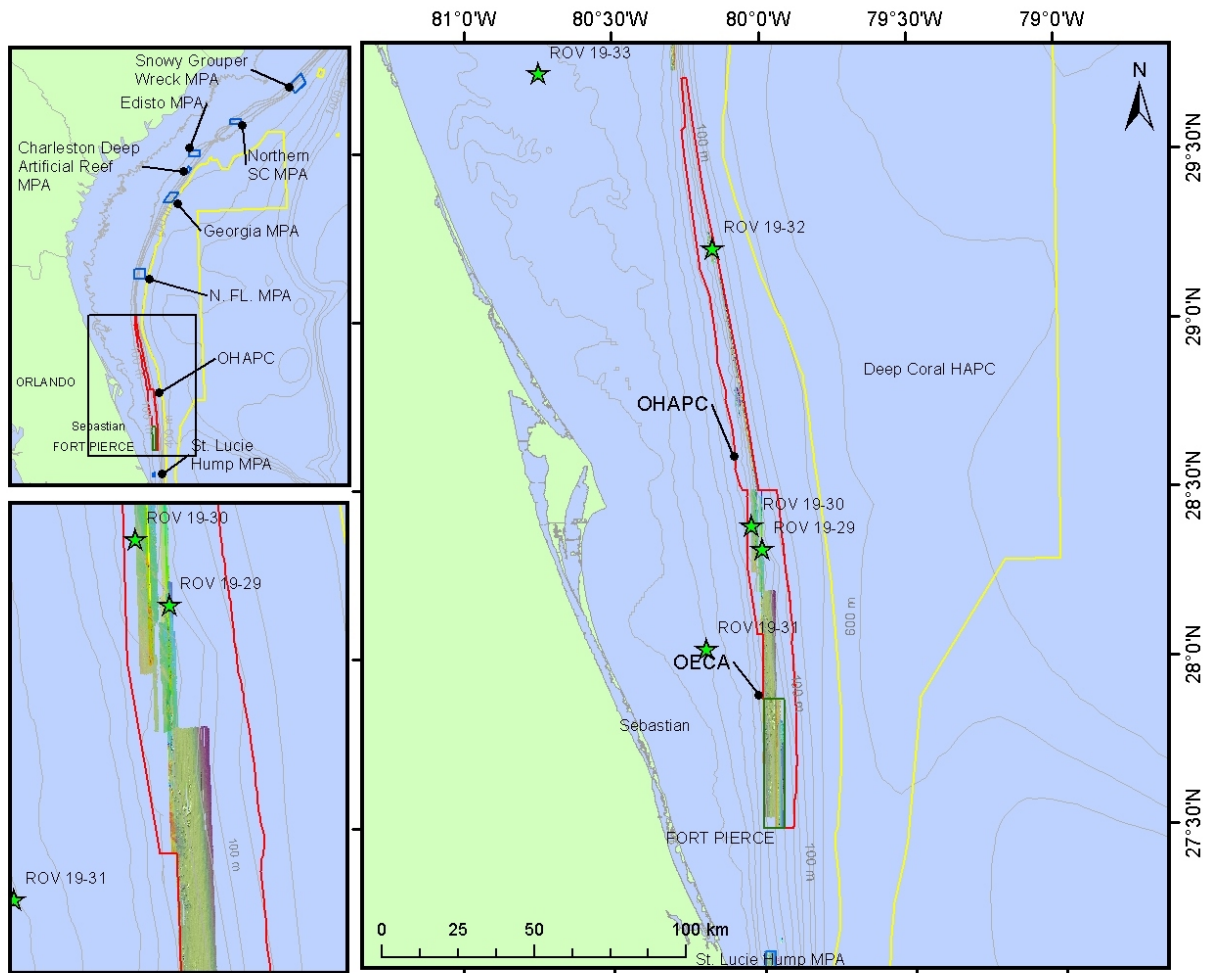


Figure 1. Locations of *Mohawk* ROV dive sites in the *Oculina* HAPC and OECA during the NOAA Ship *Pisces* cruise 19-02, June 7-20, 2019.

South Atlantic MPA's

NOAA Ship Pisces Cruise PC19-02
North Florida ROV Dives

- ★ Mohawk ROV
- Bathymetry
- OECA
- OHAPC
- MPA
- Deep Coral HAPC

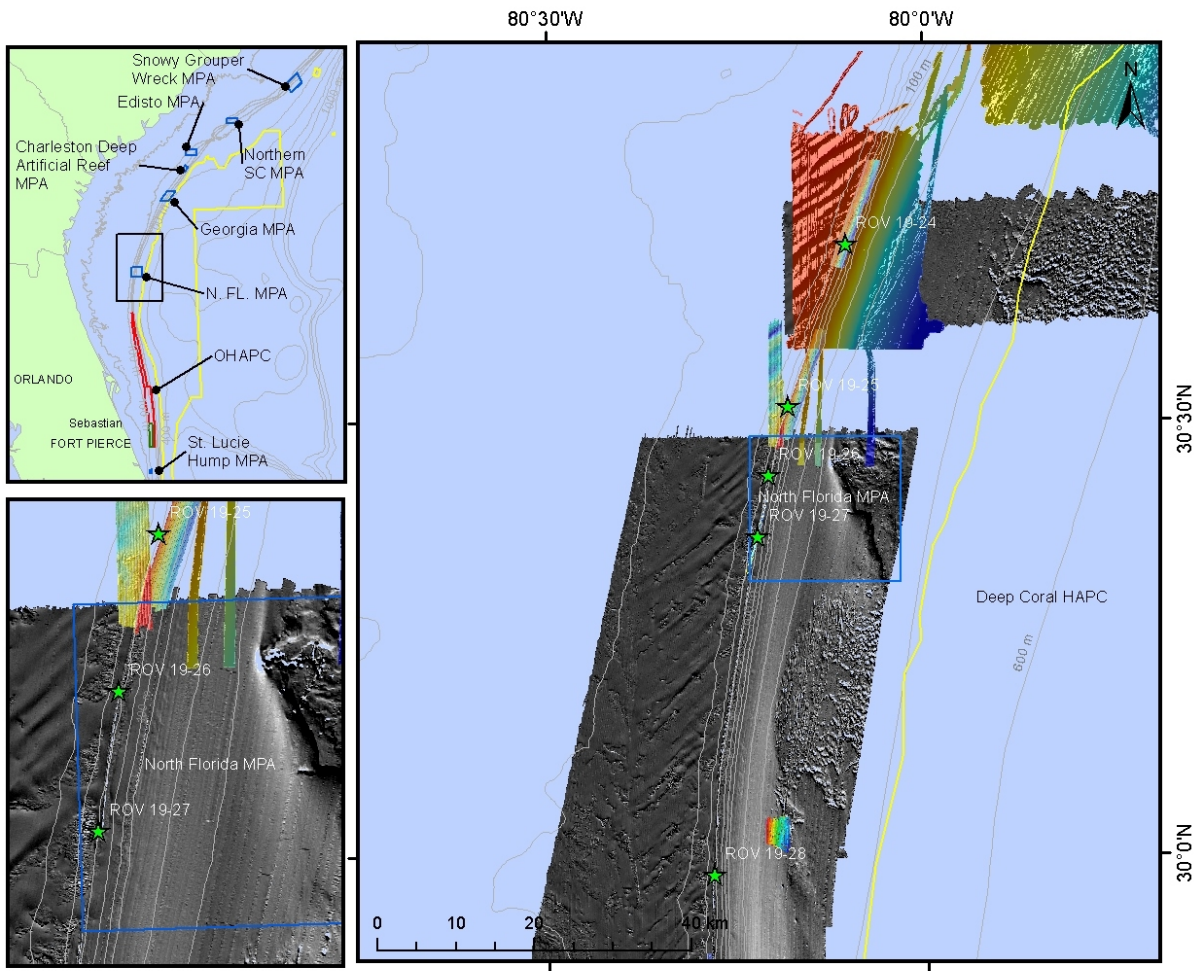


Figure 2. Locations of *Mohawk* ROV dive sites off North Florida during the NOAA Ship *Pisces* cruise 19-02, June 7-20, 2019.

South Atlantic MPA's

NOAA Ship Pisces Cruise PC19-02
Georgia ROV Dives

- ★ Mohawk ROV
- Bathymetry
- OECA
- MPA
- OHAPC
- Deep Coral HAPC

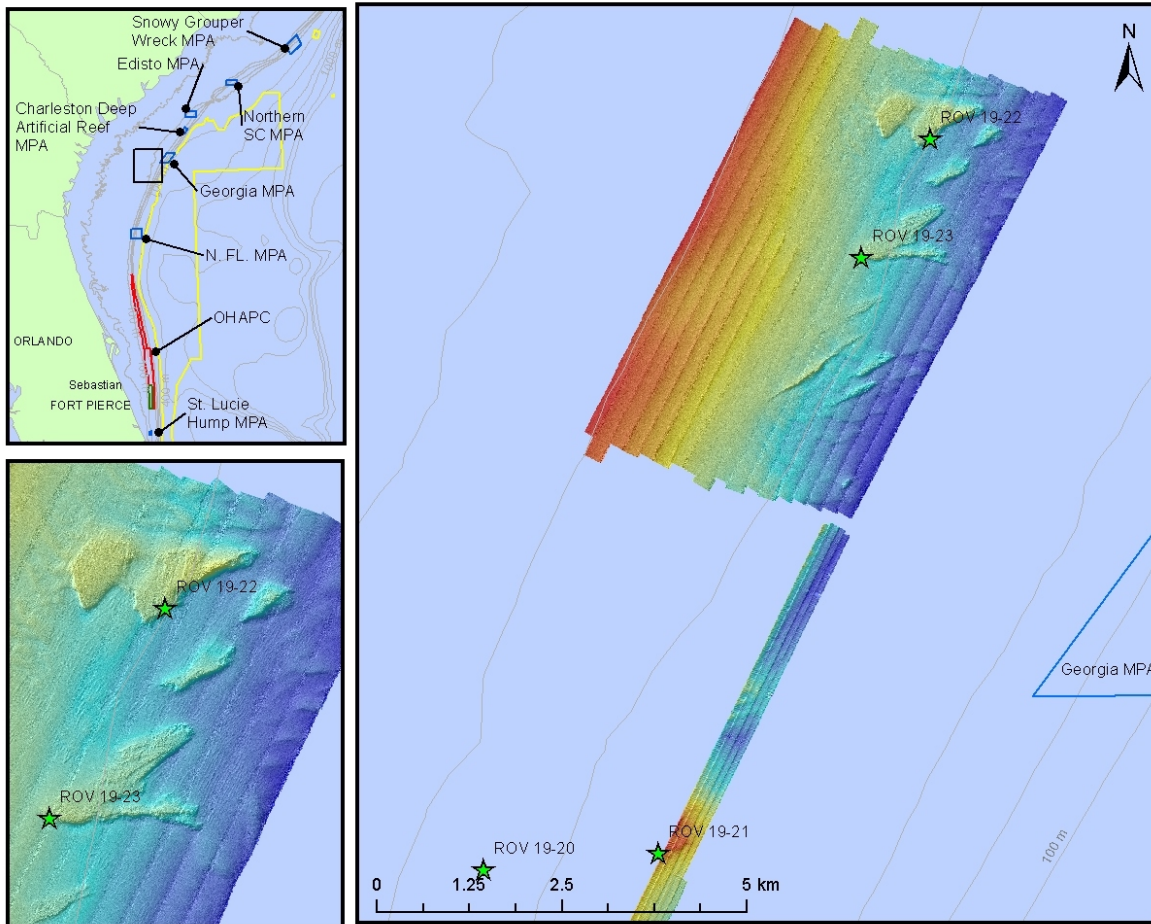


Figure 3. Locations of *Mohawk* ROV dive sites outside of Georgia MPA during the 2018 NOAA Ship *Pisces* cruise 19-02, June 7-20, 2019.

South Atlantic MPA's

NOAA Ship Pisces Cruise PC19-02
Edisto and Charleston Deep
ROV Dives

- ★ Mohawk ROV
- Bathymetry
- OECA
- MPA
- OHAPC
- Deep Coral HAPC

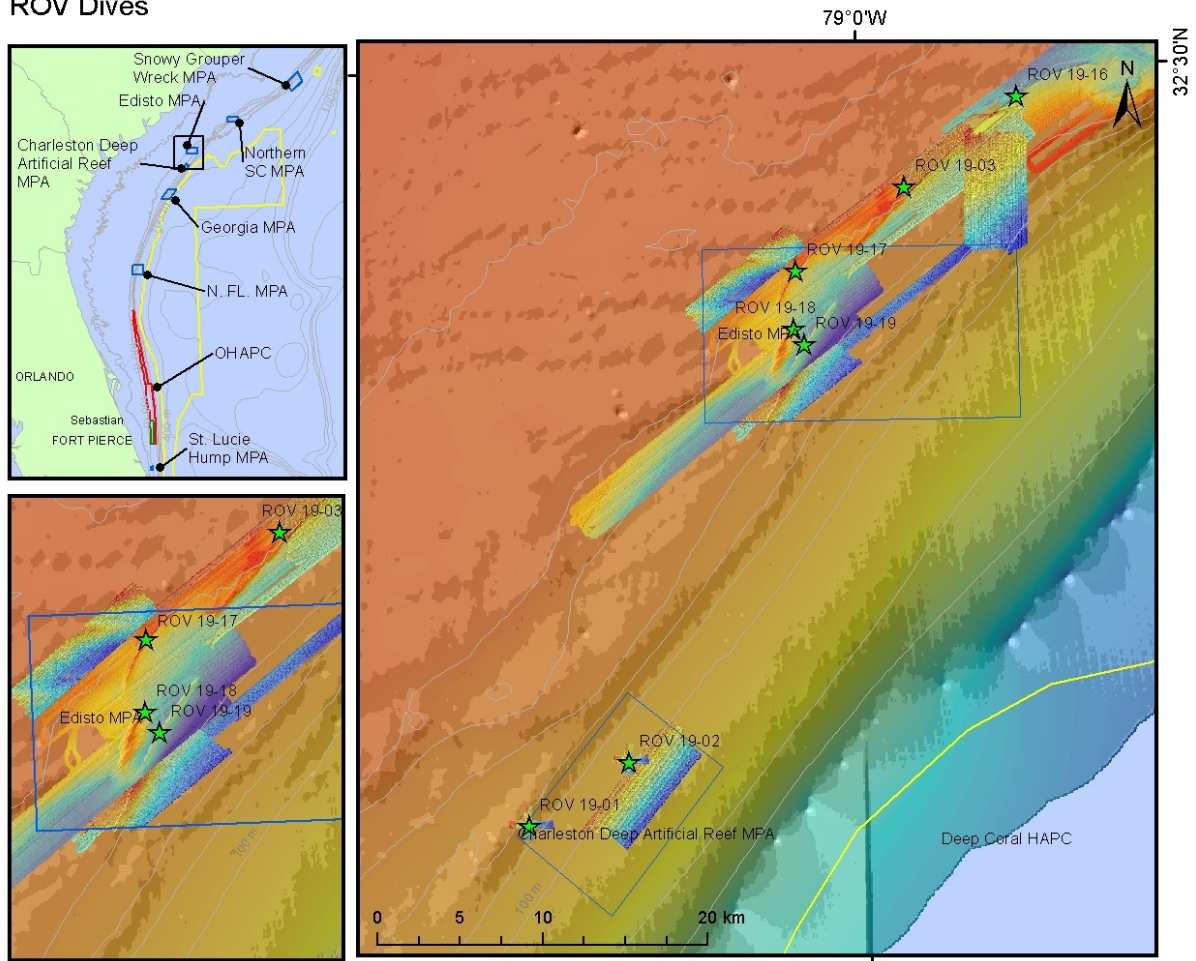


Figure 4. Locations of *Mohawk* ROV dive sites near Edisto MPA and Charleston Deep Artificial Reef MPA, South Carolina during the 2019 NOAA Ship *Pisces* cruise 19-02, June 7-20, 2019.

South Atlantic MPA's
 NOAA Ship *Pisces* Cruise PC19-02
 Devil's Hole SMZ and
 Northern S. Carolina ROV Dives

- ★ Mohawk ROV
- Bathymetry
- OECA
- OHAPC
- MPA
- Deep Coral HAPC

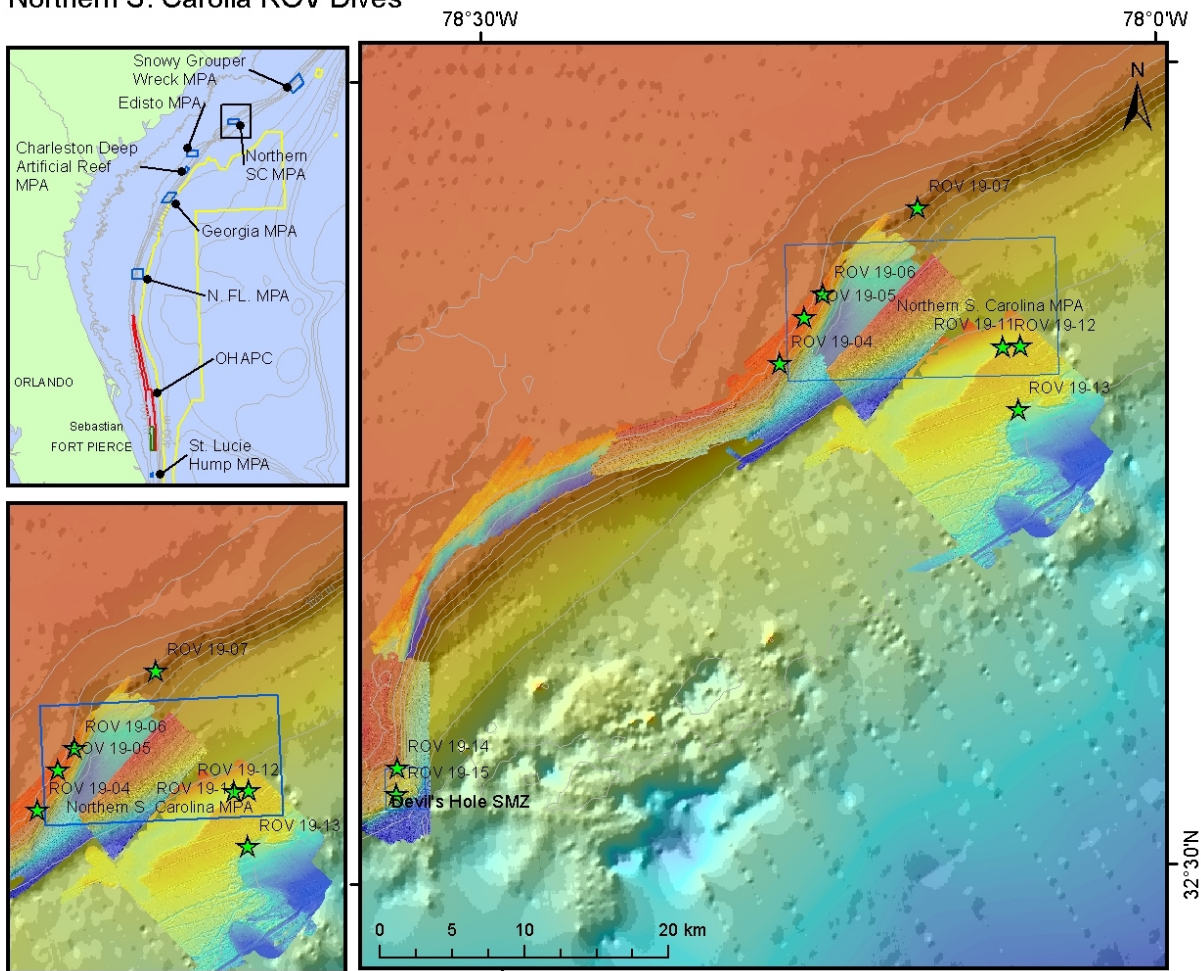


Figure 5. Locations of *Mohawk* ROV dive sites off Northern South Carolina MPA during the 2019 NOAA Ship *Pisces* cruise 19-02, June 7-20, 2019.

South Atlantic MPA's

NOAA Ship *Pisces* Cruise PC19-02
Snowy Wreck ROV Dives

★ Mohawk ROV OECA MPA
 Bathymetry OHAPC Deep Coral HAPC

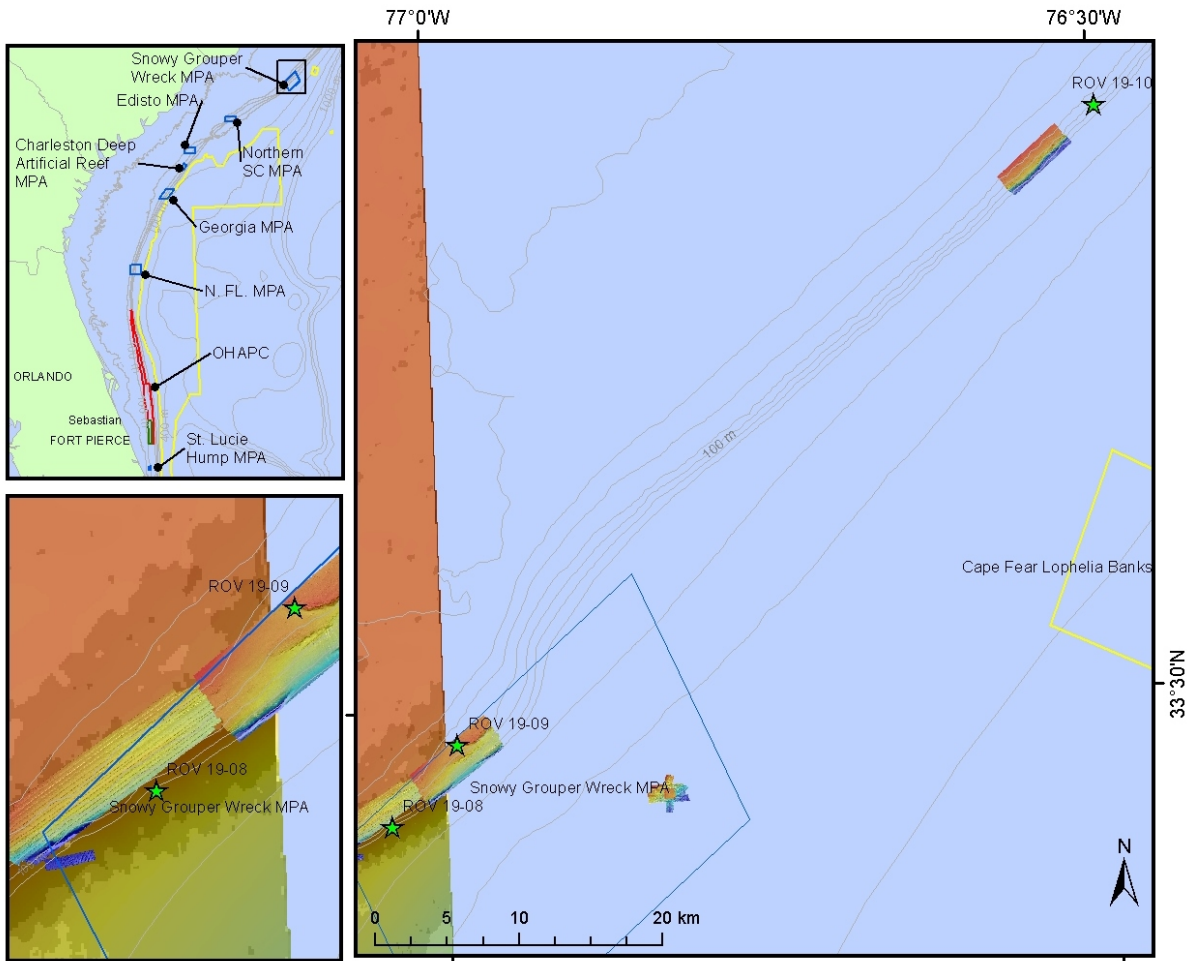


Figure 6. Locations of *Mohawk* ROV dive sites off Snowy Grouper Wreck MPA site, North Carolina during the NOAA Ship *Pisces* cruise 19-02, June 7-20, 2019.

Table 3. ROV dive sites and CTD casts from NOAA Ship *Pisces* cruise 19-02, June 7-20, 2019. (Site Number= Day-Month-Year-Site).

Site No.	Method	On Bottom		Off Bottom		Depth Range (m)	Distance (km)
		Latitude	Longitude	Latitude	Longitude		
8-VI-19-1	ROV 19-01	32.09	-79.22	32.09	-79.22	77-88	0.39
8-VI-19-2	ROV 19-02	32.12	-79.15	32.12	-79.15	92-102	0.29
8-VI-19-3	ROV 19-03	32.43	-78.97	32.43	-78.98	45-50	1.22
8-VI-19-4	CTD 19-01	32.50	-78.74			100	
9-VI-19-1	ROV 19-04	32.82	-78.28	32.82	-78.28	48-53	0.79
9-VI-19-2	ROV 19-05	32.85	-78.27	32.85	-78.26	47-51	1.08
9-VI-19-3	ROV 19-06	32.86	-78.25	32.87	-78.25	46-53	1.18
9-VI-19-4	ROV 19-07	32.91	-78.18	32.92	-78.17	61-71	0.77

9-VI-19-5	CTD 19-02	32.90	-78.16			92	
10-VI-19-1	ROV 19-08	33.43	-77.04	33.43	-77.04	90-125	0.70
10-VI-19-2	ROV 19-09	33.48	-76.99	33.48	-76.98	41-68	1.78
10-VI-19-3	CTD 19-03	33.97	-76.27			219	
11-VI-19-1	ROV 19-10	33.86	-76.49	33.87	-76.48	77-106	1.69
12-VI-19-1	ROV 19-11	32.82	-78.11	32.82	-78.11	156-165	1.35
12-VI-19-2	ROV 19-12	32.82	-78.12	32.82	-78.12	159-167	0.81
12-VI-19-3	ROV 19-13	32.79	-78.11	32.79	-78.11	167-191	0.97
12-VI-19-4	CTD 19-04						
13-VI-19-1	ROV 19-14	32.57	-78.57	32.57	-78.57	56-86	1.03
13-VI-19-2	ROV 19-15	32.56	-78.58	32.56	-78.57	85-105	0.47
13-VI-19-3	CTD 19-05	32.76	-78.05			188	
14-VI-19-1	ROV 19-16	32.48	-78.90	32.48	-78.90	46-50	0.97
14-VI-19-2	ROV 19-17	32.39	-79.04	32.38	-79.05	43-51	0.77
14-VI-19-3	ROV 19-18	32.36	-79.04	32.35	-79.05	48-56	1.15
14-VI-19-4	ROV 19-19	32.35	-79.04	32.34	-79.04	59-65	0.82
14-VI-19-5	CTD 19-06	32.56	-78.57			105	
15-VI-19-1	ROV 19-20	31.55	-79.73	32.52	-79.73	61-70	1.34
15-VI-19-2	ROV 19-21	31.55	-79.70	31.55	-79.71	69-74	0.59
15-VI-19-3	ROV 19-22	31.63	-79.66	31.64	-79.66	66-71	0.75
15-VI-19-4	ROV 19-23	31.62	-79.67	31.62	-79.67	51-72	0.79
15-VI-19-5	CTD 19-07	32.49	-79.04			63	
16-VI-19-1	ROV 19-24	30.70	-80.10	30.71	-80.10	55-62	0.92
16-VI-19-2	ROV 19-25	30.52	-80.18	30.52	-80.18	48-60	1.11
16-VI-19-3	CTD 19-08	31.55	-79.70			71	
17-VI-19-1	ROV 19-26	30.44	-80.21	30.43	-80.21	54-61	1.28
17-VI-19-2	ROV 19-27	30.37	-80.22	30.36	-80.22	59-64	1.39
17-VI-19-3	ROV 19-28	29.98	-80.28	29.99	-80.28	54-66	1.38
17-VI-19-5	CTD 19-09	30.59	-80.12			105	
18-VI-19-1	ROV 19-29	Failed				72-78	
18-VI-19-2	ROV 19-30	28.40	-80.03	28.40	-80.03	11-28	0.38
18-VI-19-3	ROV 19-31	28.03	-80.19	28.04	-80.19	27-30	1.01
18-VI-19-4	CTD 19-10	28.70	-80.06			90	
19-VI-19-1	ROV 19-32	29.22	-80.16	29.23	-80.16	69-88	1.28
19-VI-19-2	ROV 19-33	29.74	-80.75	29.74	-80.75	34-122	0.24

Table 4. Summary of ROV dive sites by state and MPA during the NOAA Ship *Pisces* cruise 19-02, June 7-20, 2019. See Appendix 3 for description of each dive site.

State/Site	Total Dives	No. Dives Inside MPA	No. Dives Outside MPA	Depth Range (m)
Florida (Total Dives)	(10)	5	5	27-122
North Florida MPA	5	26-27	24-25, 28	48-66
Oculina HAPC	5	29-30,32	31, 33	27-122

Georgia (Total Dives)	(4)	-	4	51-74
Georgia MPA	4	-	20-23	51-74
South Carolina (Total Dives)	(16)	11	5	43-191
Charleston Deep Artificial Reef MPA	2	1,2	-	92-102
Edisto MPA	5	17-19	3, 16	43-65
Northern South Carolina MPA	4	5,6	4,7	46-71
Northern South Carolina MPA (iceberg scar)	3	11-12	13	156-191
Devil's Hole SMZ	2	14-15	-	56-105
North Carolina (Total Dives)	(3)	3	-	41-125
Snowy Wreck MPA	2	8-9	-	41-125
Cape Lookout SMZ	1	10	-	77-106
Grand Total (Total Dives)	(33)	19	14	27-191

CTD Operations

Temperature and depth data were collected during ROV dives 1-9 and a full CTD was logged during dives 10-33 (Table 5; Appendix 3 shows the temperature profile for each dive). Ten shipboard CTD cast were made (Fig. 7).

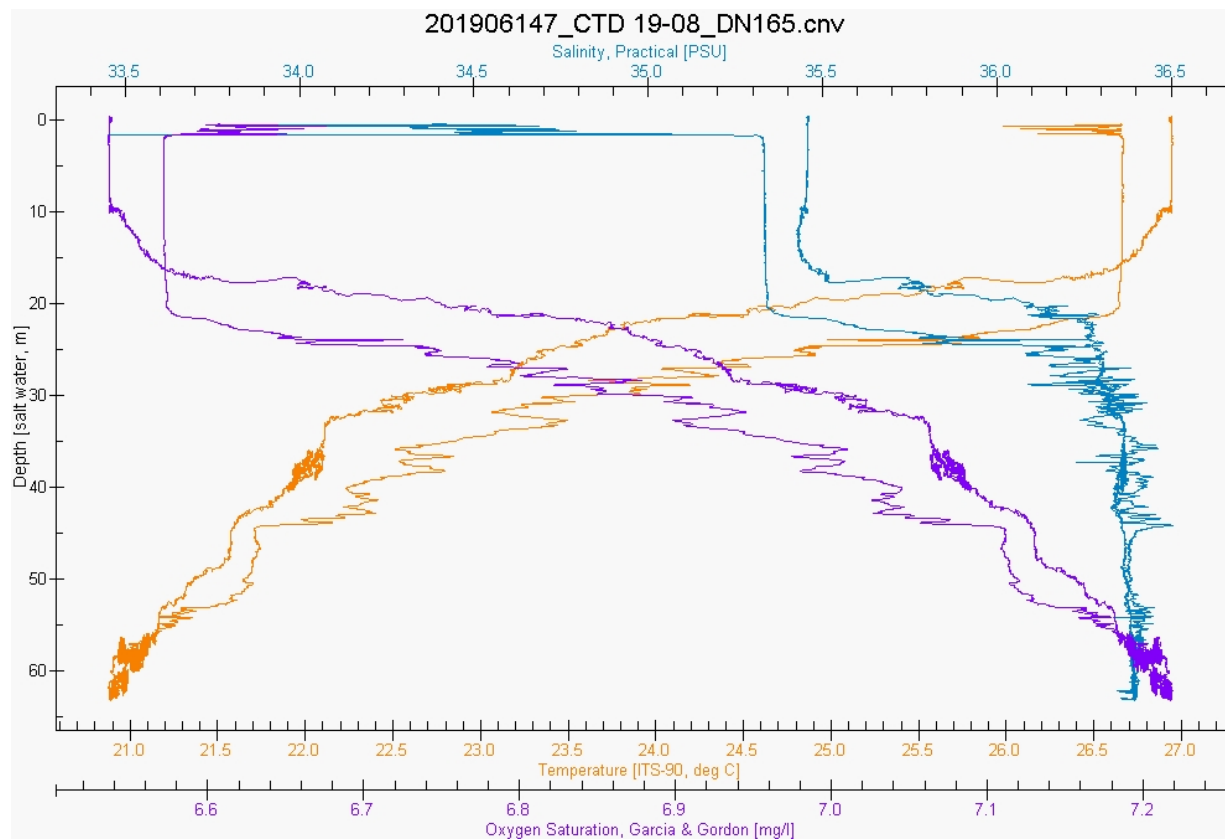


Figure 7. Example Shipboard CTD cast conducted at North Florida MPA site during the NOAA Ship Pisces cruise 19-02; CTD 19-08, June 7-20, 2019.

Table 5. Shipboard CTD data (CTD 1) and ROV temperature data (ROV dives 19-01 to 29) from NOAA Ship *Pisces* cruise 19-02, **June 7-20, 2019**. Surface and bottom temperatures, bottom salinity and bottom oxygen at maximum depth of cast.

Dive No.	Launch	Depth (m)	Surf. Temp (°C)	Bot. Min. Temp (°C)	Bot. Sal. (PSU)	Bot. Oxygen (mg/l)
ROV 19-01	6/8/2019 7:32	86.42	27.08	20.08		
ROV 19-02	6/8/2019 10:14	100.81	27.17	18.85		
ROV 19-03	6/8/2019 14:35	48.96	27.92	21.07		
CTD 19-01	6/8/2019 22:45	98.92		18.81	36.40	7.50
ROV 19-04	6/9/2019 7:32	52.15	27.11	21.90		
ROV 19-05	6/9/2019 9:45	50.29	27.30	22.16		
ROV 19-06	6/9/2019 12:42	52.52	27.38	20.78		
ROV 19-07	6/9/2019 15:44	70.35	27.76	20.08		
CTD 19-02	6/9/2019 22:27	93.34	0.00	18.54	36.32	7.54
ROV 19-08	6/10/2019 8:32	124.18	26.86	18.18		
ROV 19-09	6/10/2019 11:30	68.02	26.95	20.81		
CTD 19-03	6/10/2019 22:45	219.78		13.64	35.79	8.32
ROV 19-10	6/11/2019 11:47	102.81	28.03	24.19	36.59	6.81
ROV 19-11	6/12/2019 7:24	163.19	26.85	14.34	36.07	8.20
ROV 19-12	6/12/2019 11:51	165.21	27.03	14.31	36.10	8.20
ROV 19-13	6/12/2019 14:03	188.95	26.17	14.60	35.95	8.15
CTD 19-04	6/12/2019 18:40	188.95		14.81	35.93	8.12
ROV 19-14	6/13/2019 12:10	83.73	26.95	19.23	36.41	7.44
ROV 19-15	6/13/2019 17:37	105.31	27.07	18.54	36.40	7.54
CTD 19-05	6/13/2019 18:40	188.24		14.82	35.93	5.68
ROV 19-16	6/14/2019 7:02	49.14	26.38	20.58	36.46	7.26
ROV 19-17	6/14/2019 10:41	49.38	25.91	21.44	36.43	7.15
ROV 19-18	6/14/2019 13:26	54.83	27.29	20.87	36.42	7.22
ROV 19-19	6/14/2019 16:11	63.18	26.74	20.88	36.41	7.22
CTD 19-06	6/14/2019 20:12	62.97		20.89	36.40	5.05
ROV 19-20	6/15/2019 7:05	68.58	27.32	18.13	36.38	7.60
ROV 19-21	6/15/2019 10:09	71.41	27.48	17.52	36.35	7.69
ROV 19-22	6/15/2019 13:30	70.00	27.96	18.35	36.40	7.56
ROV 19-23	6/15/2019 15:59	69.23	27.97	18.21	36.43	7.58
CTD 19-07	6/15/2019 23:07	65.64		18.25	36.37	5.30
ROV 19-24	6/16/2019 12:02	60.94	26.42	20.19	36.32	7.31
ROV 19-25	6/16/2019 15:59	58.05	27.19	18.69	36.36	7.52
CTD 19-08	6/16/2019 22:39	104.99		15.79	36.09	7.96
ROV 19-26	6/17/2019 7:00	59.70	26.75	23.20	36.31	6.93
ROV 19-27	6/17/2019 10:06	61.61	26.98	23.12	36.32	6.94
ROV 19-28	6/17/2019 15:46	64.52	29.36	22.59	36.43	7.01
CTD 19-09	6/17/2019 23:10	68.49		18.13	36.38	5.31

ROV 19-29	6/18/2019 7:17	75.00	27.25	18.35	36.40	7.58
ROV 19-30	6/18/2019 9:30	75.97	26.47	18.09	36.14	7.61
ROV 19-31	6/18/2019 13:49	30.41	26.90	21.64	36.43	7.13
CTD 19-10	6/18/2019 23:39	89.74		16.01	36.03	7.93
ROV 19-32	6/19/2019 7:10	86.86	26.51	13.79	36.21	8.30
ROV 19-33	6/19/2019 14:15	120.38	27.03	22.74	36.21	6.99

Multibeam Sonar Surveys

Nine multibeam sonar surveys were conducted covering a total area of 169 km² (Table 6). One site was reported in two resolutions- *Pisces_2019_Cape_Lookout_2m_Grid* and *Pisces_2019_Cape_Lookout_4m_Grid*.

Table 6. Multibeam sonar survey sites from NOAA Ship *Pisces* cruise 19-02, June 7-20, 2019.

Name	Area (mi ²)	Area (km ²)	Resolution (m)	Min Depth (m)	Max Depth (m)
Florida	11.9	30.8	4	49	93
Oculina HAPC					
<i>Pisces_2019_OHAPC_4m_Grid</i>	5.7	14.8	4	64	93
Outside North Florida MPA					
<i>Pisces_2019_NorthFloridaMPA_4m_Grid</i>	6.2	16.0	4	49	75
Georgia	9.5	24.6	4	59	80
Outside Georgia MPA					
<i>Pisces_2019_Georgia_4m_Grid</i>	9.5	24.6	4	59	80
South Carolina	35.8	92.8	2-8	43	402
Edisto MPA					
<i>Pisces_2019_Edisto_4m_Grid</i>	2.2	5.7	4	43	63
Northern South Carolina MPA (iceberg scar site)					
<i>Pisces_2019_Northern_SC_MPADeep_8m_Grid</i>	14.2	36.8	8	132	402
Outside Devil's Hole SMZ					
<i>Pisces_2019_Devils_Hole_4m_Grid</i>	5.4	14.0	4	47	86
<i>Pisces_2019_Devils_Hole_All_4m_Grid</i>	10.3	26.6	4	43	184
Outside Northern South Carolina MPA					
<i>Pisces_2019_Northern_SC_MPA_2m_Grid</i>	3.7	9.6	2	48	72
North Carolina	8.0	20.8	2	131	295
Outside Cape Lookout SMZ					
<i>Pisces_2019_Cape_Lookout_2m_Grid</i>	8.0	20.8	2	131	295
Grand Total	65.2	169.0	2-8	43	402

Specimen Collections

Forty-nine of the benthic invertebrates including scleractinian corals, gorgonians, black corals, sponges and zoanths were collected and will be used for museum specimens, taxonomic

identification, genetic analysis, and live collections for the Smithsonian Ecosystem and Aquarium in Fort Pierce, Florida (Table 7).

Table 7. List of samples collected during the NOAA Ship *Pisces* cruise 19-02, June 7-20, 2019.

Sample No.	ID	Sample Type	Latitude	Longitude	Depth (m)
11-VI-19-1-001	Plexauridae	Taxonomy	33.87	-76.49	86
11-VI-19-1-002	<i>Madracis myriaster</i>	Taxonomy, DNA	35.37	-76.48	96
12-VI-19-1-001	Plexauridae	Taxonomy	32.82	-78.11	161
12-VI-19-1-002	Plexauridae	Taxonomy	32.82	-78.11	161
12-VI-19-1-003	<i>Paracolochirus mysticus</i>	Taxonomy	32.82	-78.11	161
12-VI-19-1-004	<i>Perotrochus</i> sp.	Live	32.82	-78.11	161
12-VI-19-1-005	<i>Leiodermatium lynceus</i>	Taxonomy, Chemistry	32.82	-78.11	158
12-VI-19-1-006	<i>Perotrochus</i> sp.	Taxonomy	32.82	-78.11	159
12-VI-19-1-007	<i>Penares</i> cf. sp.	Taxonomy, Chemistry	32.82	-78.11	158
12-VI-19-1-008	Annelida	Taxonomy	32.82	-78.11	158
12-VI-19-2-001	<i>Epipolasis</i> cf. <i>profunda</i>	Taxonomy, Chemistry	32.82	-78.12	160
12-VI-19-3-001	<i>Perotrochus</i> sp.	Taxonomy	32.79	-78.11	181
12-VI-19-3-002	<i>Perotrochus maureri</i>	Taxonomy	32.79	-78.11	168
12-VI-19-3-003	<i>Perotrochus maureri</i>	Taxonomy	32.79	-78.11	169
13-VI-19-1-001	<i>Madracis myriaster</i>	Taxonomy	32.57	-78.57	78
13-VI-19-1-002	Plexauridae	Taxonomy	32.57	-78.58	81
13-VI-19-1-003	<i>Antipathes atlantica</i>	Taxonomy	32.57	-78.58	85
13-VI-19-1-004	Alcyonacea- gorgonian	Taxonomy	32.57	-78.58	81
13-VI-19-2-001	Zoanthidae	Taxonomy, Chemistry	32.56	-78.57	97
13-VI-19-2-002	<i>Madracis myriaster</i>	Taxonomy	32.56	-78.57	98
14-VI-19-1-001	<i>Muricea</i> sp.	Taxonomy, Chemistry	32.48	-78.90	48
14-VI-19-1-002	<i>Cliona</i> cf. <i>tumula</i>	Taxonomy, Chemistry	32.48	-78.90	47
14-VI-19-1-003	<i>Telesto</i> sp.	Taxonomy, Chemistry	32.48	-78.90	49
14-VI-19-1-004	Scleractinia- unid cup	Taxonomy	32.48	-78.90	47
14-VI-19-3-001	<i>Aaptos</i> sp. MPA-01	Taxonomy, Chemistry	32.35	-79.50	50
14-VI-19-4-001	<i>Neofibularia nolitangere</i>	Taxonomy, Chemistry	32.35	-79.04	63
14-VI-19-4-002	<i>Diodogorgia nodulifera</i>	Taxonomy	32.35	-79.04	62
14-VI-19-4-003	<i>Muricea</i> sp.	Taxonomy	32.35	-79.04	62
15-VI-19-1-001	<i>Clathria</i> (C.) sp. MPA-01	Taxonomy, Chemistry	31.55	-79.73	66
15-VI-19-1-002	Demospongiae	LOST	31.54	-79.73	67
15-VI-19-2-001	Didemnidae	Taxonomy, Chemistry	31.55	-79.70	72

15-VI-19-4-001	<i>Cliona</i> aff. <i>celata</i>	Taxonomy, Chemistry	31.62	-79.67	70
16-VI-19-1-001	Ellisellidae	Taxonomy,	30.70	-80.10	60
16-VI-19-2-001	<i>Aaptos</i> sp. MPA-01	Taxonomy, Chemistry	30.52	-80.18	53
17-VI-19-1-001	<i>Clathria</i> (<i>Clathria</i>) <i>foliacea</i>	Taxonomy, Chemistry	30.44	-80.21	61
17-VI-19-1-002	<i>Petrochirus diogenes</i>	Live	30.43	-80.21	60
17-VI-19-2-001	<i>Hypnorgia</i> sp.	Taxonomy, Chemistry	30.36	-80.22	62
17-VI-19-2-002	<i>Stichopathes</i> sp.	Taxonomy	30.36	-80.22	62
17-VI-19-2-201	rock	Taxonomy	30.36	-80.22	62
18-VI-19-3-001	Crinoidea	Taxonomy	28.28	-80.19	29
18-VI-19-3-002	Goniasteridae	Live	28.67	-80.19	28
19-VI-19-1-001	dead standing <i>Oculina</i> (habitat)	Live	29.22	-80.16	76
19-VI-19-1-002	<i>Astrophyton muricatum</i>	Live	29.22	-80.16	76
19-VI-19-1-003	<i>Oculina varicosa</i>	Live	29.22	-80.16	71
19-VI-19-1-004	<i>Anoplodactylus lentus</i>	DNA	23.22	-80.16	71
19-VI-19-1-005	Nudibranchia	Taxonomy	29.22	-80.16	71
19-VI-19-1-006	<i>Eucidaris tribuloides</i>	Live	29.23	-80.16	82
19-VI-19-1-007	<i>Cladocora</i> sp.	Taxonomy	23.22	-80.16	71
19-VI-19-1-008	<i>Coscinasterias tenuispina</i>	Live	29.22	-80.16	76

Characterization of Benthic Habitat and Benthic Macrobiota

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

Benthic Macrobiota and Habitat

Appendix 1 lists all of the benthic macroinvertebrates 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 107 taxa of benthic macrobiota (including “unknown”) were identified from the quantitative photo transects and were used for CPCe percent cover analyses (Appendix 1). These

included 29 taxa of Cnidaria which included the following Anthozoa: 5 Scleractinia hard corals (including *Cladocora* sp., *Madracis decactis*, *Madracis myriaster*, *Madepora* sp., unidentified cup corals); 11 octocoral gorgonians (including: Alcyonacea- gorgonian, Clavulariidae (*Telesto/Carijoa*), *Diodogorgia* sp., *Ellisella* sp., Ellisellidae, *Iciligorgia schrammi* Duchassaing, 1870, *Muricea* sp., *Nicella* sp., Plexauridae, Plexauridae- MPA1, *Swiftia exserta* (Ellis & Solander, 1786), 5 Antipatharia (Antipatharia, *Antipathes atlantica* Gray, 1857, *Antipathes furcata* Gray, 1857, *Stichopathes luetkeni* Brook, 1889, *Tanacetipathes* sp.) and 32 Alcyoniina soft corals (Alcyoniina, *Nidalia occidentalis*). Eight Non-coral Cnidaria included: Actiniaria, Alcyoniina, Cerianthidae, Corallimorpharia, *Nidalia occidentalis* Gray, 1835, Octocorallia, Zoanthidae and hydroids.

Porifera were the dominant benthic macrobiota and were species rich with 33 taxa of Demospongiae and one Hexactinellida glass sponge taxa. There are many taxa that could only be identified to genus or higher level from the photos and video. Microscopic analysis is required to identify to the species or genus level. The taxonomy of the sponge samples that were collected were analyzed in detail (see Díaz, M.C., S. Farrington, S.A. Pomponi, and J.K. Reed. 2020. Morphological Diagnoses of Sponges Collected at Shelf-edge MPAs from Eastern Florida to North Carolina, between depths of 51 and 150 m, during CIOERT Expeditions (2018-2019). <http://www.cioert.org/expeditions/mesophotic-reef-ecosystems/>. Harbor Branch Oceanographic Institute Technical Report Number 190). A synoptic description of each species studied, with live, deck and microscopy photographs is presented in this report (Diaz et al. 2020).

Thirteen sponge samples were collected, and taxonomic evaluation, studying the internal and external morphology, resulted in: 1) three well recognized species from the Tropical Western Atlantic (*Leiodermatium lynceus*, *Neofibularia nolintangere*, *Clathria foliacea*), 2) four species with sibling recognized species but with major morphological differences that might require the description of new species (*Epipolasis* cf. *profunda*, *Cliona* cf. *tumula*, *Cliona* aff. *celata*), and 3) three species that only could receive generic designations (*Penares* sp.1, *Clathria* sp.1, and *Aaptos* sp.1). These results show that more than half of the species collected represent unknown species to science, or unknown variations of recognized species. Careful comparison with species types and observations of spicules under scanning electron microscope (SEM) would allow the necessary evidence to characterize and classify these new species or varieties. We suggest further characterization of these novel fauna considering their level of abundance and distribution in the MPAs studied.

More detailed collections specifically for taxonomy would undoubtedly uncover many more species of sponges. The dominant of the 33 total demosponges that were most common from the photo/video transects included *Agelas clathrodes*, *Agelas* sp., *Aiolochoxia crassa*, *Chondrosia* sp., *Clathria* sp., Demospongiae, *Cliona* cf. *tumula* Friday et al., 2016, Demospongiae- Ye sphere (MPA), *Ircinia campana*, *Ircinia* sp., *Ircinia strobilina*, *Leiodermatium lynceus*, *Oceanapia* sp., Poecilosclerida, Spirastrellidae, *Spongisorites siliquaria*.

Other fauna included Annelida (5 taxa), Mollusca (3), Arthropoda (5), Bryozoa (2), Echinodermata (12 taxa), Ascidiacea (2). Macroalgae (10 taxa) were dominant at Edisto and Northern South Carolina, but only a few taxa were identified to species or genus level such as. *Dictyota* sp., *Ochrophyta*, *Padina* sp., *Sargassum* sp., *Spatoglossum* sp.. Calcareous algae (Corallinales) were

also dominant on the shallower reefs but not identified to species. Detailed studies of the algae also would result in dozens if not hundred or more species.

Table 8. 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) during the NOAA Ship *Pisces* cruise 19-02, June 7-20, 2019. HB= bare hard bottom, SB= bare soft bottom, AR= bare artificial reef; Coral= Scleractinia hard coral, Gorg.= Octocoral (gorgonacea), Anti.= Antipatharia (black coral), Por.= Porifera (sponges), Other= all other benthic macrobiota, Hum. Deb.= human debris (fishing lines, trawl nets, anchors).

State/MPA Status	% Bare Substrate								% Hum. Deb.	
	% HB	% SB	% AR	% Coral	% Gorg.	% Anti.	% Por.	% Algae		% Other
Florida	42.52%	40.79%	0.00%	0.03%	0.15%	3.82%	3.07%	1.65%	7.93%	0.03%
North Florida MPA	32.84%	43.91%	0.00%	0.00%	0.17%	4.82%	4.67%	1.57%	12.01%	0.00%
Outside North Florida MPA	38.35%	41.71%	0.00%	0.02%	0.27%	6.43%	3.98%	2.01%	7.14%	0.08%
Oculina HAPC	64.40%	29.34%	0.00%	0.14%	0.00%	0.00%	0.68%	0.14%	5.31%	0.00%
Outside OHAPC 90' Reef, Melbourne	37.68%	51.85%	0.00%	0.00%	0.00%	0.00%	0.15%	4.14%	6.18%	0.00%
Red Snapper Sinkhole	63.98%	32.75%	0.00%	0.00%	0.00%	0.00%	1.01%	0.00%	2.27%	0.00%
Georgia	27.28%	63.25%	0.00%	0.09%	0.21%	2.06%	2.80%	0.13%	4.15%	0.02%
Outside Georgia MPA	27.28%	63.25%	0.00%	0.09%	0.21%	2.06%	2.80%	0.13%	4.15%	0.02%
South Carolina	30.02%	26.89%	4.49%	0.65%	1.42%	0.92%	3.75%	21.22%	10.56%	0.08%
Charleston Deep Artificial Reef MPA (Barge 1)	8.75%	6.04%	48.56%	0.00%	0.00%	0.00%	3.64%	0.04%	32.96%	0.00%
Charleston Deep Artificial Reef MPA (Barge 2)	2.76%	6.81%	13.30%	0.00%	0.00%	0.00%	0.27%	0.00%	76.49%	0.38%
Devil's Hole SMZ	52.05%	22.17%	0.00%	4.34%	2.39%	3.88%	3.93%	7.81%	3.30%	0.14%
Edisto MPA	32.50%	24.61%	0.00%	0.00%	1.61%	1.47%	5.17%	30.13%	4.50%	0.02%
Outside Edisto MPA	16.39%	38.76%	0.00%	0.02%	3.18%	0.17%	3.66%	32.66%	5.15%	0.00%
Northern South Carolina MPA	29.14%	12.67%	0.00%	0.21%	1.33%	0.14%	3.36%	50.07%	3.00%	0.09%
Outside Northern South Carolina MPA	35.10%	24.02%	0.00%	0.06%	0.82%	0.78%	5.97%	28.29%	4.90%	0.06%
Northern South Carolina MPA (iceberg scar site)	33.33%	60.18%	0.00%	0.00%	0.93%	0.00%	2.11%	0.00%	3.30%	0.14%
Outside Northern South Carolina MPA (iceberg scar site)	45.74%	49.82%	0.00%	0.05%	0.00%	0.00%	2.82%	0.00%	1.57%	0.00%
North Carolina	44.78%	40.29%	0.00%	0.13%	3.12%	1.18%	3.28%	5.43%	1.76%	0.05%
Cape Lookout SMZ	44.39%	35.54%	0.00%	0.00%	7.13%	1.06%	4.39%	5.81%	1.62%	0.07%
Snowy Wreck MPA	45.04%	43.45%	0.00%	0.22%	0.44%	1.25%	2.53%	5.17%	1.85%	0.04%
Total	34.70%	35.42%	2.40%	0.38%	1.24%	1.74%	3.44%	12.48%	8.14%	0.06%

CPCe Point Count analysis was used to calculate the percent cover of bare substrate type and benthic macrobiota at each dive site (Fig. 8, Table 8, Appendix 1, Appendix 3). Overall, the Inside Northern South Carolina site had the greatest biota cover (58.1%) mainly from algae cover (Fig.

8). The Charleston Deep Artificial Reef site also had over 76.7% cover of biota, but this is simply due to the barges being covered with bivalves (*Ostreidae*); however, the biotic diversity was very low on the barges.

Overall, algae had the greatest average cover (12.48%), followed by sponges (3.44%), black corals (1.74%), gorgonian octocorals (1.24%), and scleractinian corals (0.38%). Scleractinian corals were most common at Devil's Hole SMZ sites (4.34% cover), Snowy Wreck MPA (0.22%), and Northern South Carolina MPA (0.21%). Gorgonians had the greatest cover at Cape Lookout SMZ (7.13%) and Outside Edisto MPA (3.18%). Black corals were most common at North Florida MPA sites (inside- 4.82%; outside- 6.43%), followed by Devil's Hole SMZ (3.88%), and the Georgia site (2.06%). Sponges were most common at Outside Northern South Carolina MPA (5.97%) and Edisto MPA (5.17%). Macroalgae were greatest inside Northern South Carolina MPA (50.07%) and Edisto (outside- 32.66%, inside- 30.13%). Of course, the deep sites such as the Deep Artificial Reef MPA and the Iceberg scars sites had no algae. Algae appear to be quite variable over years at some sites. Some sites that were not covered with *Dictyota* and other brown algae previously had much more this year.

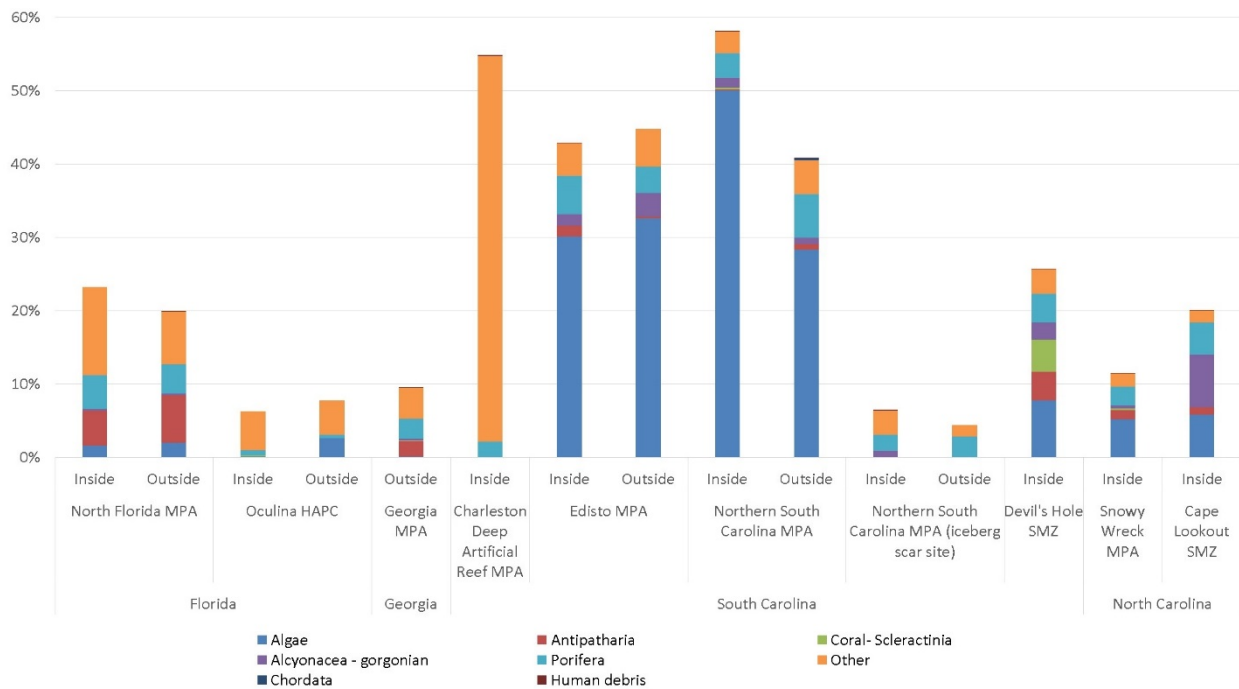


Figure 8. Percent cover of major benthic macrobiota taxa and human debris listed by MPA status and region from CPCe Point Count analysis of ROV photographic transects during the NOAA Ship *Pisces* cruise 19-02, June 7-20, 2019.

***Oculina* Coral Reef Site Surveys**

The *Oculina* reefs are at the western edge of the Florida Current, and as the current meanders, surface currents are often 1-2+ knots, making ROV dives very difficult and sometimes impossible. Usually we have to drift northerly and are unable to stop or maneuver easily. Much of the dive we are too far off bottom, and moving too fast, for good images of the bottom. 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.

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. 2017). The following analysis of the *Oculina* dives used the video to document the coral and sponge communities. Only one dive was analyzed within the OHAPC. Of the 3 dives attempted within the OHAPC, one dive (ROV 19-29) on an apparent shipwreck was aborted due strong currents and unable to get the ROV on bottom, and one dive (ROV 19-30) off Cape Canaveral had too poor visibility due to bottom nepheloid layer to analyze. Only dive ROV 19-32 was able to be analyzed. The video was first reviewed and divided into habitat types (*Oculina* mound, Valley-Rock/Rubble, and soft bottom- sand), then further divided into 5-minute increments. For each increment, Cnidaria (scleractinian hard corals, gorgonian octocorals, Alcyoniina soft corals, and antipatharians black corals), sponges, echinoderms, decapods, and human debris were identified and counted whenever the ROV was close enough to the bottom. Table 9 presents these data as total counts for each dive. A plot of these data indicates the presence of the taxa by category during the dive (Figure 9). A total of 41 colonies of live *Oculina varicosa* coral were counted (Table 9; Fig. 10). The dominant macrobiota were demosponges (206), Echinoderms (192), mostly sea urchins (186) and Antipatharians (91). A total of 56 standing dead *Oculina* coral colonies were also counted. Standing *Oculina* coral colonies, whether living or dead, 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 (George et al. 2007; Reed 2002; Reed et al. 1982; Reed and Mikkelsen 1987).

Table 9. Counts of major benthic macrobiota and fishing gear from video analysis of ROV dive 19-32 on *Oculina* HAPC reef site during the NOAA Ship *Pisces* cruise 19-02, June 7-20, 2019.

Phylum/Group/scientific name	No.
Porifera	206
Demospongiae	206
<i>Chondrilla</i> sp.	92
Demospongiae	113
Poecilosclerida	1
Cnidaria	283
Alcyonacea - Alcyoniina	10
<i>Nidalia occidentalis</i>	10
Alcyonacea - gorgonian	16
Anthozoa - Non Coral	90

Cerianthidae	85
Corallimorpharia	5
Antipatharia	91
<i>Antipathes atlantica</i>	4
<i>Stichopathes luetkeni</i>	81
<i>Tanacetipathes tanacetum</i>	6
Coral- Scleractinia	52
<i>Cladocora</i> sp.	11
<i>Oculina varicosa</i>	41
Hydrozoa	24
Chordata	3
Ascidiacea	3
Arthropoda	7
Decapoda	7
Echinodermata	192
Asteroidea	6
Echinoidea	186
Human debris	1
Human debris- fish line/gear	1
Habitat	56
dead standing <i>Oculina</i> (habitat)	56
<hr/> Grand Total	<hr/> 748

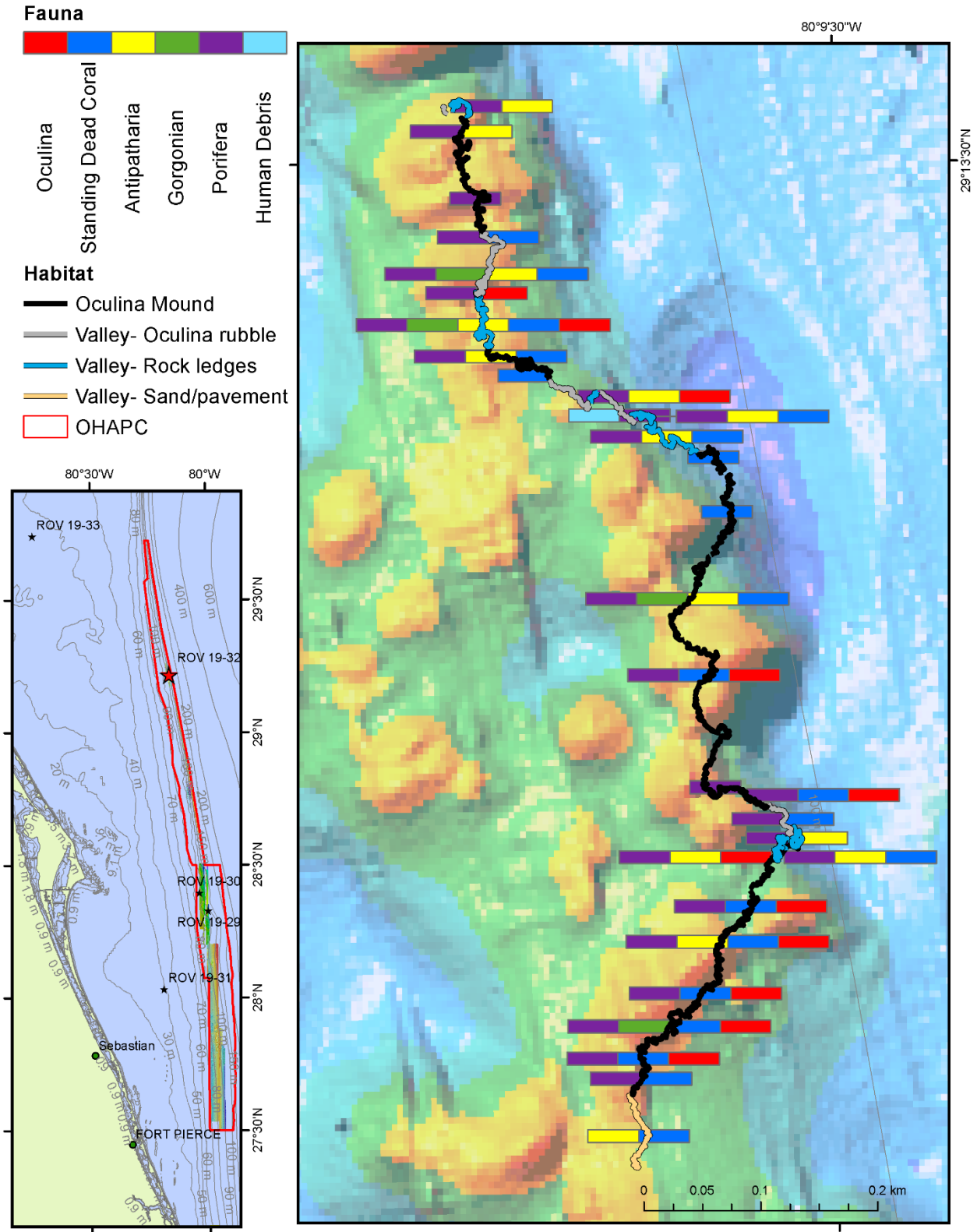


Figure 9. Presence of corals (Scleractinia, gorgonian octocorals, Antipatharia), sponges, and fishing gear based on video analysis of ROV video in 5-minute increments on *Oculina* HAPC reef sites during the NOAA Ship *Pisces* cruise 19-02, June 7-20, 2019.

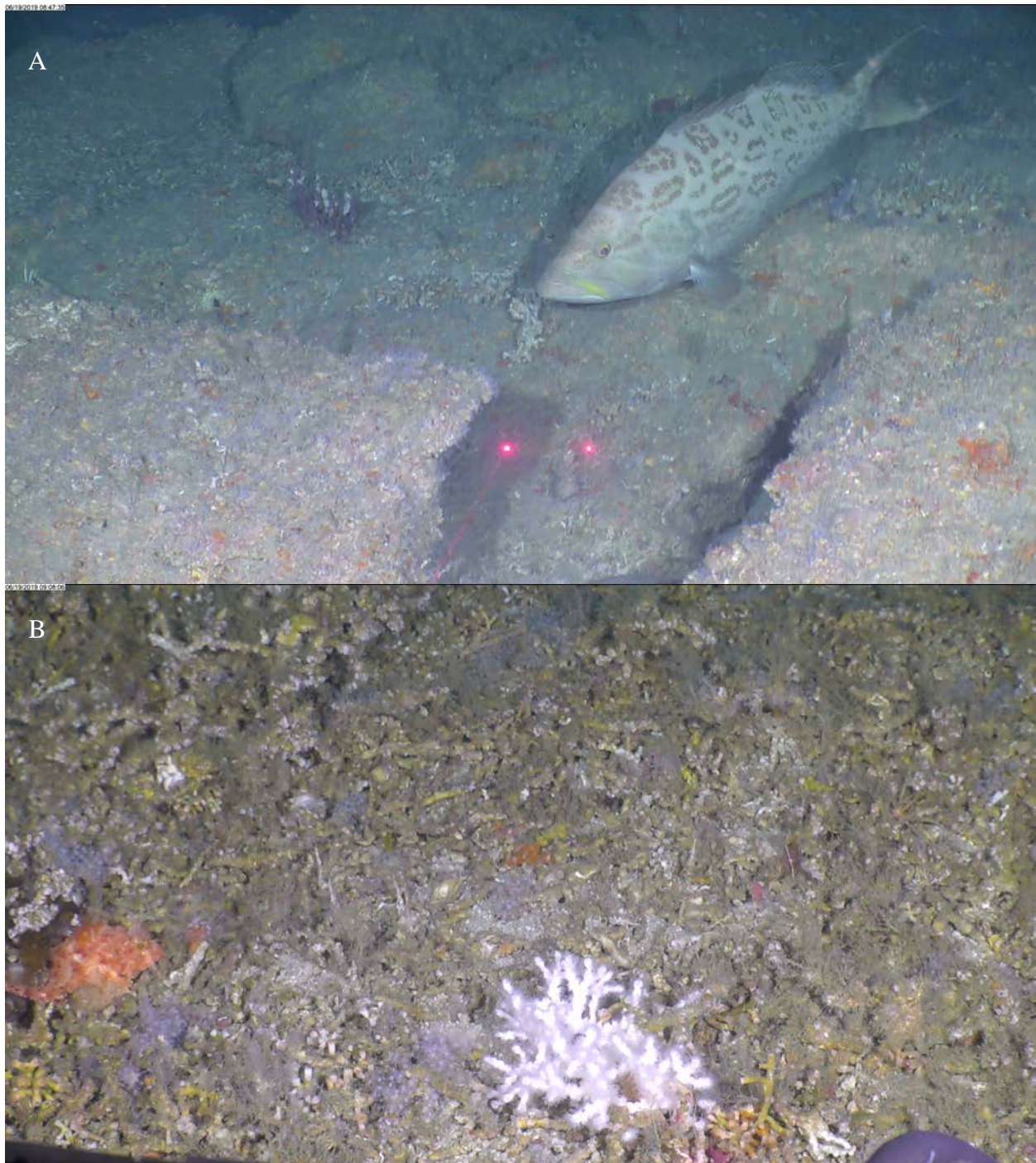


Figure 10. ROV images inside *Oculina* HAPC during the NOAA Ship *Pisces* cruise 19-02, June 7-20, 2019. A. Scamp grouper (lasers 10 cm). B. Small colony of live *Oculina varicosa* on coral rubble bottom within the HAPC. *Oculina* coral on these deepwater reefs are white and lack zooxanthellae, the algal symbiont found in shallow water corals.

Benthic Biota and Habitat Relationships

A multi-dimensional scaling (MDS) plot was made to compare each general MPA location based on Bray-Curtis similarity matrix calculated from square-root transformation of benthic macrobiota percent cover averaged by dive. Sites inside and outside each MPA were combined for the general MPA location. (Fig. 11). In general, there were three major groupings, the artificial reefs sites (barges; SIMPROF Group b), Outside Georgia dive 19-23 (Group a) and the remaining shelf-edge reef sites. There is a clear distinction between the Northern SC MPA- Iceberg scar sites (SIMPROF Group d, 60% similar to each other) and the more shallow shelf-edge MPA sites (Edisto and Northern South Carolina MPA-reef, (SIMPROF Group e, 40-60% similar), Outside Georgia (groups g, h and a). The three Northern SC iceberg scar sites (Group d- are much deeper (156-191 m), than the shelf-edge reef sites (27- 106 m) and as a result have much different biota than the reef sites. The remaining Georgia MPA site ROV19-30 was 100% sand and had to be removed from the PRIMER analysis because it was such a large outlier). There is also clustering by region within the North Florida MPA sites (Groups: g and h, 40-60% similarity) and the Northern South Carolina reef sites showing more similarity (40%- Group e). This shows the importance of having numerous MPA sites, with each having distinct characteristics and benthic communities.

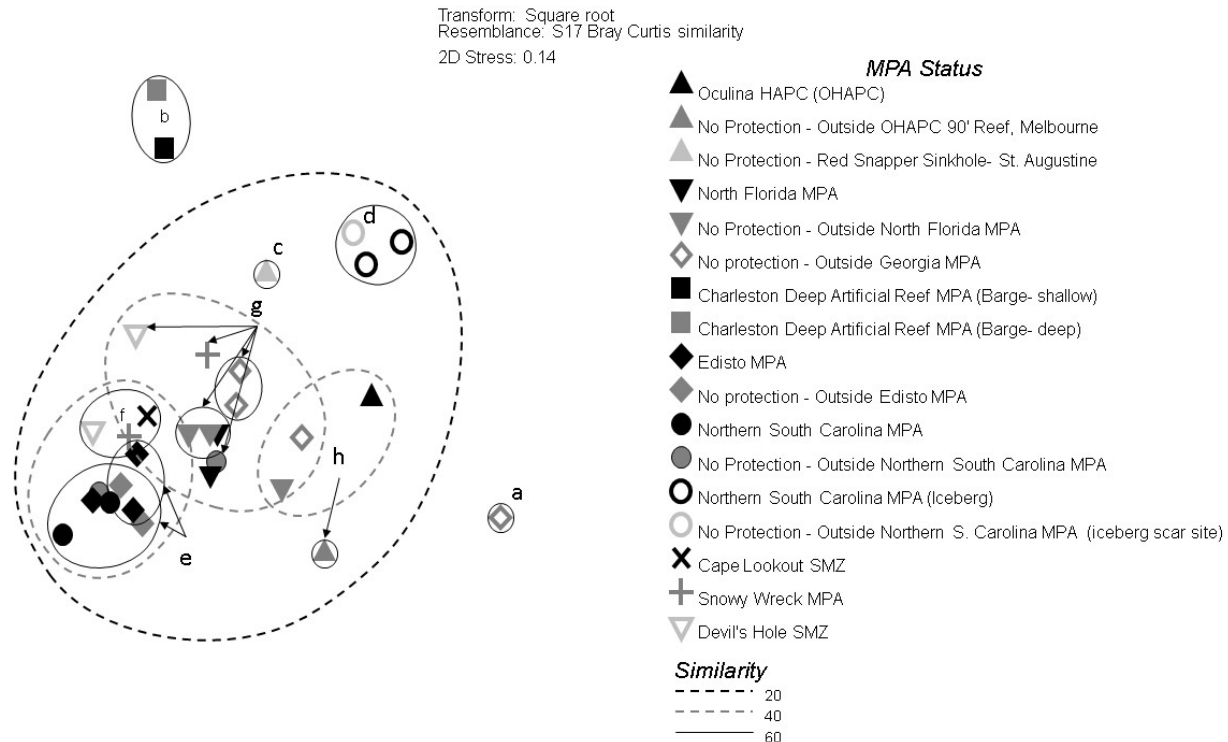


Figure 11. Multi-dimensional scaling (MDS) plot of ROV dives displayed for each general MPA location based on Bray-Curtis similarity matrix calculated from square-root transformation of benthic macrobiota percent cover averaged by dive for the 2019 NOAA Ship *Pisces* cruise. Sites inside and outside each MPA were included for the general MPA location. Assemblage similarity at 20-60% are indicated. Statistically significant SIMPROF groups are indicated by letters.

Sites Inside vs Outside the MPA for each general MPA location were compared with MDS (Fig. 12).

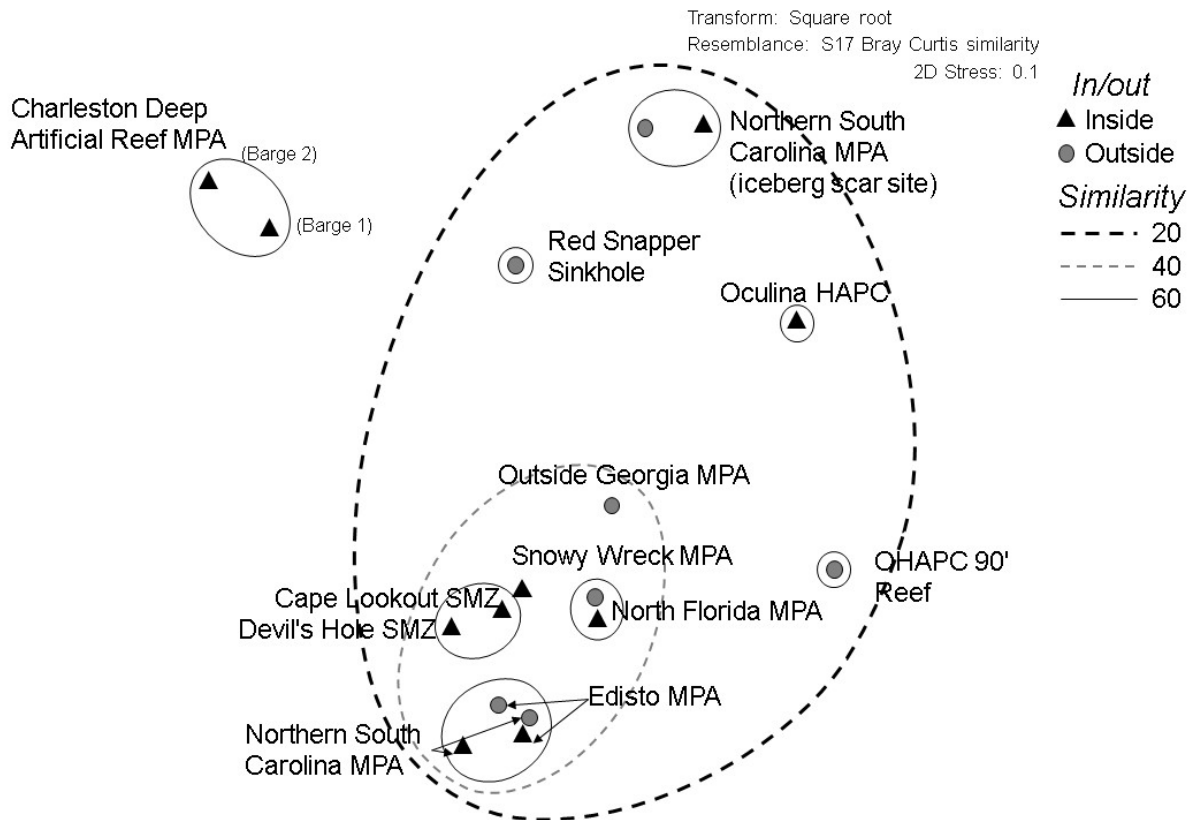


Figure 12. Multi-dimensional scaling (MDS) plot of ROV dives with species communities averaged inside and outside the MPA regions based on Bray-Curtis similarity matrix calculated from square-root transformation of benthic macrobiota percent cover for the 2019 NOAA Ship *Pisces* cruise. Assemblage similarity at 20-60% are indicated.

The North Florida MPA sites (Inside vs Outside) are 60% similar, as are the Edisto MPA sites and the Northern South Carolina MPA sites (grouping together at 60%). For the North Florida MPA region, SIMPER analysis shows that *Stichopathes luetkeni* are the largest factor contributing to the difference of Inside (Average Abundance = 0.16) vs Outside (0.14), followed by Hydroidolina (0.31 in, 0.25 out) the bushy black coral *Tanacetipathes* sp. (inside Average Abundance = 0.09, outside = 0.11), and Demospongiae unid. (0.19 inside; 0.16 outside). For the Edisto sites, the presence of *Dictyota* sp. was more abundant outside (0.44 Average Abundance), whereas Cyanobacteria (0.14), Rhodophyta (0.29) *Antipathes atlantica* (0.09) were all more abundant inside the MPA.

The MDS plot shows the relatively high similarity between the Inside vs Outside Northern SC MPA-iceberg scar sites (60%) and also for the Northern SC reef sites (60%) but 20% similarity between the iceberg and reef sites. The Inside vs Outside iceberg scar sites differ in their abundance of Plexauridae gorgonians (0.09 inside vs absent outside), Demosponges (unid) (0.08 vs 0.14), Hydroids (unid, 0.1 vs 0.05) were more abundant outside and the sponge *Leiodermatium lynceus* (more inside 0.11 vs 0.09). When comparing the Northern SC reef sites, *Dictyota* was the most common difference (0.5 inside vs 0.27 outside), followed by Rhodophyta (more common inside than out 0.34 vs 0.27). The sponge coral *Agelas clathrodes* is also more common outside the MPA.

For inside the *Oculina* sites and the closest sites to *Oculina*, outside the HAPC: the 90' reef and the Red Snapper sinkhole, are all 20% similar. The difference between the 90' reef and the OHAPC sites was the average abundance of Cyanobacteria and *Comactinia meridionalis* which were absent in the OHAPC but present in the 90' reef (0.19, 0.16 respectively). When comparing the Sinkhole to the OHAPC, fish and Spirastrellidae sponges were present with an average abundance at the sinkhole of 0.15, 0.1 respectively and absent from the OHAPC.

Analysis of Fish Video Surveys

Appendix 2 lists all fish species identified from quantitative video transects at each dive site and their densities (# individuals/1000m²). A total of 138 species were observed including 2 target species: blueline tilefish and snowy grouper. Dives 1 and 2 are discussed separately and were excluded from all analyses as they were conducted 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 13; PRIMER 6.0). Eight statistically different groups resulted from the SIMPROF test ($p < 0.05$), indicated by letters in the figure. Fish assemblages were more similar by geographic region than they were by level of protection (inside vs. outside). The eight distinct groups consisted of 1) inside and outside the deep iceberg scour sites of the Northern South Carolina MPA, 2) the OHAPC, 3) outside the Georgia MPA, 4) inside the Devil's Hole SMZ, 5) inside and outside the North Florida MPA, 6) inside and outside the Edisto MPA, 7) inside and outside the Northern South Carolina MPA, and 8) inside the Snowy Wreck MPA and inside the Cape Lookout SMZ. The SIMPER routine (PRIMER 6.0) was used to determine the distinguishing species for each geographic region. Edisto MPA was distinguished by higher densities of the most common schooling species; tomtate (*Haemulon aurolineatum*), vermilion snapper (*Rhomboplites aurorubens*), striped grunt (*Haemulon striatum*), and scad (*Decapterus* sp.) as well as damselfish (*Chromis* sp.). Devil's Hole SMZ was also distinguished by schooling species including tomtate, vermilion snapper, scad, and anthiids (Anthiadae) as well as red porgy (*Pagrus pagrus*). North Florida MPA fish species assemblages were also driven by schooling species including tomtate and vermilion snapper as well as damselfish, squirrelfish (Holocentridae), and blackbar soldierfish (*Myripristis jacobus*). Northern South Carolina MPA was distinguished by schools of tomtate, white grunt (*Haemulon plumieri*), squirrelfish, cubbyu (*Pareques umbrosus*), and damselfish. Snowy Wreck MPA and Cape Lookout SMZ were differentiated by schools of anthiids consisting of roughtongue bass (*Pronotogrammus martinicensis*) and red barbier (*Hemanthias vivanus*) as well as bigeye (*Priacanthus arenatus*) and creolefish (*Pareanthias furcifer*). Blackfin snapper (*Lutjanus buccanella*) were also a distinguishing species for Snowy Wreck MPA. The OHAPC generally lacked an abundance of fish but did have higher densities of bank sea bass (*Centopristis ocyurus*), tattler (*Serranus phoebe*), scorpionfish (Scorpaenidae), and bank butterflyfish (*Prognathodes aya*). Georgia MPA was distinguished by higher densities of red snapper (*Lutjanus campechanus*), short bigeye (*Pristigenys alta*), red porgy, grey triggerfish (*Balistes capriscus*), and cubbyu. The iceberg scour sites generally had a completely different assemblage of fish from all other locations due to the deeper depths but the most differentiating species were anthiids which consisted of a mix of roughtongue bass, red barbier and yellowfin bass (*Anthias nicholsi*) found in higher densities at the scour sites. Boarfish (*Antigonia capros*) and big roughy (*Gephyroberyx darwini*) were also

distinguishing species found only on these scours. The deeper sites also had a lack of lionfish which were observed at all other locations.

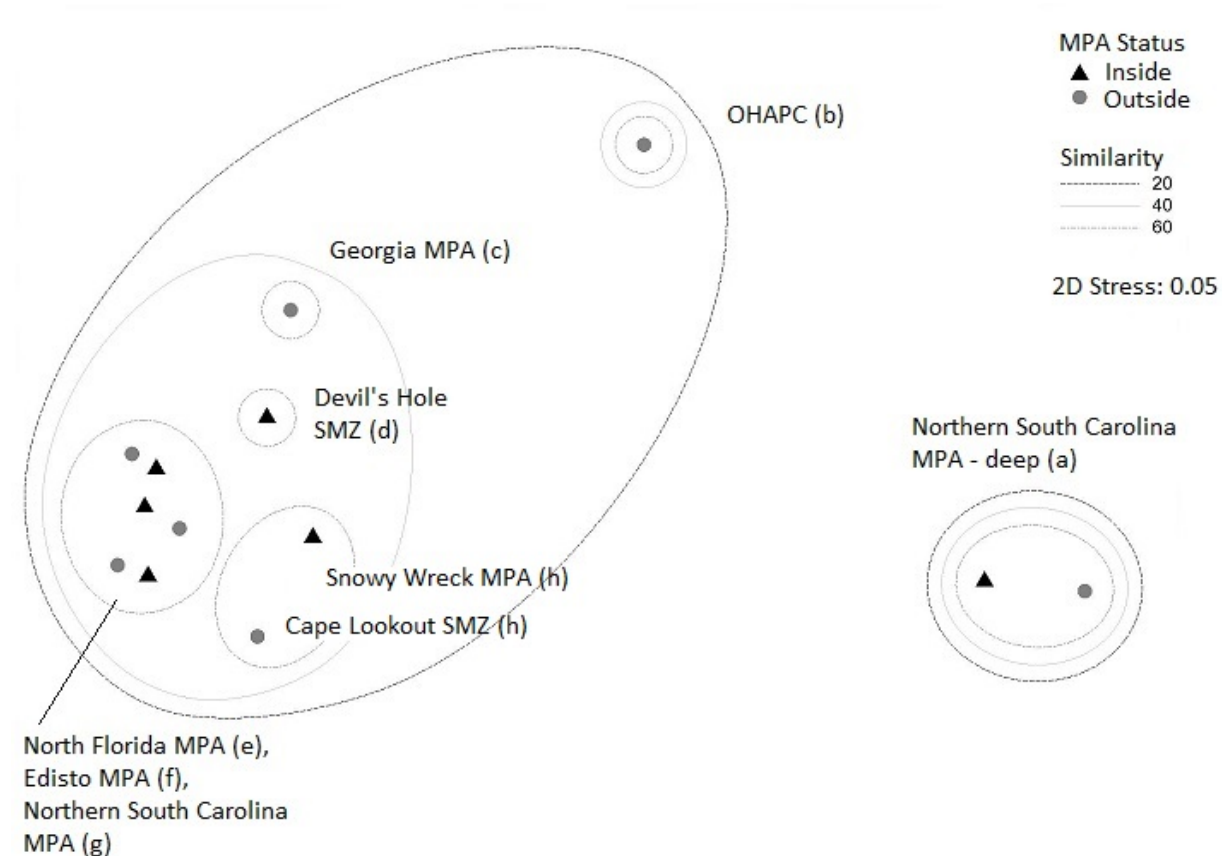


Figure 13. Multi-dimensional scaling (MDS) plot of ROV dives on the shelf-edge MPAs, SMZs and *Oculina* HAPC, with the artificial reef sites removed, based on Bray-Curtis similarity matrix calculated from fourth root transformation of fish densities for the 2019 NOAA ship *Pisces* cruise. Assemblage similarity at 20-60% are indicated. Statistically different groups from the SIMPROF routine are indicated by letters (a-h).

The DIVERSE routine (PRIMER 6.0) was used to compare species diversity inside and outside each MPA (Table 10). The highest number of species was observed inside and outside the Edisto MPA and inside the Snowy Wreck MPA ($S = 80, 85,$ and 77 respectively) while the lowest was inside and outside the Northern South Carolina at the iceberg scour sites and the OHAPC ($S = 36, 21,$ and 28 respectively). The same pattern was noted for species diversity. The highest species diversity was inside the Snowy Wreck MPA ($H' = 4.198$) while the lowest was outside the Northern South Carolina iceberg scour sites ($H' = 2.931$). When comparing diversity inside and outside each MPA, diversity was higher inside all MPAs with the exception of Edisto compared to those outside.

Table 10. Biodiversity indices for fish communities observed during video surveys conducted with a remotely operated vehicle inside and outside the shelf-edge MPAs, SMZs and *Oculina* HAPC,

with the artificial sites removed. S = total number of species; H' = Shannon-Wiener function of species diversity; J' = Pielou's evenness.

MPA	S	J'	H'(loge)
Cape Lookout SMZ - Inside	55	0.9709	3.891
Snowy Wreck MPA - Inside	77	0.9664	4.198
Northern South Carolina MPA - Inside	67	0.9567	4.023
Northern South Carolina MPA - Outside	63	0.9608	3.981
Northern South Carolina MPA - Deep - Inside	36	0.9432	3.38
Northern South Carolina MPA - Deep - Outside	21	0.9628	2.931
Devil's Hole SMZ - Inside	57	0.9285	3.754
Edisto MPA - Inside	80	0.9308	4.079
Edisto MPA - Outside	85	0.9392	4.172
Georgia MPA - Outside	58	0.9343	3.794
North Florida - Inside	73	0.9228	3.959
North Florida - Outside	58	0.952	3.865
OHAPC	28	0.9834	3.277

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 inside the Georgia MPA, outside the OHAPC, or outside Snowy Wreck MPA so comparisons could not be made for those areas. Dives were also not made outside the SMZs so comparisons are not made for those areas as well. Approximately half of the species observed at the Northern South Carolina MPA had higher densities inside the MPA while the other half had higher densities outside the MPA. Species including red hind (*Epinephelus guttatus*), scamp (*Mycteroperca phenax*), and tomtate had higher densities inside the MPA. Most species had higher densities inside the Northern South Carolina MPA at the deeper sites (iceberg scar sites). This includes target species, snowy grouper as well as red porgy and silk snapper (*Lutjanus vivanus*). At Edisto MPA, more species had higher densities outside the MPA. Species including grunts (*Haemulon* spp.), scamp, graysby (*Cephalopholis cruentata*), and vermilion snapper were more abundant inside the MPA. Most species had higher densities inside the North Florida MPA compared to outside. This includes blackfin snapper, red snapper, scamp, tomtate, and vermilion snapper. In this report, data is only based on differences of raw mean densities. Once 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/1000m²) for species of the snapper-grouper complex inside (In) and outside (Out) each MPA, SMZ and OHAPC, with artificial sites removed. CL= Cape Lookout SMZ, NC= Snowy Wreck MPA, SC = Northern South Carolina MPA, DH = Devil's Hole SMZ, ED = Edisto MPA, GA = Georgia MPA, FL = North Florida MPA, and OHAPC = Oculina Habitat Area of Particular Concern. Y = Yes and N = NO indicate whether a species had a higher density inside the MPA or not (> in). Species in bold are the target species.

Scientific Name	CL In	NC In	SC In	SC Out	> in	SC Deep In	SC Deep Out	> in	DH In	ED In	ED Out	> in	GA Out	FL In	FL Out	> in	OHAPC
<i>Balistes capriscus</i>		0.2		1.6	N					0.3	0.3	N	1.3	0.7	0.8	N	
<i>Balistes</i> sp.										0.1	0.2	N		0.1		Y	
<i>Balistes vetula</i>				0.2	N								0.1				
<i>Calamus</i> sp.	0.1	1.7	3.6	7.7	N	0.8		Y	0.6	5.5	8.1	N	1.3	0.5	0.1	Y	
<i>Caulolatilus microps</i>						0.6	0.9	N									
<i>Centropristis ocyurus</i>									0.1				0.1				2.1
<i>Cephalopholis cruentata</i>	2.4	2.7	1.9	1.6	Y				0.6	6.1	3	Y	0.2	1.1	0.4	Y	
<i>Cephalopholis fulva</i>			0.1		Y									0.1		Y	
<i>Dermatolepis inermis</i>		0.1							0.1								
<i>Epinephelus guttatus</i>			0.2		Y												
<i>Epinephelus adscensionis</i>		0.1	0.1	0.3	N					0.2	0.1	Y					
<i>Epinephelus morio</i>		0.1									0.1	N					
<i>Haemulon aurolineatum</i>		1.7	857	43.9	Y				421.1	2056	1509	Y		341.4	200.6	Y	
<i>Haemulon plumieri</i>		6.7	11.3	13.3	N					1.4	0.6	Y		0.6		Y	
<i>Hyporthodus niveatus</i>						2.8	1.8	Y					0.1				0.7
<i>Lachnolaimus maximus</i>		1	1	2.5	N					0.4	0.4	N	0.2	0.2		Y	
<i>Lutjanus analis</i>										0.1	0.2	N		0.1	0.3	N	
<i>Lutjanus apodus</i>														0.1		Y	
<i>Lutjanus buccanella</i>		13.5							0.7		0.9	N		0.4	0.1	Y	
<i>Lutjanus campechanus</i>	0.4			0.2	N				0.4		0.3	N	4.6	2.5		Y	2.8
<i>Lutjanus griseus</i>										0.9	0.9	N	0.1	1		Y	
<i>Lutjanus</i> sp.			0.1		Y						1.6	N		0.2	0.1	Y	
<i>Lutjanus synagris</i>														0.1		Y	
<i>Lutjanus vivanus</i>		0.4				0.2		Y									

<i>Mycteroperca interstitialis</i>	0.3									0.1	0.1	N					
<i>Mycteroperca microlepis</i>	0.4	0.3	0.1		Y				0.6	0.4	0.5	N	0.5	0.1		Y	0.2
<i>Mycteroperca phenax</i>		0.4	2.7	2.1	Y	0.1		Y	5.2	3.4	1.6	Y	2	1.1	0.1	Y	1.2
<i>Mycteroperca sp.</i>		0.2									0.2	N					
<i>Mycteroperca venenosa</i>		0.4															
<i>Pagrus pagrus</i>		0.9				0.8	0.5	Y	1.6	1.3	0.9	Y	3.4	0.1		Y	0.5
<i>Rhomboplites aurorubens</i>									456.8	1854	900	Y	31.2	105.7	14.3	Y	
<i>Seriola dumerili</i>	3.4	0.5		0.2	N	0.1		Y	0.6	0.5	3.9	N	0.2	0.1	5.8	N	
<i>Seriola fasciata</i>										2.2		Y					
<i>Seriola rivoliana</i>	0.4	1.9	0.7	0.6	Y				12.7	5.6	1.6	Y	1.3	0.7	0.3	Y	0.2
<i>Seriola sp.</i>		0.7	1	1.6	N	0.1	0.5	N		7.8	11.2	N	0.2	0.1	0.3	N	1.2
Serranidae														0.1		Y	
Sparidae		0.4				0.9	0.9	N					0.3				

Schools of a few snapper grouper species were observed on some dives. A large school of approximately 200 blackfin snapper was observed on a dive inside the Snowy Wreck MPA. On this same dive, a school of about 40 white grunt was also seen. Small schools of red snapper (approximately 15 individuals) were observed outside Georgia MPA and inside North Florida MPA. Several observations of juvenile fish were also made. Juvenile blackline tilefish (*Caulolatilus cyanops*) were seen on the sand surrounding one of the barges inside the Deep Charleston Artificial Reef MPA. The intermediate phase for blackfin snapper were observed in several locations including outside the Edisto MPA, inside the Snowy Wreck MPA, inside the Devil's Hole SMZ, and both inside and outside the North Florida MPA. Reproductive behavior was also observed on some dives. Greyhead scamp (one of their color phases indicating spawning behavior; (Gilmore and Jones 1992) were observed on the barges inside the Deep Charleston Artificial Reef MPA, inside Devil's Hole SMZ, inside and outside Edisto MPA, outside the Georgia MPA, inside the North Florida MPA, and in the OHAPC. A couple species of grouper were observed for the first time this year since the inception of this project. These include marbled grouper (*Dermatolepis inermis*) which were observed inside the Snowy Wreck MPA and inside Devil's Hole SMZ as well as yellowfin grouper (*Mycteroperca venenosa*) which were seen on the same dive inside the Snowy Wreck MPA.

Species diversity for snapper-grouper complex species was compared inside and outside each MPA using DIVERSE (Table 12). The highest number of species was observed inside the North Florida MPA and outside the Edisto MPA ($S = 23$) while the lowest was outside the iceberg scour sites of the Northern South Carolina MPA ($S = 5$) and inside the Cape Lookout SMZ ($S = 7$). The highest species diversity was observed inside the Snowy Wreck MPA ($H' = 2.931$) while the lowest was outside the iceberg scour sites of the Northern South Carolina MPA ($H' = 1.601$). Species diversity was higher inside the MPA vs. outside only for the deep sites of the Northern South Carolina (iceberg scour sites) and North Florida MPAs.

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, SMZs and *Oculina* OHAPC, with the artificial sites removed. S = total number of species; H' = Shannon-Wiener function of species diversity; J' = Pielou's evenness.

MPA	S	J'	H'(loge)
Cape Lookout SMZ - Inside	7	0.9791	1.905
Snowy Wreck MPA - Inside	20	0.9784	2.931
Northern South Carolina MPA - Inside	13	0.8857	2.272
Northern South Carolina MPA - Outside	13	0.9627	2.469
Northern South Carolina MPA - Deep - Inside	9	0.9815	2.157
Northern South Carolina MPA - Deep - Outside	5	0.9946	1.601
Devil's Hole SMZ - Inside	13	0.8868	2.275
Edisto MPA - Inside	19	0.8679	2.555
Edisto MPA - Outside	23	0.8916	2.796
Georgia MPA - Outside	17	0.9633	2.729
North Florida - Inside	23	0.9168	2.875

North Florida - Outside	12	0.909	2.259
OHAPC	8	0.9857	2.05

Lionfish Populations

A total of 1397 lionfish were recorded on the 2019 dives. The highest average lionfish densities were observed inside and outside the Edisto MPA as well as Devil’s Hole SMZ while the lowest densities were observed in the OHAPC (Figure 14). The only location lionfish were not observed was at the iceberg scour sites of the Northern South Carolina MPA. Lionfish densities compared for each MPA (inside vs. outside) were not significantly different (one-way ANOVA; $P>0.05$).

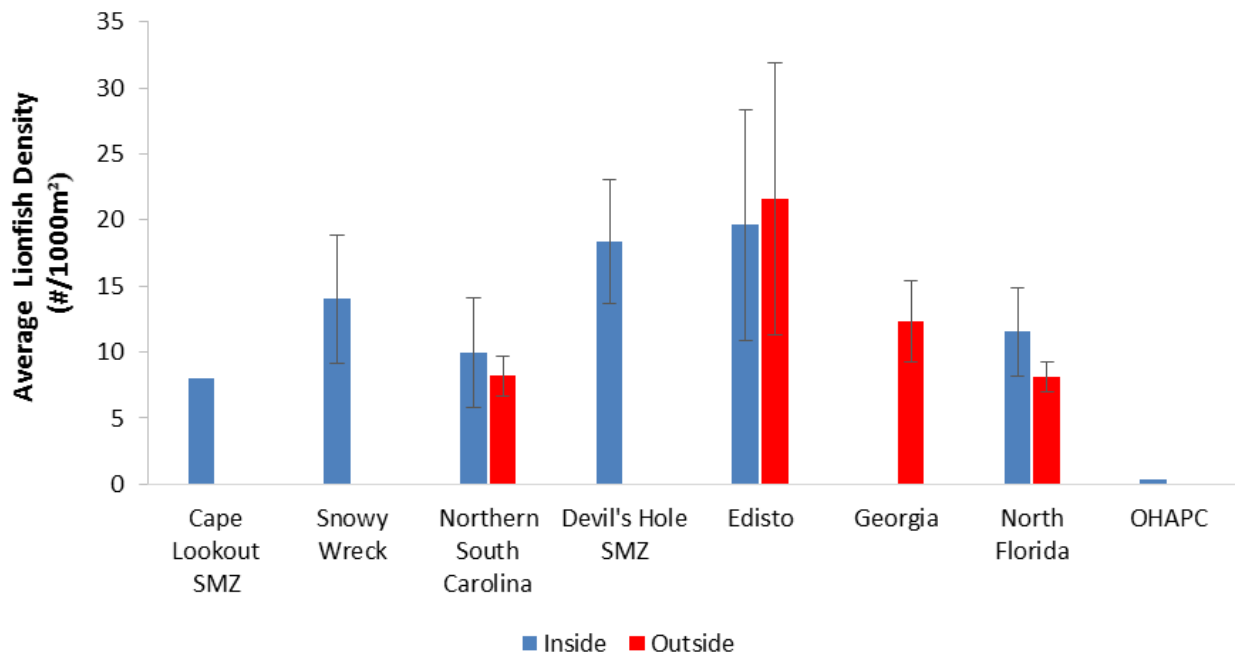


Figure 14. Density of lionfish (# individuals/1000m²) from quantitative ROV video transects during 2019 NOAA Ship *Pisces* cruise at sites inside and outside each shelf-edge MPAs, SMZs and *Oculina* OHAPC, with artificial sites removed.

Artificial Reefs

Two ROV dives were made on artificial reefs, one dive on each barge sunk to comprise the Deep Charleston Artificial Reef 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.

The barges were sunk in April 2014 and we have examined them in 2014, 2016, 2017, 2018, and now in 2019. The shallow barge is at a depth of 85 m and species of interest included 2 snowy grouper, 10 red snapper, 1 gag grouper, 5 scamp, and 92 lionfish (Table 13). The deep barge is at a depth of 100m and species of interest included 22 snowy grouper, 2 red snapper, 1 gag grouper, and 11 scamp of which 1 was in greyhead phase. No lionfish were observed on the deep barge,

however the barge was covered in Anthiadae (99% red barbler and 1% roughtongue bass) to the point where they were too small and abundant to count.

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

Shallow Barge		Deep Barge	
Scientific Name	Abundance	Scientific Name	Abundance
<i>Baldwinella vivanus</i>	65	Anthiadae	TMTC
<i>Canthigaster</i> sp.	1	<i>Calamus</i> spp.	6
<i>Caulolatilus cyanops</i>	1	<i>Hyporthodus niveatus</i>	22
<i>Centropristis ocyurus</i>	2	<i>Liopropoma eukrines</i>	8
<i>Chaetodon sedentarius</i>	7	<i>Lutjanus campechanus</i>	2
<i>Equetus lanceolatus</i>	1	<i>Mycteroperca microlepis</i>	1
<i>Halichoeres bathyphilus</i>	17	<i>Mycteroperca phenax</i>	11
<i>Holacanthus</i> spp.	7	<i>Pagrus pagrus</i>	9
<i>Hyporthodus niveatus</i>	2	<i>Pareques iwamotoi</i>	1
<i>Liopropoma eukrines</i>	2	<i>Pareques umbrosus</i>	49
<i>Lutjanus campechanus</i>	10	<i>Prognathodes aya</i>	7
<i>Mycteroperca microlepis</i>	1	<i>Prognathodes guyanensis</i>	1
<i>Mycteroperca phenax</i>	5	<i>Rhomboplites aurorubens</i>	15
<i>Pagrus pagrus</i>	3	Scorpaenidae	2
<i>Pareques iwamotoi</i>	2	<i>Seriola</i> spp.	85
<i>Pareques umbrosus</i>	4	<i>Sphoeroides spengleri</i>	1
<i>Pronotogrammus martinicensis</i>	2		
<i>Pterois volitans</i>	92		
Scorpaenidae	1		
<i>Seriola dumerili</i>	15		
<i>Seriola rivoliana</i>	3		
<i>Seriola</i> spp.	5		
<i>Serranus notospilus</i>	2		

FUTURE WORK AND CONCLUSIONS

This cruise and research have 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.

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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 2019 NOAA Ship *Pisces* cruise to the South Atlantic MPAs. Still images captured from the photo transects were analyzed using CPCe[®] software to determine relative percent cover of benthic biota and habitat types. X = presence of species from observations during dive. (Best viewed in PDF format in order to zoom view).

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 2019 NOAA Ship *Pisces* cruise to the South Atlantic MPAs. Fish density (# individuals/1000 m²) was calculated as (# of individuals/transect area) *1000. Transect length was calculated from the ROV tracking. Transect width was measured using the paired lasers.

Row Labels	Florida				Oculina HMP Inside	Georgia				South Carolina				North Carolina																
	North Florida MPA Inside	Outside	19-24	19-25		Georgia MPA Outside	19-21	19-22	19-23	Edisto MPA Inside	Outside	Northern South Carolina MPA Inside	Outside	Northern South Carolina MPA (Leeberg scar site) Inside	Outside	Devil's Hole SMZ Inside	19-15	Snowy Wreck MPA Inside	Cape Lookout SMZ Inside											
	19-26	19-27	19-24	19-25	19-28	19-32	19-20	19-21	19-22	19-23	19-17	19-18	19-19	19-03	19-16	19-05	19-06	19-04	19-07	19-11	19-12	19-13	19-14	19-15	19-08	19-09	19-10			
Tetraodontiformes																														
Balistidae																														
<i>Balistes capricornis</i> Gmelin, 1789	2.09	0.49		1.40			1.39	1.21	1.04	1.19	0.75	0.18			0.41														0.26	
<i>Balistes</i> sp.		0.16												0.46																
<i>Balistes vetula</i> Linnaeus, 1758							0.15											0.25												
Diodontidae																														
<i>Chilomycterus antillarum</i> Jordan & Rutter, 1897							0.46																							
<i>Chilomycterus schoepfii</i> (Walbaum, 1792)								0.40	0.52						0.75															
<i>Chilomycterus</i> sp.																														
<i>Diadon holocanthus</i> Linnaeus, 1758	0.26																													
<i>Diadon hystrix</i> Linnaeus, 1758														0.23										0.16						
Monacanthidae																														
<i>Aluterus scriptus</i> (Osbeck, 1765)															0.46															
<i>Cantherhines macrocorus</i> (Kollar, 1853)																0.32	0.19	0.40											0.68	
<i>Cantherhines pullus</i> (Bansan, 1842)																0.96	0.39	0.25											0.09	
<i>Stephanolepis hispidus</i> (Linnaeus, 1766)												0.25		0.25																
Ostraciidae																														
<i>Acanthostracion polygonius</i> Poey, 1876						0.15									0.23	0.27														
<i>Acanthostracion quadricornis</i> (Linnaeus, 1758)	0.16			0.23	0.15								0.18		0.23	0.41		0.39										0.57		
<i>Acanthostracion</i> sp.																														
<i>Lactophrys bicaudalis</i> (Linnaeus, 1758)														0.25																0.13
<i>Lactophrys trigonus</i> (Linnaeus, 1758)																		0.19												
Ostraciidae																														
<i>Boxfishes</i> (Fam.)	0.26												0.18		0.69			0.25						0.16					0.26	
Tetraodontidae																														
<i>Canthigaster</i> sp.	29.84	22.75	16.08	22.38	13.34	0.33	6.96	8.47	4.16	2.78	17.06	25.22	23.17	64.72	30.07	36.30	6.81	10.78	10.62				5.13	1.43	2.88	13.42	17.63			
<i>Sphaeroides spengleri</i> (Bloch, 1785)	0.26		1.43	0.47			0.15	15.33				2.51	0.35	0.50			0.19						0.48					0.09		
Tetraodontidae																														
<i>Puffers</i> (Fam.)								1.21																						
Elasmobranchii																														
Carcharhiniformes																														
Carcharhinidae																														
<i>Carcharhinus plumbeus</i> (Nardo, 1827)														0.50																
Lamniformes																														
Lamnidae																														
<i>Carcharodon carcharias</i> (Linnaeus, 1758)																							0.17		0.16					
Myliobatiformes																														
Dasyatidae																														
<i>Dasyatis centroura</i> (Mitchill, 1815)		0.16																												
<i>Dasyatis</i> sp.				0.36																										
<i>Hypanus americanus</i> (Hildebrand & Schroeder, 1928)																														
UNKNOWN BIODIVERSITY	2.09	0.65	1.43	2.56			0.31	0.81		0.40	0.50	0.88	0.25	1.47	2.88	1.93	3.11	3.92				1.22	1.26	1.15		1.28	5.64	0.78		

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 2019 NOAA Ship *Pisces* cruise to the South Atlantic MPAs:

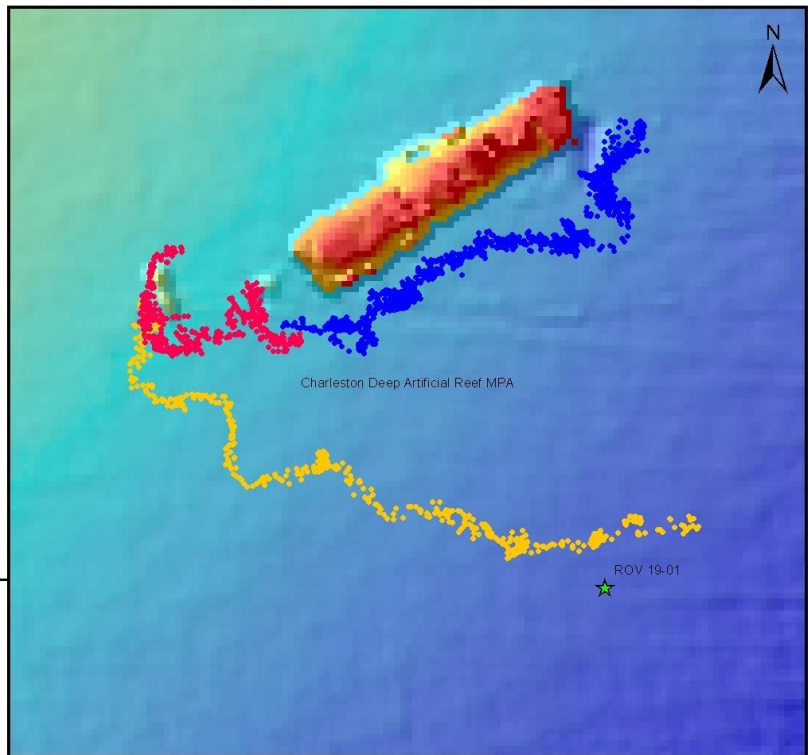
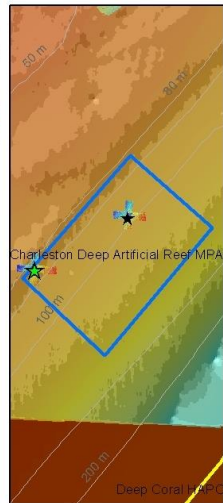
- cruise and ROV dive metadata and objectives
- figures showing each ROV dive track and habitat zones overlaid on multibeam sonar maps
- ROV dive track data (start and end coordinates, time, and depth)
- CTD plots from temperature profiles for each ROV dive
- images characterizing the habitat and biota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

Dive Site: South Carolina, Charleston Deep Artificial Reef MPA; Shallow Barge; 85 m; ROV 19-01, UNCW 707; 8-VI-19-1

General Location and Dive Track:

South Carolina, Charleston Deep Artificial Reef MPA; Shallow Barge; 85 m; ROV 19-01, UNCW 707

- ★ ROV 19-01
 - ★ Mohawk ROV
 - 201906081 - Transect 01
 - 201906081 - Transect 02
 - 201906081 - Transect 03
- Oculina HAPC
 - MPA
 - Deep Coral HAPC
 - Bathymetry



0 95 190 380 km

0 2.5 5 10 km

0 0.0075 0.015 0.03 Nautical Miles

Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: NancyFoster_14_08_Barge2

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Depth (m)

Date of Dive: 6/8/2019

Specimens: 0

Digital Photos: 192

No. DVD: 2

Hard Drive No.: 1

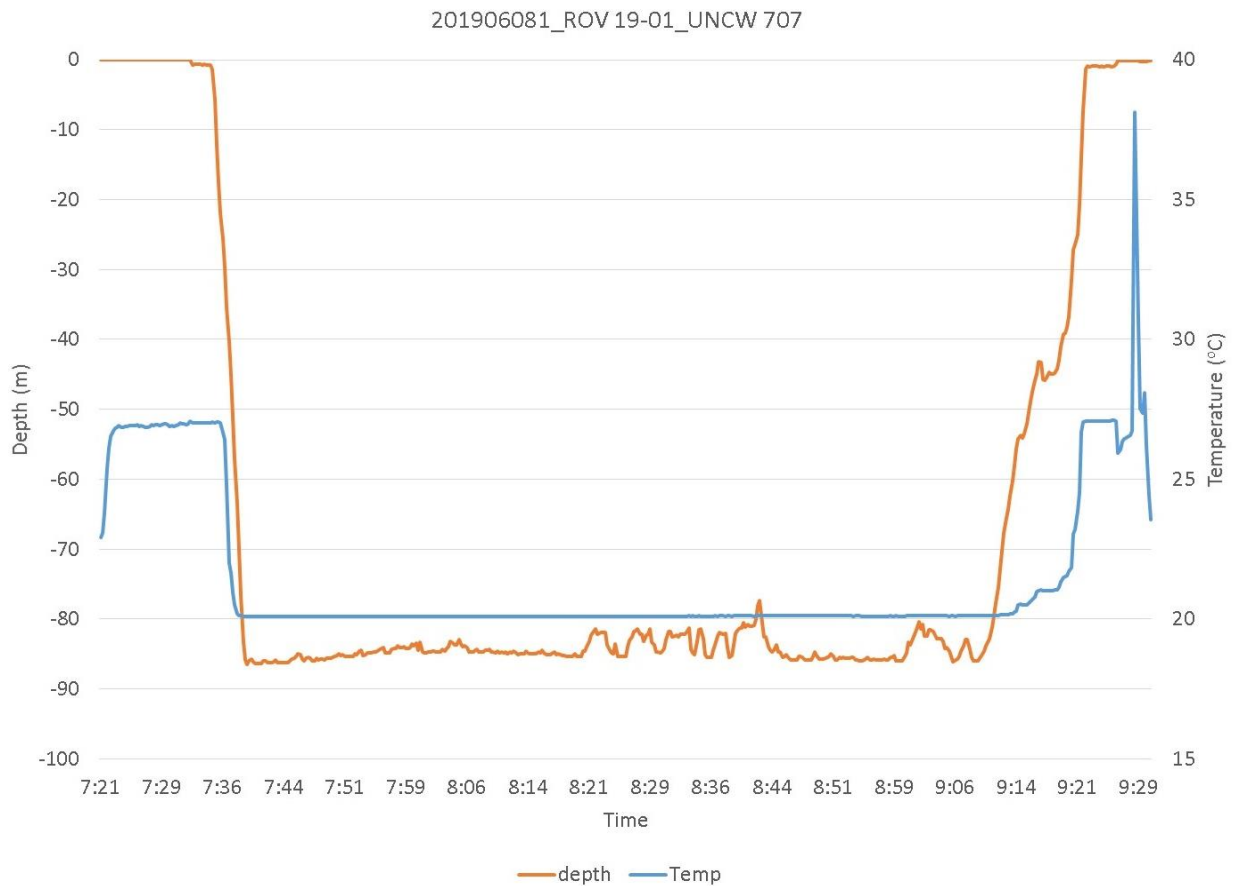
Dive Site: South Carolina, Charleston Deep Artificial Reef MPA; Shallow Barge; 85 m; ROV 19-01, UNCW 707; 8-VI-19-1

Dive Data:

Minimum Bottom Depth (m): -77.1	Total Transect Length (km): 0.395
Maximum Bottom Depth (m): -87.5	Surface Current (kn): 0.4
On Bottom (Time- EDST): 7:38	On Bottom (Lat/Long): 32.0888°N; -79.2179°W
Off Bottom (Time- EDST): 9:09	Off Bottom (Lat/Long): 32.0899°N; -79.2178°W
Physical (bottom); Temp (°C): 20.1	Salinity: N/A Visibility (m): 5 Current (kn): N/A

Physical Environment:

Distance from Dive Site(km): 0.00



Temperature and Depth were collected with a SBE39 attached to the ROV (recording descent, bottom and ascent). The ranges of the bottom data recorded during ROV 19-01 are as follows: Depth Maximum: 86.4 m and Temperature: 20.08-20.13 °C.

Dive Site: South Carolina, Charleston Deep Artificial Reef MPA; Shallow Barge; 85 m; ROV 19-01, UNCW 707; 8-VI-19-1

Dive Imagery:



Figure 1: 32°5.3804'N;79°13.0692'W: -85.7 m
Grouper and lionfish on barge debris



Figure 2: 32°5.3706'N;79°13.1069'W: -85.1 m
Lionfish on barge debris

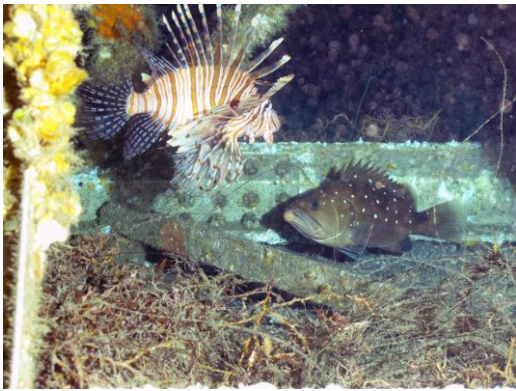


Figure 3: 32°5.3859'N;79°13.073'W: -86.2 m
Lionfish, juvenile Snowy grouper (*Hyporthodus niveatus*) at base of barge



Figure 4: 32°5.3848'N;79°13.0713'W: -86.2 m
Tangle of fishing line on the barge



Figure 5: 32°5.3785'N;79°13.079'W: -85.7 m
Lionfish on barge debris



Figure 6: 32°5.3793'N;79°13.0906'W: -84.2 m
Snowy grouper (*Hyporthodus niveatus*)

Dive Site: South Carolina, Charleston Deep Artificial Reef MPA; Shallow Barge; 85 m; ROV 19-01, UNCW 707; 8-VI-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 8-VI-19-1; ROV 19-01, UNCW Dive 707; South Carolina, Charleston Deep Artificial Reef MPA, Shallow Barge, 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 (-4 GMT). Dive Notes were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database. SBE 39 temperature/ depth recorder on ROV.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was TV Mode, ISO 100, shutter priority 1/250th, strobe on, auto focus. The TV mode was not good, changed to P Mode for remaining dives. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down or forward on vertical surfaces, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but generally headed N, depending on the ship's maneuverability with the wind and current.

ROV collection skid removed. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 82- 87 m

MB map shows ship laying ENE- WSW. Barge sunk in 2014. ROV depth and position relative to the MB map is correct. In July 2017, the boundaries of the MPA were remade so both barges are now inside. Originally in 2014, the shallow barge was outside.

Weather- Cloudy, seas 2-3 ft from SW, wind 10 kn from 221 dg, air- 27.36 C, surface water- 27.08 C, salinity- 34.2 PSU, surface current- 0.4 kn to 135 dg; bottom current (ADCP)- to S.

7:32- Launch

7:40- On bottom- 87.3 m; visibility- 5 m.

South of barge; flat coarse sand, shell hash, rubble. Amberjack, beer can, Stichopathes, lots of sediment in water. Lionfish, hermit crab, longhorn bryozoan with hermit crab (*Hippoporella*), juvenile blackline tilefish, red snapper.

8:00- debris field at SW corner of wreck, 85 m; red snapper, numerous lionfish. Vertical metal fairly bare, sparse bivalves, thin encrusting orange sponges.

8:11- 2nd debris field nearest to barge, red snapper, scamp, lionfish; sparse growth, bivalve oysters, pile of

Dive Site: South Carolina, Charleston Deep Artificial Reef MPA; Shallow Barge; 85 m; ROV 19-01, UNCW 707; 8-VI-19-1

detritus sargassum, *Stenorhynchus*.

8:17- SW corner of barge, 85.7 m. 90-100% cover of bivalves. Cubbyu, blue angelfish, pink encrusting sponge. Top of barge, 81.7 m; *Arbacia punctulata*, few fish. Steel beam hanging off south side of barge, near west end. Butterflyfish.

8:35- working along south face of barge. *Holothuria lentigenosa enodis*, scamp.

8:40- half way along south face of barge. Containers stacked on top. No signs of fish gear. Snowy grouper.

8:45- several containers and superstructure on bottom 10 m south of barge, ½ way along S side. This does not show up on the current MB of the barge which was made 2014. bank sea bass, red snapper, snowy grouper, gag grouper, piles of *Sargassum detritus*, dense lionfish.

8:57- SE debris field, superstructure and containers, at SE south side of barge, large pile of fishing line.

9:03- East end, top of barge; 82.6 m top; red barbier anthiids, few; oystreidae bivalves on top.

9:08- End of dive.

Dominant Benthic Macrobiota:

Actiniaria

Porifera- thin encrusting orange and pink

Decapoda- hermit crabs, *Stenorhynchus seticornis*

Echinodermata- *Arbacia punctulata*, *Holothuria lentigenosa*

Mollusca- Ostreidae

Bryozoa- longhorn bryozoa with hermit crab (*Hipporella*)

Algae- Piles of *Sargassum detritus*

Human Debris:

Fishing line- large pile of line; beer can

Dive Site: South Carolina, Charleston Deep Artificial Reef MPA; Shallow Barge; 85 m; ROV 19-01, UNCW 707; 8-VI-19-1

CPCe Percent Cover Analysis:

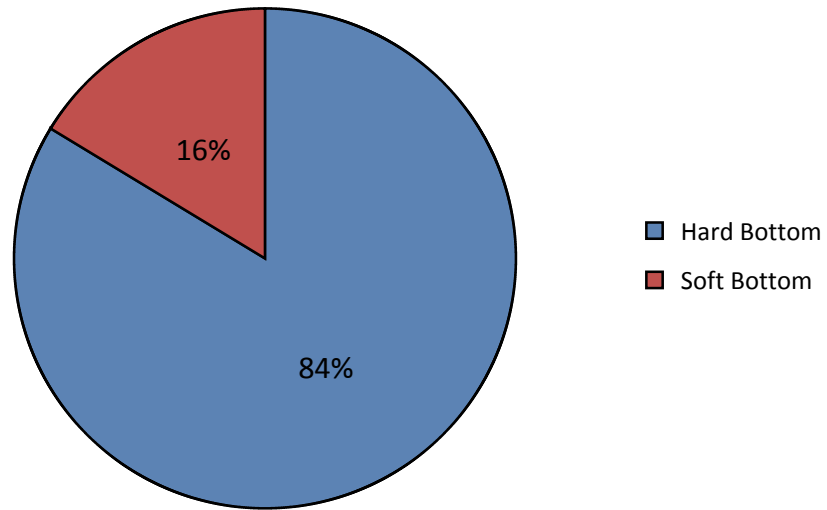
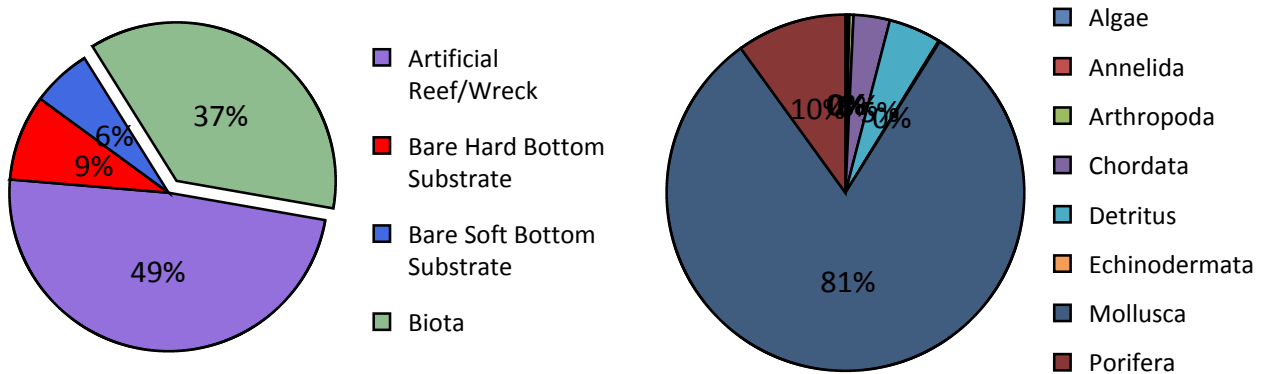


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-01. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-01.

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: South Carolina, Charleston Deep Artificial Reef MPA; Shallow Barge; 85 m; ROV 19-01, UNCW 707; 8-VI-19-1

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-01.

	%	Notes
Biota	36.65%	X
Algae	0.04%	
Ochrophyta	0.04%	
<i>Sargassum</i> sp.	0.04%	
Porifera	3.64%	
Demospongiae	3.64%	
Cnidaria- Anthozoa		X
Antipatharia		X
<i>Stichopathes luetkeni</i> Brook, 1889		X
Annelida	0.09%	X
Polychaeta	0.09%	X
Sabellidae		X
Serpulidae	0.09%	
Mollusca	29.76%	X
Bivalvia	29.76%	X
Bivalvia		X
Ostreidae	29.76%	X
Gastropoda		X
Cassidae		X
Arthropoda	0.13%	X
Crustacea	0.13%	X
Anomura		X
Cirripedia	0.04%	
Paguridae	0.09%	
<i>Stenorhynchus seticornis</i> (Herbst, 1788)		X
Bryozoa		X
Bryozoa		X
Echinodermata	0.04%	X
Echinoidea		X
<i>Arbacia punctulata</i> (Lamarck, 1816)		X
Holothuroidea	0.04%	X
<i>Holothuria (Vaneyothuria) lentiginosa enodis</i> Miller & Pawson, 1979	0.04%	X
Chordata	1.20%	
Chordata - Vertebrate	1.20%	
Actinopterygii	1.20%	
Detritus	1.73%	X

Dive Site: South Carolina, Charleston Deep Artificial Reef MPA; Shallow Barge; 85 m; ROV 19-01, UNCW 707; 8-VI-19-1

UNKNOWN		X
Human debris		X
Human debris		X
Human debris- Fishing Gear		X
Human debris- fishing line		X
Human debris- Trash		X
Human debris- cans/bottles		X
Habitat	63.35%	
Bare Hard Bottom Substrate	57.31%	
Artificial Reef/Wreck	48.56%	
Hard bottom	8.75%	
Bare rock, pavement, boulder, ledge	0.31%	
Bare rubble/cobble	8.44%	
Bare Soft Bottom Substrate	6.04%	
Grand Total	100.00%	X

Dive Site: South Carolina, Charleston Deep Artificial Reef MPA; Shallow Barge; 85 m; ROV 19-01, UNCW 707; 8-VI-19-1

Density of Fish:

Table 2. Raw counts of fish from video transects at dive site ROV 19-01.

Class/Order/Family/Taxa Author - Common Name	ROV 19-01
Actinopterygii	
Perciformes	
Carangidae	
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	15.00
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	3.00
<i>Seriola</i> sp. - Amberjack	5.00
Chaetodontidae	
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	7.00
Labridae	
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	17.00
Lutjanidae	
<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper	10.00
Malacanthidae	
<i>Caulolatilus cyanops</i> Poey, 1866 - Blackline Tilefish	1.00
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	7.00
Sciaenidae	
<i>Equetus lanceolatus</i> (Linnaeus, 1758) - Jack-knifefish	1.00
<i>Pareques iwamotoi</i> Miller & Woods, 1988 - Blackbar Drum	2.00
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	4.00
Serranidae/Anthiaginae	
<i>Baldwinella vivanus</i> (Jordan & Swain, 1885) - Red Barbier	65.00
<i>Hyporthodus niveatus</i> (Valenciennes, 1828) - Snowy Grouper	2.00
<i>Pronotogrammus martinicensis</i> (Guichenot, 1868) - Roughtongue Bass	2.00
Serranidae/Epinephelinae	
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	2.00
<i>Mycteroperca microlepis</i> (Goode & Bean, 1879) - Gag	1.00
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	5.00
Serranidae/Serraninae	
<i>Centropristis ocyurus</i> (Jordan & Evermann, 1887) - Bank Sea Bass	2.00
<i>Serranus notospilus</i> Longley, 1935 - Saddle Bass	2.00
Sparidae	
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	3.00
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	92.00
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	1.00

Dive Site: South Carolina, Charleston Deep Artificial Reef MPA; Shallow Barge; 85 m; ROV 19-01, UNCW 707; 8-VI-19-1

Tetraodontiformes

Tetraodontidae

Canthigaster sp. - Sharpnose Puffer Sp.

1.00

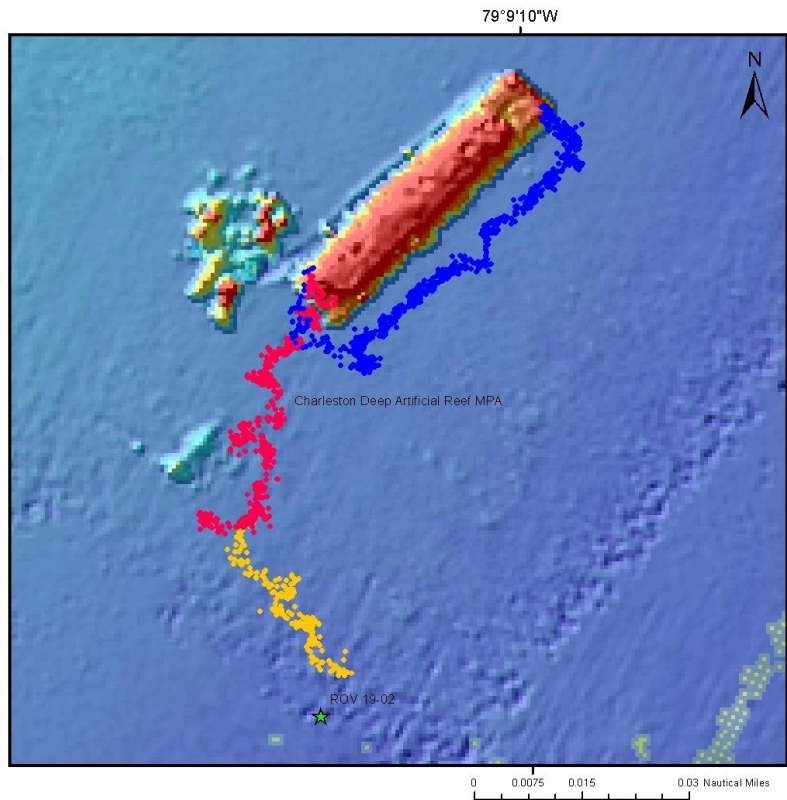
Dive Site: South Carolina, Charleston Deep Artificial Reef MPA; Deep Barge; 100 m; ROV 19-02, UNCW 708; 8-VI-19-2

General Location and Dive Track:

South Carolina, Charleston Deep Artificial Reef MPA; Deep Barge; 100 m; ROV 19-02, UNCW 708

- ★ ROV 19-02
- ★ Mohawk ROV
- 201906082 - Transect 01
- 201906082 - Transect 02
- 201906082 - Transect 03

- Oculina HAPC
- MPA
- Deep Coral HAPC
- Bathymetry



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: NancyFoster_14_08_Barge1

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Depth (m)

Date of Dive: 6/8/2019

Specimens: 0

Digital Photos: 204

No. DVD: 1

Hard Drive No.: 1

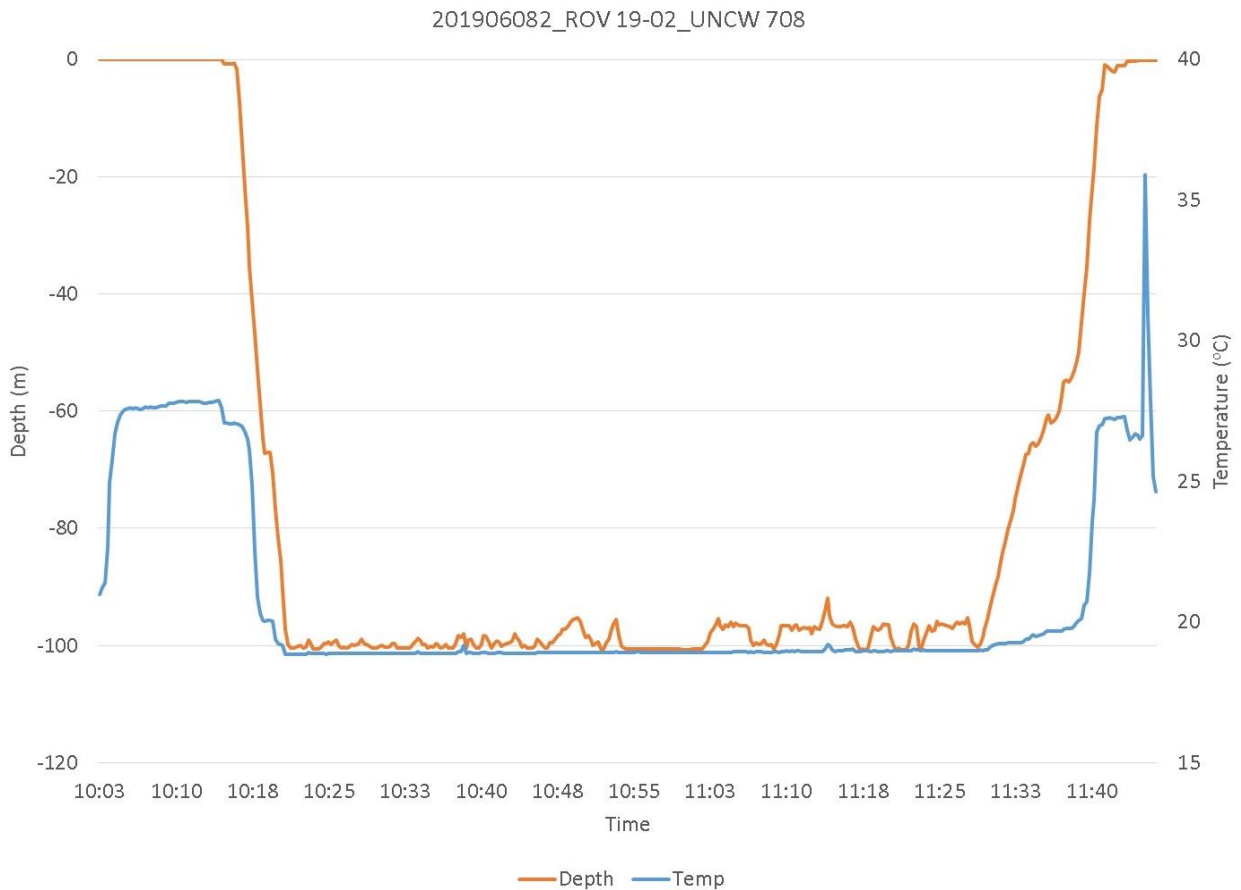
Dive Site: South Carolina, Charleston Deep Artificial Reef MPA; Deep Barge; 100 m; ROV 19-02, UNCW 708; 8-VI-19-2

Dive Data:

Minimum Bottom Depth (m): -91.6	Total Transect Length (km): 0.290
Maximum Bottom Depth (m): -101.9	Surface Current (kn): 0.3
On Bottom (Time- EDST): 10:21	On Bottom (Lat/Long): 32.1232°N; -79.1534°W
Off Bottom (Time- EDST): 11:29	Off Bottom (Lat/Long): 32.1245°N; -79.1526°W
Physical (bottom); Temp (°C): 18.9	Salinity: N/A Visibility (m): 10 Current (kn): 0.3

Physical Environment:

Distance from Dive Site(km): 0.00



Temperature and Depth were collected with a SBE39 attached to the ROV (recording descent, bottom and ascent). The ranges of the bottom data recorded during ROV 19-02 are as follows: Depth Maximum: 100.8 m and Temperature: 18.85-19.2 °C.

Dive Site: South Carolina, Charleston Deep Artificial Reef MPA; Deep Barge; 100 m; ROV 19-02, UNCW 708; 8-VI-19-2

Dive Imagery:



Figure 1: 32°7.3933'N;79°9.2039'W: -100.7 m
Almaco jack (*Seriola rivoliana*)



Figure 2: 32°7.4101'N;79°9.2223'W: -101 m
Red barbier (*Hemanthias vivanus*), crabs and oysters encrusting the barge



Figure 3: 32°7.4346'N;79°9.2082'W: -100.8 m
Horse conch (*Pleuroploca gigantea* syn. *Triplofusus giganteus*)



Figure 4: 32°7.435'N;79°9.2063'W: -99.9 m
Snowy grouper (*Hyporthodus niveatus*) on barge



Figure 5: 32°7.4402'N;79°9.1871'W: -97.2 m
Scamp (*Mycteroperca phenax*) and Snowy grouper (*Hyporthodus niveatus*)

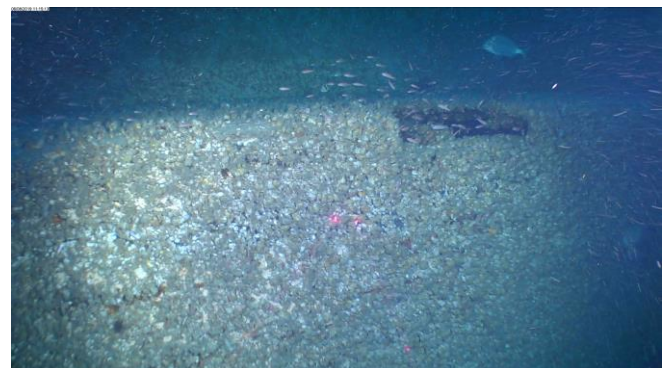


Figure 6: 32°7.4503'N;79°9.1748'W: -97.2 m
Red barbier (*Hemanthias vivanus*) and Porgy (*Calamus* sp.) at top of barge

Dive Site: South Carolina, Charleston Deep Artificial Reef MPA; Deep Barge; 100 m; ROV 19-02, UNCW 708; 8-VI-19-2

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 8-VI-19-2; ROV 19-02, UNCW Dive 708; South Carolina, Charleston Deep Artificial Reef MPA, Deep Barge, 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database. SBE 39 temperature/ depth recorder on ROV.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down or forward on vertical surfaces, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but generally headed N, depending on the ship's maneuverability with the wind and current.

ROV collection skid removed. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 100- 102 m

MB map shows ship laying NE- SW. Barge sunk in 2014. More containers on bottom that are not on the 2014 MB- moved by hurricane? ROV track position is 7 m south of the position in the 2014 MB.

Weather- Cloudy, seas 2 ft from SW, wind 9 kn from 271 dg, air- 27.93 C, surface water- 27.16 C, salinity- 33.9 PSU, surface current- 0.3 kn to 63 dg; bottom current (ADCP)- 0.3 from 270 dg.

10:14- Launch

10:21- On bottom- 102 m; visibility- 10 m. 75 m south of SW end of barge. Flat fine sand/shell hash, dense school of almaco jack; *Stichopathes*.

10:29- western debris field- container and steel structures, 100 m, dense cover of bivalves, anthiids, porgy, almaco jack, 2 snowy grouper, *Sargassum* detritus, dense red barbier anthiids, red snapper, *Stichopathes*, wrasse bass, cubbyu, amberjack.

10:39- head east toward barge; 101 m. More containers on bottom that are not on the 2014 MB- moved by hurricane? Dense cover of Ostreidae on vertical surfaces of containers. Dense anthiids, *Abacia punctulata*, horse conch, puffer.

10:47- west end of barge, debris moved to south. amberjack, snowy grouper, scamp greyhead. 100% cover of

Dive Site: South Carolina, Charleston Deep Artificial Reef MPA; Deep Barge; 100 m; ROV 19-02, UNCW 708; 8-VI-19-2

ostreidae bivalves on vertical surfaces and top of barge. Amberjack common, anthiids dense, snowy grouper, cubbyu.

10:57- SW corner of barge, 100.9 m on bottom. ROV track position is 7 m south of the position in the 2014 MB.

11:03- transecting along south side of barge to east. Top edge, 96.8 m; dense anthiids, bank butterflyfish, red snapper, amberjack, snowy grouper, snowy grouper with hook in mouth, piles of *Sargassum* detritus along bottom, fire worm *Hermodice carunculata*, wrasse bass, blackbar drum.

11:12- *Isostichopus* holothurian, crinoid,

11:17- gag grouper

11:21- SE corner of barge, 101 m on bottom; ROV 7 m south of MB map

11:29- East end of barge, 101 m on bottom. End dive.

Dominant Benthic Macrobiota:

Annelida- *Hermodice carunculata*

Decapoda- *Mithrax*

Echinodermata- *Arbacia punctulata*, *Isostichopus*?

Mollusca- Ostreidae, horse conch

Algae- piles of *Sargassum* detritus

Human Debris:

None

Dive Site: South Carolina, Charleston Deep Artificial Reef MPA; Deep Barge; 100 m; ROV 19-02, UNCW 708; 8-VI-19-2

CPCe Percent Cover Analysis:

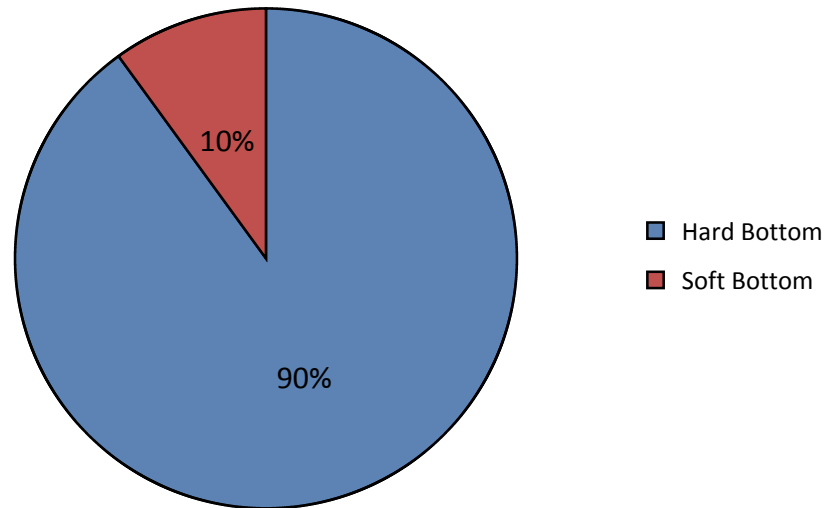
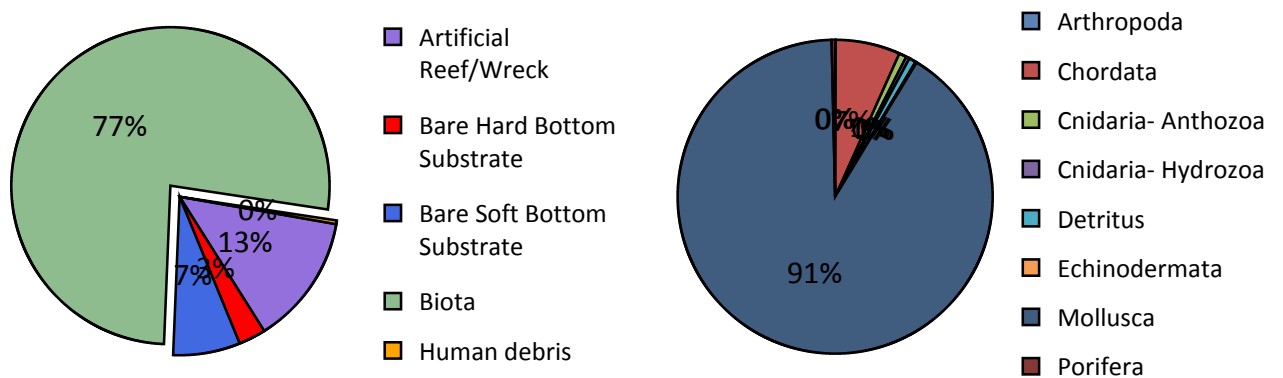


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-02. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-02. A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-02.

	%	Notes
Biota	76.76%	X
Porifera	0.27%	
Demospongiae	0.27%	
Cnidaria- Hydrozoa	0.27%	
Hydrozoa	0.27%	
Hydroidolina	0.27%	
Cnidaria- Anthozoa	0.59%	X
Anthozoa - Non Coral	0.59%	
Zoanthidae	0.59%	
Antipatharia		X
<i>Stichopathes luetkeni</i> Brook, 1889		X
Annelida		X
Polychaeta		X
<i>Hermodice carunculata</i> (Pallas, 1766)		X
Mollusca	69.84%	X
Bivalvia	69.84%	X
Ostreidae	69.84%	X
Gastropoda		X
<i>Busycon</i> sp.		X
Arthropoda	0.05%	X
Crustacea	0.05%	X
Majidae	0.05%	X
Echinodermata	0.11%	X
Crinoidea	0.05%	X
<i>Comactinia meridionalis</i> (L. Agassiz, 1865)	0.05%	
Crinoidea		X
Echinoidea		X
<i>Arbacia punctulata</i> (Lamarck, 1816)		X
Holothuroidea	0.05%	X
Holothuroidea	0.05%	
<i>Isostichopus badionotus</i> (Selenka, 1867)		X
Chordata	5.08%	
Chordata - Vertebrate	5.08%	
Actinopterygii	5.08%	
Detritus	0.54%	X
Human debris	0.38%	

Human debris	0.38%	
Human debris- Fishing Gear	0.38%	
Human debris- anchor line	0.38%	
Habitat	22.86%	
Bare Hard Bottom Substrate	16.05%	
Artificial Reef/Wreck	13.30%	
Hard bottom	2.76%	
Bare rubble/cobble	2.76%	
Bare Soft Bottom Substrate	6.81%	
Grand Total	100.00%	X

Dive Site: South Carolina, Charleston Deep Artificial Reef MPA; Deep Barge; 100 m; ROV 19-02, UNCW 708; 8-VI-19-2

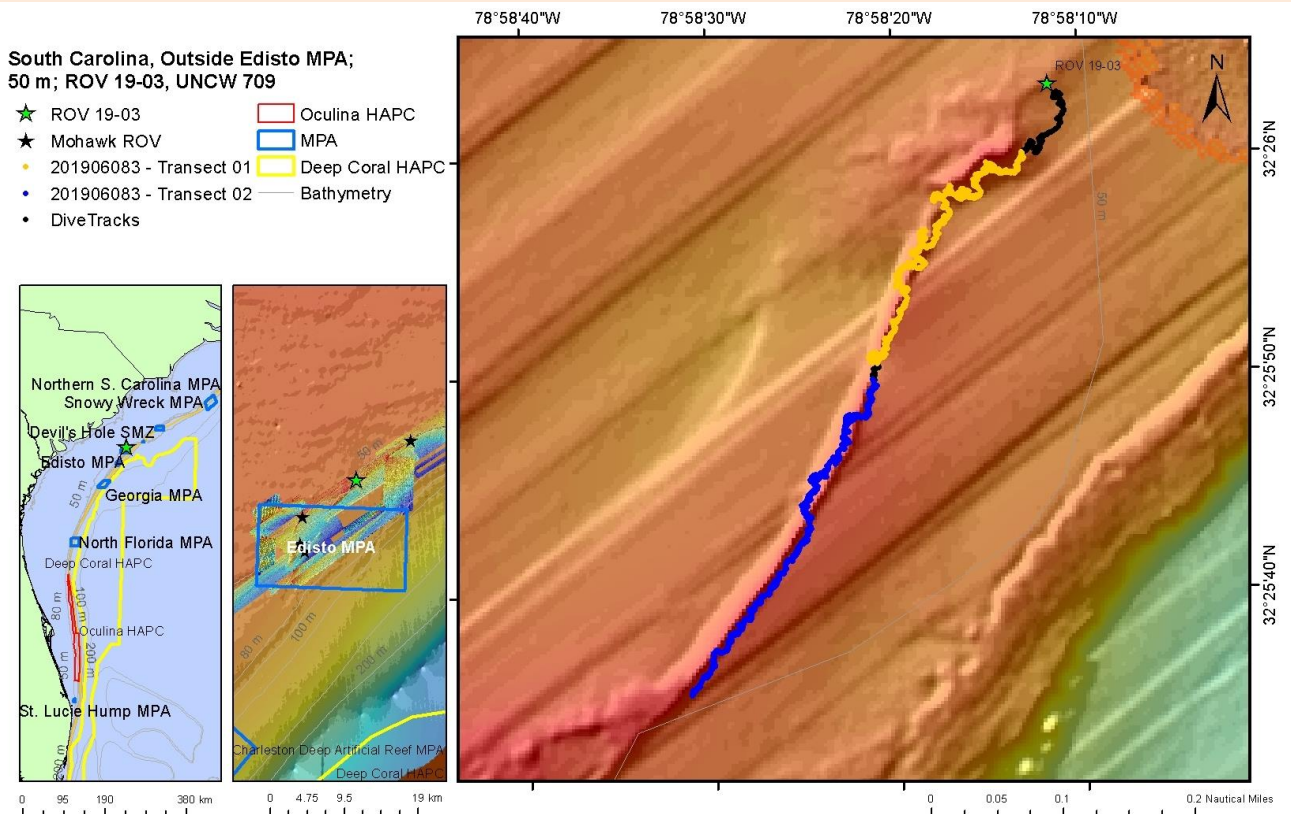
Density of Fish:

Table 2. Raw counts of fish from video transects at dive site ROV 19-02.

Class/Order/Family/Taxa Author - Common Name	ROV 19-02
Actinopterygii	
Perciformes	
Carangidae	
Seriola sp. - Amberjack	85
Chaetodontidae	
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	7
<i>Prognathodes guyanensis</i> (Durand, 1960) - French Butterflyfish	1
Lutjanidae	
<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper	2
<i>Rhomboplites aurorubens</i> (Cuvier, 1829) - Vermilion Snapper	15
Sciaenidae	
<i>Pareques iwamotoi</i> Miller & Woods, 1988 - Blackbar Drum	1
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	49
Serranidae/Anthiadae	
Anthiadae - Sea Bass: Groupers And Fairy Basslets (Fam.)	1000
<i>Hyporthodus niveatus</i> (Valenciennes, 1828) - Snowy Grouper	22
Serranidae/Epinephelinae	
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	8
<i>Mycteroperca microlepis</i> (Goode & Bean, 1879) - Gag	1
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	11
Sparidae	
<i>Calamus</i> sp. - Porgy	6
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	9
Scorpaeniformes	
Scorpaenidae	
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	2
Tetraodontiformes	
Tetraodontidae	
<i>Sphoeroides spengleri</i> (Bloch, 1785) - Bandtail Puffer	1

Dive Site: South Carolina, Outside Edisto MPA; 50 m; ROV 19-03, UNCW 709; 8-VI-19-3

General Location and Dive Track:



Site Overview:

Project: MPA Grant

Principal Investor: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Pisces_2018_Edisto_8m_Grid

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Depth (m)

Date of Dive: 6/8/2019

Specimens: 0

Digital Photos: 358

No. DVD: 3

Hard Drive No.: 1

Dive Site: South Carolina, Outside Edisto MPA; 50 m; ROV 19-03, UNCW 709; 8-VI-19-3

Dive Data:

Minimum Bottom Depth (m): -44.8	Total Transect Length (km): 1.221
Maximum Bottom Depth (m): -50.4	Surface Current (kn): 0.6
On Bottom (Time- EDST): 14:40	On Bottom (Lat/Long): 32.4341°N; -78.9698°W
Off Bottom (Time- EDST): 17:04	Off Bottom (Lat/Long): 32.4266°N; -78.9754°W
Physical (bottom); Temp (°C): 23.4	Salinity: N/A Visibility (m): N/A Current (kn): N/A

Physical Environment:

Distance from Dive Site(km): 0.00



Temperature and Depth were collected with a SBE39 attached to the ROV (recording descent, bottom and ascent). The ranges of the bottom data recorded during ROV 19-03 are as follows: Depth Maximum: 49 m and Temperature: 21.07-23.35 °C.

Dive Site: South Carolina, Outside Edisto MPA; 50 m; ROV 19-03, UNCW 709; 8-VI-19-3

Dive Imagery:

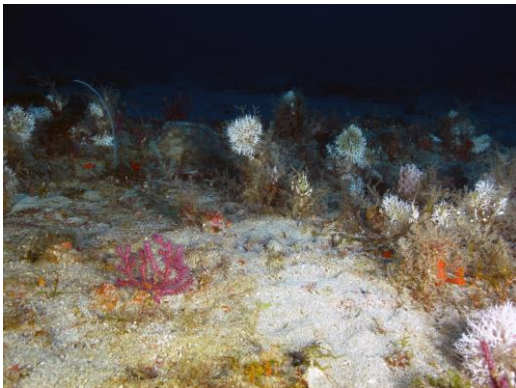


Figure 1: 32°26.0369'N;78°58.1811'W: -50.3 m
Rock ledge/pavement habitat with dense biota



Figure 2: 32°25.9936'N;78°58.2212'W: -47.2 m
Swiftia exserta octocorals



Figure 3: 32°25.9732'N;78°58.2725'W: -47.4 m
Trumpetfish (*Aulostomus maculatus*)

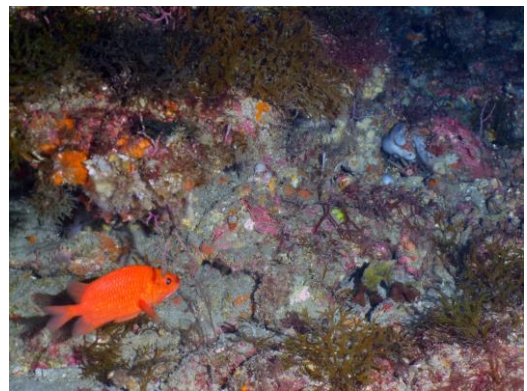


Figure 4: 32°25.9831'N;78°58.2574'W: -48 m
Cardinal soldierfish (*Plectrypops retrospinis*)

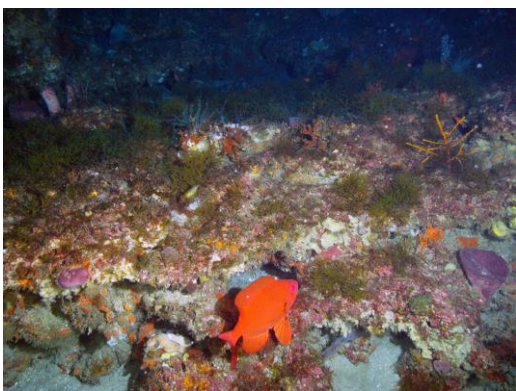


Figure 5: 32°25.9691'N;78°58.2718'W: -48 m
Bigeye (*Priacanthus arenatus*) on low relief ledges

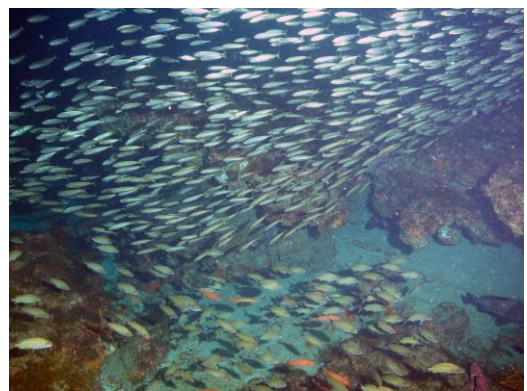


Figure 6: 32°25.9899'N;78°58.2502'W: -46.2 m
Tomtate (*Haemulon aurolineatum*), Vermilion snapper (*Rhomboplites aurorubens*), and Scad (*Decapterus* sp.)

Dive Site: South Carolina, Outside Edisto MPA; 50 m; ROV 19-03, UNCW 709; 8-VI-19-3

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 8-VI-19-3; ROV 19-03, UNCW Dive 709; South Carolina, outside Edisto MPA, 46 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database. SBE 39 temperature/ depth recorder on ROV.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent light mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down or forward on vertical surfaces, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but generally headed N, depending on the ship's maneuverability with the wind and current.

ROV collection skid removed. Tested photo setting- 3 images with Fluorescent white balance, then 3 with fish mode- no difference at this depth. Will use Fluorescent mode for rest of dive; may use Fish mode if <40 m.

Site Description/Habitat/Biota (observations during dive):

Depth range: 47- 50 m

MB map shows linear ridge, NE-SW, 1200 m long, 40 m wide; 5 m resolution. ROV transect from north end of ridge to south.

Weather- Cloudy, seas 2 ft swell from SW, wind 6 kn from 174 dg, air- 28.15 C, surface water- 27.92 C, salinity- 32.98 PSU, current- 0.6 kn to 179 dg

2:35- Launch

2:40- On bottom- 10 m visibility, low current; 50 m, north end of ridge, off the ridge, flat, ½ m flat course sand, with low relief rock boulders, < ½ m relief, dense biota, patchy, 10- 50% rock. Head SW to ridge. Hydroids, Filograna, Diodogorgia, Microdictyon?- green blades with holes, Swiftea exserta common, Amberjack common, Muricea, Titanideum, sponges- <5 cm red, yellow, orange; Phaeophyta common.

2:54- East edge of ridge, 1-2 m relief, 48.5 m at base, sand; dense biota on top; Swiftia abundant 50 cm; dense tomtate, vermilion snapper, Stichopathes, Ptilocaulis orange sponges (Axinellidae), white hairy hydroid, undercut ledges at edge; dense Dictyota algae; Ircinia, Aiolochoiria, Corallimorpharia, Antipathes atlantica, blue angelfish, orange sphere sponge.

3:03- 50 cm flat spherical sponge, brown top, bright yellow, conulose sfc. Schizoporella, spanish hogfish,

Dive Site: South Carolina, Outside Edisto MPA; 50 m; ROV 19-03, UNCW 709; 8-VI-19-3

lionfish- uncommon, longsnout butterflyfish, blackbar drum, cardinal soldierfish, *Codium*, lobster, trumpetfish, porgy, *Stichopathes*, squirrelfish, Demospongiae Ye-Sphere.

3:15- same habitat, Didemnidae, bluespotted cornetfish, *Telesto*, reef butterflyfish, grey sphere- *Spongia*?

3:25- same habitat, east slope of ridge, 48 m; *Aplysina* hollow tube cluster, purple.

3:35- heading S along east side of ledge, 48.2 m, 48 m top of ridge, less relief, less rugose. Goatfish, same biota, DMST starlet sponge.

3:42- ledge mostly gone, but looks same on MB; <1/2 m relief; no tomtate schools. 48 m. Large stingray, scamp

3:45- dense *Swiftia*

3:53- On west edge of ridge; 1 m relief undercut rock ledge; sand base- ~49 m; top 47 m; ridge 10 m wide; filefish

3:47- East base, sand, 48 m; 1 m relief ledge.

3:59- large pile longline, Spirastrellidae under ledges; gag, scamp, flat barren sand at base of ridge now, 1/2 m relief; dense scad, longline; lionfish.

4:03- MB- shows 40 m gap in ridge; ROV- ridge tapers off, same as on MB, flat sand, scattered rock boulders, low relief; hogfish; Solenandria hydroid 30 cm; *Aiochroia*, 2 cornetfish.

4:11- back on ledge, east slope, heading S; same biota, 1 m relief, low rugosity; 47 m top; top low sandy, pavement;

4:18- west edge, top 46.8 m, 1-2 m dropoff, undercut ledge, same biota, 48.5 m at sand base. Encrusting yellow sponge, *Verongida*?, Spirastrellidae, *Swiftia*, *Diodogorgia*, *Dictyota*, hydroida, hairy white hydroid dominant. *Sargassum* attached.

4:24- pile of anchor line; <1/2 m relief.

4:32- west ledge, 1-2 m relief, undercut ledge; lionfish common.

4:37- back on east slope and ledge; 1 m relief; *Telesto*, 47.5 m at base; *Callyspongia vaginalis*; large *Diogenes* crab in whelk.

5:00- ledge flattens out, <1 m relief; no change in MB, can not tell difference between 1-2 m ledges and < 1 m ledges. Lobster; *Filograna*.

5:04- 47.5 m, end dive.

Dominant Benthic Macrobiota:

Antipatharia coral- *Antipathes atlantica*, *Stichopathes* sp.

Gorgonia coral- *Diodogorgia*, *Swifteia exserta* (abundant), *Muricea*, *Titanideum frauenfeldii*

Coralliomorpha

Hydroida- White hairy, *Solendaria*

Porifera- *Aplysina*, *Callyspongia vaginalis*, Demospongiae Yellow Sphere, DMST starlet, Spirastrellidae, *Verongida*, numerous thin encrusting, *Ircinia campana*, *Aiolochoia crassa*, *Spongia*?, Axinellidae

Annelida- Serpulidae, *Filograna*

Decapoda- *Panularis argus*, *Diogenes*

Bryozoa- *Schizoporella*

Algae- *Dictyota* (dense), *Sargassum* (attached), *Microdictyon*?, various *Phaeophyta*, *Codium*?

Human Debris:

Large pile longline, pile of anchorline

CPCe Percent Cover Analysis:

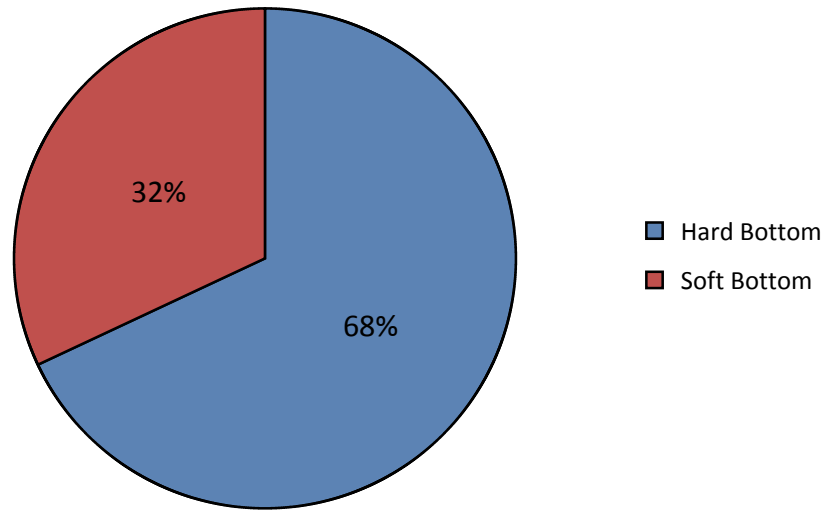
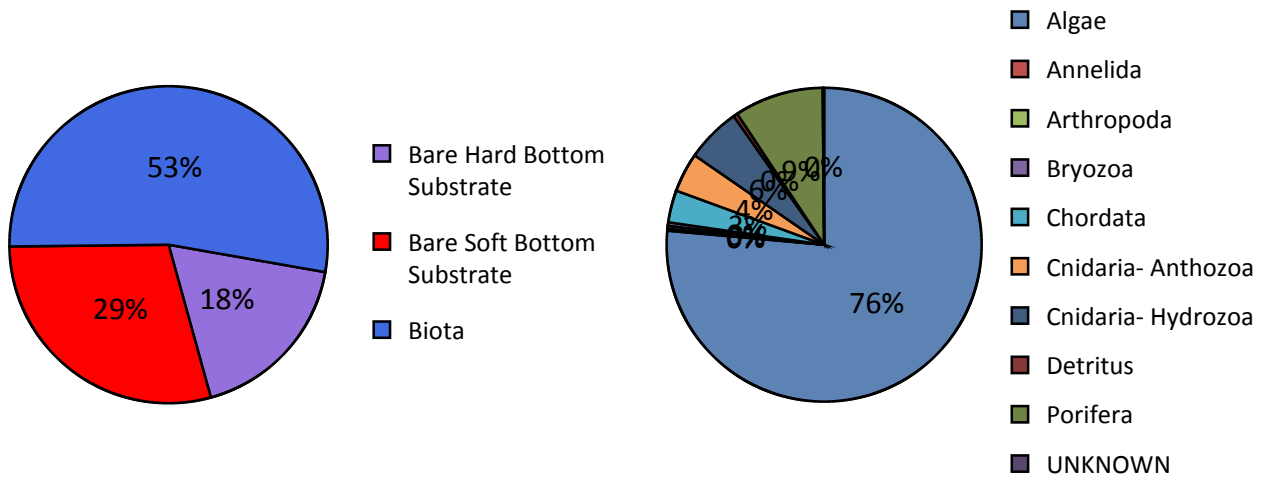


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-03. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-03.

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

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-03.

	%	Notes
Biota	52.96%	X
Algae	40.47%	X
Algae	0.34%	
Cyanobacteria	0.19%	
Chlorophyta	0.15%	X
Chlorophyta	0.15%	X
<i>Microdictyon</i> sp.		X
Ochrophyta	30.74%	X
<i>Dictyota</i> sp.	27.91%	X
Ochrophyta	2.21%	X
Padina sp.		X
<i>Sargassum</i> sp.	0.61%	X
Rhodophyta	9.05%	X
Corallinales	2.29%	X
Rhodophyta	6.76%	
Porifera	4.85%	X
Demospongiae	4.85%	X
<i>Agelas clathrodes</i> (Schmidt, 1870)	0.04%	
<i>Aiolochoiria crassa</i> (Hyatt, 1875)	0.15%	X
<i>Aplysina</i> sp.		X
Axinellidae		X
<i>Callyspongia (Cladochalina) vaginalis</i> (Lamarck, 1814)		X
<i>Clathria</i> sp.	0.04%	
<i>Cliona</i> cf. <i>tumula</i> Friday, Poppell & Hill, 2013	0.34%	X
Demospongiae	2.83%	X
Demospongiae- Ye sphere (MPA)		X
Dictyoceratida	0.04%	
<i>Erylus</i> sp.	0.08%	
<i>Ircinia campana</i> (Lamarck, 1814)	0.31%	X
<i>Ircinia</i> sp.	0.31%	X
<i>Ircinia strobilina</i> (Lamarck, 1816)	0.08%	
Poecilosclerida	0.08%	
<i>Ptilocaulis</i> sp.		X
Spirastrellidae	0.57%	X
Cnidaria- Hydrozoa	2.98%	X
Hydrozoa	2.98%	X

Hydroidolina	2.98%	X
<i>Solanderia</i> sp.		X
Cnidaria- Anthozoa	2.14%	X
Alcyonacea - Alcyoniina	0.04%	
Octocorallia	0.04%	
Alcyonacea - gorgonian	1.83%	X
Alcyonacea- gorgonian	0.15%	
Clavulariidae		X
<i>Diodogorgia</i> sp.	0.99%	X
Ellisellidae	0.04%	
<i>Muricea</i> sp.		X
<i>Swiftia exserta</i> (Ellis & Solander, 1786)	0.65%	X
Anthozoa - Non Coral	0.04%	X
Corallimorpharia	0.04%	X
Antipatharia	0.19%	X
<i>Antipathes atlantica</i> Gray, 1857	0.11%	X
<i>Stichopathes luetkeni</i> Brook, 1889	0.08%	X
Coral- Scleractinia	0.04%	
Scleractinia- unid cup	0.04%	
Annelida	0.11%	X
Polychaeta	0.11%	X
<i>Filograna</i> sp.	0.11%	X
Arthropoda	0.15%	X
Crustacea	0.15%	X
<i>Diogenes</i> sp.		X
Paguridae	0.15%	
<i>Panulirus argus</i> (Latreille, 1804)		X
Bryozoa	0.19%	X
Bryozoa	0.04%	
Gymnolaemata	0.15%	X
<i>Schizoporella</i> sp.	0.15%	X
Chordata	1.76%	X
Chordata - Invertebrate	0.08%	X
Didemnidae	0.08%	X
Chordata - Vertebrate	1.68%	
Actinopterygii	1.68%	
Detritus	0.23%	
UNKNOWN	0.08%	
Human debris		X
Human debris		X
Human debris- Fishing Gear		X
Human debris- long line		X

Human debris- Trash		X
Human debris- cans/bottles		X
Bare Hard Bottom Substrate	17.95%	
Bare Hard Bottom Substrate	17.95%	
Dead Coral	0.04%	
Bare coral rubble	0.04%	
Hard bottom	17.91%	
Bare rock, pavement, boulder, ledge	17.72%	
Bare rubble/cobble	0.19%	
Bare Soft Bottom Substrate	29.10%	
Grand Total	100.00%	X

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-03.

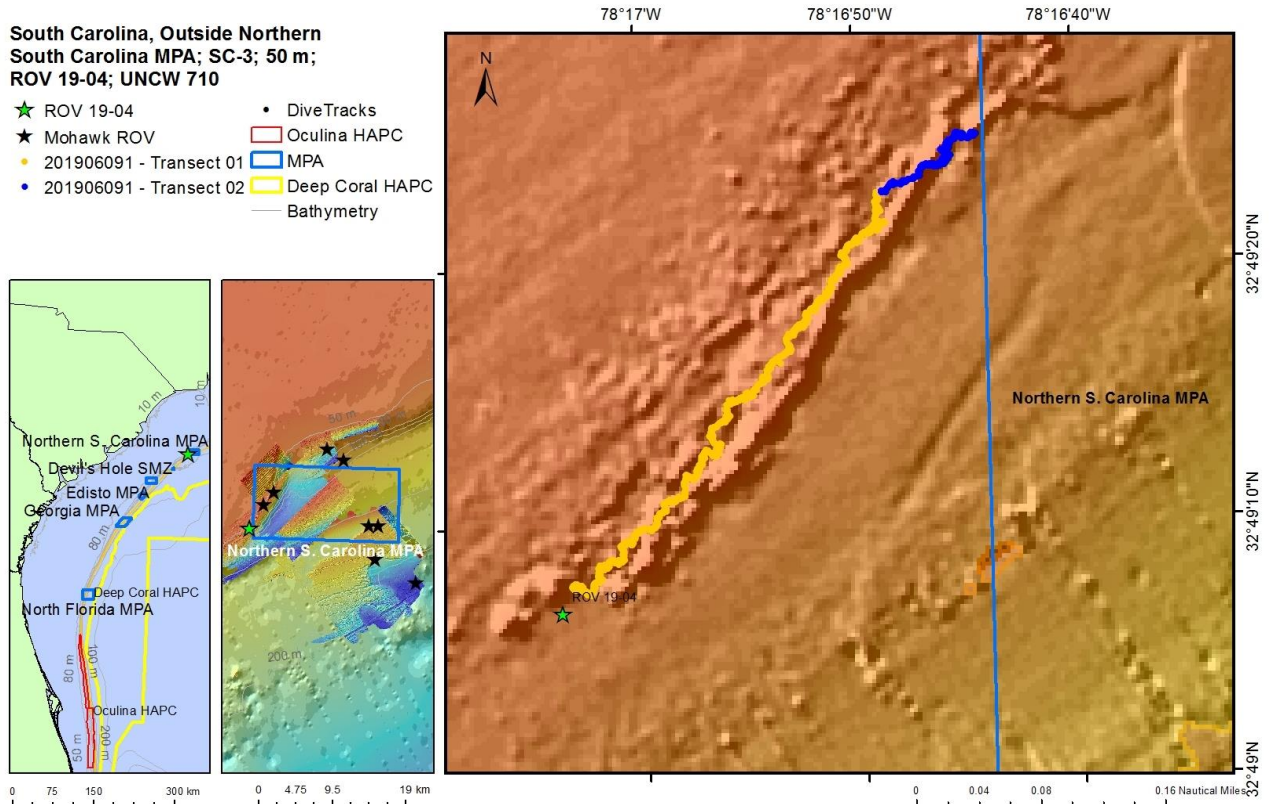
Class/Order/Family/Taxa Author - Common Name	ROV 19-03
Actinopterygii	
Anguilliformes	
Muraenidae	
<i>Gymnothorax moringa</i> (Cuvier, 1829) - Spotted Moray	0.23
<i>Muraena retifera</i> Goode & Bean, 1882 - Reticulate Moray	0.23
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	3.70
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	4.85
<i>Holocentrus rufus</i> (Walbaum, 1792) - Longspine Squirrelfish	1.39
<i>Myripristis jacobus</i> Cuvier, 1829 - Blackbar Soldierfish	1.62
<i>Plectrypops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish	1.62
Perciformes	
Acanthuridae	
<i>Acanthurus</i> sp. - Surgeonfish	2.31
Apogonidae	
<i>Apogon</i> sp. - Cardinalfish	20.80
Carangidae	
<i>Decapterus</i> sp. - Scad	577.90
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	9.48
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	1.16
<i>Seriola</i> sp. - Amberjack	29.59
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	3.01
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	27.74
<i>Prognathodes aculeatus</i> (Poey, 1860) - Longsnout Butterflyfish	0.23
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	2.77
Ephippidae	
<i>Chaetodipterus faber</i> (Broussonet, 1782) - Atlantic Spadefish	4.39
Haemulidae	
<i>Haemulon aurolineatum</i> Cuvier, 1830 - Tomtate Grunt	1619.28
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	0.69
<i>Haemulon striatum</i> (Linnaeus, 1758) - Striped Grunt	320.16
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	16.41
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	0.92

<i>Halichoeres cyanocephalus</i> (Bloch, 1791) - Yellowcheek Wrasse	0.69
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	11.10
<i>Halichoeres</i> sp. - Wrasse	28.66
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	0.69
Lutjanidae	
<i>Lutjanus analis</i> (Cuvier, 1828) - Mutton Snapper	0.46
<i>Lutjanus buccanella</i> (Cuvier, 1828) - Blackfin Snapper	1.62
<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper	0.92
<i>Lutjanus griseus</i> (Linnaeus, 1758) - Grey Snapper	2.54
<i>Lutjanus</i> sp. - Snapper	3.93
<i>Rhomboplites aurorubens</i> (Cuvier, 1829) - Vermilion Snapper	242.72
Malacanthidae	
<i>Malacanthus plumieri</i> (Bloch, 1786) - Sand Tilefish	0.23
Mullidae	
<i>Mulloidichthys martinicus</i> (Cuvier, 1829) - Yellow Goatfish	0.23
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	10.63
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	16.64
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	0.23
Pomacentridae	
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reeffish	15.26
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	53.17
<i>Chromis scotti</i> Emery, 1968 - Purple Reeffish	42.76
<i>Chromis</i> sp. - Damsel/Chromis	17.57
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damsel	2.77
Priacanthidae	
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	3.01
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	0.23
Scaridae	
<i>Sparisoma atomarium</i> (Poey, 1861) - Greenblotch Parrotfish	0.92
Sciaenidae	
<i>Equetus lanceolatus</i> (Linnaeus, 1758) - Jack-knifefish	0.69
<i>Pareques iwamotoi</i> Miller & Woods, 1988 - Blackbar Drum	0.46
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	17.80
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	4.16
<i>Epinephelus morio</i> (Valenciennes, 1828) - Red Grouper	0.23
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	2.77
<i>Mycteroperca interstitialis</i> (Poey, 1860) - Yellowmouth Grouper	0.23
<i>Mycteroperca microlepis</i> (Goode & Bean, 1879) - Gag	1.16
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	2.77
<i>Mycteroperca</i> sp. - Grouper	0.46

Serranidae/Grammistinae	
<i>Rypticus maculatus</i> Holbrook, 1855 - Whitespotted Soapfish	0.69
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	4.16
<i>Serranus baldwini</i> (Evermann & Marsh, 1899) - Lantern Bass	3.24
<i>Serranus phoebe</i> Poey, 1851 - Tattler	3.93
Sparidae	
<i>Calamus</i> sp. - Porgy	10.86
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	0.23
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	31.90
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	0.23
Syngnathiformes	
Aulostomidae	
<i>Aulostomus maculatus</i> Valenciennes, 1841 - Atlantic Trumpetfish	2.08
Fistulariidae	
<i>Fistularia tabacaria</i> Linnaeus, 1758 - Bluespotted cornetfish	0.69
Tetraodontiformes	
Balistidae	
<i>Balistes</i> sp. - Triggerfish	0.46
Diodontidae	
<i>Diodon hystrix</i> Linnaeus, 1758 - Spot-fin Porcupinefish	0.23
Monacanthidae	
<i>Aluterus scriptus</i> (Osbeck, 1765) - Scrawled Filefish	0.46
Ostraciidae	
<i>Acanthostracion polygonius</i> Poey, 1876 - Honeycomb Cowfish	0.23
<i>Acanthostracion quadricornis</i> (Linnaeus, 1758) - Scrawled Cowfish	0.23
Ostraciidae - Boxfishes (Fam.)	0.69
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	64.72
Elasmobranchii	
Myliobatiformes	
Dasyatidae	
<i>Hypanus americanus</i> (Hildebrand & Schroeder, 1928) - Southern Stingray	0.23
UNKNOWN Biota	3.47

Dive Site: South Carolina, Outside Northern South Carolina MPA; SC-3; 50 m; ROV 19-04; UNCW 710; 9-VI-19-1

General Location and Dive Track:



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Sedberry_OEBlock1_5m_UT M17N_MB_Grid

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Depth (m)

Date of Dive: 6/9/2019

Specimens: 0

Digital Photos: 228

No. DVD: 2

Hard Drive No.: 1

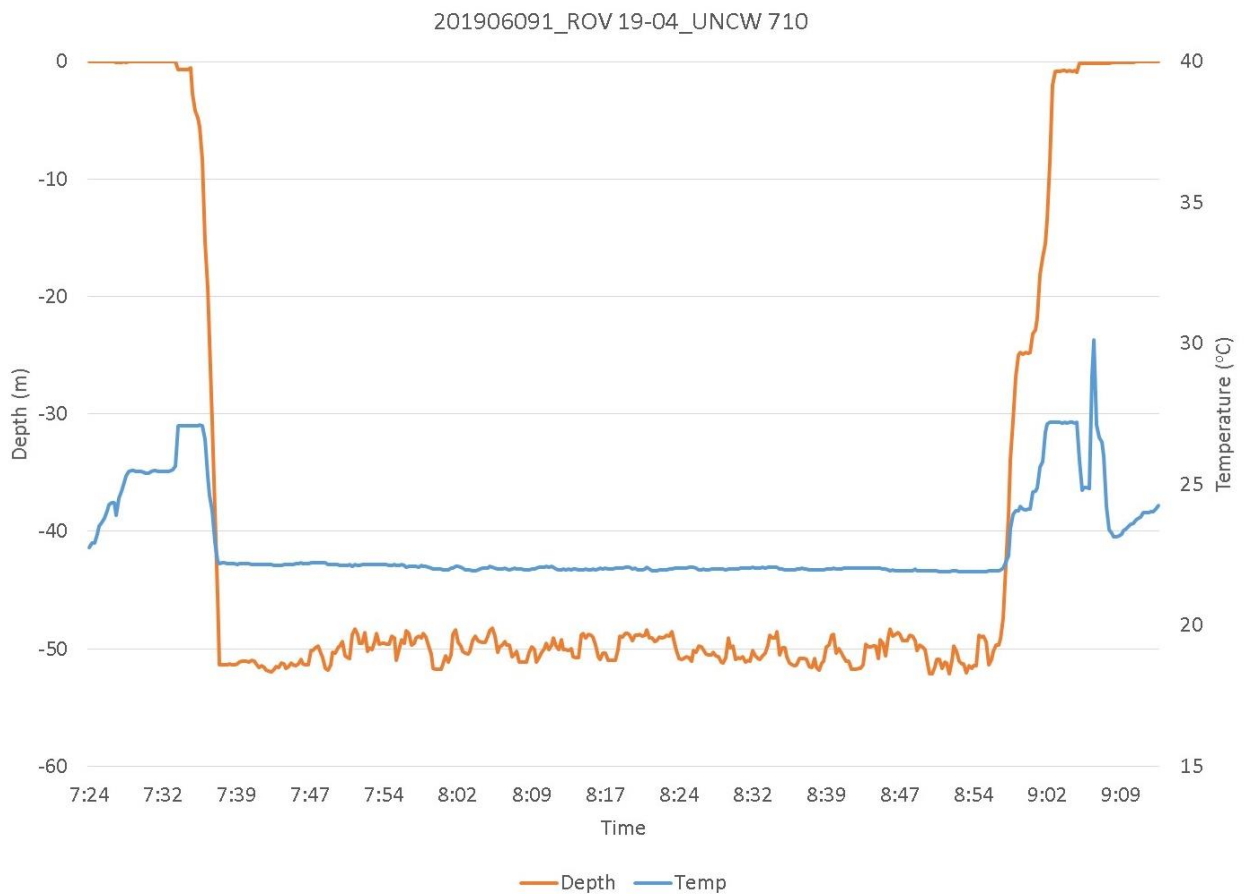
Dive Site: South Carolina, Outside Northern South Carolina MPA; SC-3; 50 m; ROV 19-04; UNCW 710; 9-VI-19-1

Dive Data:

Minimum Bottom Depth (m): -47.8	Total Transect Length (km): 0.789
Maximum Bottom Depth (m): -52.7	Surface Current (kn): .2
On Bottom (Time- EDST): 7:37	On Bottom (Lat/Long): 32.8188°N; -78.2843°W
Off Bottom (Time- EDST): 8:56	Off Bottom (Lat/Long): 32.8237°N; -78.2791°W
Physical (bottom); Temp (°C): 23	Salinity: N/A Visibility (m): N/A Current (kn): 0

Physical Environment:

Distance from Dive Site(km): 0.00



Temperature and Depth were collected with a SBE39 attached to the ROV (recording descent, bottom and ascent). The ranges of the bottom data recorded during ROV 19-04 are as follows: Depth Maximum: 52.1 m and Temperature: 21.9-22.95 °C.

Dive Site: South Carolina, Outside Northern South Carolina MPA; SC-3; 50 m; ROV 19-04; UNCW 710; 9-VI-19-1

Dive Imagery:



Figure 1: 32°49.1246'N;78°17.0468'W: -52.2 m
Diodogorgia sp. octocoral



Figure 2: 32°49.2118'N;78°16.9479'W: -50.1 m
Encrusting sponges (*Agelas* sp.) and algae on rock pavement

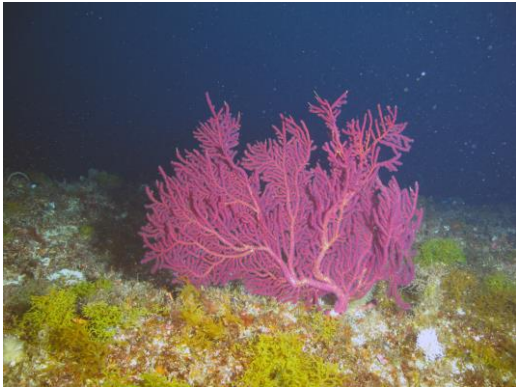


Figure 3: 32°49.2703'N;78°16.9057'W: -49.4 m
Muricia pendula octocoral



Figure 4: 32°49.3395'N;78°16.8482'W: -49.1 m
Hydroida

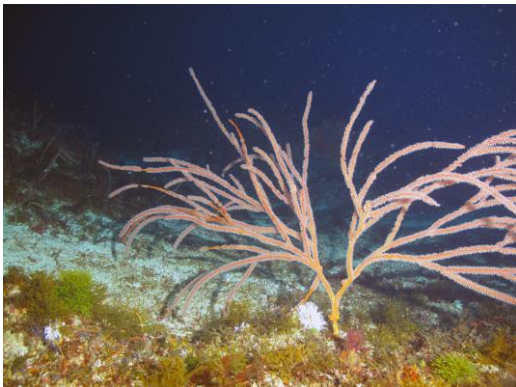


Figure 5: 32°49.3486'N;78°16.8391'W: -51.7 m
Ellisellidae octocoral

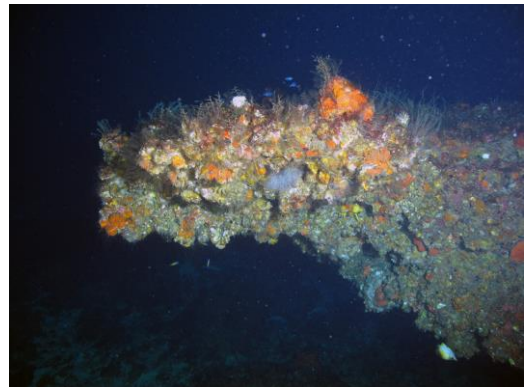


Figure 6: 32°49.3596'N;78°16.8229'W: -50 m
Rock outcrop encrusted with biota

Dive Site: South Carolina, Outside Northern South Carolina MPA; SC-3; 50 m; ROV 19-04; UNCW 710; 9-VI-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 9-VI-19-1; ROV 19-04, UNCW Dive 710; South Carolina, Outside Northern South Carolina MPA, SC 3, 50 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database. SBE 39 temperature/ depth recorder on ROV.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down or forward on vertical surfaces, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but generally headed N, depending on the ship's maneuverability with the wind and current.

ROV collection skid removed. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 49- 52 m

MB map shows NE-SW linear ridge, 6000 m long, 45- 240 m wide with individual scattered knolls on top, 5 m resolution; SW of MPA; ROV heading NE along ridge and on top.

Weather-P/ Cloudy, seas 2-3 ft from SE, wind 7 kn from 196 dg, air- 25.88 C, surface water- 27.11 C, salinity- 32.95 PSU, current- 0.2 kn to 71 dg.

7:32- Launch

7:37- On bottom- 52.2 m; visibility- 15 m, current- slight. Near start WP, heading NE along E face of ridge. Rounded rock knolls, 1 m relief, hard bottom, no ledges, dense biota- dense *Dictyota*, several species with wide and thin blades; several Rhodophyta, goey red, *Diodogorgia*, abundant large *Agelas clathrodes* (30- 50 cm), *Callyspongia vaginalis*, *Filograna*.

7:46- Start photo xs, head NE. 2 m escarpment, no undercut ledges; *Tanacetipathes*, *Ellisella elongata* orange whips, *Antipathes atlantica*, 50 cm hydroida, *Solanderia* hydroida, scamp, rock beauty, reef butterflyfish, *Stichopathes*. 50 cm branched *Ellisella elongata*, hogfish.

7:53- 50 m top of knoll, gooey red algae, *Dictyota* dense. 51.5 m at base; 1.5 m relief. Filefish, *Ircinia*. Large smooth rock knolls, no undercut, 1-2 m relief. Few lionfish.

Dive Site: South Carolina, Outside Northern South Carolina MPA; SC-3; 50 m; ROV 19-04; UNCW 710; 9-VI-19-1

8:03- On top, west of east ridge; Some areas with narrow channels between knolls; areas on top with solid rock pavement; 80% cover biota. Several scamp.

8:07- 51.4 m; top of knoll area, 52 m in sand/rubble at base of knolls; *Telesto*, anchor line; grey ascidian, *Stichopodium*

8:15- 51.5 m in sediment between knolls; scattered knolls 3-5 m diameter; wrasse bass, squirrelfish, sunshinefish, *Ircinia* spp., lionfish, Didemnidae.

8:25- transecting in valley and knolls west of main ridge. *Iciligorgia schrammi*, *Ircinia strobilina*, bank butterflyfish, *Aiolochoira crassa*, tattler.

8:40- Same area and biota; school of white grunt, goatfish.

8:42- hd east to go to east face of main ridge. French angelfish.

8:45- top of main ridge, 49.7 m, flat rock pavement, dense biota; *Muricea*, dense *Dicyota* spp., Rhodophyta spp., gooey red, hydroida, *Ellisella*, *Stichopathes*, *Agelas clathrodes*, *Callyspongia vaginalis*.

8:49- East base of ridge. 52.5 m, 2.7 m relief; 45o slope, some small undercut ledges, sand/rubble, low relief rock at base. No current; heading NE along east face; same biota.

8:56- near west edge of MPA; end dive.

Dominant Benthic Macrobiota:

Antipatharia coral- *Antipathes atlantica*, *Stichopathes luetkeni*, *Stichopathes* sp., *Tanacetipathes*

Gorgonia coral- *Diodogorgia*, *Ellisella elongata*, *Telesto*, *Iciligorgia schrammi*, *Muricia*

Hydroida- 50 cm hydroid w/ zoanthids, *Solanderia*

Porifera- *Agelas clathrodes* (abundant), *Ircinia campana*, *I. strobilina*, *Callyspongia vaginalis*, *Aiolochoira*

Annelida- *Filograna*

Echinodermata- *Narcissia trigonaria*

Algae- dense *Dictyota* spp., Rhodophyta spp., lots gooey red

Human Debris:

Anchor line

Dive Site: South Carolina, Outside Northern South Carolina MPA; SC-3; 50 m; ROV 19-04; UNCW 710; 9-VI-19-1

CPCe Percent Cover Analysis:

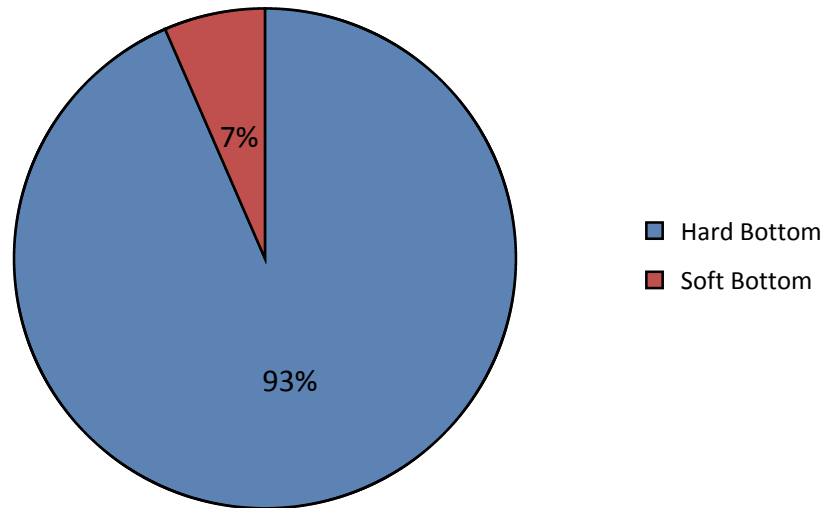
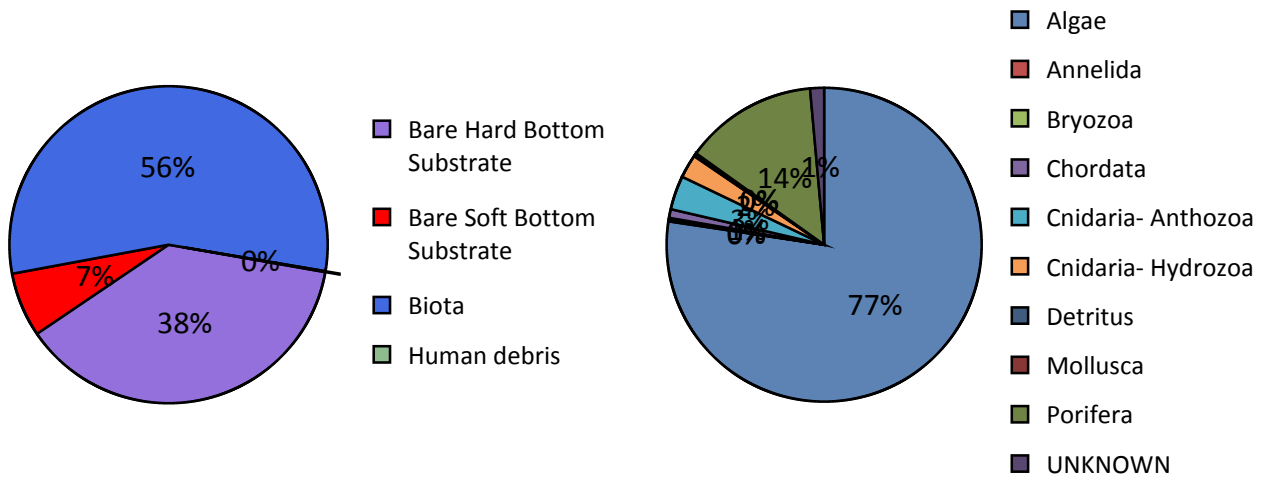


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-04. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-04. 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: South Carolina, Outside Northern South Carolina MPA; SC-3; 50 m; ROV 19-04; UNCW 710; 9-VI-19-1

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-04.

	%	Notes
Biota	55.62%	X
Algae	43.04%	X
Algae- Unid.	0.20%	
Cyanobacteria	0.70%	
Chlorophyta	0.15%	
Ochrophyta	30.12%	X
<i>Dictyota</i> sp.	28.13%	X
Ochrophyta	1.94%	X
<i>Padina</i> sp.	0.05%	
<i>Styopodium</i> sp.		X
Rhodophyta	11.88%	X
Corallinales	2.04%	
Rhodophyta	9.84%	X
Porifera	7.60%	X
Demospongiae	7.60%	X
<i>Agelas clathrodes</i> (Schmidt, 1870)	1.84%	X
<i>Agelas</i> sp.	0.80%	
<i>Aiolochoia crassa</i> (Hyatt, 1875)		X
<i>Callyspongia (Cladochalina) vaginalis</i> (Lamarck, 1814)		X
<i>Callyspongia</i> sp.	0.05%	
Demospongiae	3.88%	
<i>Ircinia</i> sp.	0.10%	
<i>Ircinia strobilina</i> (Lamarck, 1816)	0.05%	X
<i>Niphates</i> sp.	0.05%	
<i>Oceanapia</i> sp.	0.30%	
Poecilosclerida	0.05%	
Spirastrellidae	0.50%	
Cnidaria- Hydrozoa	1.34%	X
Hydrozoa	1.34%	X
Hydroidolina	1.34%	X
Solanderia sp.		X
Cnidaria- Anthozoa	1.94%	X
Alcyonacea - Alcyoniina	0.05%	
Octocorallia	0.05%	
Alcyonacea - gorgonian	1.19%	X
Alcyonacea- gorgonian	0.20%	

Dive Site: South Carolina, Outside Northern South Carolina MPA; SC-3; 50 m; ROV 19-04; UNCW 710; 9-VI-19-1

<i>Diodogorgia</i> sp.	0.20%	X
<i>Ellisella barbadensis</i> (Pallas, 1766)		X
<i>Ellisella</i> sp.	0.75%	X
Ellisellidae	0.05%	
<i>Hypnogorgia</i> sp.		X
<i>Iciligorgia schrammi</i> Duchassaing, 1870		X
<i>Muricea</i> sp.		X
Antipatharia	0.60%	X
Antipatharia		X
<i>Antipathes atlantica</i> Gray, 1857	0.15%	X
<i>Stichopathes luetkeni</i> Brook, 1889	0.05%	X
<i>Tanacetipathes</i> sp.	0.40%	X
Coral- Scleractinia	0.10%	
<i>Madracis decactis</i> (Lyman, 1859)	0.05%	
<i>Madracis myriaster</i> (Milne Edwards & Haime, 1850)	0.05%	
Annelida	0.05%	X
Polychaeta	0.05%	X
<i>Filograna</i> sp.	0.05%	X
Sabellidae		X
Mollusca	0.10%	
Bivalvia	0.10%	
Bryozoa	0.15%	
Echinodermata		X
Asteroidea		X
<i>Narcissia trigonaria</i> Sladen, 1889		X
Chordata	0.50%	X
Chordata - Invertebrate	0.10%	X
Ascidiacea	0.10%	
Didemnidae		X
<i>Eudistoma</i> sp.		X
Chordata - Vertebrate	0.40%	
Actinopterygii	0.40%	
Detritus	0.10%	
UNKNOWN	0.80%	
Human debris	0.10%	X
Human debris	0.10%	X
Human debris- Fishing Gear	0.10%	X
Human debris- anchor line	0.10%	X
Habitat	44.28%	
Bare Hard Bottom Substrate	37.72%	
Hard bottom	37.72%	
Bare rock, pavement, boulder, ledge	36.68%	

Dive Site: South Carolina, Outside Northern South Carolina MPA; SC-3; 50 m; ROV 19-04; UNCW 710; 9-VI-19-1

Bare rubble/cobble	1.04%	
Bare Soft Bottom Substrate	6.56%	
Grand Total	100.00%	X

Dive Site: South Carolina, Outside Northern South Carolina MPA; SC-3; 50 m; ROV 19-04; UNCW 710; 9-VI-19-1

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-04.

Class/Order/Family/Taxa Author - Common Name	ROV 19-04
Actinopterygii	
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	2.45
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	1.96
<i>Holocentrus rufus</i> (Walbaum, 1792) - Longspine Squirrelfish	3.19
<i>Myripristis jacobus</i> Cuvier, 1829 - Blackbar Soldierfish	0.74
Perciformes	
Acanthuridae	
<i>Acanthurus chirurgus</i> (Bloch, 1787) - Doctorfish	1.72
<i>Acanthurus</i> sp. - Surgeonfish	0.74
Carangidae	
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	0.25
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	0.98
<i>Seriola</i> sp. - Amberjack	0.49
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	3.43
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	12.25
<i>Prognathodes aculeatus</i> (Poey, 1860) - Longsnout Butterflyfish	1.23
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	1.47
Haemulidae	
<i>Haemulon aurolineatum</i> Cuvier, 1830 - Tomtate Grunt	68.14
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	10.05
<i>Haemulon striatum</i> (Linnaeus, 1758) - Striped Grunt	7.35
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	4.66
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	0.74
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	4.17
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	0.98
Mullidae	
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	3.68
Pomacanthidae	
<i>Centropyge argi</i> Woods & Kanazawa, 1951 - Cherubfish	0.98
<i>Holacanthus</i> sp. - Angelfish	4.17
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	1.47
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	0.74

Dive Site: South Carolina, Outside Northern South Carolina MPA; SC-3; 50 m; ROV 19-04; UNCW 710; 9-VI-19-1

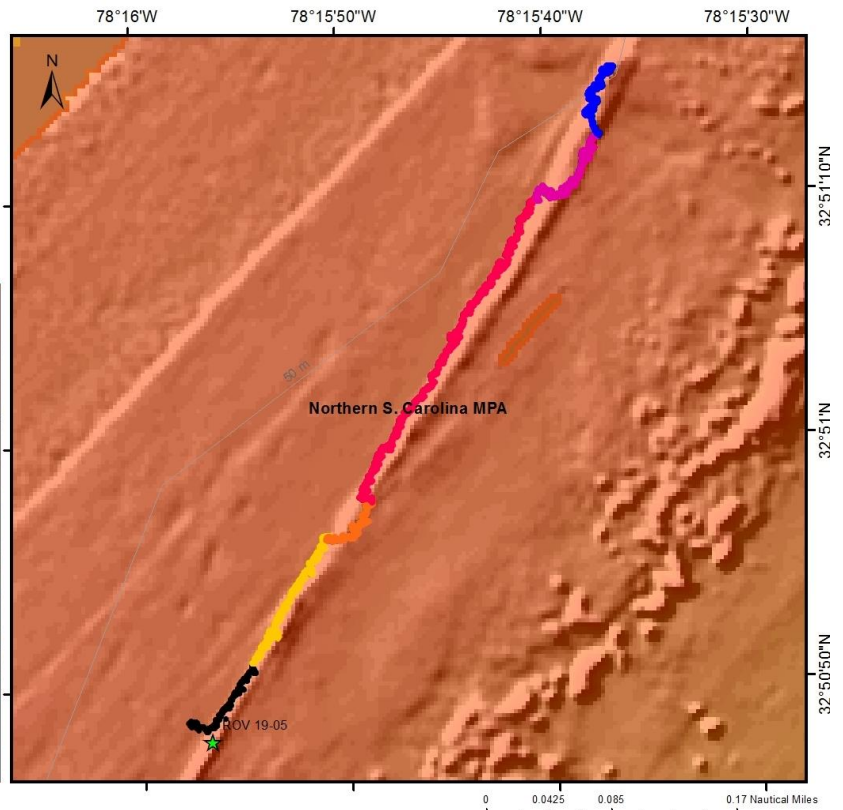
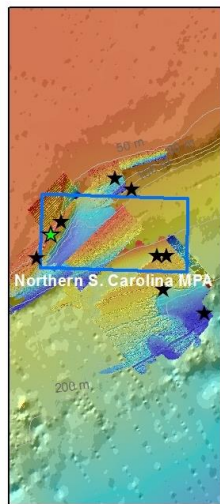
Pomacentridae	
<i>Chromis cyanea</i> (Poey, 1860) - Blue Chromis	0.25
<i>Chromis enchrysur</i> Jordan & Gilbert, 1882 - Yellowtail Reef fish	2.21
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	53.19
<i>Chromis scotti</i> Emery, 1968 - Purple Reef fish	4.41
<i>Chromis</i> sp. - Damselfish/chromis	12.99
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damselfish	0.49
Priacanthidae	
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	0.25
Scaridae	
<i>Sparisoma atomarium</i> (Poey, 1861) - Greenblotch Parrotfish	5.39
Sciaenidae	
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	20.83
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	0.49
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	0.98
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	1.96
<i>Paranthias furcifer</i> (Valenciennes, 1828) - Creole-fish	0.25
Serranidae/Grammistinae	
<i>Rypticus saponaceus</i> (Bloch & Schneider, 1801) - Greater Soapfish	0.74
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	5.39
<i>Serranus baldwini</i> (Evermann & Marsh, 1899) - Lantern Bass	2.94
<i>Serranus phoebe</i> Poey, 1851 - Tattler	2.94
<i>Serranus tigrinus</i> (Bloch, 1790) - Harlequin Bass	0.25
Sparidae	
<i>Calamus</i> sp. - Porgy	4.66
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	6.62
Tetraodontiformes	
Balistidae	
<i>Balistes vetula</i> Linnaeus, 1758 - Queen Triggerfish	0.25
Monacanthidae	
<i>Cantherhines macrocerus</i> (Hollard, 1853) - Whitespotted Filefish	0.49
<i>Cantherhines pullus</i> (Ranzani, 1842) - Orangespotted Filefish	0.25
Ostraciidae	
Ostraciidae - Boxfishes (Fam.)	0.25
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	10.78
UNKNOWN Biota	3.92

Dive Site: South Carolina, Northern South Carolina MPA; SC-1; 50 m; ROV 19-05; UNCW 711; 9-VI-19-2

General Location and Dive Track:

South Carolina, Northern
South Carolina MPA; SC-1;
50 m; ROV 19-05; UNCW 711

- ★ ROV 19-05
- ★ Mohawk ROV
- 201906092 - Transect 01
- 201906092 - Transect 02
- 201906092 - Transect 03
- 201906092 - Transect 04
- 201906092 - Transect 05
- DiveTracks
- Oculina HAPC
- MPA
- Deep Coral HAPC
- Bathymetry



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Sedberry_OEBlock1_5m_UT M17N_MB_Grid

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Depth (m)

Date of Dive: 6/9/2019

Specimens: 0

Digital Photos: 318

No. DVD: 2

Hard Drive No.: 1

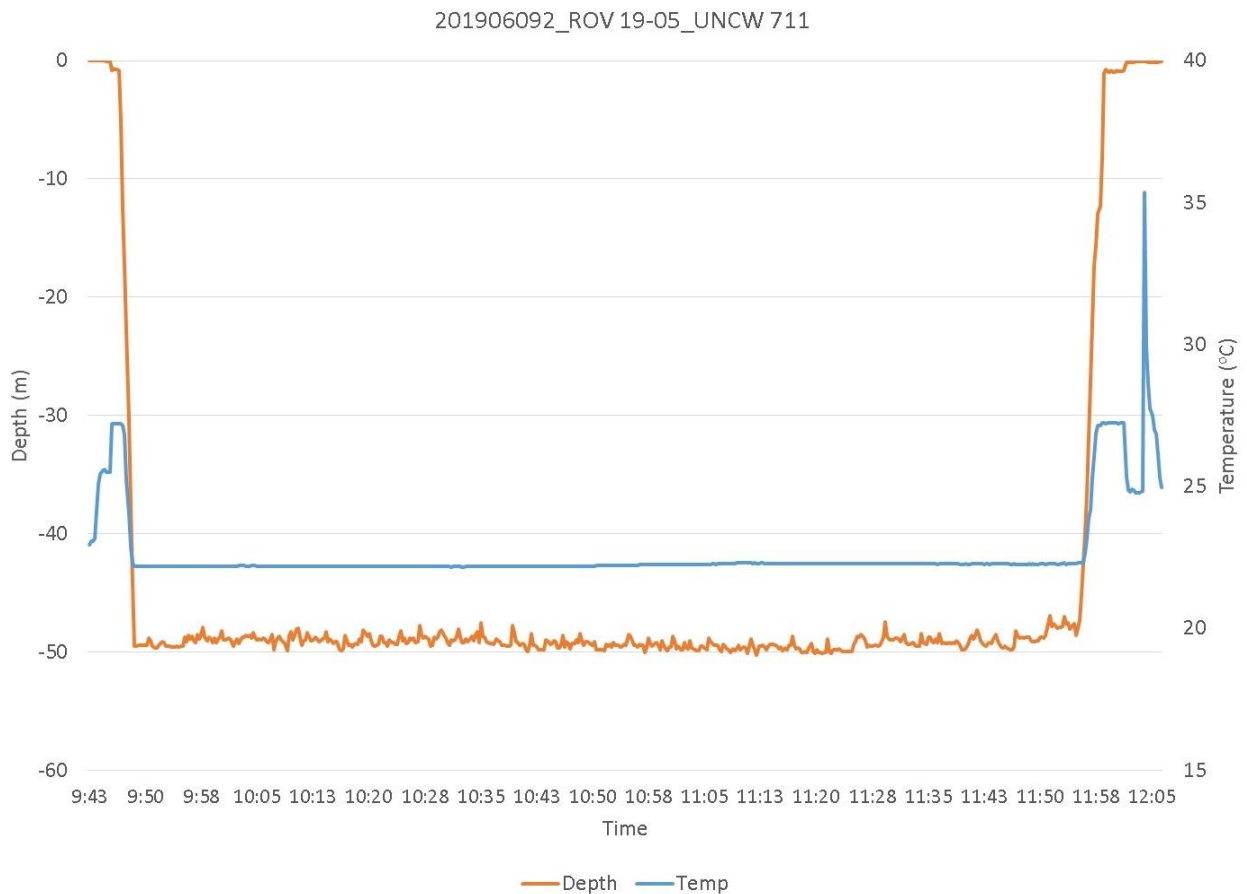
Dive Site: South Carolina, Northern South Carolina MPA; SC-1; 50 m; ROV 19-05; UNCW 711; 9-VI-19-2

Dive Data:

Minimum Bottom Depth (m): -47.1	Total Transect Length (km): 1.078
Maximum Bottom Depth (m): -50.7	Surface Current (kn): 0.5
On Bottom (Time- EDST): 9:48	On Bottom (Lat/Long): 32.8468°N; -78.2661°W
Off Bottom (Time- EDST): 11:54	Off Bottom (Lat/Long): 32.8541°N; -78.2604°W
Physical (bottom); Temp (°C): 22.8	Salinity: N/A Visibility (m): 20 Current (kn): 0.1

Physical Environment:

Distance from Dive Site(km): 0.00



Temperature and Depth were collected with a SBE39 attached to the ROV (recording descent, bottom and ascent). The ranges of the bottom data recorded during ROV 19-05 are as follows: Depth Maximum: 50.3 m and Temperature: 22.16-22.84 °C.

Dive Site: South Carolina, Northern South Carolina MPA; SC-1; 50 m; ROV 19-05; UNCW 711; 9-VI-19-2

Dive Imagery:



Figure 1: 32°50.9902'N;78°15.812'W: -50.2 m
Greenblotch parrotfish (*Sparisoma atomarium*)



Figure 2: 32°50.9118'N;78°15.87'W: -48.7 m
Swiftia exserta with polyps exsert



Figure 3: 32°50.9708'N;78°15.8219'W: -49.9 m
Tomate (*Haemulon aurolineatum*), Cubbyu (*Pareques umbrosus*), Red hind (*Epinephelus guttatus*), and dense algae



Figure 4: 32°50.9716'N;78°15.8218'W: -49.8 m
Cubbyu (*Pareques umbrosus*), Red hind (*Epinephelus guttatus*)



Figure 5: 32°51.028'N;78°15.778'W: -49.8 m
Spotted moray (*Gymnothorax moringa*)



Figure 6: 32°51.1718'N;78°15.6527'W: -49.4 m
Tube sponge (*Aplysina* sp.), and dense algae

Dive Site: South Carolina, Northern South Carolina MPA; SC-1; 50 m; ROV 19-05; UNCW 711; 9-VI-19-2

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 9-VI-19-2; ROV 19-05, UNCW Dive 711; South Carolina, Northern South Carolina MPA, SC 1, 50 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database. SBE 39 temperature/ depth recorder on ROV.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down or forward on vertical surfaces, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but generally headed N, depending on the ship's maneuverability with the wind and current.

ROV collection skid removed. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 48- 50 m

MB map shows NE-SW linear ridge inside MPA; 3200 m long, 30 m wide; ROV heading NE along ridge.

Weather- Cloudy, seas 1-2 ft from SE, wind 15 kn from 315 dg, air- 25.95 C, surface water- 27.3 C, salinity- 33.87 PSU, current- 0.5 kn to 313 dg.

9:47- Launch

9:49- On bottom- 50 m; visibility- 15 m, current- 0.1 from SW; 20 m to west base of ridge. Flat sediment, low relief flat rock; 50% cover of Dictyota, *Spatoglossum?*, *Narcissia trigonaria*, hydroids. Head E to ridge. Scamp.

9:52- West base of ridge, 50 m, *Dictyota* spp., flat blade Phaeophyta- *Spatoglossum?*, *Spriastrellidae*, *Chondrosia?*, ½-1 m relief, flat rock boulders, undercut ledges of 1 m wide, rectangular rock boulders at edge, 10-20o slope; scamp, tomtate, southern stingray, *Agelas clathrodes*, dense cover of Phaeophyta, sponges, *Ellisella elongata*, white grunt, graysby, *Aiolochroia crassa*, reef butterflyfish, rock beauty, lionfish, jackknife fish, DMST starlet sponge, scamp, sharpnose puffer, blue angelfish, squirrelfish, doctorfish, *Muricea*

10:04- top of ridge; 48.5 m; 1.5 m relief. Tansect along west edge. *Tanacetipathes*, Verongida yellow crust, bushy Axinellidae

10:16- West slope; same habitat, biota; jackknife fish, *Swiftia exserta*, Spanish hogfish.

10:23- top of ridge is flat pavement, dense algae. Cont. xs along west edge.

Dive Site: South Carolina, Northern South Carolina MPA; SC-1; 50 m; ROV 19-05; UNCW 711; 9-VI-19-2

10:25- Hd east across ridge; top flat pavement, low relief 49.5 m, low rugosity; mostly algae. *Ircinia campana*, hogfish.

10:28- East base, 49.7 m, coarse sand at base, slope very low relief, ½ m relief, no ledges. Hd NE along east face of ridge. Current from SE. Patchy pavement and sediment. Mostly algae, DMST sponge, *Ellisella* whips, *Agelas clathrodes*, gooey red algae, *Diodogorgia*, *Spatoglossum*, *Dictyota*.

10:33- Hd W across ridge.

10:35- On west slope, hd NE along slope; low relief, low slope, ½ m boulders, *Tanacetipathes*, same biota, red hind, graysby, *Chondylactis*, greenblotch parrotfish, dense tomtate, porgy, soapfish.

10:49- West slope, 1-2 m relief over 10 m width of slope; scattered ½ m relief flat boulders and rock slabs; flat coarse sand at base; spotted moray, scorpionfish, stripped grunt, yellow club *Verongida*.

11:01- Same habitat; lobster, cornetfish, cubbyu, *Clathriidae*.

11:10- *Swiftia exserta* abundant in small area

11:33- Back on east face of ridge; 50 m; ½ m relief, low slope, no undercut ledges; same biota; coarse sand and sand waves at base; hd NE along ridge slope. *Aplysina*, *Filograna*.

11:40- Change HD to west side of ridge; top of ridge, flat pavement, 49.0 m; dense algae.

11:42- On west slope heading NE; low relief slope 1 m, low slope, ½ m relief flat rock boulders, undercut slabs; sand/rubble at west base; same biota; tomtate schools, lionfish, scamp.

11:51- 1-2 m relief, west slope; 48 m at top.

11:54- end of transect; end of dive.

Dominant Benthic Macrobiota:

Antipatharia coral- *Tanacetipathes*

Gorgonia coral- *Diodogorgia*, *Muricea*, *Ellisella elongata*, *Swiftia exserta*

Actiniaria- *Chondylactis gigantea*

Hydroida

Porifera- *Agelas clathrodes*, *Spirastrellidae*, *Ircinia campana*, *Clathriidae*, *Verongida* yellow crust, *Verongida* club, DMST starlet sponge, *Chondrosia*, *Aplysina*

Annelida- *Filograna*

Decapoda- Lobster

Echinodermata- *Narcissia trigonaria*

Algae- *Dictyota* spp. (dense), *Spatoglossum*?; Rhodophyta spp., gooey red (common)

Human Debris:

1 can

Dive Site: South Carolina, Northern South Carolina MPA; SC-1; 50 m; ROV 19-05; UNCW 711; 9-VI-19-2

CPCe Percent Cover Analysis:

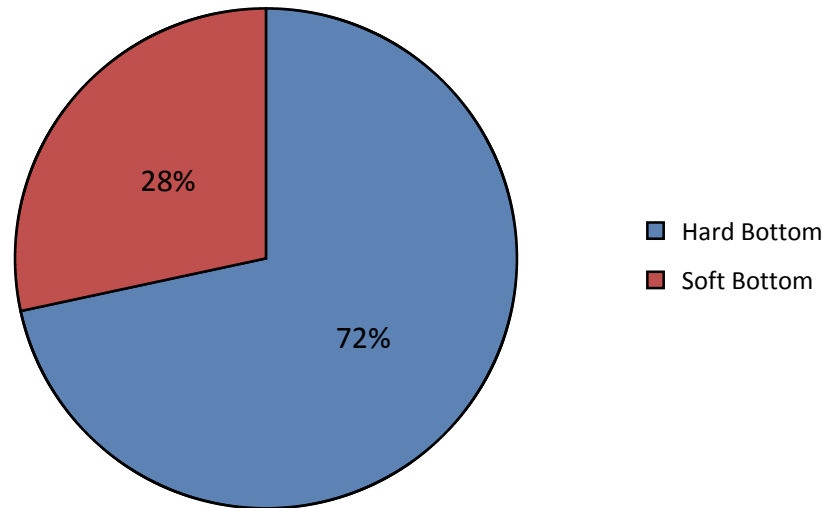
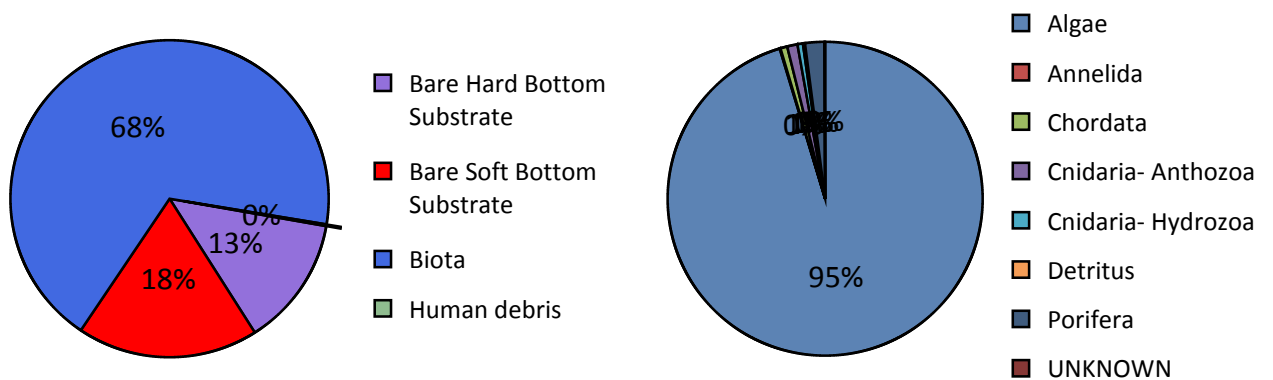


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-05. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-05.

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: South Carolina, Northern South Carolina MPA; SC-1; 50 m; ROV 19-05; UNCW 711; 9-VI-19-2

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-05.

	%	Notes
Biota	68.16%	X
Algae	64.98%	X
Algae- Unid.	0.24%	
Cyanobacteria	0.10%	
Chlorophyta	0.48%	
Ochrophyta	57.58%	X
<i>Dictyota</i> sp.	51.52%	X
Ochrophyta	4.52%	
<i>Padina</i> sp.	0.05%	X
<i>Spatoglossum</i> sp.	1.49%	X
Rhodophyta	6.59%	X
Corallinales	0.43%	
Rhodophyta	6.16%	X
Porifera	1.35%	X
Demospongiae	1.35%	X
<i>Agelas clathrodes</i> (Schmidt, 1870)	0.10%	X
<i>Aiolochoira crassa</i> (Hyatt, 1875)		X
<i>Aplysina</i> sp.		X
Axinellidae		X
<i>Callyspongia (Cladochalina) vaginalis</i> (Lamarck, 1814)		X
<i>Chondrosia</i> sp.		X
<i>Cinachyrella</i> sp.		X
<i>Cliona</i> cf. <i>tumula</i> Friday, Poppell & Hill, 2013	0.19%	X
Demospongiae	0.72%	
<i>Ircinia campana</i> (Lamarck, 1814)		X
<i>Ircinia</i> sp.	0.05%	
<i>Ircinia strobilina</i> (Lamarck, 1816)	0.24%	
Microcionidae		X
Spirastrellidae	0.05%	X
Verongiida		X
Cnidaria- Hydrozoa	0.38%	X
Hydrozoa	0.38%	X
Hydroidolina	0.38%	X
Cnidaria- Anthozoa	0.72%	X
Alcyonacea - gorgonian	0.63%	X
<i>Diodogorgia</i> sp.		X

Dive Site: South Carolina, Northern South Carolina MPA; SC-1; 50 m; ROV 19-05; UNCW 711; 9-VI-19-2

<i>Ellisella barbadensis</i> (Pallas, 1766)		X
<i>Ellisella</i> sp.	0.05%	X
<i>Muricea</i> sp.		X
<i>Swiftia exserta</i> (Ellis & Solander, 1786)	0.58%	X
Anthozoa - Non Coral		X
<i>Condylactis gigantea</i> (Weinland, 1860)		X
Antipatharia	0.10%	X
<i>Antipathes atlantica</i> Gray, 1857	0.10%	
<i>Tanacetipathes</i> sp.		X
Annelida	0.05%	X
Polychaeta	0.05%	X
<i>Filograna</i> sp.	0.05%	X
<i>Spirobranchus giganteus</i> (Pallas, 1766)		X
Arthropoda		X
Crustacea		X
<i>Panulirus argus</i> (Latreille, 1804)		X
Echinodermata		X
Asteroidea		X
<i>Narcissia trigonaria</i> Sladen, 1889		X
Chordata	0.48%	X
Chordata - Invertebrate	0.05%	X
Ascidiacea	0.05%	
<i>Eudistoma</i> sp.		X
Chordata - Vertebrate	0.43%	
Actinopterygii	0.43%	
Detritus	0.14%	
UNKNOWN	0.05%	
Human debris	0.19%	X
Human debris	0.19%	X
Human debris- Fishing Gear	0.19%	
Human debris- Trash		X
Human debris- cans/bottles		X
Habitat	31.65%	
Bare Hard Bottom Substrate	13.23%	
Hard bottom	13.23%	
Bare rock, pavement, boulder, ledge	13.23%	
Bare Soft Bottom Substrate	18.42%	
Grand Total	100.00%	

Dive Site: South Carolina, Northern South Carolina MPA; SC-1; 50 m; ROV 19-05; UNCW 711; 9-VI-19-2

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-05.

Class/Order/Family/Taxa Author - Common Name	ROV 19-05
Actinopterygii	
Anguilliformes	
Muraenidae	
<i>Gymnothorax moringa</i> (Cuvier, 1829) - Spotted Moray	1.28
Muraenidae - Moray Eels (Fam.)	0.32
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	5.14
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	12.85
<i>Myripristis jacobus</i> Cuvier, 1829 - Blackbar Soldierfish	0.96
<i>Plectrypops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish	0.32
Perciformes	
Acanthuridae	
<i>Acanthurus chirurgus</i> (Bloch, 1787) - Doctorfish	6.10
<i>Acanthurus</i> sp. - Surgeonfish	1.93
Apogonidae	
<i>Apogon pseudomaculatus</i> Longley, 1932 - Twospot Cardinalfish	0.32
<i>Apogon</i> sp. - Cardinalfish	0.96
Carangidae	
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	1.28
<i>Seriola</i> sp. - Amberjack	0.64
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	6.42
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	16.38
<i>Prognathodes aculeatus</i> (Poey, 1860) - Longsnout Butterflyfish	0.32
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	0.64
Haemulidae	
<i>Haemulon aurolineatum</i> Cuvier, 1830 - Tomtate Grunt	2184.39
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	26.66
<i>Haemulon striatum</i> (Linnaeus, 1758) - Striped Grunt	256.99
Kyphosidae	
<i>Kyphosus</i> sp. - Chub	0.32
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	13.17
<i>Bodianus rufus</i> (Linnaeus, 1758) - Spanish Hogfish	1.28
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	0.96

Dive Site: South Carolina, Northern South Carolina MPA; SC-1; 50 m; ROV 19-05; UNCW 711; 9-VI-19-2

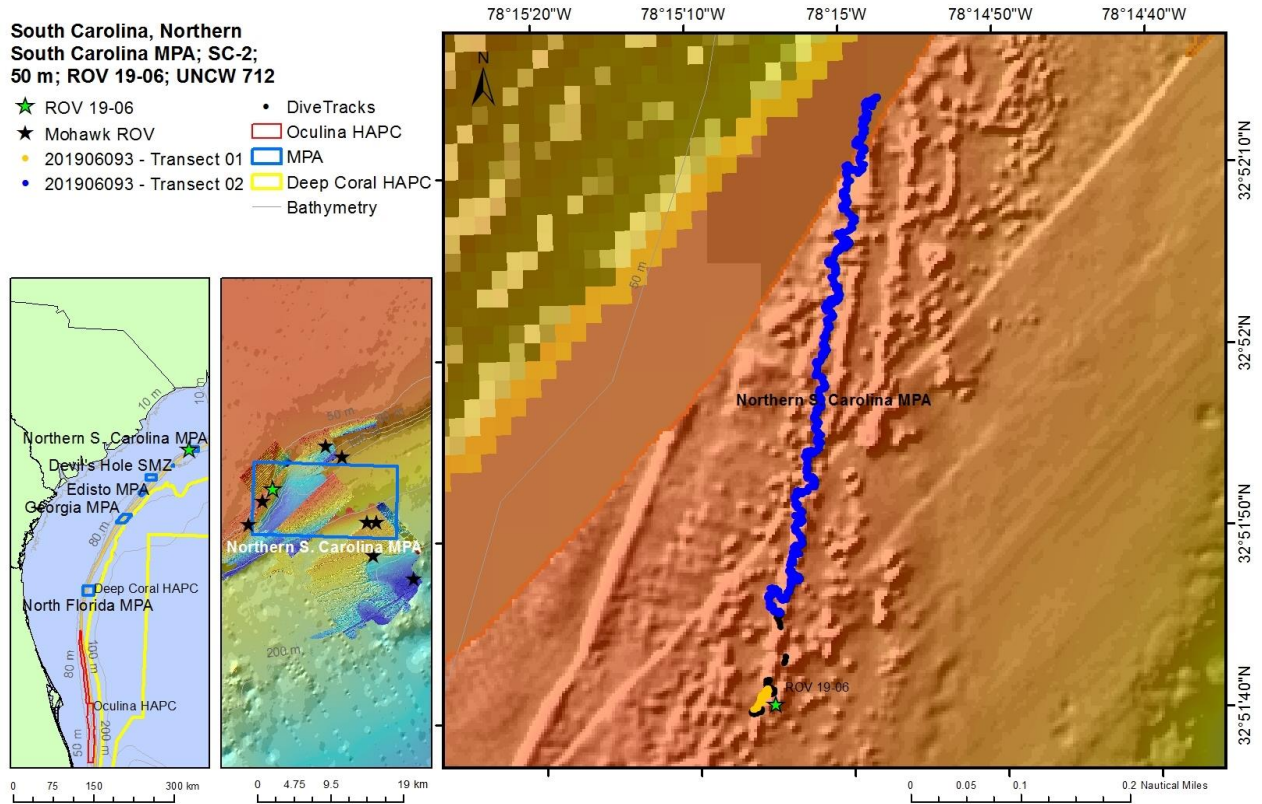
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	26.98
<i>Halichoeres</i> sp. - Wrasse	2.89
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	0.64
<i>Xyrichtys</i> sp. - Unidentified Razorfish	0.32
Lutjanidae	
<i>Lutjanus</i> sp. - Snapper	0.32
Mullidae	
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	12.85
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	10.28
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	6.10
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	0.32
Pomacentridae	
<i>Chromis cyanea</i> (Poey, 1860) - Blue Chromis	0.32
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reeffish	0.96
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	8.99
<i>Chromis scotti</i> Emery, 1968 - Purple Reeffish	2.25
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damselfish	0.64
Priacanthidae	
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	1.28
Scaridae	
<i>Sparisoma atomarium</i> (Poey, 1861) - Greenblotch Parrotfish	12.85
Sciaenidae	
<i>Equetus lanceolatus</i> (Linnaeus, 1758) - Jack-knifefish	9.96
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	157.40
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	4.50
<i>Epinephelus guttatus</i> (Linnaeus, 1758) - Red Hind	0.64
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	2.25
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	5.14
Serranidae/Grammistinae	
<i>Rypticus saponaceus</i> (Bloch & Schneider, 1801) - Greater Soapfish	2.25
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	1.28
<i>Serranus baldwini</i> (Evermann & Marsh, 1899) - Lantern Bass	0.96
<i>Serranus phoebe</i> Poey, 1851 - Tattler	7.39
Sparidae	
<i>Calamus</i> sp. - Porgy	3.85
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	14.13
<i>Scorpaena plumieri</i> Bloch, 1789 - Spotted Scorpionfish	0.32

Dive Site: South Carolina, Northern South Carolina MPA; SC-1; 50 m; ROV 19-05; UNCW 711; 9-VI-19-2

Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	0.32
Syngnathiformes	
Aulostomidae	
<i>Aulostomus maculatus</i> Valenciennes, 1841 - Atlantic Trumpetfish	0.96
Fistulariidae	
<i>Fistularia tabacaria</i> Linnaeus, 1758 - Bluespotted cornetfish	0.32
Tetraodontiformes	
Monacanthidae	
<i>Cantherhines macrocerus</i> (Hollard, 1853) - Whitespotted Filefish	0.32
<i>Cantherhines pullus</i> (Ranzani, 1842) - Orangespotted Filefish	0.96
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	36.30
Elasmobranchii	
Myliobatiformes	
Dasyatidae	
<i>Hypanus americanus</i> (Hildebrand & Schroeder, 1928) - Southern Stingray	0.32
UNKNOWN Biota	1.93

Dive Site: South Carolina, Northern South Carolina MPA; SC-2; 50 m; ROV 19-06; UNCW 712; 9-VI-19-3

General Location and Dive Track:



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Sedberry_OEBlock1_5m_UT M17N_MB_Grid

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Depth (m)

Date of Dive: 6/9/2019

Specimens: 0

Digital Photos: 204

No. DVD: 2

Hard Drive No.: 1

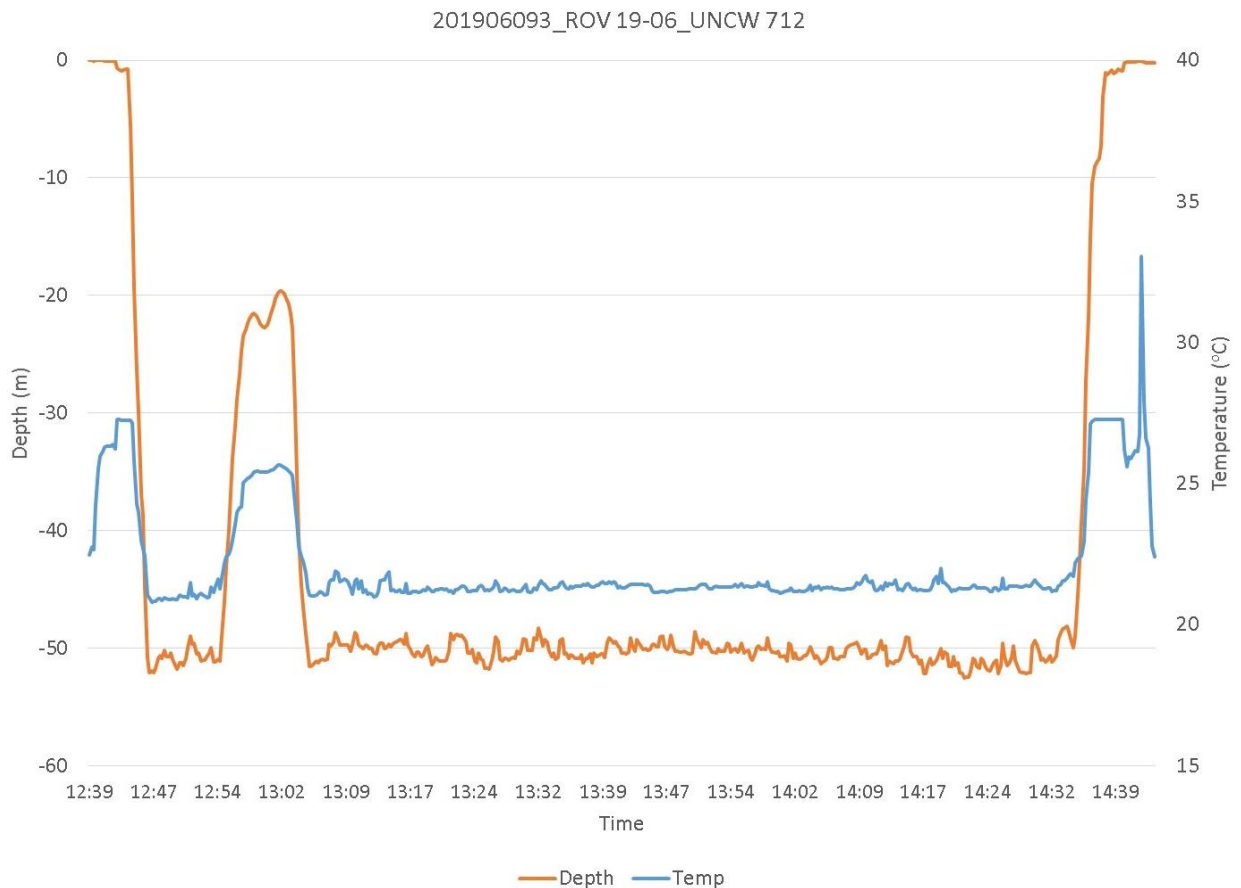
Dive Site: South Carolina, Northern South Carolina MPA; SC-2; 50 m; ROV 19-06; UNCW 712; 9-VI-19-3

Dive Data:

Minimum Bottom Depth (m): -46	Total Transect Length (km): 1.180
Maximum Bottom Depth (m): -52.9	Surface Current (kn): 0.5
On Bottom (Time- EDST): 12:45	On Bottom (Lat/Long): 32.8612°N; -78.2518°W
Off Bottom (Time- EDST): 14:32	Off Bottom (Lat/Long): 32.8705°N; -78.2494°W
Physical (bottom); Temp (°C): 22.7	Salinity: N/A Visibility (m): N/A Current (kn): N/A

Physical Environment:

Distance from Dive Site(km): 0.00



Temperature and Depth were collected with a SBE39 attached to the ROV (recording descent, bottom and ascent). The ranges of the bottom data recorded during ROV 19-06 are as follows: Depth Maximum: 52.5 m and Temperature: 20.78-25.66 °C.

Dive Site: South Carolina, Northern South Carolina MPA; SC-2; 50 m; ROV 19-06; UNCW 712; 9-VI-19-3

Dive Imagery:

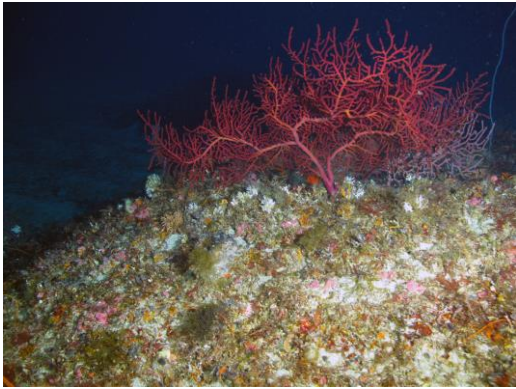


Figure 1: 32°51.8189'N;78°15.064'W: -51.4 m
Muricea pendula

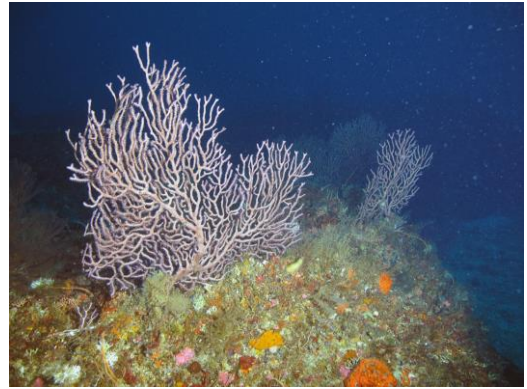


Figure 2: 32°52.1381'N;78°15.0002'W: -50.2 m
Hypnogorgia sp.



Figure 3: 32°52.1925'N;78°14.9839'W: -51.8 m
Lobster (*Panulirus argus*)



Figure 4: 32°52.2089'N;78°14.9782'W: -52.6 m
Coney grouper(*Cephalopholis fulva*)



Figure 5: 32°52.0018'N;78°15.0256'W: -51.2 m
Hard bottom with dense brown algae (*Dictyota* sp.)
and red algae



Figure 6: 32°52.0798'N;78°15.0191'W: -50.7 m
Scamp (*Mycteroperca phenax*), Reef butterflyfish
(*Chaetodon sedentarius*)

Dive Site: South Carolina, Northern South Carolina MPA; SC-2; 50 m; ROV 19-06; UNCW 712; 9-VI-19-3

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 9-VI-19-3; ROV 19-06, UNCW Dive 712; South Carolina, Northern South Carolina MPA, SC 2, 50 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database. SBE 39 temperature/ depth recorder on ROV.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down or forward on vertical surfaces, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but generally headed N, depending on the ship's maneuverability with the wind and current.

ROV collection skid removed. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 50- 52.5 m

MB map shows area of rounded knolls inside MPA, east of morning ridge dive; ROV XS heading N.

Weather- Cloudy, seas 2 ft from SE, wind 12 kn from 137 dg, air- 26.26 C, surface water- 27.38 C, salinity- 33.9 PSU, current- 0.5 kn to 343 dg.

12:42- Launch

12:45- On bottom- 52.7 m; visibility- 15 m, current- 0; close to WP; flat coarse sand with sand waves, smooth rock knolls, 30-45 dg slope, rounded top, no undercut ledges, 1-2 m tall. Scattered knolls with sand planes between. Heading N; *Stichopathes*, Rhodophyta and Phaeophyta, *Dictyota* spp., *Filograna*, *Ellisella elongata*, *Callyspongia vaginalis*, less algae than am dives; *Tanacetipathes* black coral, *Agelas clathrodes*, *Antipathes atlantica*, *Aplysina* hollow tubes.

12:54- loss of power.

1:05- Back on. On bottom, 52 m, sand; 50.2 m on top; knolls 2-3 diameter, 1-2 m tall, 30 dg slope, round top; *Stichopathes luetkeni*, gooey red algae, squirrel fish, white grunt.

1:10- elongated rounded knoll, ~10 m wide, forming N-S ridge; lionfish, DMST starlet sponges, *Ircinia campana*, *Schizoporella*, hogfish, *Iciligorgia schrammi*, *Penicillus*, porgy, *Muricea*, blue angelfish.

1:24- same habitat; spotfin butterflyfish, spanish hogfish.

Dive Site: South Carolina, Northern South Carolina MPA; SC-2; 50 m; ROV 19-06; UNCW 712; 9-VI-19-3

1:40- same habitat, biota; traveling through series of knolls with sand chutes. More *Dictyota*, red algae, *Stichopathes*, *Ircinia campana*, *Filograna* abundant.

1:55- same; *Microdictyon* green algae, scamp, *Solendaria*, *Muricea*, *Iciligorgia*, *Dictyota* and Rhodophyta, dense *Filograna*, lionfish.

2:11- 51 m in sand chutes; 1 m knolls, same biota; scamp, *Iciligorgia*, 30 cm hydroids on top of knolls, bank butterflyfish, spotted moray eel, *Swiftia exserta* (1).

2:24- 52.5 m, in sand chute, lobster in small hole at base of knoll; 50 m on top knoll; off MB; 2 m knolls continue.

2:32- 50 m, end xs, end dive.

Dominant Benthic Macrobiota:

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

Gorgonia coral- *Muricea*, *Iciligorgia schrammi*, *Diodogorgia*, *Ellisella elongata*, *Swiftia exserta* (1)

Hydroida- 30 cm stinging black, *Solendaria*

Porifera- *Agelas clathrodes*, *Ircinia campana*, DMST starlet, *Callyspongia vaginalis*, *Aplysina* hollow tubes

Annelida- *Filograna* (dense)

Decapoda- lobster

Bryozoa- *Schizoporella*

Algae- *Dictyota* spp., Rhodophyta spp., gooey red, *Microdictyon*

Human Debris:

None

Dive Site: South Carolina, Northern South Carolina MPA; SC-2; 50 m; ROV 19-06; UNCW 712; 9-VI-19-3

CPCe Percent Cover Analysis:

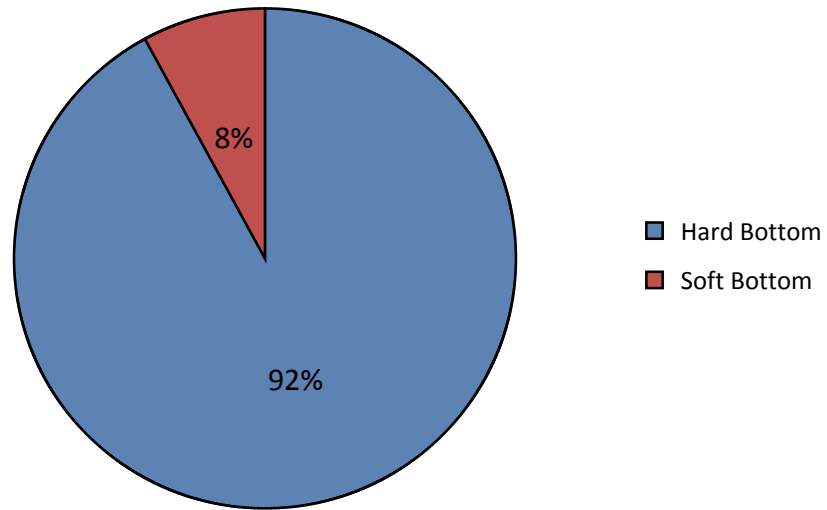
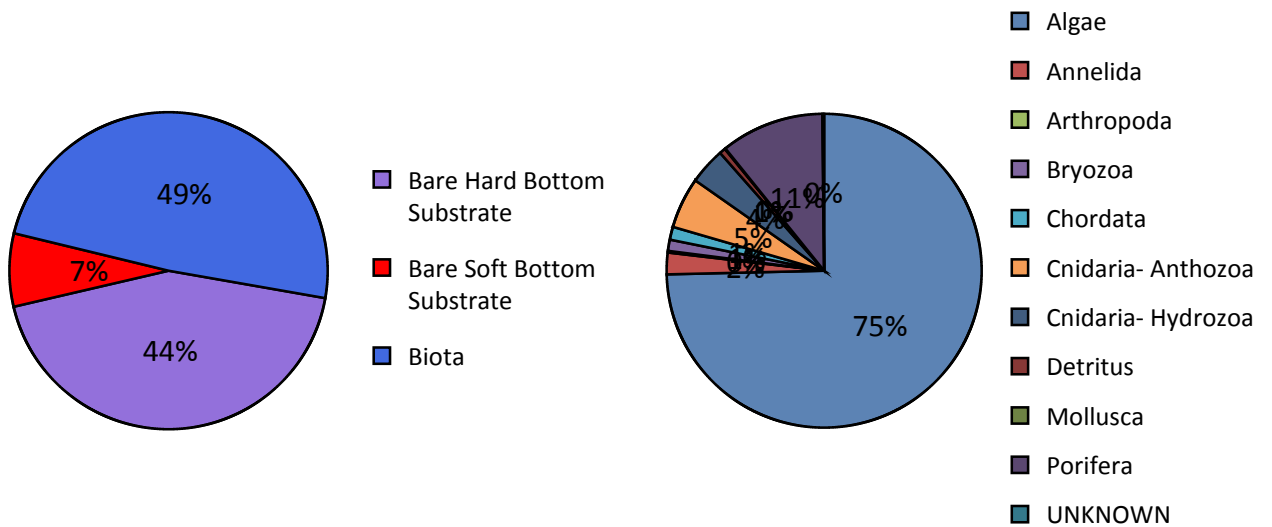


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-06. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-06. 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: South Carolina, Northern South Carolina MPA; SC-2; 50 m; ROV 19-06; UNCW 712; 9-VI-19-3

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-06.

	%	Notes
Biota	48.98%	X
Algae	36.55%	X
Algae- Unid.	0.31%	
Cyanobacteria	0.52%	
Chlorophyta	0.70%	X
Chlorophyta	0.70%	
<i>Microdictyon</i> sp.		X
<i>Penicillus</i> sp.		X
<i>Ulva</i> sp.		X
Ochrophyta	10.12%	X
<i>Dictyota</i> sp.	8.42%	X
Ochrophyta	1.70%	X
Rhodophyta	24.90%	X
Corallinales	5.49%	
Rhodophyta	19.41%	X
Porifera	5.19%	X
Demospongiae	5.19%	X
<i>Agelas clathrodes</i> (Schmidt, 1870)	0.39%	X
<i>Agelas</i> sp.	0.17%	
<i>Aplysina</i> sp.		X
<i>Callyspongia (Cladochalina) vaginalis</i> (Lamarck, 1814)		X
<i>Callyspongia</i> sp.	0.09%	
<i>Cliona</i> cf. <i>tumula</i> Friday, Poppell & Hill, 2013	0.09%	X
Demospongiae	3.40%	
<i>Ircinia campana</i> (Lamarck, 1814)		X
<i>Ircinia strobilina</i> (Lamarck, 1816)	0.09%	X
Microcionidae		X
<i>Niphates</i> sp.	0.09%	
<i>Oceanapia</i> sp.	0.70%	
Spirastrellidae	0.17%	X
Cnidaria- Hydrozoa	1.83%	X
Hydrozoa	1.83%	X
Hydroidolina	1.83%	X
<i>Solanderia</i> sp.		X
Cnidaria- Anthozoa	2.57%	X
Alcyonacea - Alcyoniina	0.04%	

Dive Site: South Carolina, Northern South Carolina MPA; SC-2; 50 m; ROV 19-06; UNCW 712; 9-VI-19-3

<i>Nidalia occidentalis</i> Gray, 1835	0.04%	
Alcyonacea - gorgonian	1.96%	X
Alcyonacea- gorgonian	0.17%	
<i>Bebryce</i> sp.		X
<i>Diodogorgia</i> sp.	0.09%	
<i>Ellisella barbadensis</i> (Pallas, 1766)		X
<i>Ellisella</i> sp.	1.48%	X
Ellisellidae	0.04%	
<i>Iciligorgia schrammi</i> Duchassaing, 1870	0.17%	X
<i>Muricea</i> sp.		X
<i>Swiftia exserta</i> (Ellis & Solander, 1786)		X
Antipatharia	0.17%	X
<i>Antipathes atlantica</i> Gray, 1857		X
<i>Stichopathes luetkeni</i> Brook, 1889	0.13%	X
<i>Tanacetipathes</i> sp.	0.04%	X
Coral- Scleractinia	0.39%	
<i>Madracis myriaster</i> (Milne Edwards & Haime, 1850)	0.39%	
Annelida	1.09%	X
Polychaeta	1.09%	X
<i>Filograna</i> sp.	1.09%	X
Mollusca	0.04%	
Bivalvia	0.04%	
Arthropoda	0.09%	X
Crustacea	0.09%	X
<i>Panulirus argus</i> (Latreille, 1804)	0.09%	X
Scyllaridae		X
Bryozoa	0.57%	X
Bryozoa	0.17%	X
Gymnolaemata	0.39%	X
<i>Schizoporella</i> sp.	0.39%	X
Chordata	0.65%	X
Chordata - Invertebrate	0.17%	X
Ascidiacea	0.09%	
Didemnidae	0.09%	
<i>Eudistoma</i> sp.		X
Chordata - Vertebrate	0.48%	
Actinopterygii	0.48%	
Detritus	0.31%	
UNKNOWN	0.09%	
Habitat	51.02%	
Bare Hard Bottom Substrate	43.57%	
Hard bottom	43.57%	

Dive Site: South Carolina, Northern South Carolina MPA; SC-2; 50 m; ROV 19-06; UNCW 712; 9-VI-19-3

Bare rock, pavement, boulder, ledge	43.35%	
Bare rubble/cobble	0.22%	
Bare Soft Bottom Substrate	7.46%	
Grand Total	100.00%	X

Dive Site: South Carolina, Northern South Carolina MPA; SC-2; 50 m; ROV 19-06; UNCW 712; 9-VI-19-3

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-06.

Class/Order/Family/Taxa Author - Common Name	ROV 19-06
Actinopterygii	
Anguilliformes	
Muraenidae	
<i>Gymnothorax moringa</i> (Cuvier, 1829) - Spotted Moray	0.58
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	3.11
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	3.50
<i>Holocentrus rufus</i> (Walbaum, 1792) - Longspine Squirrelfish	1.56
<i>Myripristis jacobus</i> Cuvier, 1829 - Blackbar Soldierfish	2.53
Perciformes	
Acanthuridae	
<i>Acanthurus chirurgus</i> (Bloch, 1787) - Doctorfish	0.97
<i>Acanthurus</i> sp. - Surgeonfish	0.78
Carangidae	
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	0.39
<i>Seriola</i> sp. - Amberjack	1.17
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	3.50
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	15.76
<i>Prognathodes aculeatus</i> (Poey, 1860) - Longsnout Butterflyfish	0.39
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	2.14
Haemulidae	
<i>Haemulon aurolineatum</i> Cuvier, 1830 - Tomtate Grunt	53.49
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	1.95
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	8.36
<i>Clepticus parrae</i> (Bloch & Schneider, 1801) - Creole Wrasse	1.56
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	1.17
<i>Halichoeres cyanocephalus</i> (Bloch, 1791) - Yellowcheek Wrasse	2.14
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	8.95
<i>Halichoeres</i> sp. - Wrasse	19.45
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	1.17
Microdesmidae	
<i>Ptereleotris</i> sp. - Dartfish	0.19
Mullidae	

Dive Site: South Carolina, Northern South Carolina MPA; SC-2; 50 m; ROV 19-06; UNCW 712; 9-VI-19-3

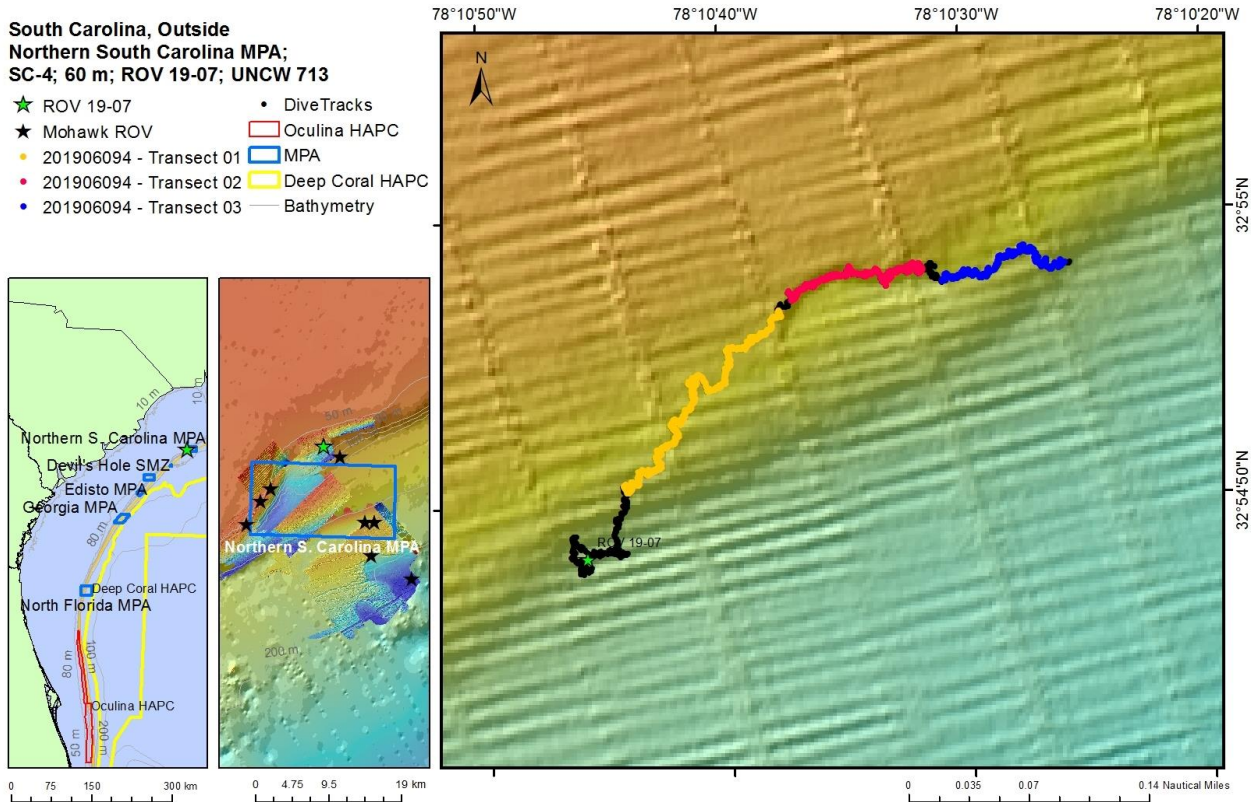
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	0.39
Pomacanthidae	
<i>Centropyge argi</i> Woods & Kanazawa, 1951 - Cherubfish	0.58
<i>Holacanthus</i> sp. - Angelfish	6.81
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	2.92
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	0.39
Pomacentridae	
<i>Chromis enchrysur</i> Jordan & Gilbert, 1882 - Yellowtail Reeffish	0.58
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	40.65
<i>Chromis scotti</i> Emery, 1968 - Purple Reeffish	2.72
Scaridae	
<i>Sparisoma atomarium</i> (Poey, 1861) - Greenblotch Parrotfish	3.11
Sciaenidae	
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	2.14
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	0.39
<i>Cephalopholis fulva</i> (Linnaeus, 1758) - Coney	0.19
<i>Epinephelus adscensionis</i> (Osbeck, 1765) - Rock Hind	0.19
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	0.97
<i>Mycteroperca microlepis</i> (Goode & Bean, 1879) - Gag	0.19
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	1.17
<i>Paranthias furcifer</i> (Valenciennes, 1828) - Creole-fish	1.56
Serranidae/Grammistinae	
<i>Rypticus saponaceus</i> (Bloch & Schneider, 1801) - Greater Soapfish	0.97
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	3.89
<i>Serranus baldwini</i> (Evermann & Marsh, 1899) - Lantern Bass	5.25
<i>Serranus phoebe</i> Poey, 1851 - Tattler	10.50
<i>Serranus tortugarum</i> Longley, 1935 - Chalk Bass	1.17
Sparidae	
<i>Calamus</i> sp. - Porgy	3.50
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	5.84
Syngnathiformes	
Aulostomidae	
<i>Aulostomus maculatus</i> Valenciennes, 1841 - Atlantic Trumpetfish	0.19
Fistulariidae	
<i>Fistularia tabacaria</i> Linnaeus, 1758 - Bluespotted cornetfish	0.19
Tetraodontiformes	
Monacanthidae	
<i>Cantherhines macrocerus</i> (Hollard, 1853) - Whitespotted Filefish	0.19

Dive Site: South Carolina, Northern South Carolina MPA; SC-2; 50 m; ROV 19-06; UNCW 712; 9-VI-19-3

<i>Cantherhines pullus</i> (Ranzani, 1842) - Orangespotted Filefish	0.39
Ostraciidae	
<i>Acanthostracion quadricornis</i> (Linnaeus, 1758) - Scrawled Cowfish	0.39
<i>Lactophrys trigonus</i> (Linnaeus, 1758) - Buffalo Trunkfish	0.19
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	6.81
<i>Sphoeroides spengleri</i> (Bloch, 1785) - Bandtail Puffer	0.19
UNKNOWN Biota	3.11

Dive Site: South Carolina, Outside Northern South Carolina MPA; SC-4; 60 m; ROV 19-07; UNCW 713; 9-VI-19-4

General Location and Dive Track:



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Pisces_2018_North_SC_area_4m_Grid

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Depth (m)

Date of Dive: 6/9/2019

Specimens: 0

Digital Photos: 122

No. DVD: 2

Hard Drive No.: 1

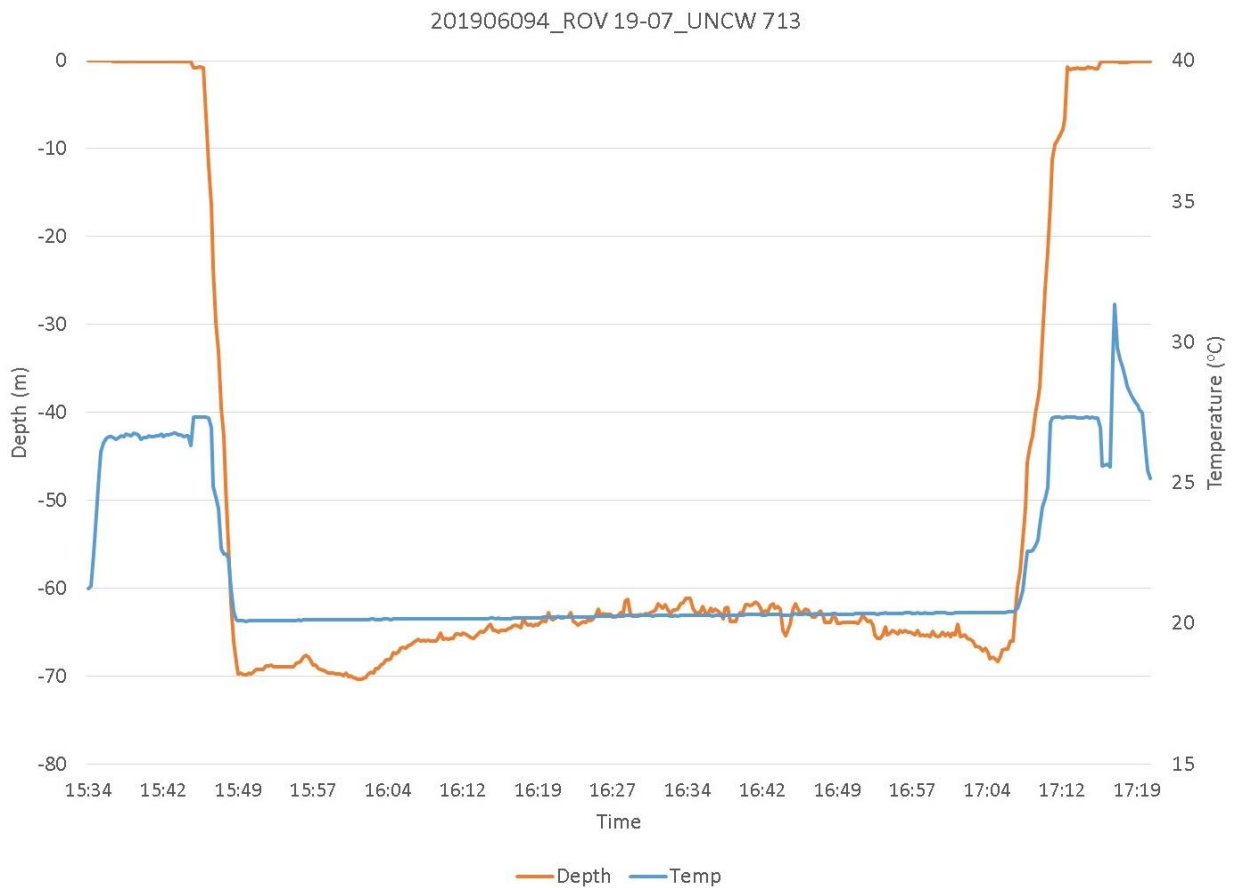
Dive Site: South Carolina, Outside Northern South Carolina MPA; SC-4; 60 m; ROV 19-07; UNCW 713; 9-VI-19-4

Dive Data:

Minimum Bottom Depth (m): -61.3	Total Transect Length (km): 0.769
Maximum Bottom Depth (m): -71	Surface Current (kn): 1
On Bottom (Time- EDST): 15:49	On Bottom (Lat/Long): 32.9132°N; -78.1795°W
Off Bottom (Time- EDST): 17:05	Off Bottom (Lat/Long): 32.9162°N; -78.1739°W
Physical (bottom); Temp (°C): 20.4	Salinity: N/A Visibility (m): 5 Current (kn): 0.5

Physical Environment:

Distance from Dive Site(km): 0.00



Temperature and Depth were collected with a SBE39 attached to the ROV (recording descent, bottom and ascent). The ranges of the bottom data recorded during ROV 19-07 are as follows: Depth Maximum: 70.4 m and Temperature: 20.08-20.42 °C.

Dive Site: South Carolina, Outside Northern South Carolina MPA; SC-4; 60 m; ROV 19-07; UNCW 713; 9-VI-19-4

Dive Imagery:



Figure 1: 32°54.8005'N;78°10.7762'W: -70.5 m
Spotted moray (*Gymnothorax moringa*)



Figure 2: 32°54.9304'N;78°10.6471'W: -63.5 m
Red sea urchin (*Astropyga magnifica*)



Figure 3: 32°54.9565'N;78°10.6177'W: -63.2 m
Stout moray (*Muraena robusta*)

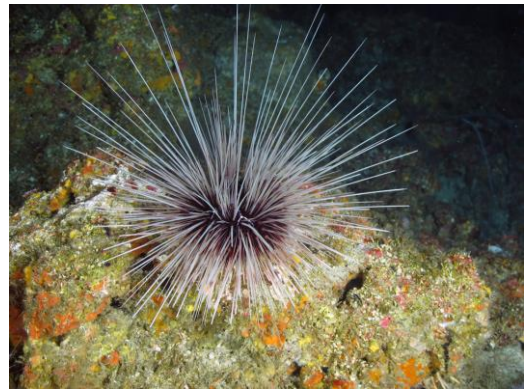


Figure 4: 32°54.9652'N;78°10.555'W: -63.3 m
Sea urchin (*Diadema antillarum?*)



Figure 5: 32°54.9682'N;78°10.5397'W: -64.2 m
Spotted moray (*Gymnothorax moringa*)



Figure 6: 32°54.9761'N;78°10.474'W: -65.9 m
Lionfish (*Pterois volitans*)

Dive Site: South Carolina, Outside Northern South Carolina MPA; SC-4; 60 m; ROV 19-07; UNCW 713; 9-VI-19-4

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 9-VI-19-4; ROV 19-07, UNCW Dive 713; South Carolina, Outside Northern South Carolina MPA, SC 4, 60 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database. SBE 39 temperature/ depth recorder on ROV.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down or forward on vertical surfaces, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but generally headed N, depending on the ship's maneuverability with the wind and current.

ROV collection skid removed. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: m

MB map shows NE-SW oriented scarp, 4 km long, 60 m top, 70 m base, facing east, fairly featureless; north of MPA.

Weather- P/cloudy, seas 3ft from SE, wind 18 kn from 163 dg, air- 26.53 C, surface water- 27.46 C, salinity- 33.37 PSU, current- 1.0 kn to 59 dg.

3:44- Launch

3:49- On bottom- 70.8 m; visibility- 5 m, current- 0.5 kn from N; at base of scarp near WP; flat sediment, shells, rubble. Blue angelfish, rock scour hole with short bigeye, spotted moray, orange starfish. Heading N toward scarp. Branching bryozoa, *Ircinia*. Patchy hard bottom, hogfish, thorny oyster, tattler, terebellid tubes all over bottom. *Filograna*.

3:59- hd NE parallel to base of scarp. Pavement with sediment veneer, sparse exposed rock, sediment, rubble, shell.

4:02- Change hd to N to head upslope; bigeyes in holes, encrusting orange sponge on rock, *Ircinia* w/ hydroids, hogfish, *Calappa* crab, 67.5 m, more hard bottom, hydroids, *Ircinia*.

4:09- 65 m, on top of 'scarp' in MB; head NE toward a definite ledge feature on the MB (64- 61 m), 240 m to

Dive Site: South Carolina, Outside Northern South Carolina MPA; SC-4; 60 m; ROV 19-07; UNCW 713; 9-VI-19-4

the NE. Start xs photos; *Ircinia campana*, flat sediment, patchy exposed hard bottom, bigeye in scour holes, bryozoa orange branching, sea biscuit *Meoma*, yellowtail reeffish, lizardfish.

4:26- 64 m, hd to ledge of MB; same habitat; purple urchin *Areosoma?*,

4:31- at ledge, 63.3 m top of ledge, 64.2 m on east face of slope, 62.5 m half way down ledge on MB, 20o slope; base of ledge 66.0 m, sand; 4 m relief, same on MB; numerous fish, scatter rock outcrops, 25 cm relief, hydroids, *Stichopathes*, *Filograna*, amberjack, hogfish, *Calamus porgy*, lionfish, *Filograna*, stout moray eel, stairstep face of ridge, with 25 cm outcrops, orange and yellow encrusting, *Geodia neptuni*, Spirastrellidae, hydroids, bank butterflyfish, white grunt, rock hind, ½ m rocks, triggerfish, hake, *Diodogorgia*, large white spine urchin, spanish hogfish, blackbar drum, spotted moray.

4:49- at east end of ledge feature on MB; 64.5 m, still rock outcrops, blue angelfish, rock hind, *Ellisella elongata*, lionfish, cubbyu, orange starfish.

4:54- off ledge, back on flat hard bottom and sand, 66 m; *Ircinia* covered with *Filograna*, hydroids, bigeyes, tattlers, white grunt, hogfish.

5:03- near main escarpment on MB, 67.8 m, flat, exposed rock pavement, sand, scoured rock w fish, *Diodogorgia*, *Stichopathes*, hydroids, *Narcissia trigonaria*.

5:05- 67.5 m; end xs, end dive.

Dominant Benthic Macrobiota:

Antipatharia coral- *Stichopathes*

Gorgonia coral- *Diodogorgia*, *Ellisella elongata*

Hydroida

Porifera- *Ircinia* spp., *Ircinia campana*, *Geodia neptuni*, Spirastrellidae, orange and yellow encrusting

Annelida- *Filograna*, Terebellidae

Decapoda- *Calappa*

Echinodermata- *Meoma*, orange asteroidea, *Narcissia trigonaria*, large long white spine urchin, large long spine purple urchin- *Areosoma?* (did not have sacks on spine tips)

Mollusca- thorny oyster

Bryozoa- orange bushy

Human Debris:

None

Dive Site: South Carolina, Outside Northern South Carolina MPA; SC-4; 60 m; ROV 19-07; UNCW 713; 9-VI-19-4

CPCe Percent Cover Analysis:

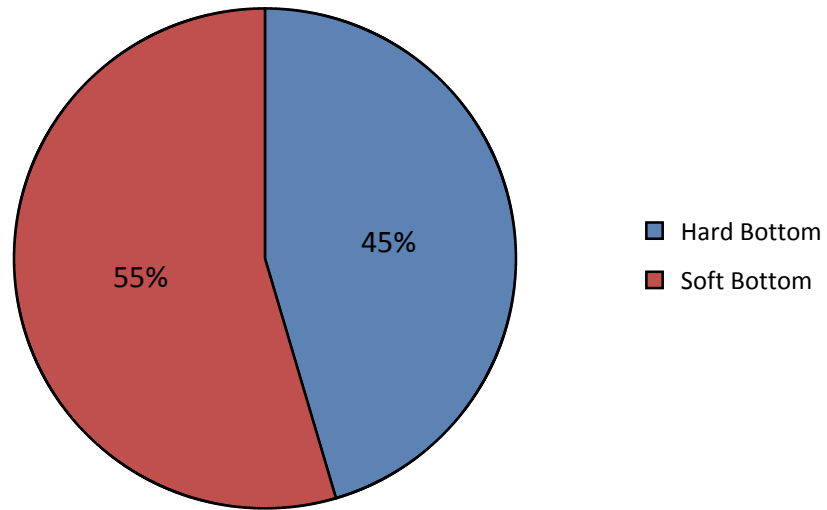
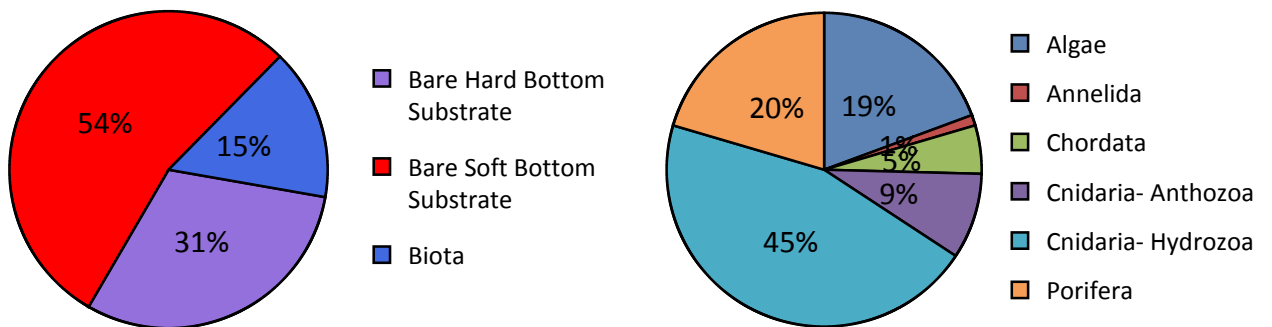


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-07. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-07.

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

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes of benthic macro-biota and substrate from photographic transects at dive site ROV 19-07.

	%	Notes
Biota	15.43%	X
Algae	2.98%	
Rhodophyta	2.98%	
Corallinales	2.90%	
Rhodophyta	0.09%	
Porifera	3.15%	X
Demospongiae	3.15%	X
<i>Agelas clathrodes</i> (Schmidt, 1870)		X
<i>Agelas</i> sp.	0.09%	
<i>Cliona cf. tumula</i> Friday, Poppell & Hill, 2013	0.09%	X
Demospongiae	2.47%	
<i>Geodia neptuni</i> (Sollas, 1886)	0.09%	X
<i>Ircinia campana</i> (Lamarck, 1814)	0.26%	X
<i>Ircinia</i> sp.		X
Spirastrellidae	0.17%	X
Cnidaria- Hydrozoa	6.99%	X
Hydrozoa	6.99%	X
Hydroidolina	6.99%	X
Cnidaria- Anthozoa	1.36%	X
Alcyonacea - Alcyoniina	0.09%	
Octocorallia	0.09%	
Alcyonacea - gorgonian	0.17%	X
Alcyonacea- gorgonian	0.17%	
<i>Diodogorgia</i> sp.		X
<i>Ellisella barbadensis</i> (Pallas, 1766)		X
Antipatharia	1.11%	X
<i>Antipathes atlantica</i> Gray, 1857	0.17%	X
<i>Stichopathes luetkeni</i> Brook, 1889	0.94%	X
Annelida	0.17%	X
Polychaeta	0.17%	X
<i>Filograna</i> sp.	0.17%	X
Terebellidae		X
Mollusca		X
Bivalvia		X
<i>Spondylus</i> sp.		X
Arthropoda		X

Crustacea		X
Anomura		X
<i>Calappa</i> sp.		X
Decapoda		X
Scyllaridae		X
Bryozoa		X
Bryozoa		X
Echinodermata		X
Asteroidea		X
Asteroidea		X
<i>Narcissia trigonaria</i> Sladen, 1889		X
Echinoidea		X
Echinoidea		X
<i>Meoma</i> sp.		X
Chordata	0.77%	
Chordata - Vertebrate	0.77%	
Chordata	0.77%	
Bare Hard Bottom Substrate	30.61%	
Bare Hard Bottom Substrate	30.61%	
Hard bottom	30.61%	
Bare rock, pavement, boulder, ledge	30.61%	
Bare Soft Bottom Substrate	53.96%	
Grand Total	100.00%	X

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-07.

Class/Order/Family/Taxa Author - Common Name	ROV 19-07
Actinopterygii	
Anguilliformes	
Muraenidae	
<i>Gymnothorax moringa</i> (Cuvier, 1829) - Spotted Moray	2.21
<i>Muraena robusta</i> Osório, 1911 - Stout Moray	0.89
Aulopiformes	
Synodontidae	
<i>Synodus</i> sp. - Lizardfish	0.44
Beryciformes	
Holocentridae	
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	11.07
Gadiformes	
Phycidae	
Phycidae - Phycid Hakes (Fam.)	0.44
Perciformes	
Carangidae	
Carangidae - Jacks And Pompanos (Fam.)	1.33
<i>Seriola</i> sp. - Amberjack	3.54
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	3.10
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	14.61
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	5.31
Haemulidae	
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	19.03
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	6.64
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	29.66
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	0.44
<i>Halichoeres</i> sp. - Wrasse	106.24
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	5.31
Lutjanidae	
<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper	0.44
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	4.43
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	3.10
Pomacentridae	

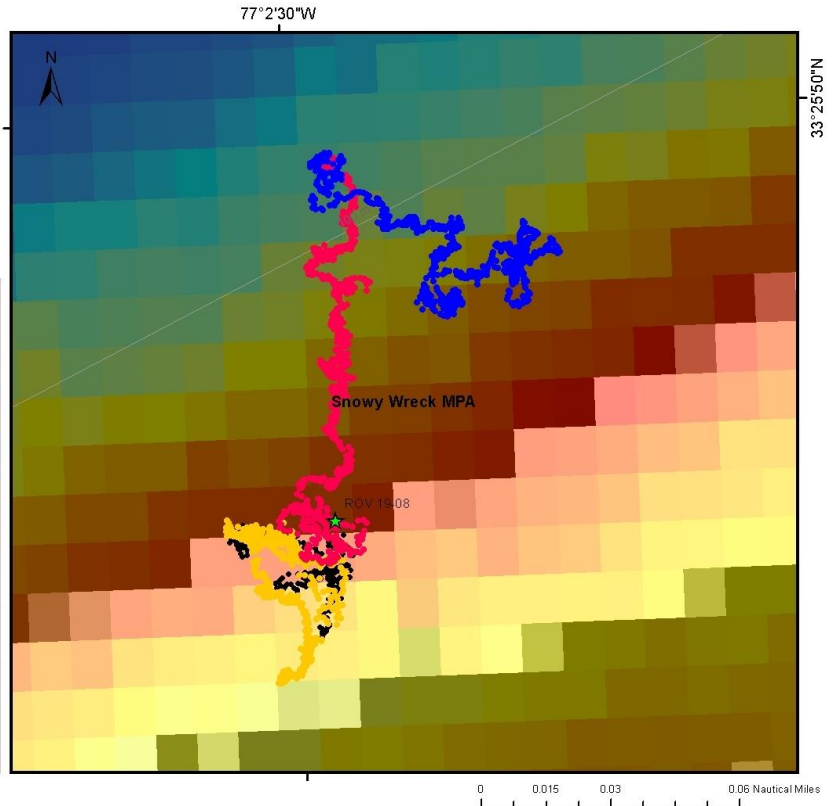
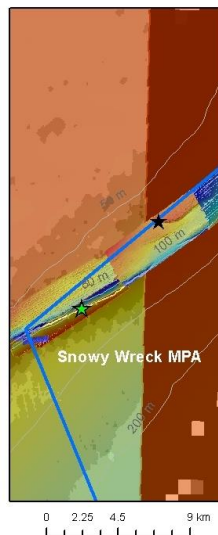
<i>Chromis enchrysur</i> Jordan & Gilbert, 1882 - Yellowtail Reeffish	27.89
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	64.19
<i>Chromis scotti</i> Emery, 1968 - Purple Reeffish	4.87
<i>Chromis</i> sp. - Damselfish/chromis	8.85
Priacanthidae	
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	1.33
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	27.00
Sciaenidae	
<i>Pareques iwamotoi</i> Miller & Woods, 1988 - Blackbar Drum	0.44
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	4.43
Serranidae/Anthiadae	
<i>Pronotogrammus martinicensis</i> (Guichenot, 1868) - Roughtongue Bass	0.44
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	3.54
<i>Epinephelus adscensionis</i> (Osbeck, 1765) - Rock Hind	0.89
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	1.33
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	2.21
<i>Paranthias furcifer</i> (Valenciennes, 1828) - Creole-fish	1.33
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	0.44
<i>Serranus phoebe</i> Poey, 1851 - Tattler	43.82
Sparidae	
<i>Calamus</i> sp. - Porgy	13.28
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	9.74
Tetraodontiformes	
Balistidae	
<i>Balistes capriscus</i> Gmelin, 1789 - Grey Triggerfish	4.43
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	10.62
<i>Sphoeroides spengleri</i> (Bloch, 1785) - Bandtail Puffer	1.33

Dive Site: North Carolina, Snowy Wreck MPA: Reef; NC-3; 110 m; ROV 19-08; UNCW 714; 10-VI-19-1

General Location and Dive Track:

North Carolina, Snowy Wreck MPA:
Reef; NC-3; 110 m; ROV 19-08; UNCW 714

- ★ ROV 19-08
- ★ Mohawk ROV
- 201906101 - Transect 01
- 201906101 - Transect 02
- 201906101 - Transect 03
- DiveTracks
- Oculina HAPC
- MPA
- Deep Coral HAPC
- Bathymetry



Site Overview:

Project: MPA Grant

Principal Investator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Pisces_2017_NC2

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Depth (m)

Date of Dive: 6/10/2019

Specimens: 0

Digital Photos: 180

No. DVD: 2

Hard Drive No.: 1

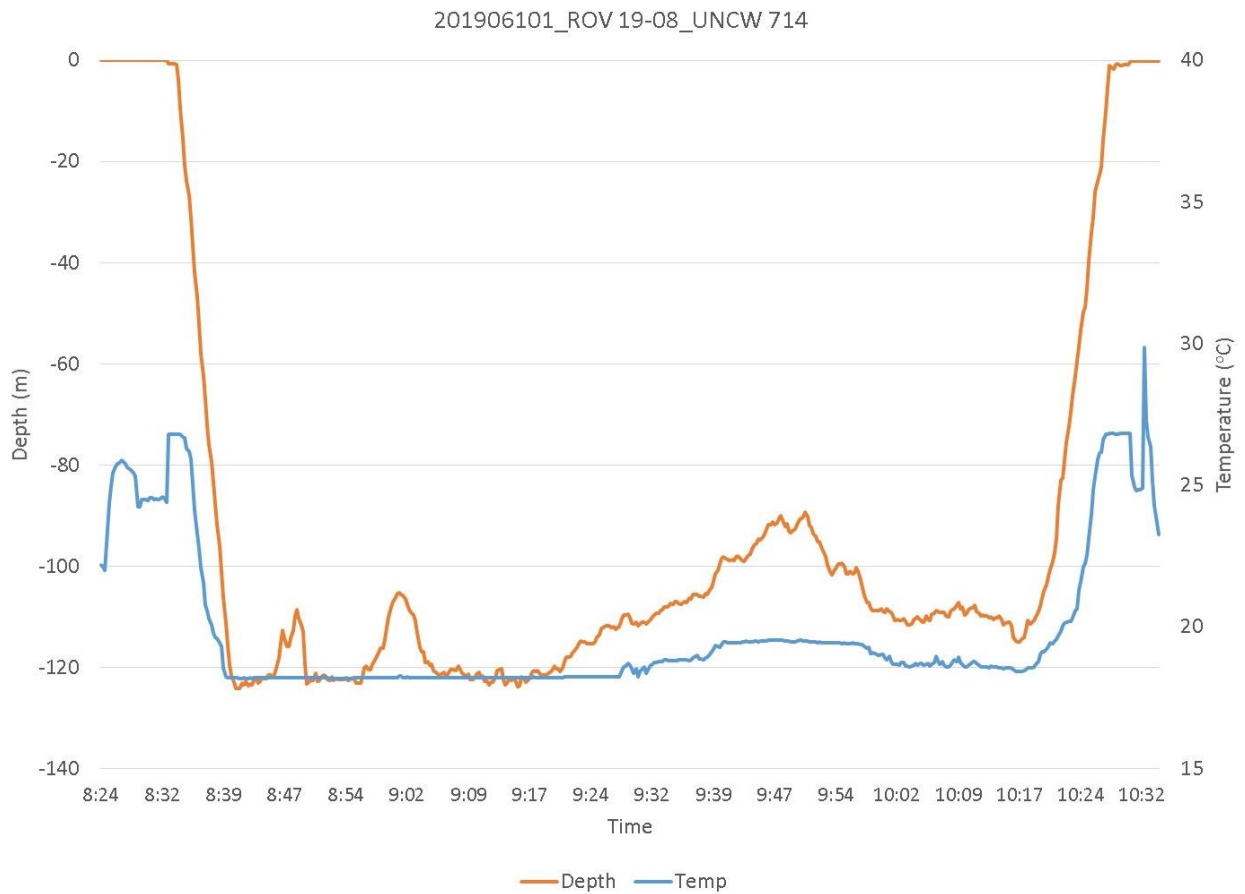
Dive Site: North Carolina, Snowy Wreck MPA: Reef; NC-3; 110 m; ROV 19-08; UNCW 714; 10-VI-19-1

Dive Data:

Minimum Bottom Depth (m): -89.5	Total Transect Length (km): 0.699
Maximum Bottom Depth (m): -125.1	Surface Current (kn): 0.4
On Bottom (Time- EDST): 8:40	On Bottom (Lat/Long): 33.429°N; -77.042°W
Off Bottom (Time- EDST): 10:20	Off Bottom (Lat/Long): 33.43°N; -77.0409°W
Physical (bottom); Temp (°C): 18.2	Salinity: N/A Visibility (m): 10 Current (kn): N/A

Physical Environment:

Distance from Dive Site(km): 0.00



Temperature and Depth were collected with a SBE39 attached to the ROV (recording descent, bottom and ascent). The ranges of the bottom data recorded during ROV 19-08 are as follows: Depth Maximum: 124.2 m and Temperature: 18.18-19.54 °C.

Dive Imagery:

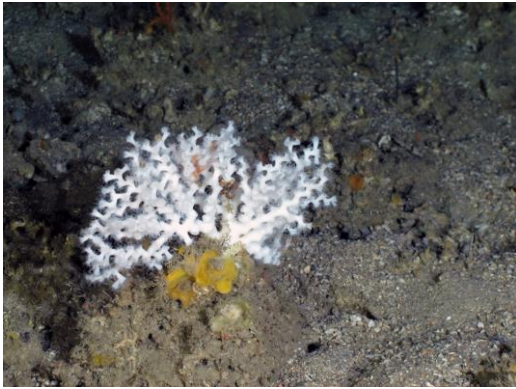


Figure 1: 33°25.7361'N;77°2.518'W: -123 m
Azooxanthellate scleractinian coral (*Madrepora carolina* or *M. oculata*)

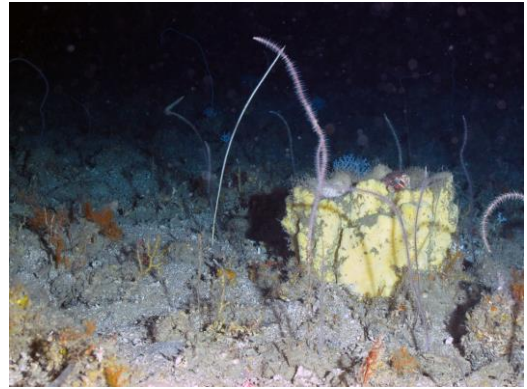


Figure 2: 33°25.7467'N;77°2.494'W: -122 m
Ircinia sponge and whip corals

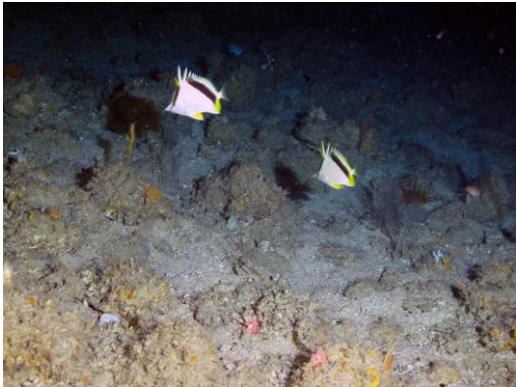


Figure 3: 33°25.7586'N;77°2.4932'W: -118.3 m
Bank butterflyfish (*Prognathodes aya*)



Figure 4: 33°25.7698'N;77°2.492'W: -115.8 m
Highfin scorpionfish (*Pontinus rathbuni*)



Figure 5: 33°25.7727'N;77°2.4916'W: -112 m
Spanish flag (*Gonioplectrus hispanus*) on eroded rock ledge



Figure 6: 33°25.7727'N;77°2.4916'W: -112.5 m
Blackbar drum (*Pareques iwamotoi*), scleractinian coral on rock

Dive Site: North Carolina, Snowy Wreck MPA: Reef; NC-3; 110 m; ROV 19-08; UNCW 714; 10-VI-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 10-VI-19-1; ROV 19-08, UNCW Dive 714; Snowy Wreck MPA Reef Site, NC 3, 110 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database. SBE 39 temperature/ depth recorder on ROV.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down or forward on vertical surfaces, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but generally headed N, depending on the ship's maneuverability with the wind and current.

ROV collection skid removed. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 93- 125 m

MB map shows an NE-SW escarpment with trough at NW corner of MPA, 20 m resolution. Top of escarpment 80 m, trough 120 m, ridge seaward of trough 105 m. ROV XS heading NE along trough at 110 m.

Weather- P/cloudy, seas 3-4 ft from SE, wind 8 kn from 185 dg, air- 27.5 C, surface water- 26.86 C, salinity- 34.99 PSU, current- 0.6 kn to 265 dg.

8:32- Launch

8:40- On bottom- 125 m; visibility- 5- 10 m, current- variable, $\frac{3}{4}$ kn near end ; in trench, at WP, flat, rock pavement with 5-10 cm cobble, dense *Stichopathes luetkeni*, 5-10 cm *Madrepora oculata* common.

8:46- Ship having trouble station keeping, 20 kn wind from SW. Pulled off bottom.

8:50- back on bottom, 124 m. Same habitat. Red solo cup on *Madrepora*. Spherical white Astrophorida, yellow paramuriceids, *Madrepora* with *Astroporpa annulata*, and spiny ophiuroid. Plastic sheet.

8:55- Hd SE to go up ridge on S side of trough. Sand/shell hash, rubble, cobble,

8:59- 110 m, 100% sand/shell; 105 m on top of ridge.

9:01- Change heading, hd NE across trough and up escarpment. Amberjack.

9:09- 124 m, XS parallel to trough HD NE; in trough, cobble, *Madrepora*, *Stichopathes*, lionfish, scorpionfish. Fishing line.

Dive Site: North Carolina, Snowy Wreck MPA: Reef; NC-3; 110 m; ROV 19-08; UNCW 714; 10-VI-19-1

9:16- Hd NE upslope, *Madrepora* abundant, vase sponge with yellow encrusting on sfc, hermit crab, 80% hard bottom, 5-15 cm *Madrepora*, bank butterflyfish, yellow encrusting *Verongida*?

9:22- 116 m, rock ledge 1 m relief, rock pavement and outcrops, low relief and low slope. Scorpionfish, hydroid, fewer *Madrepora*, rock boulders and outcrops < ½ m, very eroded rock, spanish flag fish, 20 cm *Oculina varicosa* (or *Madracis myriaster*); too far away to see.

9:28- 5-10 dg slope, ½ m boulders, 112 m; sparse, biota, few black coral, anthiids, lionfish, ye *verongida*, hydroids, small white sponges, wrasse bass, jackknife fish, *Stichopathes*, fishing line, *Bebryce*?, *Tanacetipathes*, *Antipathes furcata*?, porgies.

9:36- 106 m, dense 5-10 cm orange and yellow paramuriceids, white *Oceanapia*, rock cobble, small boulders, hd N.

9:40- 100 m 30 dg slope, rock, 80% HB, ye *Verongida*, *Stichopathes*, bigeye, lionfish, Axinellida sponge knocked over; 92 m, 5-10 dg slope.

9:46- 93 m, flat top, rock <1/2 m relief boulders or outcrops. Change hd, head downslope then parallel to slope between 100 and 115 m. Reef butterflyfish, red snapper, amberjack, scamp, red barbier.

9:55- 100 m, 30 dg slope, ½ m boulders, current- difficult for ROV; 2 scamp.

10:00- 110 m, boulders, outcrops, ledges; fishing line, spanish flag, 5-10 cm white coral, *Stylaster*?,

10:10- 110 m, XS parallel to slope along the northern rim of the trough, staying at about 110 m. rock boulders; 50 cm tall, highly rugose, lots of hidy holes. scorpionfish. Fishing line, *Oceanapia*.

10:17- 114 m, jagged boulders ½ m tall 10-20o slope, same scorpion fish we just saw.

10:20- 110 m; end xs, end dive.

Dominant Benthic Macrobiota:

Scleractinia coral- *Madrepora oculata*, *Oculina varicosa*/or *Madracis myriaster*, *Stylaster*?

Antipatharia coral- *Tanacetipathes*, *Antipatharia furcata*, *Antipatharia* spp., *Stichopathes*

Gorgonia coral- yellow and orange *Paramuriceidae*

Hydroida

Porifera- Yellow encrusting *Verongida*, *Oceanapia*, spherical white *Astrophorida*

Human Debris:

Fishing line

CPCe Percent Cover Analysis:

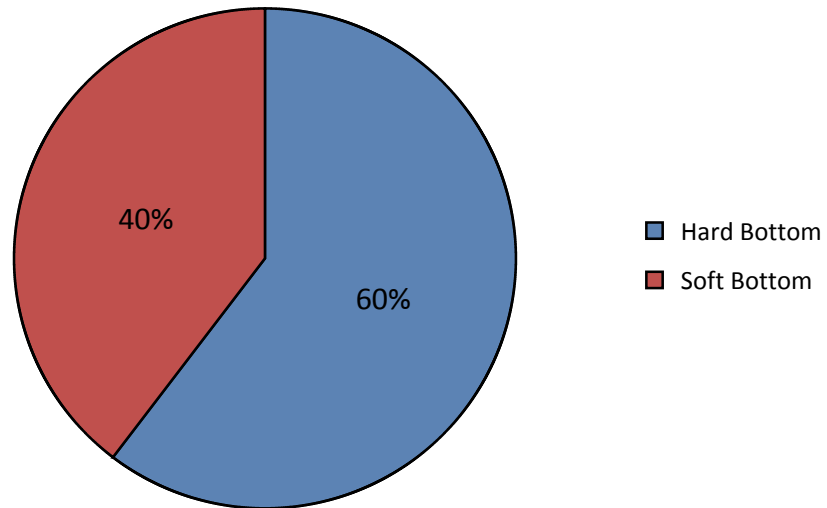
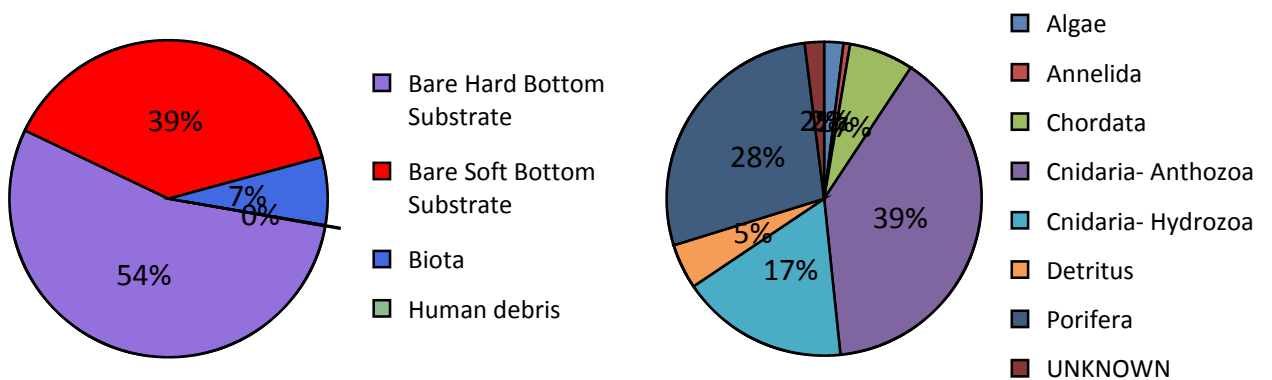


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-08. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-08.

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: North Carolina, Snowy Wreck MPA: Reef; NC-3; 110 m; ROV 19-08; UNCW 714; 10-VI-19-1

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-08.

	%	Notes
Biota	6.93%	X
Algae	0.14%	
Algae- Unid.	0.05%	
Ochrophyta	0.05%	
<i>Dictyota</i> sp.	0.05%	
Rhodophyta	0.05%	
Porifera	1.93%	X
Demospongiae	1.93%	X
Axinellidae		X
Demospongiae	1.83%	
<i>Ircinia</i> sp.		X
<i>Oceanapia</i> sp.	0.05%	X
Poecilosclerida	0.05%	
Tetractinellida		X
Verongiida		X
Cnidaria- Hydrozoa	1.19%	X
Hydrozoa	1.19%	X
Hydroidolina	1.19%	
<i>Stylaster</i> sp.		X
Cnidaria- Anthozoa	2.71%	X
Alcyonacea - gorgonian	0.50%	X
Alcyonacea- gorgonian	0.23%	X
Paramuriceidae		X
Plexauridae- MPA1	0.28%	
Antipatharia	1.93%	X
Antipatharia	0.28%	
<i>Antipathes furcata</i> Gray, 1857	0.55%	X
<i>Stichopathes luetkeni</i> Brook, 1889	0.69%	X
<i>Tanacetipathes</i> sp.	0.41%	X
Coral- Scleractinia	0.28%	X
<i>Madracis myriaster</i> (Milne Edwards & Haime, 1850)	0.05%	
<i>Madrepora oculata</i> Linnaeus, 1758		X
<i>Madrepora</i> sp.	0.18%	
<i>Oculina varicosa</i> Le Sueur, 1820		X
Scleractinia- unid cup	0.05%	
Annelida	0.05%	

Dive Site: North Carolina, Snowy Wreck MPA: Reef; NC-3; 110 m; ROV 19-08; UNCW 714; 10-VI-19-1

Polychaeta	0.05%	
<i>Filograna</i> sp.	0.05%	
Arthropoda		X
Crustacea		X
Decapoda		X
Echinodermata		X
Ophiuroidea		X
<i>Asteroporpa (Asteroporpa) annulata</i> Örsted & Lütken in: Lütken, 1856		X
<i>Ophiothrix (Ophiothrix) sp.</i>		X
Chordata	0.46%	
Chordata - Vertebrate	0.46%	
Actinopterygii	0.46%	
Detritus	0.32%	
UNKNOWN	0.14%	
Human debris	0.09%	X
Human debris	0.09%	X
Human debris- other	0.09%	
Human debris- Trash		X
Human debris- plastic		X
Habitat	92.98%	
Bare Hard Bottom Substrate	54.31%	
Dead Coral	0.23%	
Bare coral rubble	0.05%	
dead standing Scleractinia (habitat)	0.18%	
Hard bottom	54.08%	
Bare rock, pavement, boulder, ledge	52.16%	
Bare rubble/cobble	1.93%	
Bare Soft Bottom Substrate	38.67%	
Grand Total	100.00%	X

Dive Site: North Carolina, Snowy Wreck MPA: Reef; NC-3; 110 m; ROV 19-08; UNCW 714; 10-VI-19-1

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-08.

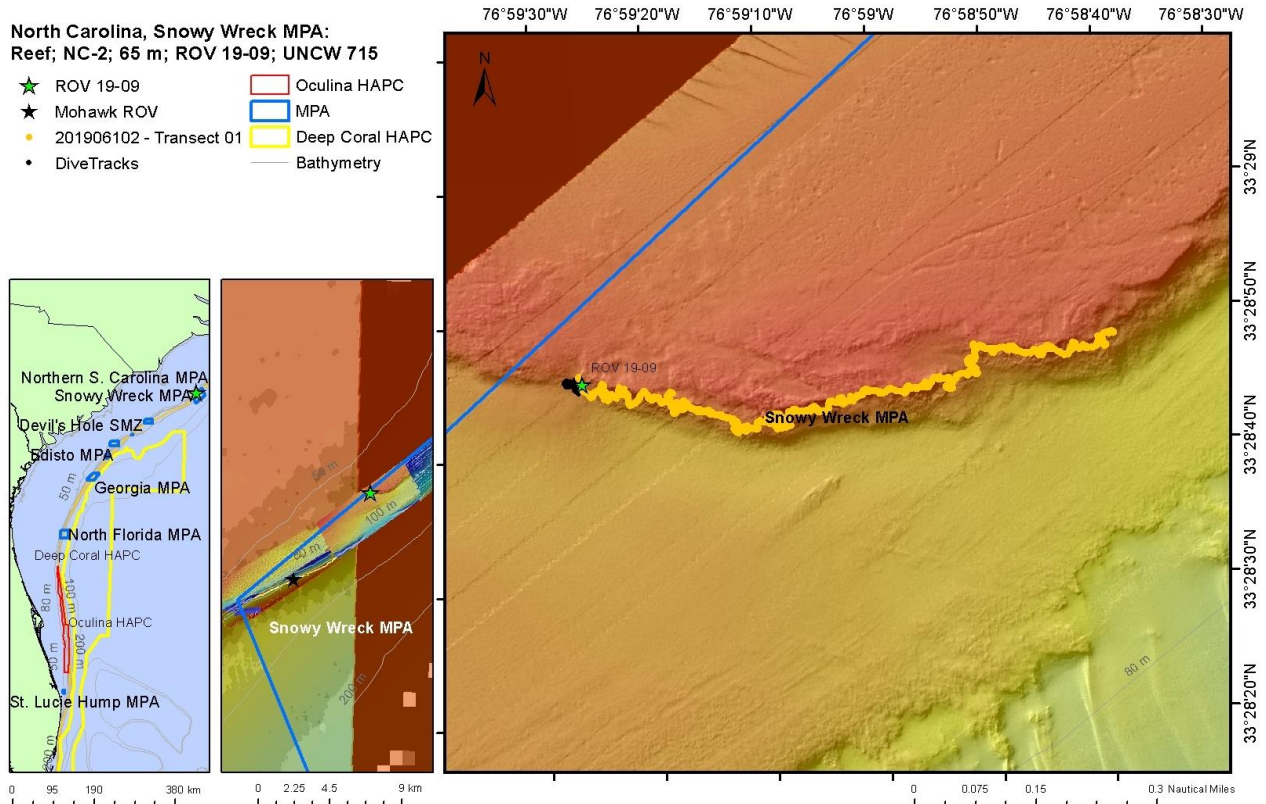
Class/Order/Family/Taxa Author - Common Name	ROV 19-08
Actinopterygii	
Anguilliformes	
Muraenidae	
<i>Gymnothorax moringa</i> (Cuvier, 1829) - Spotted Moray	0.32
Aulopiformes	
Synodontidae	
<i>Synodus</i> sp. - Lizardfish	0.32
Beryciformes	
Holocentridae	
<i>Plectrypops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish	0.32
Perciformes	
Apogonidae	
<i>Apogon pseudomaculatus</i> Longley, 1932 - Twospot Cardinalfish	0.32
Carangidae	
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	0.32
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	4.48
<i>Seriola</i> sp. - Amberjack	1.92
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	0.96
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	2.56
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	5.77
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	0.32
<i>Decodon puellaris</i> (Poey, 1860) - Red Hogfish	1.28
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	3.20
<i>Halichoeres</i> sp. - Wrasse	12.81
Lutjanidae	
<i>Lutjanus vivanus</i> (Cuvier, 1828) - Silk Snapper	1.92
Pomacanthidae	
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	0.32
Priacanthidae	
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	15.37
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	4.16
Sciaenidae	
<i>Equetus lanceolatus</i> (Linnaeus, 1758) - Jack-knifefish	0.64
<i>Pareques iwamotoi</i> Miller & Woods, 1988 - Blackbar Drum	0.96

Dive Site: North Carolina, Snowy Wreck MPA: Reef; NC-3; 110 m; ROV 19-08; UNCW 714; 10-VI-19-1

<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	0.64
Serranidae/Anthiaginae	
Anthiaginae - Sea Bass: Groupers And Fairy Basslets (Fam.)	241.51
<i>Hemanthias vivanus</i> (Jordan & Swain, 1885) - Red Barbier	8.65
<i>Plectranthias garrupellus</i> Robins & Starck, 1961 - Apricot Bass	0.96
<i>Pronotogrammus martinicensis</i> (Guichenot, 1868) - Roughtongue Bass	82.64
Serranidae/Epinephelinae	
<i>Gonioplectrus hispanus</i> (Cuvier, 1828) - Spanish Flag	1.92
<i>Liopropoma aberrans</i> (Poey, 1860) - Eye Stripe Basslet	4.80
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	7.05
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	0.96
Serranidae/Grammistinae	
<i>Rypticus saponaceus</i> (Bloch & Schneider, 1801) - Greater Soapfish	0.96
Serranidae/Serraninae	
<i>Serranus notospilus</i> Longley, 1935 - Saddle Bass	0.64
<i>Serranus phoebe</i> Poey, 1851 - Tattler	9.29
Sparidae	
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	4.16
Sparidae - Porgies (Fam.)	1.92
Scorpaeniformes	
Scorpaenidae	
<i>Pontinus rathbuni</i> Goode & Bean, 1896 - Highfin Scorpionfish	0.32
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	18.90
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	1.92
Tetraodontiformes	
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	2.88
UNKNOWN Biota	1.28

Dive Site: North Carolina, Snowy Wreck MPA: Reef; NC-2; 65 m; ROV 19-09; UNCW 715; 10-VI-19-2

General Location and Dive Track:



Site Overview:

Project: MPA Grant

Principal Investator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: NancyFoster_14_08_MPA_NC_SnowyWreck

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Depth (m)

Date of Dive: 6/10/2019

Specimens: 0

Digital Photos: 598

No. DVD: 4

Hard Drive No.: 1

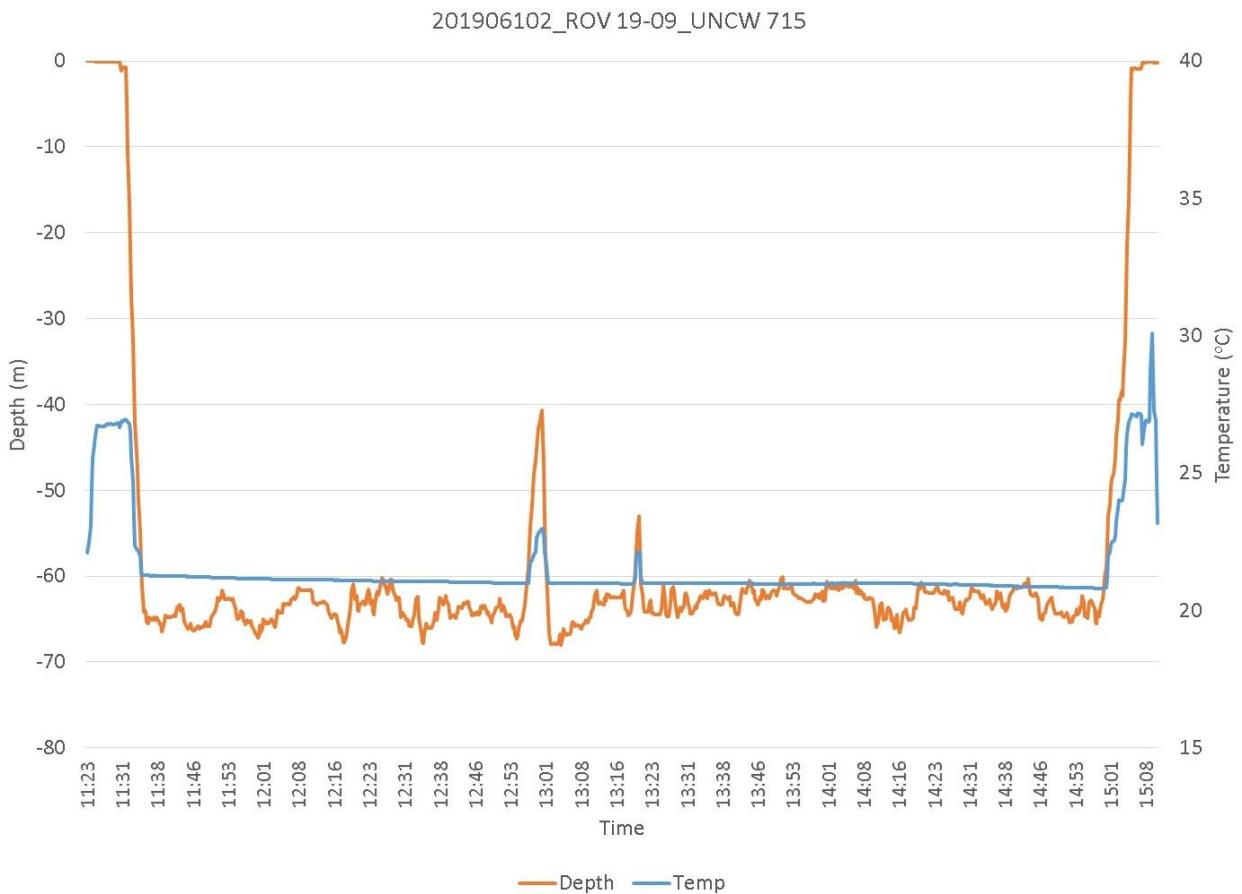
Dive Site: North Carolina, Snowy Wreck MPA: Reef; NC-2; 65 m; ROV 19-09; UNCW 715; 10-VI-19-2

Dive Data:

Minimum Bottom Depth (m): -40.9	Total Transect Length (km): 1.778
Maximum Bottom Depth (m): -68.4	Surface Current (kn): 1.3
On Bottom (Time- EDST): 11:34	On Bottom (Lat/Long): 33.4794°N; -76.991°W
Off Bottom (Time- EDST): 14:59	Off Bottom (Lat/Long): 33.48°N; -76.978°W
Physical (bottom); Temp (°C): 22	Salinity: N/A Visibility (m): 30 Current (kn): 0.5

Physical Environment:

Distance from Dive Site(km): 0.00



Temperature and Depth were collected with a SBE39 attached to the ROV (recording descent, bottom and ascent). The ranges of the bottom data recorded during ROV 19-09 are as follows: Depth Maximum: 68 m and Temperature: 20.81-22.97 °C.

Dive Imagery:



Figure 1: 33°28.752'N;76°59.4397'W: -66.7 m
Tube sponge (*Aplysina* sp.)



Figure 2: 33°28.7488'N;76°59.423'W: -66.4 m
Swiftia exserta

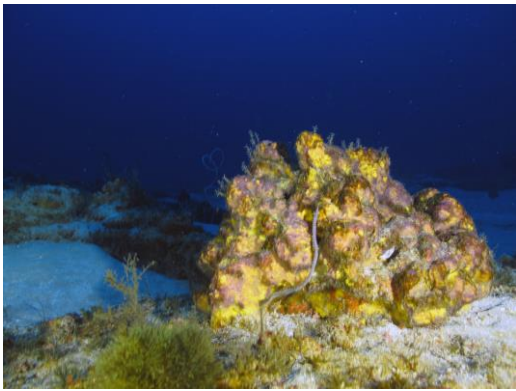


Figure 3: 33°28.7564'N;76°59.4104'W: -63.3 m
Unid. demosponge (*Aiolochoira crassa*?)



Figure 4: 33°28.7464'N;76°59.3855'W: -64.7 m
Lobster (*Panularis argus*)



Figure 5: 33°28.6962'N;76°59.2048'W: -67.4 m
Colony of azooxanthellate *Madracis myriaster* and orange sponge (*Agelas clathroides*)

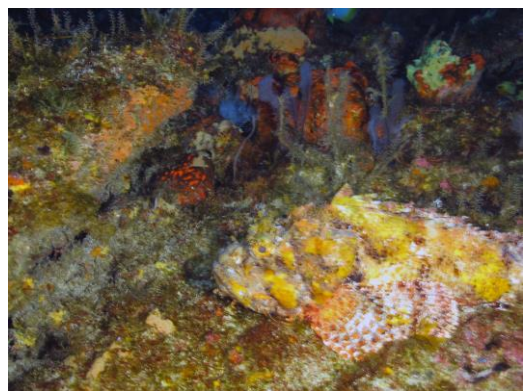


Figure 6: 33°28.718'N;76°59.1262'W: -62.5 m
Dense biota, sponges, tunicates, algae, hydroids and a scorpion fish

Dive Site: North Carolina, Snowy Wreck MPA: Reef; NC-2; 65 m; ROV 19-09; UNCW 715; 10-VI-19-2

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 10-VI-19-2; ROV 19-09, UNCW Dive 715; Snowy Wreck MPA Reef Site, NC 2, 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database. SBE 39 temperature/ depth recorder on ROV.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down or forward on vertical surfaces, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but generally headed N, depending on the ship's maneuverability with the wind and current.

ROV collection skid removed. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 63- 68 m

MB map shows curved escarpment NE-SW and NW-SE, 1.7 nmi; 61 m top, 70 m at base. ROV hd SE along escarpment.

Weather- P/cloudy, seas 2-3 ft from SE, wind 13 kn from 227 dg, air- 27.17 C, surface water- 26.95 C, salinity- 34.9 PSU, current- 1.3 kn to 355 dg.

11:31- Launch

11:35- On bottom- 66.6 m; visibility- 15 m, current- 0.5 kn from NNE. Near base of escarpment, 30 m to WP. Flat sediment with rubble, cobble, small boulders ¼ m; *Swiftia exserta* common, *Stichopathes*.

11:40- Start xs along lower escarpment, hd SE; 10- 50% hard bottom, cobble, small boulders, <25 cm relief, small undercut rock; start photo xs; *Agelas clathrodes*, scamp, unusual habitat for *Swiftia*, very sandy; *Alplysina* white and purple hollow tube, *S. luetkeni*, gorgonian with large purple polyps yellow branches *Thesea?*, lionfish.

11:50- 63 m, top of escarpment on MB; same habitat; *Ellisella elongata*, small boulders and sand; ¼ m relief; *Aiolochroia crassa* 50 cm, bushy green-?, no slope visible coming up the escarpment. *Agelas clathrodes*.

11:58- 67.5 m, ½ way down escarpment, no visible slope, rock and sand, 10-25% HB, same biota, 50 cm vase orange heavily encrusted *Agelas clathrodes*, lobster, 50 cm eroded white sponge, soapfish;

12:06- 63 m, ½ m relief boulders, near top of MB escarpment; cup corals under ledge 2 spp., Spirastrellidae, scorpionfish, green fuz on bottom-Chlorophyta?, DMST starlet sponge, hydroid, amberjack, *Calamus porgy*,

Dive Site: North Carolina, Snowy Wreck MPA: Reef; NC-2; 65 m; ROV 19-09; UNCW 715; 10-VI-19-2

bigeye, graysby, *Tanacetipathes*, white grunt, squirrelfish, lionfish, fish line, reef butterflyfish.

12:19- 62 m, upper slope, hogfish, spotfin hogfish, 30 cm *Geodia neptuni*, reef butterflyfish, parrotfish, creolefish, 2 yellowfin grouper, *Isostichopus*, *Pyrosoma*, rock beauty.

12:30- 65.5 m, marbled grouper (first seen on MPA cruise or by AD and SH)

12:38- 64 m, school blackfin snapper (>100); lionfish, fishing line, fishing line, ye te Verongida.

12:52- 65 m, *Pyrosoma*, same habitat- varies from low to ½ m relief outcrops and boulders, XS mostly along top edge, slope less than 5-10 dg, no real escarpment.

13:00- Lost power, off bottom.

1:01- 68 m, 5 cm fuzzy balls common, green, bifurcate tips, but look too thin for Dictyota. 30 cm *Madracis myriaster*, white on vertical rock face; 2 more *Madracis*, light brown w zooxanthellae.

1:10- Escarpment corner, changes from NW-SE face to SW-NE face. Hd along upper slope hd NE. 64 m, ½ m boulders, numerous green fuzzy bushy algae- *Cladophora?*. Fishing line.

1:19- HD camera not responding; reboot.

1:21- On bottom, 64.5 m, mid slope of MB; HD will not zoom or white balance; video slight too green. Cont xs to ENE along slope. Several *Swiftia* and *Stichophates*.

1:24- Reboot whole system. HD camera- zoom and white balance still will not work.

1:27- On bottom, 63 m; low relief <1/4 m rock, ½ m rock, some 1 m relief; same biota, 50 cm *Geodia neptuni*, *Tanacetipathes*.

1:37- MB on upper steep scarp; ROV 64 m, 10-15 dg slope, ½ m rock boulders and sand. Dense sponges, algae; *Madracis* under rock, 30 cm *Madracis myriaster*, *Ellisella elongata*, *Stichopathes*, *Aplysina* tubes, *Swiftia* common, grey trigger, gag grouper, fishing line, lobster- 2, fishing line.

1:52- upper edge of escarpment, 63 m; ½ m rock and sand; same biota, fishing line.

2:13- MB shows gap of 45 m in escarpment, may be slump. ROV- 66 m, flat sand bottom, patchy pavement. Maybe thin veneer, covered with rubble and green colored algae, few *Stichopathes*.

2:25- 62.3 m, MB back on upper edge of escarpment; ROV- 10 dg slope, ¼- ½ m rock boulders, sand, 10-50% HB; 3 lionfish, lobster, cup coral, *Agelas*, *Stichopathes*, hydroids, green encrusting and turf algae, *Swiftia exserta*, *Iciligorgia schrammi*- abundant here, lobster, *Swiftia* with orange polyps, *Diodogorgia*.

2:40- 62 m, top edge; same habitat, dense *Iciligorgia*, 2 lobster out of hole, 8 lionfish, *Swiftia* common, yellow Verongida vase, *Madracis myriaster*, lobster, lobster, black grouper.

2:55- 65 m, MB escarpment less pronounced; ROV- flat, low relief, <1/4 m boulders, mostly sand.

2:59- 64 m, end of dive.

Dominant Benthic Macrobiota:

Scleractinia coral- 2 spp. Cup coral, *Madracis myriaster* (several colonies 10-30 cm)

Antipatharia coral- *Stichopathes luetkeni*, *Tanacetipathes*

Gorgonia coral- *Diodogorgia*, *Swiftia exserta* (abundant), *Ellisella elongata*, *Iciligorgia schrammi* (abundant near end), Thesea?

Hydroida spp.

Porifera- *Agelas clathrodes* (very abundant), *Aplysina tubes*, *Geodia neptuni*, DMST sponge, Spirastrellidae, *Aiolochoira crassa*

Decapoda- Lobster (common and out of holes)

Echinodermata- *Isostichopus*

Chordata- *Pyrosoma*

Algae- Green colored algae turf and bushy balls common (color of video may be too green)- *Cladophora?*, *Dictyota?*

Human Debris:

Fishing lines- several

CPCe Percent Cover Analysis:

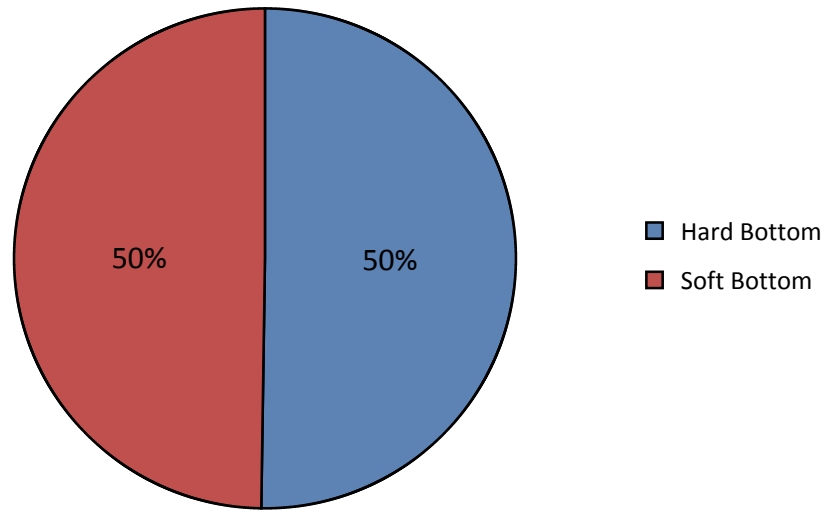
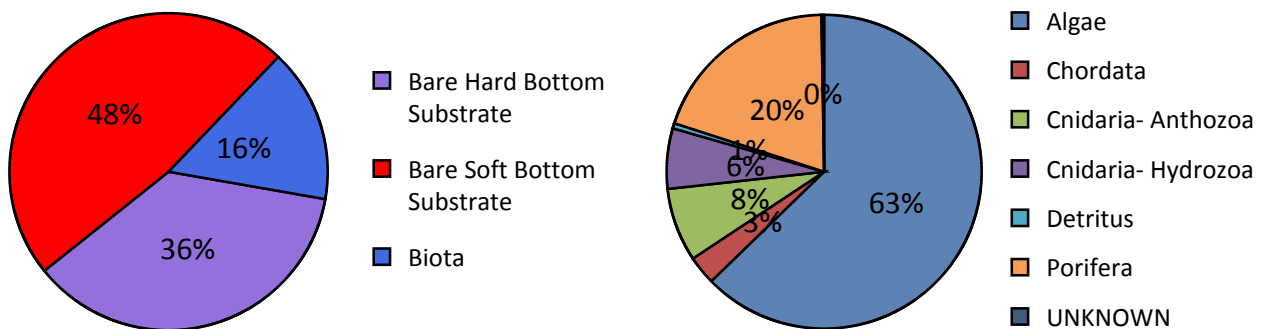


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-09. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-09.

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: North Carolina, Snowy Wreck MPA: Reef; NC-2; 65 m; ROV 19-09; UNCW 715; 10-VI-19-2

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-09.

	%	Notes
Biota	15.66%	X
Algae	9.82%	X
Algae- Unid.	0.30%	
Cyanobacteria	0.34%	
Chlorophyta	0.04%	X
Ochrophyta	5.12%	X
Ochrophyta	5.12%	X
<i>Sargassum</i> sp.		X
Rhodophyta	4.02%	
Corallinales	1.35%	
Rhodophyta	2.67%	
Porifera	3.09%	X
Demospongiae	3.09%	X
<i>Agelas clathrodes</i> (Schmidt, 1870)	1.14%	X
<i>Agelas</i> sp.	0.04%	
<i>Aiolochoira crassa</i> (Hyatt, 1875)	0.25%	X
<i>Aplysina</i> sp.		X
Axinellidae		X
<i>Cliona</i> cf. <i>tumula</i> Friday, Poppell & Hill, 2013		X
Demospongiae	1.65%	X
Dictyoceratida		X
<i>Geodia neptuni</i> (Sollas, 1886)		X
Spirastrellidae		X
Cnidaria- Hydrozoa	0.97%	X
Hydrozoa	0.97%	X
Hydroidolina	0.97%	X
Cnidaria- Anthozoa	1.18%	X
Alcyonacea - gorgonian	0.38%	X
Alcyonacea- gorgonian	0.08%	X
<i>Diodogorgia</i> sp.		X
<i>Ellisella barbadensis</i> (Pallas, 1766)		X
<i>Iciligorgia schrammi</i> Duchassaing, 1870	0.08%	X
<i>Swiftia exserta</i> (Ellis & Solander, 1786)	0.21%	X
<i>Thesea</i> sp.		X
Antipatharia	0.63%	X
Antipatharia	0.04%	X

Dive Site: North Carolina, Snowy Wreck MPA: Reef; NC-2; 65 m; ROV 19-09; UNCW 715; 10-VI-19-2

<i>Antipathes atlantica</i> Gray, 1857		X
<i>Stichopathes luetkeni</i> Brook, 1889	0.47%	X
<i>Tanacetipathes</i> sp.	0.13%	X
Coral- Scleractinia	0.17%	X
<i>Madracis myriaster</i> (Milne Edwards & Haime, 1850)	0.17%	X
Scleractinia- unid colonial		X
Scleractinia- unid cup		X
Annelida		X
Polychaeta		X
<i>Filograna</i> sp.		X
Arthropoda		X
Crustacea		X
Majidae		X
<i>Panulirus argus</i> (Latreille, 1804)		X
Echinodermata		X
Holothuroidea		X
<i>Isostichopus badionotus</i> (Selenka, 1867)		X
Chordata	0.47%	X
Chordata - Invertebrate		X
<i>Pyrosoma</i> sp.		X
Chordata - Vertebrate	0.47%	
Actinopterygii	0.47%	
Detritus	0.08%	
UNKNOWN	0.04%	
Human debris		X
Human debris		X
Human debris- Fishing Gear		X
Human debris- fishing line		X
Human debris- anchor line		X
Habitat	84.34%	
Bare Hard Bottom Substrate	36.48%	
Hard bottom	36.48%	
Bare rock, pavement, boulder, ledge	30.00%	
Bare rubble/cobble	6.47%	
Bare Soft Bottom Substrate	47.86%	
Grand Total	100.00%	X

Dive Site: North Carolina, Snowy Wreck MPA: Reef; NC-2; 65 m; ROV 19-09; UNCW 715; 10-VI-19-2

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-09.

Class/Order/Family/Taxa Author - Common Name	ROV 19-09
Actinopterygii	
Anguilliformes	
Muraenidae	
<i>Gymnothorax moringa</i> (Cuvier, 1829) - Spotted Moray	0.09
<i>Muraena retifera</i> Goode & Bean, 1882 - Reticulate Moray	0.17
<i>Muraena robusta</i> Osório, 1911 - Stout Moray	0.09
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	3.85
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	11.54
<i>Myripristis jacobus</i> Cuvier, 1829 - Blackbar Soldierfish	0.77
<i>Plectrypops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish	0.09
Perciformes	
Acanthuridae	
<i>Acanthurus chirurgus</i> (Bloch, 1787) - Doctorfish	5.90
<i>Acanthurus coeruleus</i> Bloch & Schneider, 1801 - Blue Tang	0.43
<i>Acanthurus</i> sp. - Surgeonfish	4.10
Carangidae	
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	0.51
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	1.20
<i>Seriola</i> sp. - Amberjack	0.43
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	1.88
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	22.74
<i>Prognathodes aculeatus</i> (Poey, 1860) - Longsnout Butterflyfish	0.26
Haemulidae	
<i>Haemulon aurolineatum</i> Cuvier, 1830 - Tomtate Grunt	2.14
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	8.55
<i>Haemulon striatum</i> (Linnaeus, 1758) - Striped Grunt	2.56
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	10.26
<i>Clepticus parrae</i> (Bloch & Schneider, 1801) - Creole Wrasse	2.91
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	0.94
<i>Halichoeres cyanocephalus</i> (Bloch, 1791) - Yellowcheek Wrasse	1.03
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	9.23
<i>Halichoeres</i> sp. - Wrasse	23.85

Dive Site: North Carolina, Snowy Wreck MPA: Reef; NC-2; 65 m; ROV 19-09; UNCW 715; 10-VI-19-2

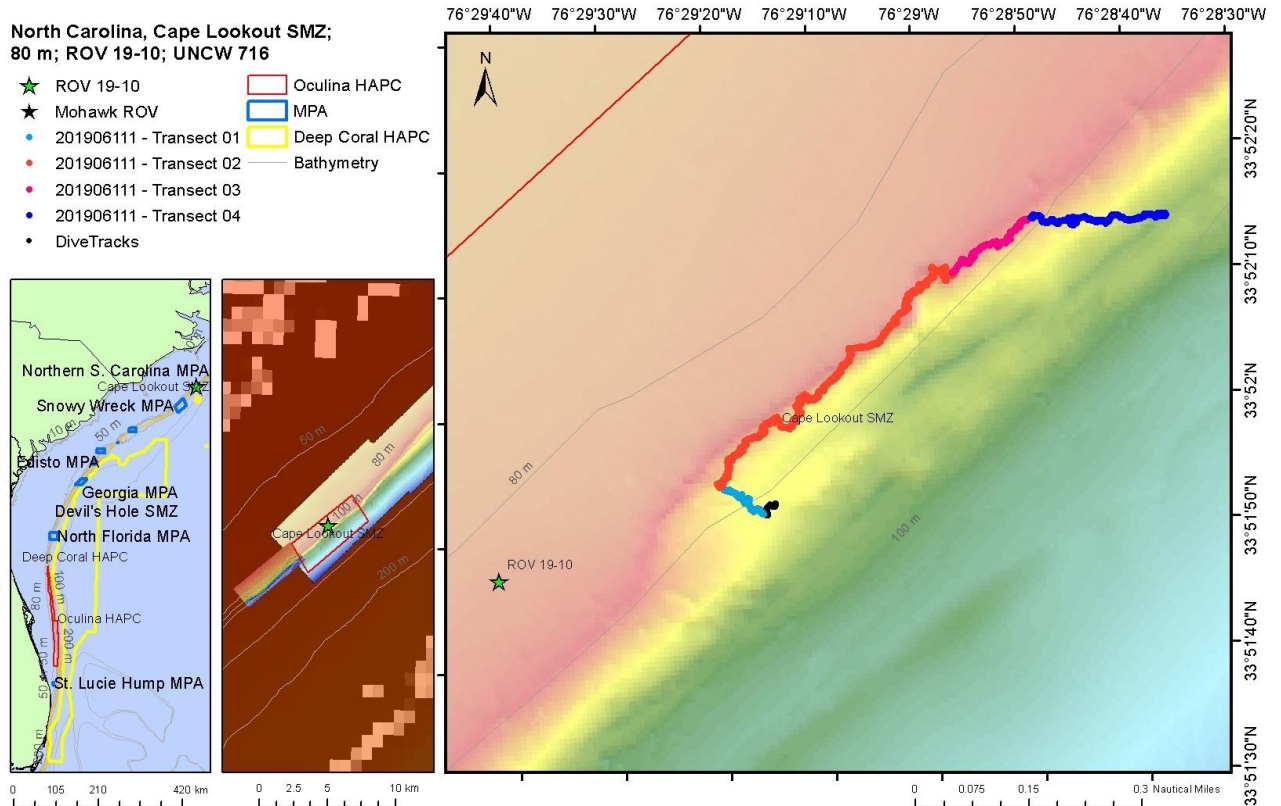
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	1.28
Lutjanidae	
<i>Lutjanus buccanella</i> (Cuvier, 1828) - Blackfin Snapper	17.10
Mullidae	
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	0.43
Pomacanthidae	
<i>Centropyge argi</i> Woods & Kanazawa, 1951 - Cherubfish	0.60
<i>Holacanthus</i> sp. - Angelfish	1.71
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	3.93
Pomacentridae	
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reeffish	0.85
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	47.19
<i>Chromis scotti</i> Emery, 1968 - Purple Reeffish	2.82
<i>Chromis</i> sp. - Damsel/Chromis	7.10
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damsel	0.77
Priacanthidae	
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	29.06
Scaridae	
Scaridae - Parrotfishes (Fam.)	0.17
<i>Sparisoma aurofrenatum</i> (Valenciennes, 1840) - Redband Parrotfish	0.85
Sciaenidae	
<i>Equetus lanceolatus</i> (Linnaeus, 1758) - Jack-knifefish	0.17
<i>Parques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	7.01
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	3.42
<i>Dermatolepis inermis</i> (Valenciennes, 1833) - Marbled Grouper	0.09
<i>Epinephelus adscensionis</i> (Osbeck, 1765) - Rock Hind	0.09
<i>Epinephelus morio</i> (Valenciennes, 1828) - Red Grouper	0.09
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	0.26
<i>Mycteroperca microlepis</i> (Goode & Bean, 1879) - Gag	0.43
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	0.26
<i>Mycteroperca</i> sp. - Grouper	0.26
<i>Mycteroperca venenosa</i> (Linnaeus, 1758) - Yellowfin Grouper	0.51
<i>Paranthias furcifer</i> (Valenciennes, 1828) - Creole-fish	10.86
Serranidae/Grammistinae	
<i>Rypticus saponaceus</i> (Bloch & Schneider, 1801) - Greater Soapfish	1.20
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	0.51
<i>Serranus phoebe</i> Poey, 1851 - Tattler	0.77
Sparidae	
<i>Calamus</i> sp. - Porgy	2.14
Scorpaeniformes	

Dive Site: North Carolina, Snowy Wreck MPA: Reef; NC-2; 65 m; ROV 19-09; UNCW 715; 10-VI-19-2

Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	9.15
<i>Scorpaena plumieri</i> Bloch, 1789 - Spotted Scorpionfish	0.60
Tetraodontiformes	
Balistidae	
<i>Balistes capriscus</i> Gmelin, 1789 - Grey Triggerfish	0.26
Monacanthidae	
<i>Cantherhines macrocerus</i> (Hollard, 1853) - Whitespotted Filefish	0.68
<i>Cantherhines pullus</i> (Ranzani, 1842) - Orangespotted Filefish	0.09
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	13.42
<i>Sphoeroides spengleri</i> (Bloch, 1785) - Bandtail Puffer	0.09
UNKNOWN Biota	5.64

Dive Site: North Carolina, Cape Lookout SMZ; 80 m; ROV 19-10; UNCW 716; 11-VI-19-1

General Location and Dive Track:



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: SMZ_NB43_MB_3m_MLLW_CCFHR_40_195.tif

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/11/2019

Specimens: 2

Digital Photos: 299

No. DVD: 4

Hard Drive No.: 1

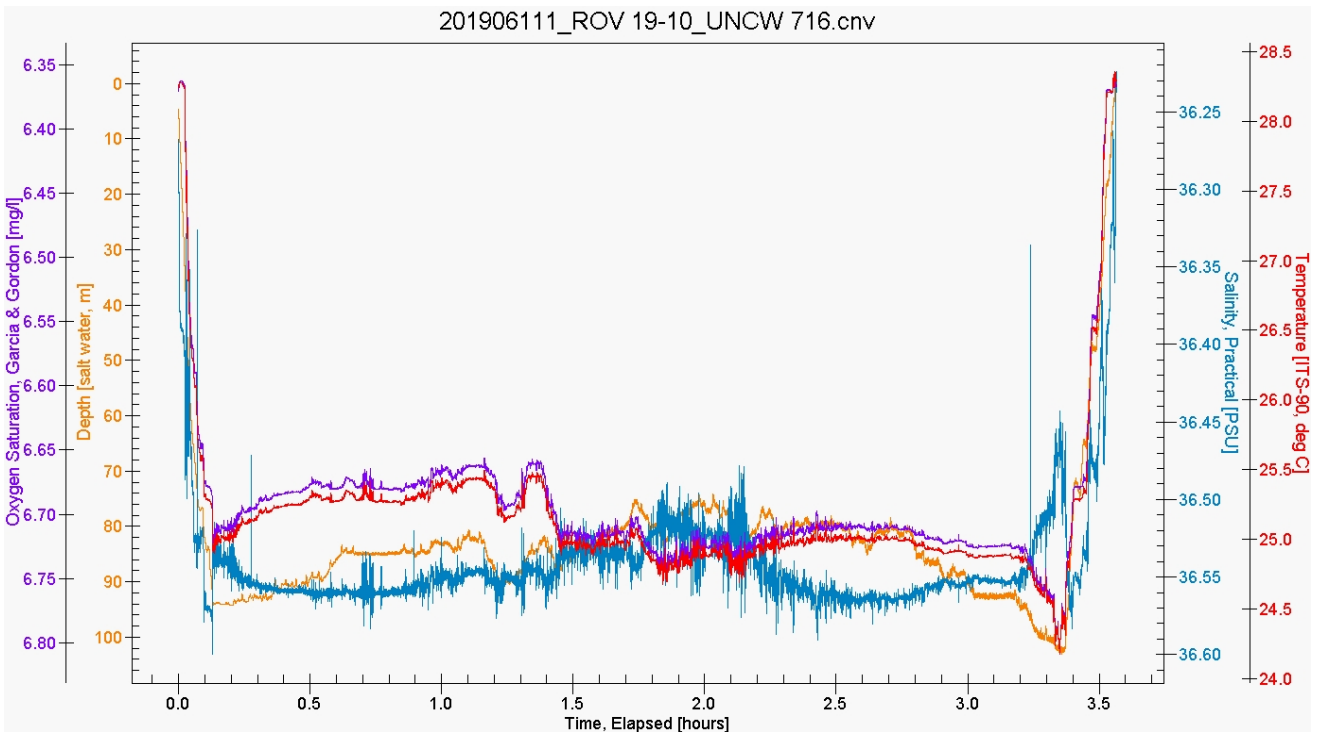
Dive Site: North Carolina, Cape Lookout SMZ; 80 m; ROV 19-10; UNCW 716; 11-VI-19-1

Dive Data:

Minimum Bottom Depth (m): -76.9	Total Transect Length (km): 1.686
Maximum Bottom Depth (m): -105.8	Surface Current (kn): 1.6
On Bottom (Time- EDST): 11:57	On Bottom (Lat/Long): 33.8642°N; -76.4877°W
Off Bottom (Time- EDST): 15:12	Off Bottom (Lat/Long): 33.8706°N; -76.4771°W
Physical (bottom); Temp (°C): 25.3	Salinity: 36.57 Visibility (m): 15 Current (kn): 0.25

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-10 are as follows: Depth Maximum: 102.8 m, Temperature: 24.19-25.49 °C, Salinity: 36.4-36.6 PSU, Oxygen Saturation: 6.7-6.8 mg/l.

Dive Site: North Carolina, Cape Lookout SMZ; 80 m; ROV 19-10; UNCW 716; 11-VI-19-1

Dive Imagery:



Figure 1: 33°51.8938'N;76°29.3285'W: -92.1 m
Panularis argus



Figure 2: 33°52.0052'N;76°29.2074'W: -86.9 m
Encrusting demosponge



Figure 3: 33°52.0105'N;76°29.1981'W: -89.6 m
Corals (colonial and solitary cups) under ledge



Figure 4: 33°52.0783'N;76°29.0941'W: -82.3 m
Oceanapia sp. sponge



Figure 5: 33°52.1302'N;76°29.0322'W: -79.8 m
Colony of azooxanthellate *Madracis myriaster* or *Oculina varicosa*



Figure 6: 33°52.1645'N;76°28.9681'W: -84.2 m
Azooxanthellate coral (*Oculina varicosa* or *Madracis myriaster*)

Dive Site: North Carolina, Cape Lookout SMZ; 80 m; ROV 19-10; UNCW 716; 11-VI-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 11-VI-19-1; ROV 19-10, UNCW Dive 716; North Carolina, Cape Lookout SMZ, 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

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ROV collection skid and Fastcat 49 CTD on ROV. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 78- 105 m

MB map shows NE-SW ridge, >25 km long, 80-112 m depths; ROV xs to north along slope. SMZ made 2017.

Weather- Pt/cloudy, seas 2-3 ft from SW, wind 9 kn from 297 dg, air- 27.38 C, surface water- 28.03 C, salinity- 31.67 PSU, current- 1.6 kn to 8 dg.

11:47- Launch. Big angle on cable

11:57 - On bottom- 95.5 m; visibility- 15 m, current- 0.25 fr SW; on upper slope in MB; 80% HB, flat pavement, rubble, cobble 10-20 cm, sediment; *Stichopathes luetkeni*, *Antipathes atlantica*.

12:02- start xs, 200 m to WP near top of ridge, hd NW; ROV about ½ down slope of MB; start photo xs; 5 cm orange paramuriceid gorgonians abundant, bigeye, *Antipathes furcata*, cobble, boulders ¼ m. Ye-encrusting Verongida.

12:13- 92 m, hd NW, rock pavement, <¼ m boulders, cobble, 90% HB, flat, low rolling hills; dense orange gorgonians, *Stichopathes*, low relief, flat; amberjack, Spirastrellidae, lobster, Almaco jack.

12:19- Base of upper escarpment on MB; 93 m; ROV-Cancelled- no dive, current 2.1 kn

¼ m boulders, 10-30 dg slope, rugose, 80% HB; Ye encrusting Verongidae, *Stichopathes*, *A. atlantica*, several spp 5 cm gorgonians, orange, reddish; yellow Demospongiae, tattler, dense orange paramuriceidae, soapfish; low relief pavement; *Geodia neptuni* 30 cm.

12:30- 86.4 m, Terebellidae tubes dense; Tanacetipathes; flat rock pavement

Sample-1: 5-cm orange Paramuriceidae, 2 specimens; bin 3; 25.3 C, 36.5 salinity, 0 current.

12:40- cont xs to NE; *Geodia neptuni*, ye-wh *Oceanapia*, juvenile cubbyu, puffer, ¼ m boulders, 5 dg slope, reef butterflyfish, *A. atlantica*, *Geodia neptuni*, DMST starlet sponge, blue angelfish, rock beauty, lionfish, spotfin hogfish, white am lo Demospongiae, shortnose puffer, spotfin butterflyfish, longsnout butterflyfish.

12:55- 84.5 m, 80% HB, pavement, <1/4 m relief, 5 dg slope; 10 cm yellow demosponges, encrusting pink sponges, white lobate sponges, orange gorgonians, *Stichopathes*. Head downslope.

13:03- 93 m, xs parallel to slope to NE; rugged rock, ½ m relief, 10-30 dg slope, same biota, *Hemanthias*, red snapper, wrasse bass, spotted moray, orange Spirastrellidae.

13:12- 30 dg slope, base of upper escarpment on MB, 85 m; creolefish, several lionfish, rugged rock, rugose rock, low relief, lobster-2, amberjack, cubbyu, cup coral, encrusting coral under ledge- appears to be white *Oculina varicosa*, lobster.

13:25- 30 dg smooth rock slope, 84.5 m; fishing line, mountain dew can, thin encrusting light pink sponge, smooth sfc; roughtongue bass, beer bottle, fishing line, black plastic bag, flame scallop.

13:33- top of plateau on MB; ROV- 78 m, flat, rock pavement, sand, 80% HB, same biota; cowfish. Upper slope- 30 dg, low relief pavement, white *Oceanapia*, low rugosity, 90% HB; same biota, barracuda.

13:44- 1 m ledge, 3 m long; *Hemanthias* school, creolefish school.

13:48- MB shows cove on upper slope; ROV- sediment w/ 10 cm cobble ¼ m boulders, ½- 1 m ledges undercut, 15 cm white *Oculina varicosa*, on vertical rock, 79 m; goatfish, fishing line, scamp or yellowmouth grouper, red snapper, 0 current (surface 1.8 kn, 1.5 kn at 50 m on ADCP).

14:00- In cove of MB, ROV- 84.4 m, 1 m ledge on east side; saddle bass, schools of creolefish, gag grouper, long line.

14:04- upper slope hd NE, low relief rock, flat to 10 dg slope; patchy 1 m ledges; gag, 84 m, Hydroid, 1 m *Oculina/Madracis*- 2 colonies under overhang rock white, cup corals, 83 m; 1 m ledges, lots of fish, yellow mouth, dense and diverse sponges, long line.

14:10- Change heading downslope to steeper slope on MB; anchor line;

14:14- 2.2 kn surface current, 0 current on bottom. No problem working.

14:21- 86.7 m, upper slope of MB; *Aiochroia crassa*, rubble cobble, small boulders, low relief pavement, ledges; lionfish, gag, fishing line, 50 cm *Geodia neptuni*, longline.

14:35- Change hd to SE to apparent ledge ½ way down slope on MB, 270 m to S.

14:49- 94 m, hd downslope, low relief rock, <1/4 m relief, cobble, boulders.

14:52- 95.8 m.

Sample 2: *Madracis myriaster*, 3 bushes, 50 cm diameter, white; temp- 2.8 C, Salinity 36.5; bucket 1 and bin 1; 25 cm boulders, flat bottom.

15:00- 50 cm *Madracis*, white on rock, 96 m; same biota; 90% hard bottom, cobble, small boulders.

15:04- 100 m, appears flat but going down slope, *Tanacetipathes*, *Antipathes atlantica*.

15:06- 103.4 m, 60 cm white *Madracis*; flat rock pavement, no relief, 10 cm yellow-tan gorgonian, *Stichopathes*.

15:10- At WP of MB; 105.6 m, flat rock slabs, <25 cm biota; *Stichopathes*, orange gorgonian.

15:11- 105 m, end of dive.

Dominant Benthic Macrobiota:

Scleractinia coral- cup corals; *Oculina varicosa*?, *Madracis myriaster* (70 cm; 1 sample verified- J. Reed)

Antipatharia coral- *Stichopathes luetkeni*, *Antipathes atlantica*, *Tanacetipathes*, *Antipathes furcata*

Gorgonia coral- 5 cm orange Plexauridae, reddish gorgonia,

Hydroida

Porifera- numerous *Demospongia*, white lobate, thin pink encrusting, Spirastrellidae, *Oceanapia*, *Aiolochroia crassa*, yellow encrusting *Verongida*, *Geodia neptuni*, DMST starlet,

Dive Site: North Carolina, Cape Lookout SMZ; 80 m; ROV 19-10; UNCW 716; 11-VI-19-1

Annelida- Terebellidae

Samples: 2

Plexauridae- orange, *Madracis myriaster*

Human Debris:

Fishing line and longline- common

Bottles, can, plastic bags

CPCe Percent Cover Analysis:

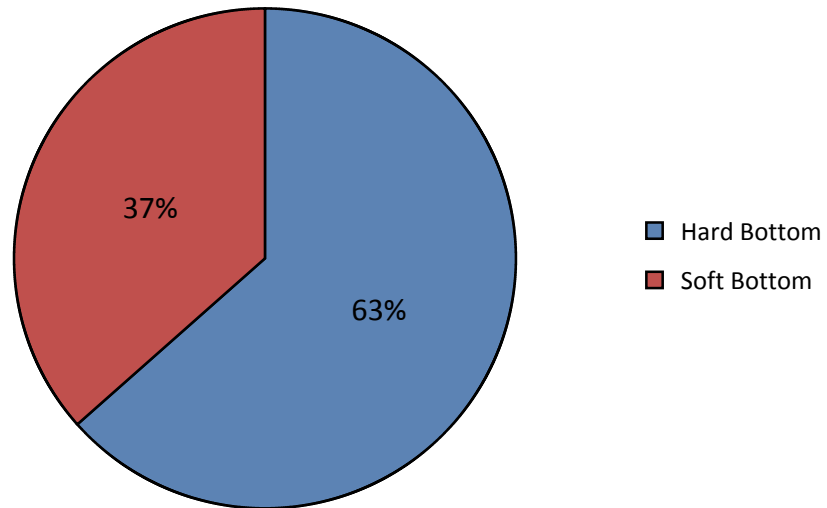
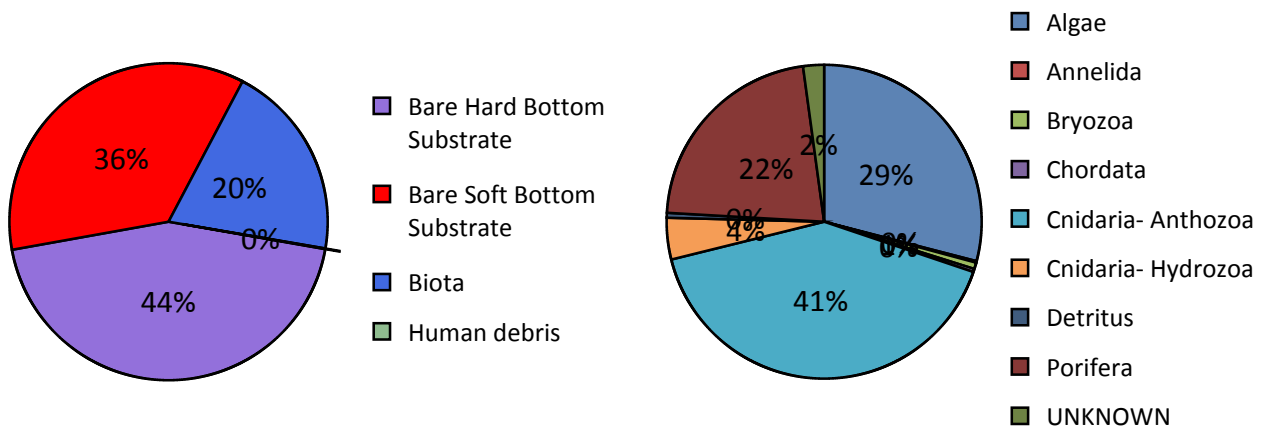


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-10. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-10.

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

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Samples, Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-10.

	%	Notes	Samp.
Biota	20.01%	X	X
Algae	5.81%	X	
Algae	0.13%		
Cyanobacteria	0.03%		
Chlorophyta	0.03%		
Ochrophyta	0.59%		
Rhodophyta	5.02%	X	
Corallinales	4.52%	X	
Rhodophyta	0.50%		
Porifera	4.39%	X	
Demospongiae	4.39%	X	
<i>Agelas</i> sp.	0.07%		
<i>Aiolochoira crassa</i> (Hyatt, 1875)	0.10%	X	
<i>Aplysina</i> sp.		X	
<i>Cliona cf. tumula</i> Friday, Poppell & Hill, 2013		X	
Demospongiae	3.80%	X	
<i>Erylus</i> sp.		X	
<i>Geodia neptuni</i> (Sollas, 1886)		X	
<i>Geodia</i> sp.		X	
<i>Oceanapia</i> sp.		X	
Spirastrellidae	0.43%	X	
Verongiida		X	
Cnidaria- Hydrozoa	0.86%	X	
Hydrozoa	0.86%	X	
Hydroidolina	0.86%	X	
Cnidaria- Anthozoa	8.19%	X	X
Alcyonacea - gorgonian	7.13%	X	X
Alcyonacea- gorgonian	0.46%	X	
Paramuriceidae		X	
Plexauridae			X
Plexauridae- MPA1	6.67%		
Antipatharia	1.06%	X	
Antipatharia	0.17%		
<i>Antipathes atlantica</i> Gray, 1857	0.33%	X	
<i>Antipathes furcata</i> Gray, 1857	0.03%	X	
<i>Stichopathes luetkeni</i> Brook, 1889	0.43%	X	
<i>Tanacetipathes</i> sp.	0.10%	X	

Coral- Scleractinia		X	X
<i>Madracis myriaster</i> (Milne Edwards & Haime, 1850)		X	X
<i>Oculina varicosa</i> Le Sueur, 1820		X	
Scleractinia- unid colonial		X	
Scleractinia- unid cup		X	
Annelida	0.03%		
Polychaeta	0.03%		
<i>Filograna</i> sp.	0.03%		
Mollusca		X	
Bivalvia		X	
<i>Spondylus</i> sp.		X	
Arthropoda		X	
Crustacea		X	
<i>Panulirus argus</i> (Latreille, 1804)		X	
Bryozoa	0.13%		
Bryozoa	0.13%		
Chordata	0.07%	X	
Chordata - Invertebrate		X	
Didemnidae		X	
Chordata - Vertebrate	0.07%		
Actinopterygii	0.07%		
Detritus	0.10%		
UNKNOWN	0.43%		
Human debris	0.07%	X	
Human debris	0.07%	X	
Human debris- Fishing Gear	0.07%	X	
Human debris- anchor line	0.07%		
Human debris- fishing line		X	
Human debris- long line		X	
Human debris- Trash		X	
Human debris- cans/bottles		X	
Bare Hard Bottom Substrate	44.39%	X	
Bare Hard Bottom Substrate	44.39%	X	
Burrow		X	
Octopus garden		X	
Hard bottom	44.39%		
Bare rock, pavement, boulder, ledge	37.78%		
Bare rubble/cobble	6.61%		
Bare Soft Bottom Substrate	35.54%		
Grand Total	100.00%	X	X

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-10.

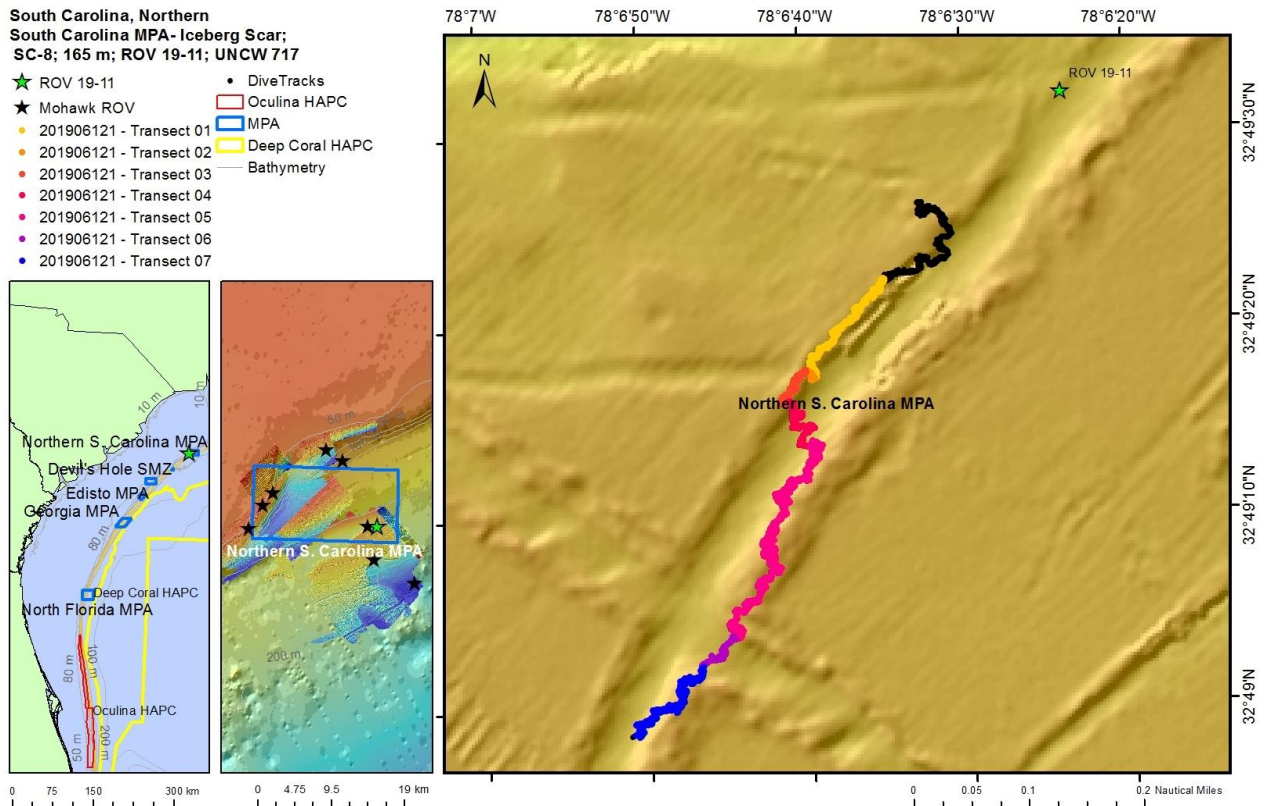
Class/Order/Family/Taxa Author - Common Name	ROV 19-10
Actinopterygii	
Anguilliformes	
Muraenidae	
<i>Gymnothorax moringa</i> (Cuvier, 1829) - Spotted Moray	0.26
<i>Muraena robusta</i> Osório, 1911 - Stout Moray	0.13
Muraenidae - Moray Eels (Fam.)	0.39
Aulopiformes	
Synodontidae	
<i>Synodus</i> sp. - Lizardfish	0.13
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	8.62
<i>Holocentrus rufus</i> (Walbaum, 1792) - Longspine Squirrelfish	0.26
<i>Myripristis jacobus</i> Cuvier, 1829 - Blackbar Soldierfish	6.40
<i>Plectrypops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish	0.26
Perciformes	
Acanthuridae	
<i>Acanthurus</i> sp. - Surgeonfish	0.13
Apogonidae	
<i>Apogon pseudomaculatus</i> Longley, 1932 - Twospot Cardinalfish	0.39
<i>Apogon</i> sp. - Cardinalfish	0.39
Carangidae	
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	3.40
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	0.39
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	1.18
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	13.71
<i>Prognathodes aculeatus</i> (Poey, 1860) - Longsnout Butterflyfish	0.52
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	0.13
<i>Prognathodes guyanensis</i> (Durand, 1960) - French Butterflyfish	0.26
Haemulidae	
<i>Haemulon striatum</i> (Linnaeus, 1758) - Striped Grunt	35.92
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	7.58
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	7.58
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	0.39

<i>Halichoeres</i> sp. - Wrasse	2.74
Lutjanidae	
<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper	0.39
Mullidae	
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	0.91
Pomacanthidae	
<i>Centropyge argi</i> Woods & Kanazawa, 1951 - Cherubfish	0.78
<i>Holacanthus</i> sp. - Angelfish	0.52
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	4.18
Pomacentridae	
<i>Chromis enchrysur</i> a Jordan & Gilbert, 1882 - Yellowtail Reeffish	1.31
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	52.64
<i>Chromis scotti</i> Emery, 1968 - Purple Reeffish	4.70
<i>Chromis</i> sp. - Damsel/Chromis	0.26
Priacanthidae	
Priacanthidae - Bigeyes Or Catalufas (Fam.)	0.39
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	10.45
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	3.27
Scaridae	
<i>Sparisoma atomarium</i> (Poey, 1861) - Greenblotch Parrotfish	0.39
Sciaenidae	
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	15.67
Serranidae/Anthiinae	
<i>Hemanthias vivanus</i> (Jordan & Swain, 1885) - Red Barbier	198.54
<i>Pronotogrammus martinicensis</i> (Guichenot, 1868) - Roughtongue Bass	24.03
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	2.35
<i>Gonioplectrus hispanus</i> (Cuvier, 1828) - Spanish Flag	0.26
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	3.66
<i>Mycteroperca interstitialis</i> (Poey, 1860) - Yellowmouth Grouper	0.26
<i>Mycteroperca microlepis</i> (Goode & Bean, 1879) - Gag	0.39
<i>Paranthias furcifer</i> (Valenciennes, 1828) - Creole-fish	13.06
Serranidae/Grammistinae	
<i>Rypticus saponaceus</i> (Bloch & Schneider, 1801) - Greater Soapfish	0.39
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	2.48
<i>Serranus phoebe</i> Poey, 1851 - Tattler	8.36
Sparidae	
<i>Calamus</i> sp. - Porgy	0.13
Sphyraenidae	
<i>Sphyraena barracuda</i> (Edwards, 1771) - Great Barracuda	0.26
Scorpaeniformes	

Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	7.97
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	0.91
Tetraodontiformes	
Ostraciidae	
<i>Acanthostracion</i> sp. - Cowfish	0.13
Ostraciidae - Boxfishes (Fam.)	0.26
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer	17.63
UNKNOWN Biota	0.78

Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-8; 165 m; ROV 19-11; UNCW 717; 12-VI-19-1

General Location and Dive Track:



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Sedberry_OEBlock2_5m_UT M17N_MB

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/12/2019

Specimens: 8

Digital Photos: 227

No. DVD: 3

Hard Drive No.: 1

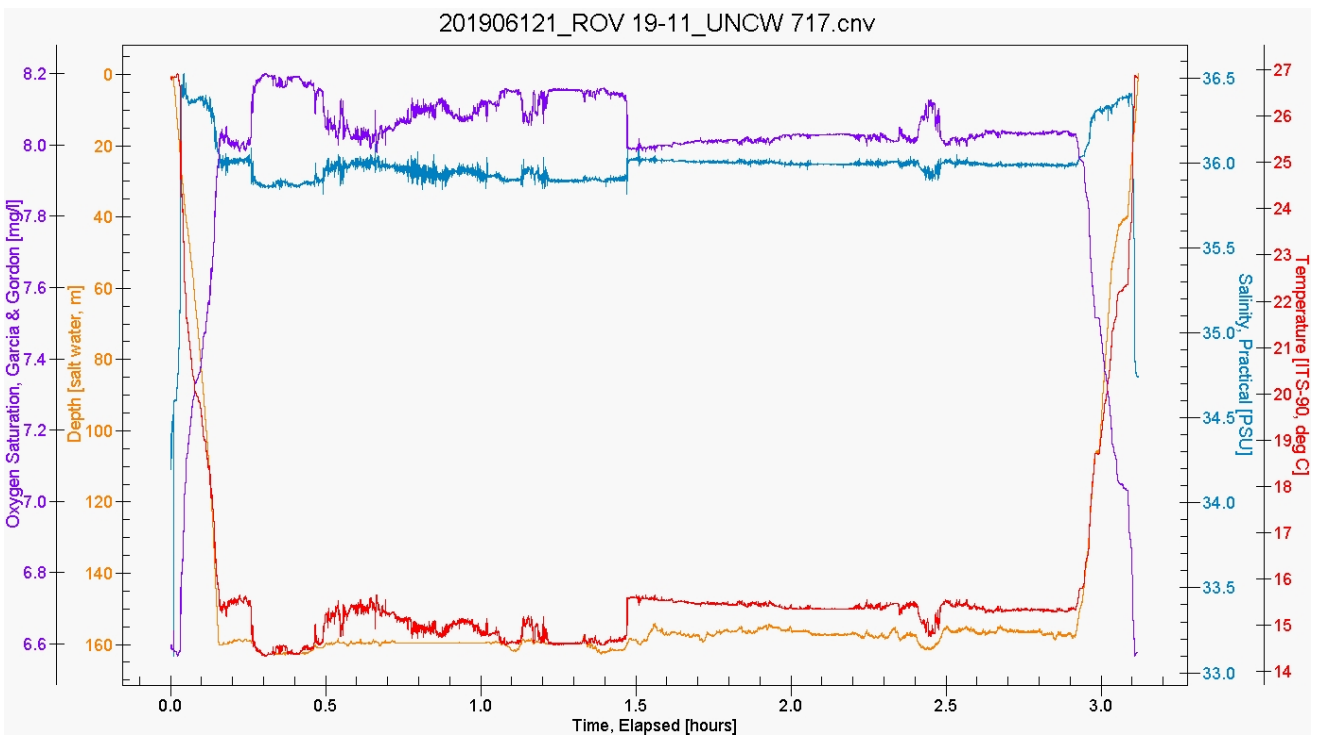
Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-8; 165 m; ROV 19-11; UNCW 717; 12-VI-19-1

Dive Data:

Minimum Bottom Depth (m): -155.8	Total Transect Length (km): 1.349
Maximum Bottom Depth (m): -164.9	Surface Current (kn): 0.9
On Bottom (Time- EDST): 7:34	On Bottom (Lat/Long): 32.824°N; -78.1092°W
Off Bottom (Time- EDST): 10:19	Off Bottom (Lat/Long): 32.8162°N; -78.1143°W
Physical (bottom); Temp (°C): 15.8	Salinity: 36.07 Visibility (m): 5 Current (kn): 0

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-11 are as follows: Depth Maximum: 163.2 m, Temperature: 14.34-15.86 °C, Salinity: 35.8-36.1 PSU, Oxygen Saturation: 7.9-8.2 mg/l.

Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-8; 165 m; ROV 19-11; UNCW 717; 12-VI-19-1

Dive Imagery:



Figure 1: 32°49.4341'N;78°6.5497'W: -161.1 m
Snowy grouper (*Hyporthodus niveatus*)

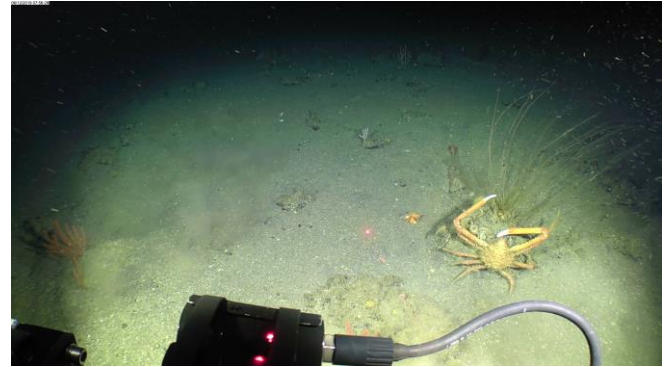


Figure 2: 32°49.37'N;78°6.5855'W: -161.4 m
Spider crab (*Rochinia* sp.)



Figure 3: 32°49.1932'N;78°6.6877'W: -159.6 m
Snowy grouper (*Hyporthodus niveatus*)



Figure 4: 32°49.1572'N;78°6.71'W: -158.1 m
Spider crab (*Rochinia* sp.)

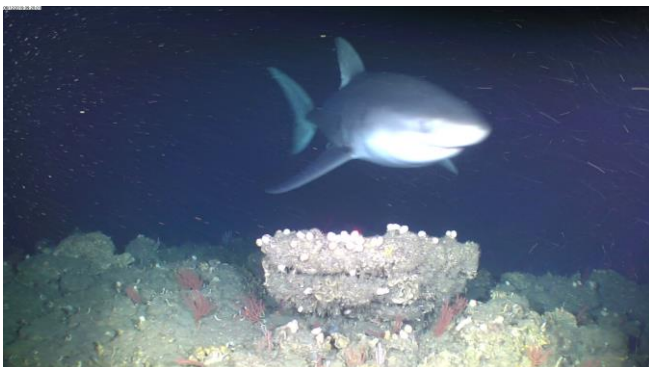


Figure 5: 32°49.1406'N;78°6.7139'W: -156.7 m
Great white shark (*Carcharodon carcharias*)

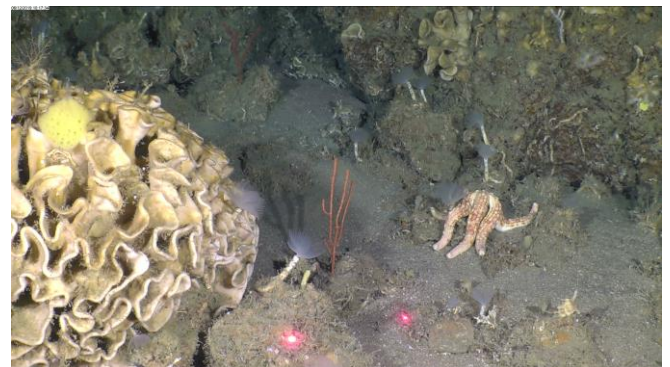


Figure 6: 32°48.9818'N;78°6.8518'W: -159.6 m
Cauliflower sponge (*Leiodermatium* sp.), sea stars, serpulid worms, *Ellisella* sp. gorgonians

Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-8; 165 m; ROV 19-11; UNCW 717; 12-VI-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 12-VI-19-1; ROV 19-11, UNCW Dive 717; South Carolina, Northern South Carolina MPA (Deep), Ice Berg Scour Site, 160 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 157- 165 m

MB map shows apparent ice berg scours, 165 m base of scour, 159 m top, 60 m wide; ROV xs along scour.

Weather- Cloudy/rain, seas 2-3 ft from SE, wind 11 kn from 54 dg, air- 24.8 C, surface water- 26.85 C, salinity- 33.16 PSU, current- 0.9 kn to 208 dg.

7:05- Launch. Loss video on launch, loss ROV power.

7:10- Recover

7:24- Launch

7:35- On bottom- 161.8 m; visibility- 5 m, current- 0.1, bottom temperature- 14.7 C; top of scour, west side; fine sediment, 5-10 cm cobble, snowy grouper, 10 cm white and orange gorgonians, *Leiodermatium*; 25 cm boulders, boarfish, spider crab, hydroids, hd SE to scour.

7:41- 15 cm plate *Astrophorida*.

7:43- 165 m, in scour, 100% soft bottom, fine sediment. Squid.

7:53- 162.5 m; back on north wall, hd SW along N slope; 25- 50 cm boulders, gorgonians, 30 cm long hydroids- Nemertesia, boarfish, spider crab- Majidae, serpulidae, snowy grouper, tattler, *Paracolochirus mysticus* sea weeny, encrusting yellow sponge.

Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-8; 165 m; ROV 19-11; UNCW 717; 12-VI-19-1

8:09- 162 m, cobble and boulders, top edge of scour.

Sample 1- 10 cm white Plexauridae gorgonian, sparsely branched; abundant, bin 3

Sample 2- 10 cm orange Plexauridae gorgonian, sparsely branched; abundant, bin 3

Sample 3- *Paracolochirus mysticus*, 2", white, brown spots; abundant; suction 3

8:25- Cont xs along N edge; Anthiidae. Cross intersection of scour with soft bottom.

8:33- 161.5 m- on north rim, 25- 50 cm boulders; slit shell, hermit crab; light yellow lobate demosponge, red porgy.

8:39- 161.5 m, north rim of scour, 25 cm boulders

Sample 4- *Perotrochus* sp., either *P. maureri* or *P. qouyanus*; uncommon

8:44- Cont xs; 164 m in scour; hd to S rim. lizardfish.

8:53- On S rim, 160.5 m, 25- 50 cm boulders, grey sediment; same biota; blueline tilefish, snowy grouper, darwin slimehead, orange and white gorgonians, sea weenies, starfish, *Leiodermatium*, blackbar drum, *Corallistes*, rugged, ½ m relief boulders, hairy hydroids.

8:58- Top of south rim, 157 m, hd SW along rim; scorpionfish, eroded rock, more relief and more rugged than N rim; lots of *Leiodermatium*, greenband wrasse. Snowy grouper making possible mating behavior, dorsal fin in unusual raised form, shaking body, and listing sideways near another snowy grouper, school of snowy grouper nearby, dozen or so. Rough tounge anthiid.

9:14- 158 m, Majidae eating something.

9:20- great white shark swam by, 6-8 ft.

9:24- 158 m, top of S rim, 25-50 cm boulders

Sample 5- *Leiodermatium* sp., folded tubes, shrek ear sponge, thin plates, tan; abundant
May have additional species on it. Human debris- plate.

Sample 7- white amorphous Demospongiae, spicule; with Sample 5.

Sample 8- Annelida, 8 cm chitonous tubes, Sabellidae?; with Sample 5.

9:39- South rim, red barbier, snowy grouper, boarfish, snipefish.

9:50- crossing intersecting scour, 163.3 m.

9:53- South rim, 161 m; same habitat, biota; ½ m boulders, rugged; *Holothuria lentigenosa enodis*; starfish, Cidaroida, slitshell.

10:10- 158.6 m, south rim, boulders

Sample 6- *Perotrochus* sp., Suction 4.

10:15- cont xs along S rim; *Corallistes* common, starfish, darwin slimhead.

10:19- 161 m, end xs, end dive.

Dominant Benthic Macrobiota:

Gorgonia coral- 10 cm white and orange Plexauridae, several spp

Hydroida- *Nemertesia*

Porifera- *Leiodermatium* (abundant), *Corallistes* plates, *Astrophorida* plates and bowls; thin encrusting yellow demosponges, yellow lobates and finger demosponges

Annelida- Serpulidae

Decapoda- Majidae, Paguridae

Echinodermata- *Paracolochirus mysticus*, Cidaroida

Mollusca- squid, *Perotrochus* sp.

Samples: 8

Leiodermatium, Plexauridae- 2 spp. white and orange, 2 *Perotrochus* (AD), *Paracolochirus mysticus*, Sabellidae, Demospongiae- white amorphous

Human Debris: Dinner plate

Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-8; 165 m; ROV 19-11; UNCW 717; 12-VI-19-1

CPCe Percent Cover Analysis:

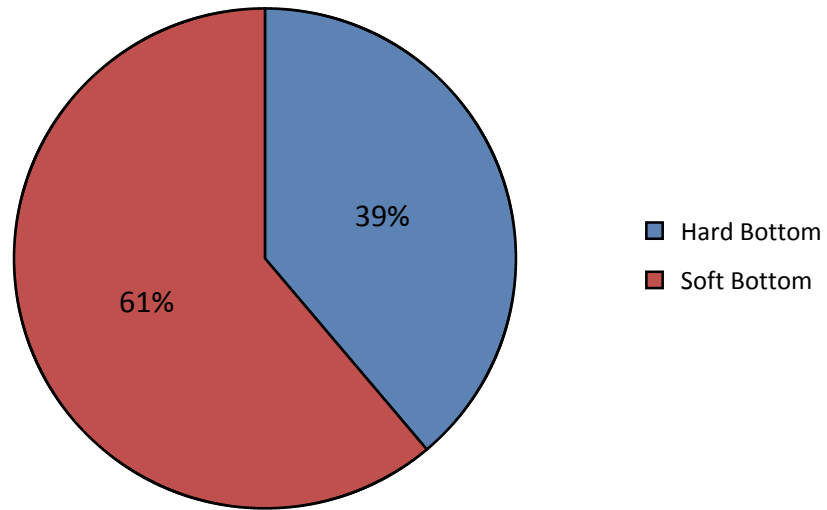
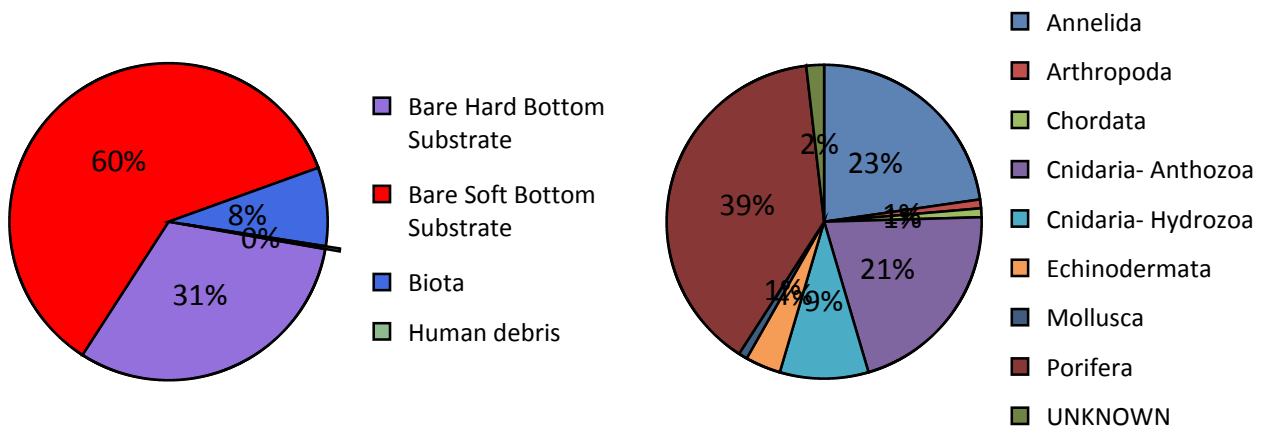


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-11. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-11.

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: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-8; 165 m; ROV 19-11; UNCW 717; 12-VI-19-1

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Samples, Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-11.

	%	Notes	Samp.
Biota	8.02%	X	X
Porifera	3.13%	X	X
Demospongiae	2.99%	X	X
<i>Corallistes</i> sp.		X	
Demospongiae	0.66%	X	
<i>Leiodermatium lynceus</i> Schmidt, 1870	2.33%	X	X
<i>Penares</i> cf. sp.			X
Tetractinellida		X	
Hexactinellida		X	
Porifera	0.15%		
Cnidaria- Hydrozoa	0.73%	X	
Hydrozoa	0.73%	X	
Hydroidolina	0.73%	X	
<i>Nemertesia</i> sp.		X	
Cnidaria- Anthozoa	1.68%	X	X
Alcyonacea - gorgonian	1.68%	X	X
Alcyonacea- gorgonian		X	
Gorgonacea- white fan		X	
Plexauridae	1.68%		X
Annelida	1.82%	X	X
Annelida	0.15%		X
Polychaeta	1.68%	X	
Sabellidae	0.15%	X	
Serpulidae	1.53%	X	
Mollusca	0.07%	X	X
Cephalopoda		X	
Teuthida		X	
Gastropoda	0.07%	X	X
Gastropoda	0.07%		
<i>Perotrochus maureri</i> Harasewych & Askew, 1993		X	
<i>Perotrochus</i> sp.			X
Arthropoda	0.07%	X	
Crustacea	0.07%	X	
Anomura		X	
Majidae		X	
Paguridae	0.07%		

Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-8; 165 m; ROV 19-11;
UNCW 717; 12-VI-19-1

Echinodermata	0.29%	X	X
Asteroidea	0.22%	X	
Echinoidea		X	
<i>Eucidaris tribuloides</i> (Lamarck, 1816)		X	
Holothuroidea	0.07%	X	X
<i>Holothuria (Vaneyothuria) lentiginosa enodis</i> Miller & Pawson, 1979		X	
<i>Paracolochirus mysticus</i> (Deichmann, 1930)	0.07%	X	X
Chordata	0.07%		
Chordata - Vertebrate	0.07%		
Actinopterygii	0.07%		
UNKNOWN	0.15%	X	
Human debris	0.29%	X	
Human debris	0.29%	X	
Human debris- Fishing Gear	0.15%		
Human debris- fish line/gear	0.15%		
Human debris- other	0.15%	X	
Habitat	91.69%		
Bare Hard Bottom Substrate	31.34%		
Hard bottom	31.34%		
Bare rock, pavement, boulder, ledge	31.12%		
Bare rubble/cobble	0.22%		
Bare Soft Bottom Substrate	60.35%		
Grand Total	100.00%		

Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-8; 165 m; ROV 19-11;
UNCW 717; 12-VI-19-1

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-11.

Class/Order/Family/Taxa Author - Common Name	ROV 19-11
Actinopterygii	
Anguilliformes	
Muraenidae	
<i>Muraena retifera</i> Goode & Bean, 1882 - Reticulate Moray	0.17
Aulopiformes	
Synodontidae	
<i>Synodus</i> sp. - Lizardfish	0.17
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	0.17
<i>Ostichthys trachypoma</i> (Günther, 1859) - Bigeye Soldierfish	1.91
Trachichthyidae	
<i>Gephyroberyx darwinii</i> (Johnson, 1866) - Darwin Slimehead	2.26
Gadiformes	
Moridae	
<i>Laemonema</i> sp. - Codling Den.	1.74
Perciformes	
Caproidae	
<i>Antigonia capros</i> Lowe, 1843 - Deepbody Boarfish	19.27
Carangidae	
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	0.17
Chaetodontidae	
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	0.35
Labridae	
<i>Decodon puellaris</i> (Poey, 1860) - Red Hogfish	5.38
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	1.56
<i>Halichoeres</i> sp. - Wrasse	0.35
Lutjanidae	
<i>Lutjanus vivanus</i> (Cuvier, 1828) - Silk Snapper	0.35
Malacanthidae	
<i>Caulolatilus microps</i> Goode & Bean, 1878 – Blueline Tilefish	0.69
Priacanthidae	
<i>Cookeolus japonicus</i> (Cuvier, 1829) - Longfinned Bullseye	0.52
Priacanthidae - Bigeyes Or Catalufas (Fam.)	0.17
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	0.35
Sciaenidae	

Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-8; 165 m; ROV 19-11;
UNCW 717; 12-VI-19-1

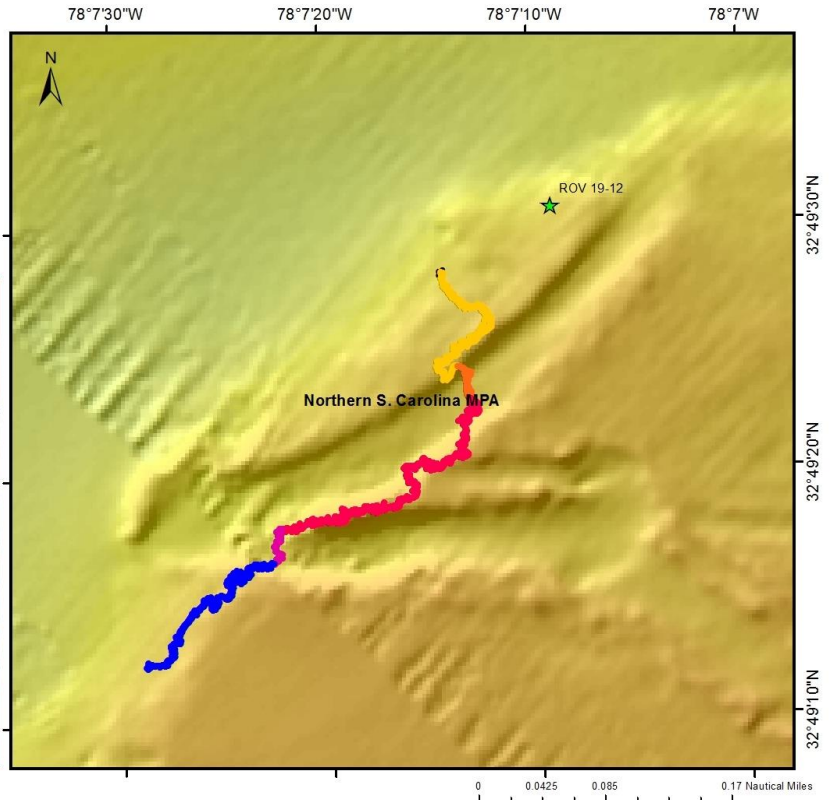
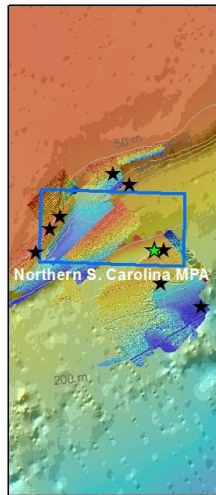
<i>Pareques iwamotoi</i> Miller & Woods, 1988 - Blackbar Drum	4.86
Serranidae/Anthiadae	
Anthiadae - Sea Bass: Groupers And Fairy Basslets (Fam.)	55.22
<i>Anthias nicholsi</i> Firth, 1933 - Yellowfin Bass	0.52
<i>Hemanthias vivanus</i> (Jordan & Swain, 1885) - Red Barbier	5.73
<i>Hyporthodus niveatus</i> (Valenciennes, 1828) - Snowy Grouper	3.65
<i>Plectranthias garrupellus</i> Robins & Starck, 1961 - Apricot Bass	9.03
<i>Pronotogrammus martinicensis</i> (Guichenot, 1868) - Roughtongue Bass	21.18
Serranidae/Epinephelinae	
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	0.17
Serranidae/Serraninae	
<i>Serranus notospilus</i> Longley, 1935 - Saddle Bass	3.82
Sparidae	
<i>Calamus</i> sp. - Porgy	1.39
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	1.04
Sparidae - Porgies (Fam.)	0.69
Scorpaeniformes	
Scorpaenidae	
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	10.07
Elasmobranchii	
Lamniformes	
Lamnidae	
<i>Carcharodon carcharias</i> (Linnaeus, 1758) - Great White Shark	0.17
UNKNOWN Biota	1.22

Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-06; 160 m; ROV 19-12; UNCW 718; 12-VI-19-2

General Location and Dive Track:

South Carolina, Northern
South Carolina MPA- Iceberg Scar;
SC-06; 160 m; ROV 19-12; UNCW 718

- ★ ROV 19-12
- ★ Mohawk ROV
- 201906122 - Transect 01
- 201906122 - Transect 02
- 201906122 - Transect 03
- 201906122 - Transect 04
- 201906122 - Transect 05
- DiveTracks
- Oculina HAPC
- MPA
- Deep Coral HAPC
- Bathymetry



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Sedberry_OEBlock2_5m_UT M17N_MB

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/12/2019

Specimens: 1

Digital Photos: 108

No. DVD: 2

Hard Drive No.: 1

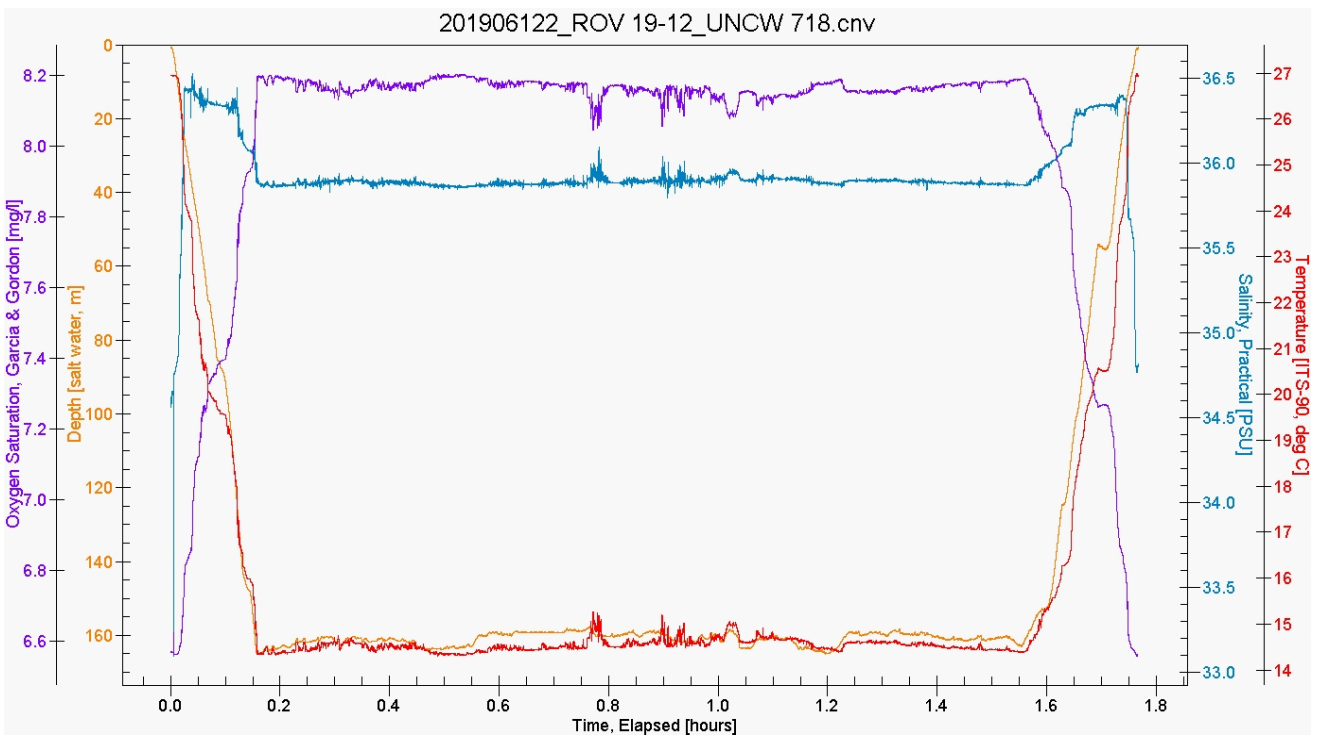
Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-06; 160 m; ROV 19-12; UNCW 718; 12-VI-19-2

Dive Data:

Minimum Bottom Depth (m): -159.3	Total Transect Length (km): 0.813
Maximum Bottom Depth (m): -167.3	Surface Current (kn): 1.1
On Bottom (Time- EDST): 12:02	On Bottom (Lat/Long): 32.8243°N; -78.1207°W
Off Bottom (Time- EDST): 13:26	Off Bottom (Lat/Long): 32.82°N; -78.1247°W
Physical (bottom); Temp (°C): 15.6	Salinity: 36.03 Visibility (m): N/A Current (kn): 0

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-12 are as follows: Depth Maximum: 165.2 m, Temperature: 14.31-15.63 °C, Salinity: 35.8-36.1 PSU, Oxygen Saturation: 8-8.2 mg/l.

Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-06; 160 m; ROV 19-12; UNCW 718; 12-VI-19-2

Dive Imagery:



Figure 1: 32°49.4193'N;78°7.2262'W: -163.5 m
Spider crab (*Mithrax* sp.)

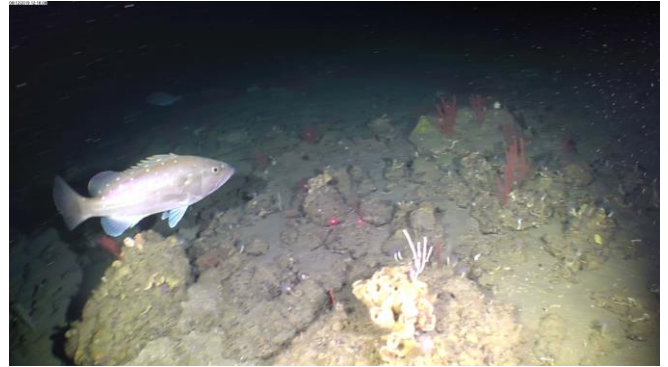


Figure 2: 32°49.4197'N;78°7.2307'W: -163 m
Snowy grouper (*Hyporthodus niveatus*)



Figure 3: 32°49.3933'N;78°7.2273'W: -165.3 m
Hermit crab (*Diogenes* sp.)



Figure 4: 32°49.3782'N;78°7.2182'W: -161.9 m
Spinycheek scorpionfish (*Neomerinthe hemingwayi*)



Figure 5: 32°49.3658'N;78°7.228'W: -161 m
ROV manipulator collection of a demosponge



Figure 6: 32°49.3016'N;78°7.35'W: -162.9 m
Bulleye (*Cookeolus japonicus*)

Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-06; 160 m; ROV 19-12; UNCW 718; 12-VI-19-2

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 12-VI-19-2; ROV 19-12, UNCW Dive 718; South Carolina, Northern South Carolina MPA (Deep), Ice Berg Scour Site, 70 nmi offshore; 160 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 161- 165 m

MB map shows apparent ice berg scours on flat topped plateau; ROV xs along NE-SW escarpment on north side of plateau, scarp facing NW, 159 m top, 174 m base of escarpment; and along NE-SW scour.

Weather- Cloudy, seas 2-3 ft from SE, wind 12 kn from 187 dg, air- 26.01 C, surface water- 27.03 C, salinity- 34.32 PSU, current- 1.1 kn to 213 dg.

11:51- Launch

12:02- On bottom- 167 m; visibility- 5 m, current- 0.1 kn, heading SE up slope toward ice berg scour; MB- ½ way down face of slope, flat, pavement, 10 cm cobble; 10 cm orange gorgonian, Serpulidae, blue encrusting *Hymedesmia*, *Leiodermatium*, scorpionfish, Majidae, *Paracolochirus mysticus*.

12:11- 163 m, top edge of scour, north wall, 25-50 cm boulders; 30 dg slope; hd SW along top rim; snowy grouper common, boarfish common, orange and white Plexauridae common, *Leiodermatium* common, Serpulidae, 30 cm long hydroids- *Nemertesia*.

12:22- HD SE across scour, 165 m, in scour bottom, fine grey sand; Paguridae, tattler, branching ye sponges common, scorpionfish.

12:30- 161 m, south rim of scour, 25 cm rock boulders

Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-06; 160 m; ROV 19-12; UNCW 718; 12-VI-19-2

Sample 1- 10 cm cream-yellow lobate fingers, very soft, Demospongiae, common to abundant; Bin 3.

12:36- Continue XS along S rim of scour; 25-50 cm boulders. Human debris- boot. Squid, 30 cm *Nemertesia* hydroid, Corallistes, anthiids, blueline tilefish, darwin slimehead;

12:48- 165 m, lower slope, 45 dg slope, boulders, ledges; on north rim of second scour; rugged, rugose. Scamp, 5 cm brown tubes on rock- hydroids or annelids- same as collected on previous dive; Cidaroid urchin, yellow encrusting demosponge, wrasse bass, bulleye,

13:00- 164 m, north slope; dense Sample 1 sponges.

13:03- at end of peninsula where 2 scours merge; flat fine sediment.

13:10- 161 m, xs along north facing slope of plateau escarpment, hd SW; flat sediment, 10- 15 cm boulders, low relief, low rugosity, yellow finger sponge, orange gorgonians, white gorgonians, *Leiodermatium*, few fish.

13:22- ½ m boulders with fish. 163 m, rugose; french angelfish, human debris- yogurt cup. Back to flat low relief cobble, few fish.

13:26- 165 m, end xs, end dive.

Dominant Benthic Macrobiota:

Gorgonia coral- 10 cm white and orange Plexauridae

Hydroida- *Nemertesia*

Porifera- *Leiodermatium* (abundant), Corallistes cups, thin encrusting yellow demosponges, yellow lobates and finger demosponges, *Hymedesmia*

Annelida- Serpulidae

Decapoda- Majidae, Paguridae

Echinodermata- *Paracolochirus mysticus*, Cidaroida

Mollusca- squid, *Perotrochus* sp.

Samples: 1

Demospongiae, yellow lobate fingers

Human Debris:

Cup, boot

Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-06; 160 m; ROV 19-12; UNCW 718; 12-VI-19-2

CPCe Percent Cover Analysis:

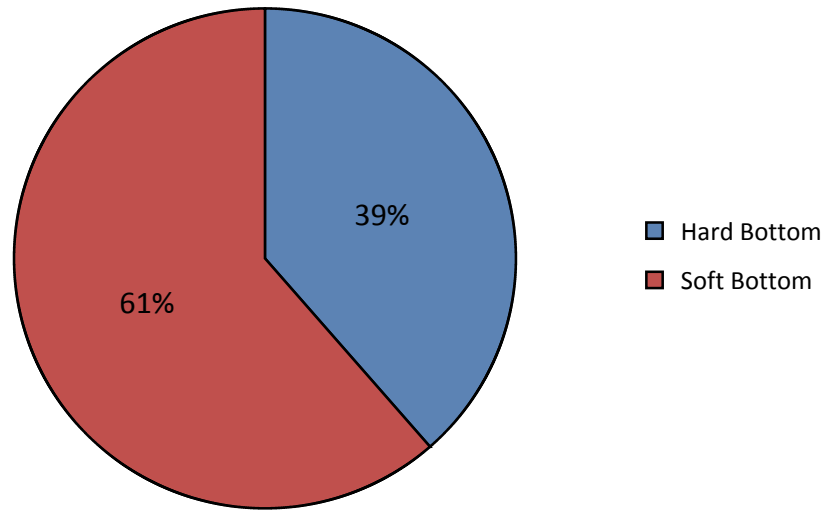
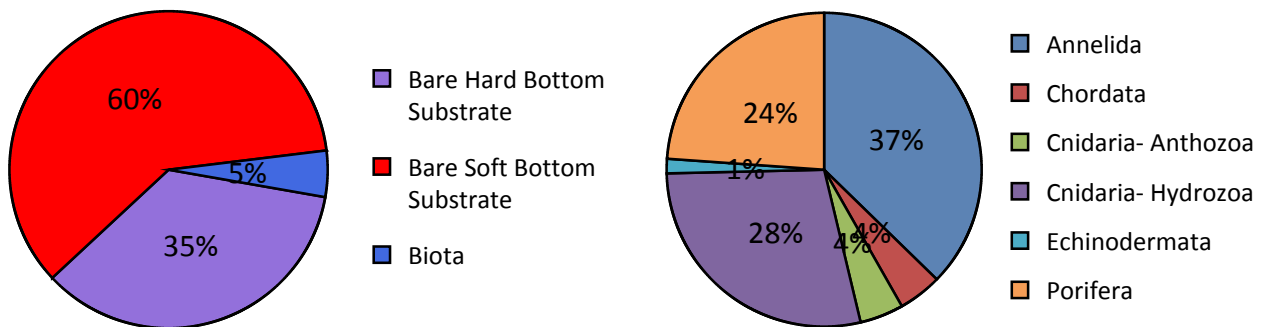


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-12. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-12.

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: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-06; 160 m; ROV 19-12; UNCW 718

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Samples, Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-12.

	%	Notes	Samp.
Biota	4.72%	X	X
Porifera	1.13%	X	X
Demospongiae	1.06%	X	X
<i>Auleta</i> sp.	0.07%		
Demospongiae	0.56%	X	
<i>Epipolasis</i> cf. <i>profunda</i> Diaz, van Soest & Pomponi, 1993			X
<i>Hymedesmia</i> sp.		X	
<i>Leiodermatium lynceus</i> Schmidt, 1870	0.42%	X	
Hexactinellida	0.07%		
Cnidaria- Hydrozoa	1.34%	X	
Hydrozoa	1.34%	X	
Hydroidolina	1.34%		
Nemertesia sp.		X	
Cnidaria- Anthozoa	0.21%	X	
Alcyonacea - gorgonian	0.21%	X	
Alcyonacea- gorgonian		X	
Gorgonacea- white fan		X	
Plexauridae	0.21%		
Annelida	1.76%	X	
Polychaeta	1.76%	X	
Sabellidae	0.42%	X	
Serpulidae	1.34%	X	
Mollusca		X	
Gastropoda		X	
<i>Perotrochus maureri</i> Harasewych & Askew, 1993		X	
Arthropoda		X	
Crustacea		X	
Anomura		X	
Majidae		X	
Echinodermata	0.07%	X	
Holothuroidea	0.07%	X	
<i>Paracolochirus mysticus</i> (Deichmann, 1930)	0.07%	X	
Chordata	0.21%		
Chordata - Vertebrate	0.21%		
Actinopterygii	0.21%		

Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-06; 160 m; ROV 19-12; UNCW 718

Human debris	X
Human debris	X
Human debris- other	X
Human debris- Trash	X
Human debris- plastic	X
Habitat	95.28%
Bare Hard Bottom Substrate	35.26%
Hard bottom	35.26%
Bare rock, pavement, boulder, ledge	34.06%
Bare rubble/cobble	1.20%
Bare Soft Bottom Substrate	60.01%
Grand Total	100.00%

Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-06; 160 m; ROV 19-12; UNCW 718

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-12.

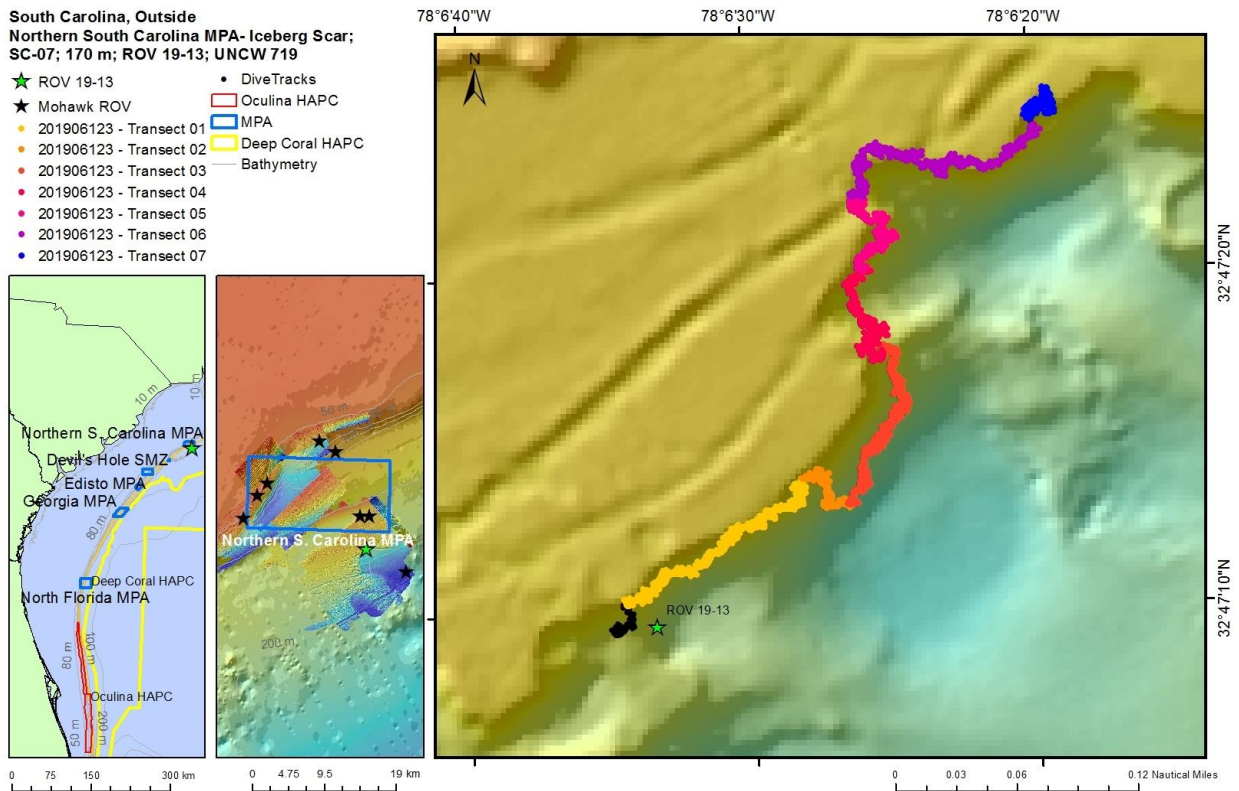
Class/Order/Family/Taxa Author - Common Name	ROV 19-12
Actinopterygii	
Beryciformes	
Holocentridae	
<i>Ostichthys trachypoma</i> (Günther, 1859) - Bigeye Soldierfish	2.01
Trachichthyidae	
<i>Gephyroberyx darwinii</i> (Johnson, 1866) - Darwin Slimehead	13.31
Gadiformes	
Moridae	
<i>Laemonema</i> sp. - Codling Den.	0.75
Lophiiformes	
Ogcocephalidae	
<i>Ogcocephalus</i> sp. - Batfish	0.25
Perciformes	
Caproidae	
<i>Antigonia capros</i> Lowe, 1843 - Deepbody Boarfish	26.62
Carangidae	
<i>Seriola</i> sp. - Amberjack	0.25
Chaetodontidae	
<i>Prognathodes guyanensis</i> (Durand, 1960) - French Butterflyfish	0.50
Labridae	
<i>Decodon puellaris</i> (Poey, 1860) - Red Hogfish	6.28
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	0.50
Malacanthidae	
<i>Caulolatilus microps</i> Goode & Bean, 1878 - Blueline Tilefish	0.50
Priacanthidae	
<i>Cookeolus japonicus</i> (Cuvier, 1829) - Longfinned Bullseye	5.27
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	0.75
Sciaenidae	
<i>Pareques iwamotoi</i> Miller & Woods, 1988 - Blackbar Drum	2.26
Serranidae/Anthiadae	
Anthiadae - Sea Bass: Groupers And Fairy Basslets (Fam.)	131.84
<i>Anthias nicholsi</i> Firth, 1933 - Yellowfin Bass	5.52
<i>Anthias woodsi</i> Anderson & Heemstra, 1980 - swallowtail bass	0.25
<i>Hemanthias vivanus</i> (Jordan & Swain, 1885) - Red Barbier	20.84
<i>Hyporthodus niveatus</i> (Valenciennes, 1828) - Snowy Grouper	1.51
<i>Plectranthias garrupellus</i> Robins & Starck, 1961 - Apricot Bass	11.30
<i>Pronotogrammus martinicensis</i> (Guichenot, 1868) - Roughtongue Bass	21.09

Dive Site: South Carolina, Northern South Carolina MPA- Iceberg Scar; SC-06; 160 m; ROV 19-12; UNCW 718

Serranidae/Epinephelinae	
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	0.50
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	0.25
Serranidae/Serraninae	
<i>Serranus notospilus</i> Longley, 1935 - Saddle Bass	7.28
Sparidae	
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	0.50
Sparidae - Porgies (Fam.)	1.26
Scorpaeniformes	
Scorpaenidae	
<i>Neomerinthe hemingwayi</i> Fowler, 1935 - Spinycheek Scorpionfish	0.75
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	7.79
UNKNOWN Biota	1.26

Dive Site: South Carolina, Outside Northern South Carolina MPA- Iceberg Scar; SC-07; 170 m; ROV 19-13; UNCW 719; 12-VI-19-3

General Location and Dive Track:



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Sedberry_OEBlock2_5m_UT M17N_MB

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/12/2019

Specimens: 3

Digital Photos: 213

No. DVD: 2

Hard Drive No.: 1

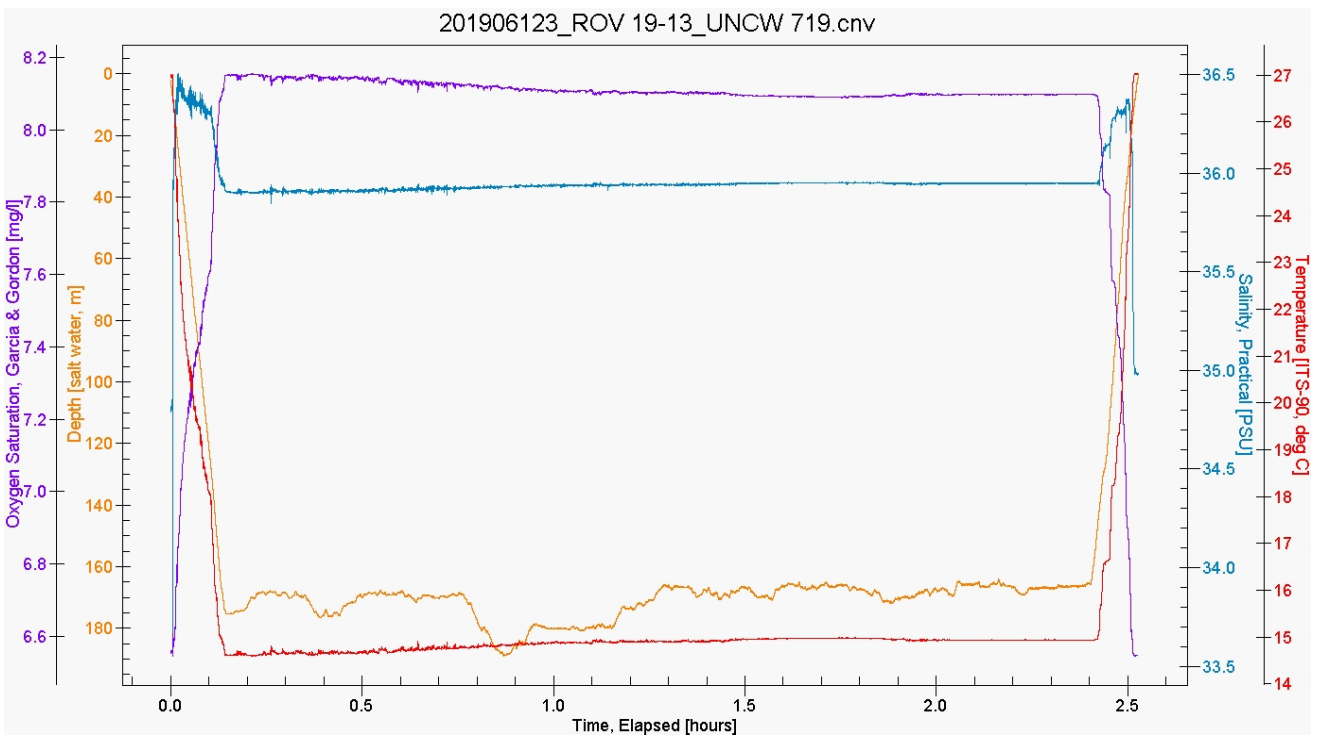
Dive Site: South Carolina, Outside Northern South Carolina MPA- Iceberg Scar; SC-07; 170 m; ROV 19-13; UNCW 719; 12-VI-19-3

Dive Data:

Minimum Bottom Depth (m): -166.5	Total Transect Length (km): 0.972
Maximum Bottom Depth (m): -190.9	Surface Current (kn): 0.7
On Bottom (Time- EDST): 14:48	On Bottom (Lat/Long): 32.786°N; -78.1098°W
Off Bottom (Time- EDST): 17:03	Off Bottom (Lat/Long): 32.7902°N; -78.1056°W
Physical (bottom); Temp (°C): 14.9	Salinity: 35.94 Visibility (m): 5 Current (kn): N/A

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-13 are as follows: Depth Maximum: 189 m, Temperature: 14.6-14.99 °C, Salinity: 35.9-36 PSU, Oxygen Saturation: 8.1-8.2 mg/l.

Dive Site: South Carolina, Outside Northern South Carolina MPA- Iceberg Scar; SC-07; 170 m; ROV 19-13; UNCW 719; 12-VI-19-3

Dive Imagery:



Figure 1: 32°47.1734'N;78°6.571'W: -170.3 m
Carolina hake (*Urophycis earllii*)



Figure 2: 32°47.176'N;78°6.5658'W: -172.2 m
Spinycheek scorpionfish (*Neomerinthe hemingwayi*)

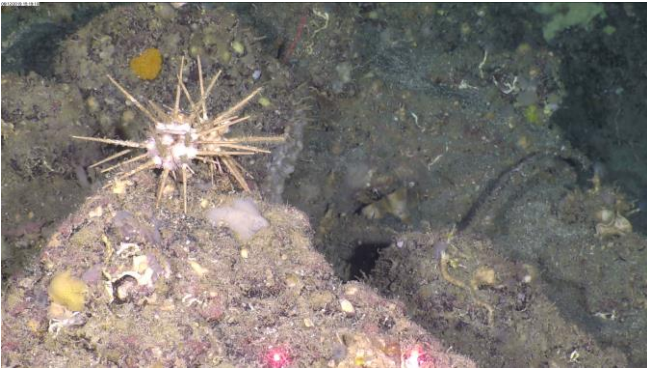


Figure 3: 32°47.2189'N;78°6.4829'W: -172.2 m
Pencil sea urchin (*Stylocidaris affinis*)



Figure 4: 32°47.249'N;78°6.4333'W: -182.1 m
Slit shell (*Perotrochus amabilis?*)



Figure 5: 32°47.2657'N;78°6.4186'W: -181.8 m
Sea cucumber (*Holothuria lentigenosa enodis*)



Figure 6: 32°47.293'N;78°6.4234'W: -172.6 m
Sea urchin (*Coelopleurus floridanus*)

Dive Site: South Carolina, Outside Northern South Carolina MPA- Iceberg Scar; SC-07; 170 m; ROV 19-13; UNCW 719; 12-VI-19-3

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 12-VI-19-3; ROV 19-13, UNCW Dive 719; South Carolina, Outside Northern South Carolina MPA (Deep), Ice Berg Scour Site, 75 nmi offshore; 170 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 168- 191 m

MB map shows apparent ice berg scours on flat topped plateau; ROV xs along NE-SW escarpment on south side of plateau, scarp facing SE, 168 m top, 197 m base of escarpment.

Weather- Cloudy/rain, seas 2-3 ft from SE, wind 14 kn from 193 dg, air- 26.86 C, surface water- 27.16 C, salinity- 34.43 PSU, current- 0.7 kn to 259 dg.

2:38 - Launch

14:48- On bottom- 177 m; visibility- 5 m, current- 0.1 fr NE, 14.6 C; on face of MB escarpment, ROV- flat, black and grey sediment, cobble, 25- 50 cm boulders, 1 m ledges, 30-45 dg slope; heading NE; Serpulid polychaetes, *Leiodermatium*, darwin slimehead, Laemonema, snowy grouper, ye encrusting Verongida, Cideroidea, white encrusting demospongia, hake, scorpionfish, Asteroidea, thick folded plate Asteroophorida, *Holothuria lentiginosa* enodis common, boarfish, blue *Hymedesmia*.

15:09- 171 m, upper scarp, same habitat, rugged, rugose, rock boulders, 1/2- 1 m ledges, 45 dg slope; *Stylocidaris*, *Paracolochirus mysticus*, Corallistes, anthiids, moray eel.

15:26- 171 m; change hd, head S downslope to bottom of escarpment.

182 m- 45 dg slope, rugged, boulders.

Dive Site: South Carolina, Outside Northern South Carolina MPA- Iceberg Scar; SC-07; 170 m; ROV 19-13; UNCW 719; 12-VI-19-3

15:32- 191 m- near base of slope, 14.8 C; 10 dg slope, rock pavement, 25-50 cm boulders, rock slabs broken off, 2 m square, 25 cm thick, low diversity and density; few sponges, *Leiodermatium*, *Astrophorida*, slimehead, red-orange gorgonian, *Stylocidaris*, asteroid, folded plate *Astrophorida*, *Paracolochirus*, slit shell.

15:39- 182 m; rock slope and boulders

Sample 1- *Paratrochus* (for AD), Bin 3.

15:55- 173 m, red and white long spine urchin *Coelopleurus floridanus*; upper slope, rock boulders, flat rock slabs; 170 m- top of escarpment, fractured flat rock slabs and pavement, rugged, rugose; yellowfin bass, hake, blueline tilefish, field *Coelopleurus*, snowy grouper, cup coral.

16:15- 169 m, top edge; same habitat/biota. *Macrorhynchia* 20 cm hydroids common, abundant sea weenies, 1 m *Astrophorida*, dense *Leiodermatium*, Euritidae- *Farrea*.

16:39- 170 m, top edge, same habitat.

16:44- 168 m; top edge.

Sample 2- 2 *Paratrochus* sp., Bin 2, Suction 4.

16:53- 171 m, top edge.

16:55- 169.4 m, top edge.

Sample 3- 2 *Paratrochus*, Suction 1, Bin 2.

Dominant Benthic Macrobiota:

Gorgonia coral- 10 cm white and orange Plexauridae

Hydroida- *Macrorhynchia*

Porifera- *Leiodermatium* (abundant), Corallistes cups, thin encrusting yellow demosponges, , *Hymedesmia*, white encrusting demosponges, 30 – 50 m folded plate Pachastrellidae

Annelida- Serpulidae

Decapoda- Paguridae

Echinodermata- *Paracolochirus mysticus*, *Stylocidaris*, *Coelopleurus floridanus*

Mollusca- *Peratrochus* sp. (abundant)

Samples: 5

5 *Paratrochus* slit shells (AD)

Human Debris:

None

Dive Site: South Carolina, Outside Northern South Carolina MPA- Iceberg Scar; SC-07; 170 m; ROV 19-13; UNCW 719; 12-VI-19-3

CPCe Percent Cover Analysis:

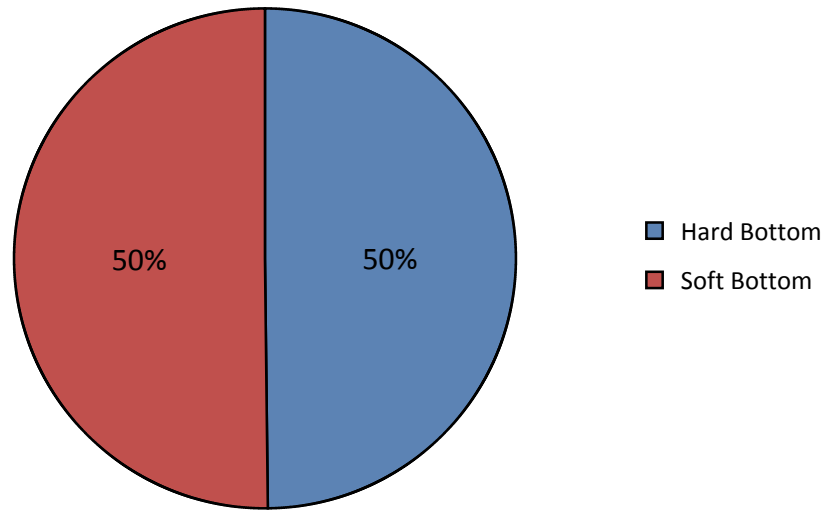
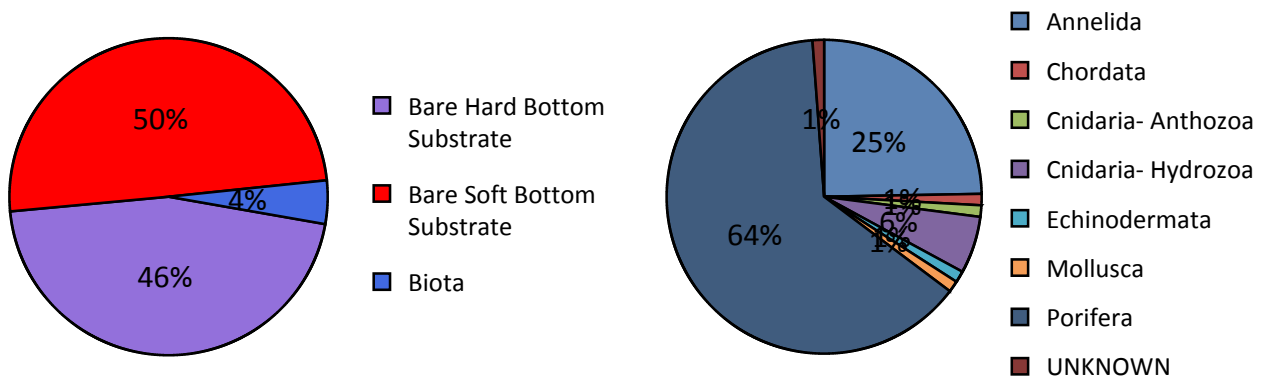


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-13. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-13.

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: South Carolina, Outside Northern South Carolina MPA- Iceberg Scar; SC-07; 170 m; ROV 19-13; UNCW 719; 12-VI-19-3

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Samples, Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-13.

	%	Notes	Samp.
Biota	4.44%	X	X
Porifera	2.82%	X	
Demospongiae	2.72%	X	
<i>Corallistes</i> sp.		X	
<i>Corallistes typus</i> Schmidt, 1870		X	
Demospongiae	1.98%	X	
<i>Hymedesmia</i> sp.		X	
<i>Leiodermatium</i> sp.	0.73%	X	
Pachastrellidae		X	
Tetractinellida		X	
Verongiida		X	
Hexactinellida	0.05%	X	
<i>Farrea</i> sp.		X	
Hexactinellida	0.05%		
Porifera	0.05%		
Cnidaria- Hydrozoa	0.26%	X	
Hydrozoa	0.26%	X	
Hydroidolina	0.26%		
<i>Macrorhynchia</i> sp.		X	
Nemertesia sp.		X	
Cnidaria- Anthozoa	0.05%	X	
Alcyonacea - gorgonian		X	
Coral- Scleractinia	0.05%	X	
Scleractinia- unid cup	0.05%	X	
Annelida	1.10%	X	
Annelida	0.05%		
Polychaeta	1.04%	X	
Sabellidae	0.42%	X	
Serpulidae	0.63%	X	
Mollusca	0.05%	X	X
Gastropoda	0.05%	X	X
Gastropoda	0.05%		
<i>Perotrochus maureri</i> Harasewych & Askew, 1993		X	X
<i>Perotrochus</i> sp.			X
Echinodermata	0.05%	X	
Asteroidea		X	

Dive Site: South Carolina, Outside Northern South Carolina MPA- Iceberg Scar; SC-07; 170 m; ROV 19-13; UNCW 719; 12-VI-19-3

Echinoidea		X
<i>Coelopleurus floridanus</i> A. Agassiz, 1872		X
<i>Stylocidaris</i> sp.		X
Holothuroidea	0.05%	X
<i>Holothuria (Vaneyothuria) lentiginosa enodis</i> Miller & Pawson, 1979	0.05%	X
Holothuroidea		X
<i>Paracolochirus mysticus</i> (Deichmann, 1930)		X
Chordata	0.05%	
Chordata - Vertebrate	0.05%	
Actinopterygii	0.05%	
UNKNOWN	0.05%	
Habitat	95.56%	
Bare Hard Bottom Substrate	45.74%	
Hard bottom	45.74%	
Bare rock, pavement, boulder, ledge	44.18%	
Bare rubble/cobble	1.57%	
Bare Soft Bottom Substrate	49.82%	
Grand Total	100.00%	

Dive Site: South Carolina, Outside Northern South Carolina MPA- Iceberg Scar; SC-07; 170 m; ROV 19-13; UNCW 719; 12-VI-19-3

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-13.

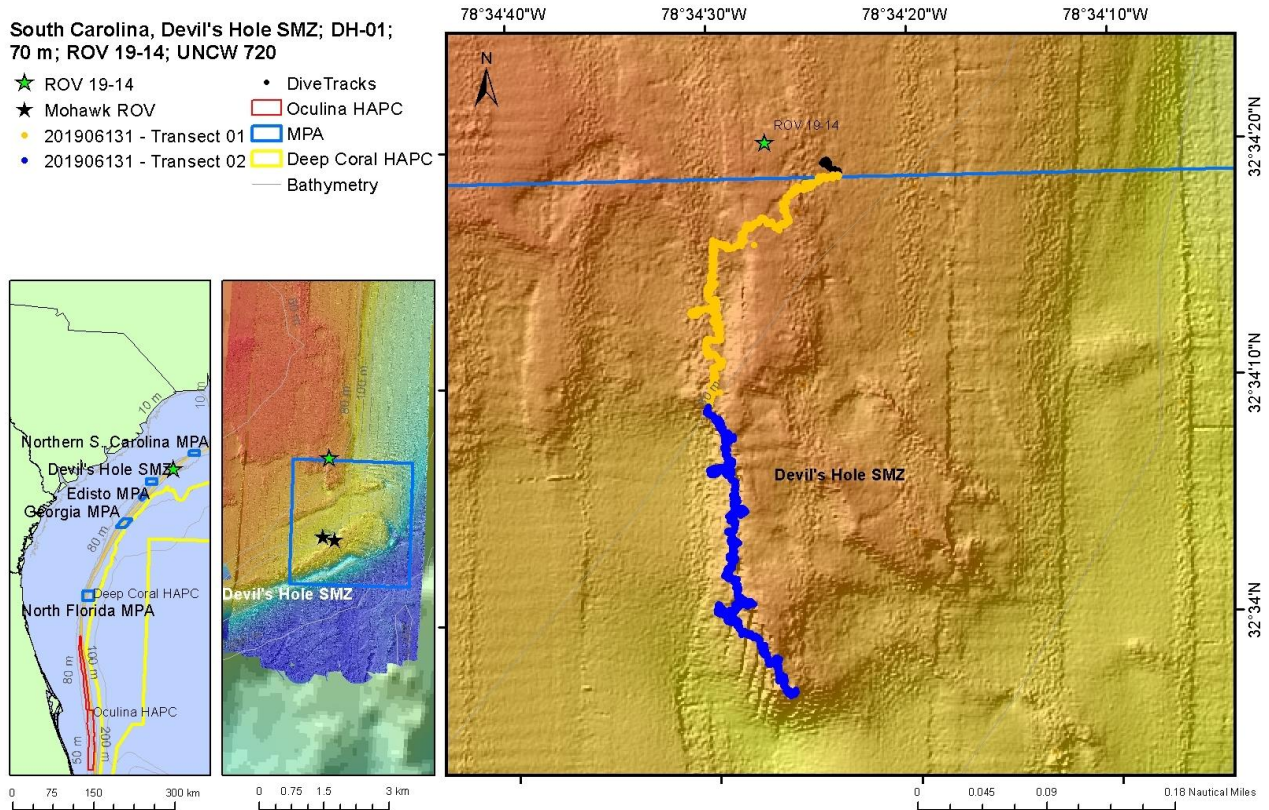
Class/Order/Family/Taxa Author - Common Name	ROV 19-13
Actinopterygii	
Anguilliformes	
Muraenidae	
<i>Gymnothorax funebris</i> Ranzani, 1839 - Green Moray	0.46
<i>Muraena retifera</i> Goode & Bean, 1882 - Reticulate Moray	0.23
Aulopiformes	
Synodontidae	
<i>Synodus intermedius</i> (Spix & Agassiz, 1829) - Sand Diver	0.46
Beryciformes	
Holocentridae	
<i>Ostichthys trachypoma</i> (Günther, 1859) - Bigeye Soldierfish	0.46
Trachichthyidae	
<i>Gephyroberyx darwinii</i> (Johnson, 1866) - Darwin Slimehead	29.20
Gadiformes	
Moridae	
<i>Laemonema</i> sp. - Codling Den.	2.30
Phycidae	
Phycidae - Phycid Hakes (Fam.)	0.23
<i>Urophycis earllii</i> (Bean, 1880) - Carolina Hake	0.92
Perciformes	
Caproidae	
<i>Antigonia capros</i> Lowe, 1843 - Deepbody Boarfish	14.48
Carangidae	
<i>Seriola</i> sp. - Amberjack	0.46
Labridae	
<i>Decodon puellaris</i> (Poey, 1860) - Red Hogfish	2.53
Malacanthidae	
<i>Caulolatilus microps</i> Goode & Bean, 1878 - Blueline Tilefish	0.92
Sciaenidae	
<i>Pareques iwamotoi</i> Miller & Woods, 1988 - Blackbar Drum	0.46
Serranidae/Anthiadae	
Anthiadae - Sea Bass: Groupers And Fairy Basslets (Fam.)	64.37
<i>Anthias nicholsi</i> Firth, 1933 - Yellowfin Bass	42.07
<i>Hemanthias vivanus</i> (Jordan & Swain, 1885) - Red Barbier	36.55
<i>Hyporthodus niveatus</i> (Valenciennes, 1828) - Snowy Grouper	1.84
<i>Plectranthias garrupellus</i> Robins & Starck, 1961 - Apricot Bass	5.98

Dive Site: South Carolina, Outside Northern South Carolina MPA- Iceberg Scar; SC-07; 170 m; ROV 19-13; UNCW 719; 12-VI-19-3

<i>Pronotogrammus martinicensis</i> (Guichenot, 1868) - Roughtongue Bass	1.15
Sparidae	
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	0.46
Sparidae - Porgies (Fam.)	0.92
Scorpaeniformes	
Scorpaenidae	
<i>Neomerinthe hemingwayi</i> Fowler, 1935 - Spinycheek Scorpionfish	0.23
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	17.93
UNKNOWN Biota	1.15

Dive Site: South Carolina, Devil's Hole SMZ; DH-01; 70 m; ROV 19-14; UNCW 720; 13-VI-19-1

General Location and Dive Track:



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Pisces_2013_EastDevilsHole MPA_MB

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/13/2019

Specimens: 4

Digital Photos: 284

No. DVD: 3

Hard Drive No.: 1

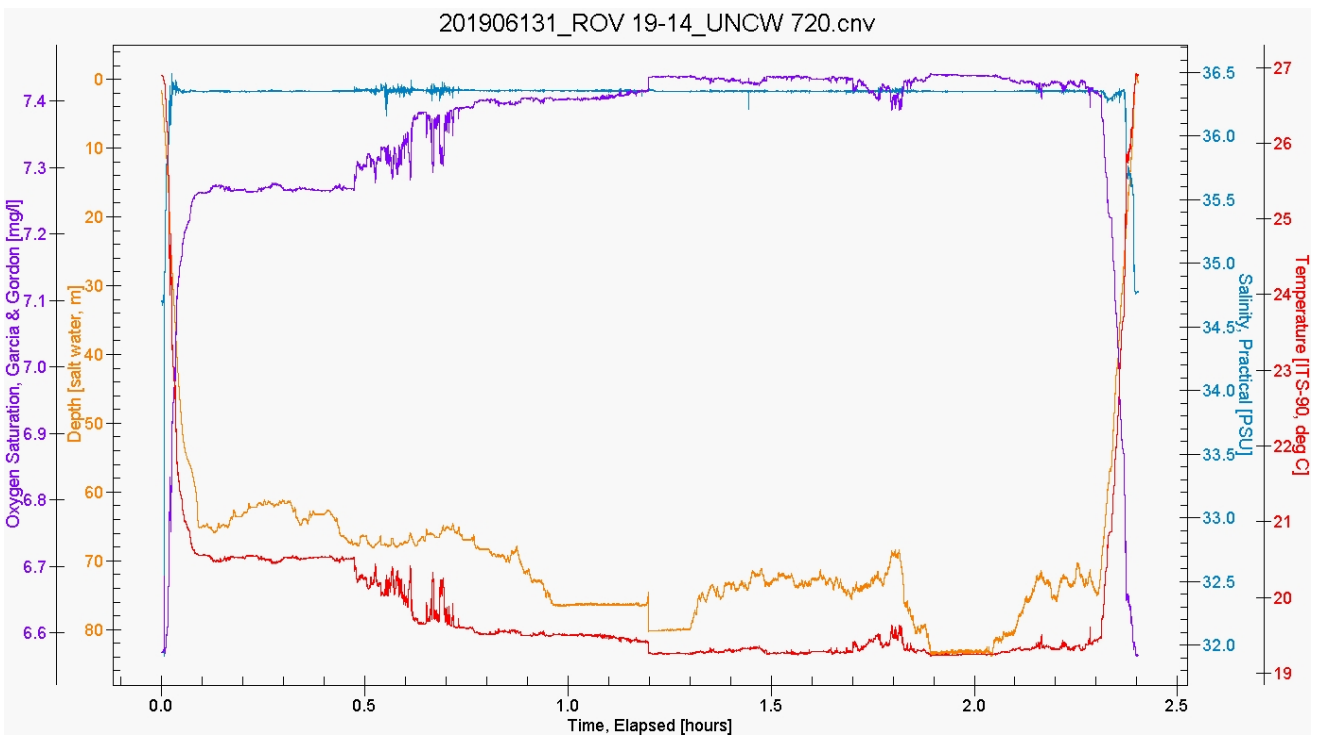
Dive Site: South Carolina, Devil's Hole SMZ; DH-01; 70 m; ROV 19-14; UNCW 720; 13-VI-19-1

Dive Data:

Minimum Bottom Depth (m): -55.7	Total Transect Length (km): 1.030
Maximum Bottom Depth (m): -85.5	Surface Current (kn): 0.1
On Bottom (Time- EDST): 12:17	On Bottom (Lat/Long): 32.572°N; -78.5734°W
Off Bottom (Time- EDST): 14:45	Off Bottom (Lat/Long): 32.5658°N; -78.5743°W
Physical (bottom); Temp (°C): 20.6	Salinity: 36.35 Visibility (m): N/A Current (kn): 0

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-14 are as follows: Depth Maximum: 83.7 m, Temperature: 19.23-20.59 °C, Salinity: 36.2-36.4 PSU, Oxygen Saturation: 7.3-7.4 mg/l.

Dive Site: South Carolina, Devil's Hole SMZ; DH-01; 70 m; ROV 19-14; UNCW 720; 13-VI-19-1

Dive Imagery:



Figure 1: 32°34.291'N;78°34.4413'W: -62.8 m
Swiftia exserta with exsert polyps



Figure 2: 32°34.2839'N;78°34.4393'W: -62.8 m
Dense fields of *Swiftia exserta*



Figure 3: 32°34.2326'N;78°34.5056'W: -68.8 m
Slipper lobster (*Scyllaridae*)



Figure 4: 32°34.1517'N;78°34.5063'W: -69.5 m
Scamp (*Mycteroperca phenax*), Tomtoate (*Haemulon aurolineatum*)

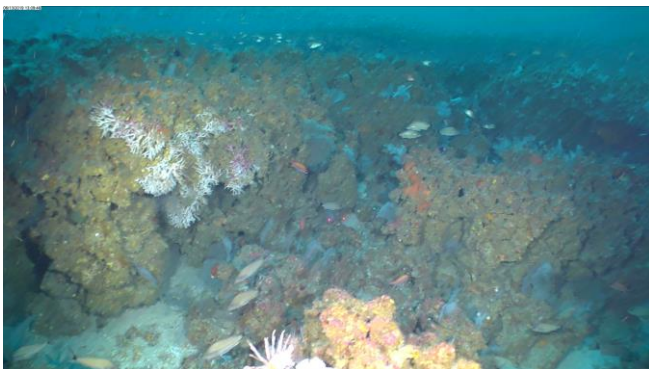


Figure 5: 32°34.1422'N;78°34.5'W: -70.5 m
Moderate relief ledges (1 m), with *Madracis myriaster* coral and schools of tomtoate (*Haemulon aurolineatum*)



Figure 6: 32°34.1043'N;78°34.4942'W: -77.7 m
Lionfish and coral (*Madracis myriaster*)

Dive Site: South Carolina, Devil's Hole SMZ; DH-01; 70 m; ROV 19-14; UNCW 720; 13-VI-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 13-VI-19-1; ROV 19-14, UNCW Dive 720; South Carolina, Devil's Hole SMZ, 70 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 64- 85 m

MB map shows N-S oriented escarpment, facing W at southern edge of plateau, top 65 m, bottom 84 m; ROV heading S along escarpment.

Weather- Sunny, seas 2-4 ft from SW, wind 13 kn from 288 dg, air- 25.92 C, surface water- 26.95 C, salinity- 34.11 PSU, current- 0.1- 0.4 kn to 72 dg.

12:10 - Launch

12:17- On bottom- 66.6 m; visibility- 15 m, current- 0; 180 m NE of WP, outside border of SMZ, on top of plateau of MB.

12:20- Inside SMZ, hd SW. Flat pavement, cobble, sediment; algae, hydroids, 5 cm gorgonians, small sponges, *Swiftea exserta*, *Diodogorgia*, asteroid, *Geodia neptuni*, *Ellisella* whip, Rhodophyta, hydroids, Amberjack, bank butterflyfish, *Swiftea* abundant, solid field of *Swiftea* over 30 m area; orange ball sponges, bigeye, tattler, lionfish, CCA, green algae, reef butterflyfish.

12:31- near top edge of MB escarpment, 64 m; flat pavement, cobble, dense small biota.

12:33- On slope in MB, 64 m, at WP of MB; same habitat, pavement, sediment, 5-10 dg slope; french angelfish, *Geodia neptuni*, 5-10 cm gorgonians- red, orange, sparsely branched; CCA, *Ellisella* whip, *Antipathes atlantica*, *Diodogorgia*, green leaf algae- *Ulva*?

Dive Site: South Carolina, Devil's Hole SMZ; DH-01; 70 m; ROV 19-14; UNCW 720; 13-VI-19-1

12:37- 64 m; hd S along lower slope of MB escarpment; 68.5 m, Scyllaridae slipper lobster out walking.

12:44- lost power and video; no CTD.

12:48- power back, 68.5 m.

12:52- CTD back on; low relief hills, pavement, cobble, sediment, 10-20 cm hydroids common, *Filograna*, *Peyssonnelia*.

12:57- 69 m, ½ m ledge, *Spirastrella*, pavement, 25 cm relief boulders; ledge outcrop ½ m, rough tongue antheids, spotfin hogfish, lionfish, 2 scamp.

13:06- 69.5 m, top of scarp on MB; ROV shows 2 relief, 2-3 m round boulders on drop off, 30 dg slope over 10 m, dense fish- scamp, dense tomtate, vermilion snapper;

13:10- 71 m, 14.5 C, ½ down slope, 30-45 dg slope, bottom flattens out with sand and 1 m boulders; several 30 cm *Oculina/Madracis* white coral on vertical rock, marbled grouper, lionfish, 1 m diam coral on rock- *Oculina/ Madracis*- numerous colonies 10- 50 cm, dense anthiid schools, dense *Antipathes atlantica*, *Antipathes furcata*,.

13:17- 77.7 m, lower part of slope, 1 m boulders, 1 m diameter *Oculina/Madracis* white w/pink bases. 14.5 C.

Sample 1- *Madracis myriaster*, Bucket 1, Bin 1.

13:31- Loss of power; computer failure, Windows 7;

13:40- 81.3 m;

Sample 2- 10 cm orange Plexauridae, long polyps, photo and collect Sample 2 again- two specimens. Bin 2 and 3.

13:44- cont xs along lower slope of MB escarpment. 75 m, striped grunt, porgy, dense school of scad, ¼ to ½ m boulders at base of slope, very eroded rock; dense *Antipathes atlantica*, *Madracis*, goatfish, lionfish, scamp, amberjack, rock beauty, 1-2 m boulders, blue angelfish, dozens of amberjack,

13:57- 75 m, 2-3 ridge of *Madracis* on vertical rock; *Tanacetipathes*, 30- 50 cm *Madracis*, 4 *Madracis*.

14:06- Power loss; came back immediately.

14:07- 75 m, same habitat, dense *Antipathes*, greyhead scamp, *Madracis*

14:12- 1 m *Madracis*, several 10-30 cm, 75 m; *Madracis*, cup corals, *Stichopathes luetkeni*, fishing line wrapped around rock, dense *Madracis*, 2 *Madracis*, 2 *Madracis*.

14:18- 78 m, flat boulders ½ to 2 m, 1 m *Madracis*, 81.5 m, 1.5 m *Madracis*, dense field of *Madracis*.

14:23- 85.2 m, base of slope, 25 cm boulders.

Sample 3- *Antipathes atlantica*, 15 cm, white, dense mesh fan; Bin 3

14:29- cont xs to end WP; boulders covered with *Madracis*, 84 m, more boulders with *Madracis*. All identifications tentative, some could be *Oculina* too. Boulder w/ *Madracis*, fishing line, boulder w/ *Madracis*, dozen lionfish on same boulder, 76 m, fishing line on boulder, 2-3 m relieve boulders, on MB at southern tip of escarpment, 30-45 dg slope, more boulders w/ *Madracis*, dense *Madracis* on boulders

14:40- 74 m, 8-10 ft great white, female, denser coral.

14:45- end xs at end of southern point of plateau on MB; end dive.

Dominant Benthic Macrobiota:

Scleractinia coral- *Madracis myriaster* (dense, 1+ m colonies covering boulders), cup corals

Antipatharia coral- *Antipathes atlantica* (dense), *Stichopathes luetkeni*, *Stichopathes* sp., *Antipathes furcata*

Gorgonia coral- *Diodogorgia*, several spp of 10 cm Plexauridae, orange, red; *Swiftia exserta*- dense field at beginning

Hydroida

Porifera- small encrusting, *Spirastrella*, 30 cm *Geodia neptuni*

Annelida- *Filograna*

Decapoda- Scyllaridae

Echinodermata- *Narcissia trigonaria*

Algae- Unid spp. green colored, Rhodophyta, CCA, *Peyssonnelia*

Dive Site: South Carolina, Devil's Hole SMZ; DH-01; 70 m; ROV 19-14; UNCW 720; 13-VI-19-1

Fish- large (8-10 ft) great white swam by, female

Samples: 3

Madracis myriaster, Plexauridae- orange, *Antipathes atlantica*

Human Debris:

Fishing line wrapped on boulders common

CPCe Percent Cover Analysis:

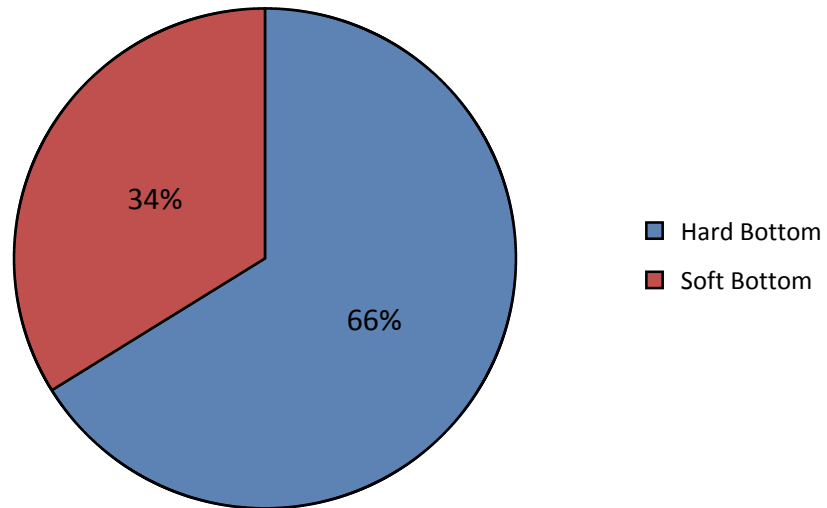
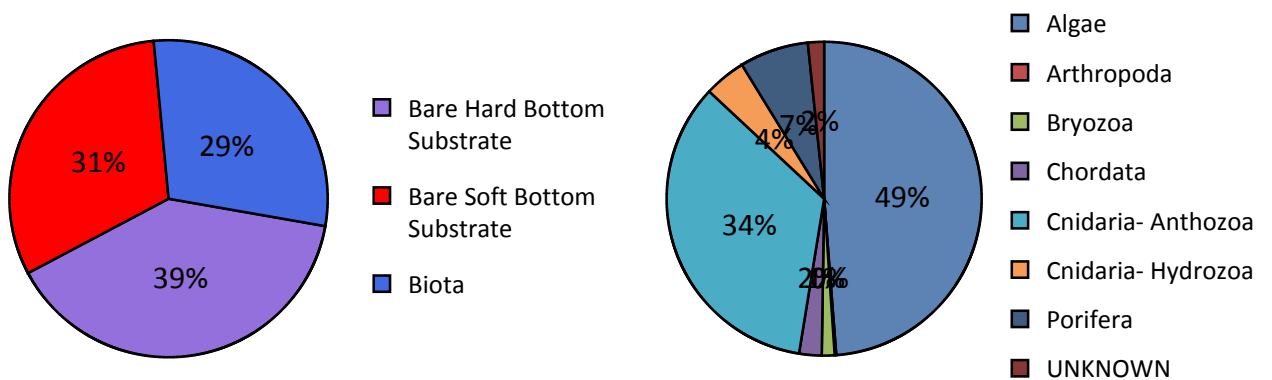


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-14. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-14.

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

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-14.

	%	Notes	Samp.
Biota	29.27%	X	X
Algae	14.27%	X	
Algae	0.14%		
Cyanobacteria	1.01%		
Chlorophyta	0.10%	X	
Ochrophyta	2.12%		
Rhodophyta	10.90%	X	
Corallinales	10.41%	X	
<i>Peyssonnelia</i> sp.		X	
Rhodophyta	0.48%	X	
Porifera	2.07%	X	
Demospongiae	2.07%	X	
<i>Agelas clathrodes</i> (Schmidt, 1870)	0.05%		
<i>Cliona</i> cf. <i>tumula</i> Friday, Poppell & Hill, 2013	0.05%	X	
Demospongiae	1.45%	X	
<i>Geodia neptuni</i> (Sollas, 1886)		X	
<i>Geodia</i> sp.		X	
Poecilosclerida	0.10%		
Spirastrellidae	0.05%	X	
<i>Spongisorites siliquaria</i> van Soest & Stentoft, 1988	0.39%		
Cnidaria- Hydrozoa	1.25%	X	
Hydrozoa	1.25%	X	
Hydroidolina	1.25%	X	
Cnidaria- Anthozoa	10.08%	X	X
Alcyonacea - Alcyoniina	0.14%		
Alcyoniina	0.05%		
Octocorallia	0.10%		
Alcyonacea - gorgonian	4.53%	X	X
Alcyonacea- gorgonian	0.19%	X	X
Clavulariidae	0.77%		
<i>Diodogorgia</i> sp.	0.05%	X	
<i>Ellisella</i> sp.	0.14%	X	
Plexauridae			X
Plexauridae- MPA1	3.38%		
<i>Swiftia exserta</i> (Ellis & Solander, 1786)		X	
Antipatharia	5.01%	X	X

Antipatharia	0.05%		
<i>Antipathes atlantica</i> Gray, 1857	3.95%	X	X
<i>Antipathes furcata</i> Gray, 1857	0.77%	X	
<i>Stichopathes luetkeni</i> Brook, 1889	0.19%	X	
<i>Tanacetipathes</i> sp.	0.05%	X	
Coral- Scleractinia	0.39%	X	X
<i>Madracis myriaster</i> (Milne Edwards & Haime, 1850)	0.39%	X	X
<i>Madrepora oculata</i> Linnaeus, 1758		X	
Scleractinia- unid cup		X	
Annelida		X	
Polychaeta		X	
<i>Filograna</i> sp.		X	
Arthropoda	0.05%	X	
Crustacea	0.05%	X	
Scyllaridae	0.05%	X	
Bryozoa	0.39%		
Echinodermata		X	
Asteroidea		X	
Asteroidea		X	
<i>Narcissia trigonaria</i> Sladen, 1889		X	
Chordata	0.68%		
Chordata - Vertebrate	0.68%		
Actinopterygii	0.68%		
UNKNOWN	0.48%		
Human debris		X	
Human debris		X	
Human debris- Fishing Gear		X	
Human debris- fishing line		X	
Bare Hard Bottom Substrate	39.44%		
Bare Hard Bottom Substrate	39.44%		
Hard bottom	39.44%		
Bare rock, pavement, boulder, ledge	21.22%		
Bare rubble/cobble	18.23%		
Bare Soft Bottom Substrate	31.29%		
Grand Total	100.00%	X	X

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-14.

Class/Order/Family/Taxa Author - Common Name	ROV 19-14
Actinopterygii	
Actinopterygii- mixed school - Mixed School	1763.10
Aulopiformes	
Synodontidae	
<i>Synodus</i> sp. - Lizardfish	0.48
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	8.66
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	0.64
<i>Plectrypops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish	0.64
Perciformes	
Carangidae	
<i>Decapterus</i> sp. - Scad	801.41
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	0.16
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	17.15
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	0.96
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	6.73
<i>Prognathodes aculeatus</i> (Poey, 1860) - Longsnout Butterflyfish	0.80
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	8.33
Haemulidae	
<i>Haemulon aurolineatum</i> Cuvier, 1830 - Tomtate Grunt	649.14
<i>Haemulon striatum</i> (Linnaeus, 1758) - Striped Grunt	4.01
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	10.42
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	3.21
<i>Halichoeres</i> sp. - Wrasse	0.96
Lutjanidae	
<i>Lutjanus buccanella</i> (Cuvier, 1828) - Blackfin Snapper	0.48
<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper	0.64
<i>Rhomboplites aurorubens</i> (Cuvier, 1829) - Vermilion Snapper	705.24
Mullidae	
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	0.80
Pomacanthidae	
<i>Centropyge argi</i> Woods & Kanazawa, 1951 - Cherubfish	7.37
<i>Holacanthus</i> sp. - Angelfish	2.72
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	0.80

<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	0.32
Pomacentridae	
<i>Chromis enchrysur</i> Jordan & Gilbert, 1882 - Yellowtail Reeffish	9.62
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	2.08
<i>Chromis scotti</i> Emery, 1968 - Purple Reeffish	4.17
<i>Chromis</i> sp. - Damselfish/chromis	2.89
Priacanthidae	
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	0.16
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	2.40
Sciaenidae	
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	11.54
Serranidae/Anthiadininae	
Anthiadininae - Sea Bass: Groupers And Fairy Basslets (Fam.)	1065.88
<i>Pronotogrammus martinicensis</i> (Guichenot, 1868) - Roughtongue Bass	4.49
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	0.64
<i>Dermatolepis inermis</i> (Valenciennes, 1833) - Marbled Grouper	0.16
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	3.21
<i>Mycteroperca microlepis</i> (Goode & Bean, 1879) - Gag	0.96
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	5.29
Serranidae/Grammistinae	
<i>Rypticus saponaceus</i> (Bloch & Schneider, 1801) - Greater Soapfish	0.32
<i>Rypticus</i> sp. - Soapfish	0.16
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	2.56
<i>Serranus baldwini</i> (Evermann & Marsh, 1899) - Lantern Bass	0.16
<i>Serranus phoebe</i> Poey, 1851 - Tattler	4.49
Sparidae	
<i>Calamus</i> sp. - Porgy	0.64
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	1.28
Sphyraenidae	
<i>Sphyraena barracuda</i> (Edwards, 1771) - Great Barracuda	0.16
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	23.08
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	0.32
Tetraodontiformes	
Diodontidae	
<i>Diodon hystrix</i> Linnaeus, 1758 - Spot-fin Porcupinefish	0.16
Ostraciidae	
Ostraciidae - Boxfishes (Fam.)	0.16
Tetraodontidae	

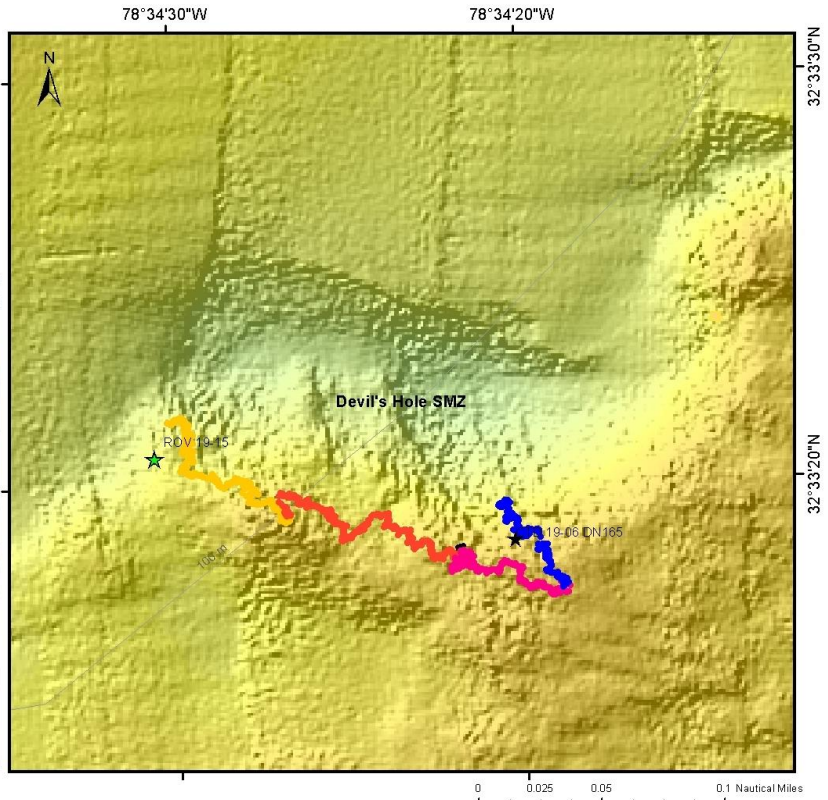
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	5.13
<i>Sphoeroides spengleri</i> (Bloch, 1785) - Bandtail Puffer	0.48
Elasmobranchii	
Lamniformes	
Lamnidae	
<i>Carcharodon carcharias</i> (Linnaeus, 1758) - Great White Shark	0.16

Dive Site: South Carolina, Devil's Hole SMZ; DH-03; 100 m; ROV 19-15; UNCW 721; 13-VI-19-2

General Location and Dive Track:

South Carolina, Devil's Hole SMZ; DH-03; 100 m; ROV 19-15; UNCW 721

- ★ ROV 19-15
- ★ Mohawk ROV
- 201906132 - Transect 01
- 201906132 - Transect 02
- 201906132 - Transect 03
- 201906132 - Transect 04
- DiveTracks
- Oculina HAPC
- MPA
- Deep Coral HAPC
- Bathymetry



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Pisces_2013_EastDevilsHole MPA_MB

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/13/2019

Specimens: 2

Digital Photos: 174

No. DVD: 1

Hard Drive No.: 1

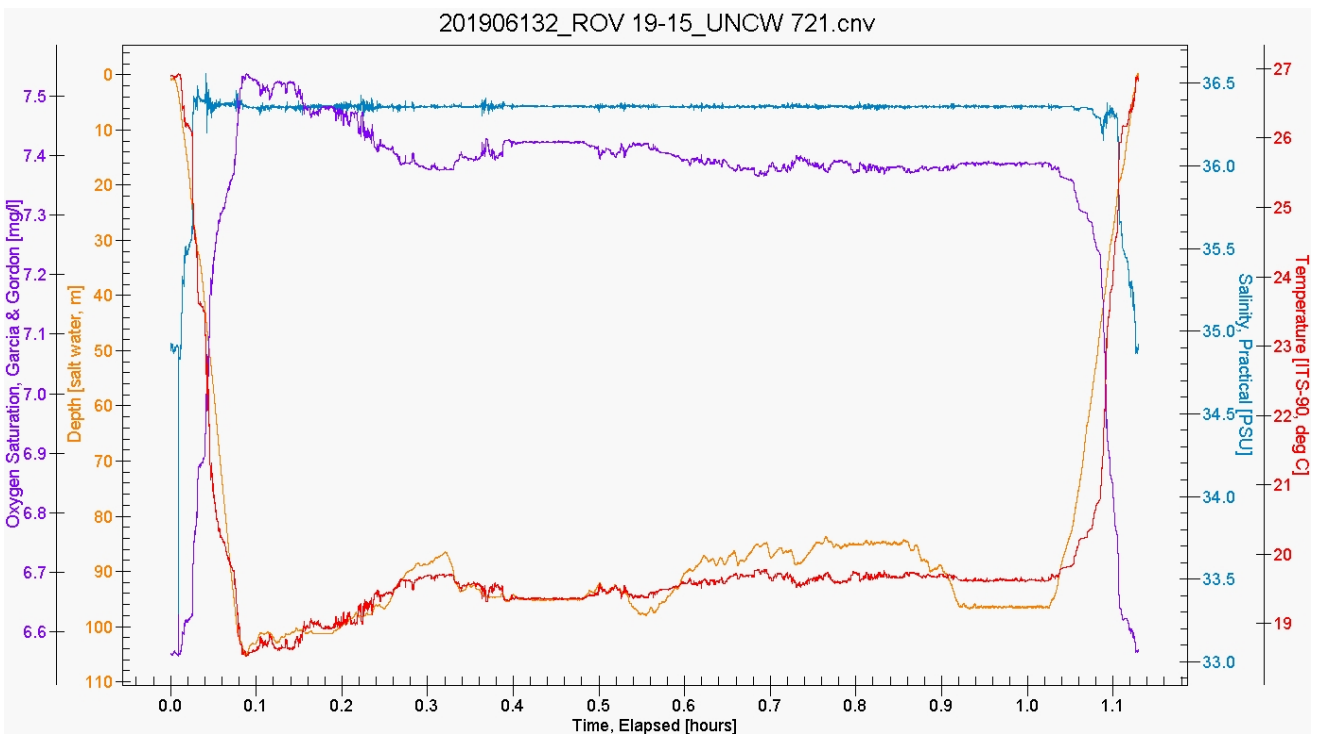
Dive Site: South Carolina, Devil's Hole SMZ; DH-03; 100 m; ROV 19-15; UNCW 721; 13-VI-19-2

Dive Data:

Minimum Bottom Depth (m): -85.1	Total Transect Length (km): 0.469
Maximum Bottom Depth (m): -105	Surface Current (kn): 0.5
On Bottom (Time- EDST): 17:44	On Bottom (Lat/Long): 32.556°N; -78.5751°W
Off Bottom (Time- EDST): 18:40	Off Bottom (Lat/Long): 32.5554°N; -78.5725°W
Physical (bottom); Temp (°C): 18.6	Salinity: 36.36 Visibility (m): 25 Current (kn): N/A

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-15 are as follows: Depth Maximum: 105.3 m, Temperature: 18.54-19.79 °C, Salinity: 36.3-36.4 PSU, Oxygen Saturation: 7.4-7.5 mg/l.

Dive Site: South Carolina, Devil's Hole SMZ; DH-03; 100 m; ROV 19-15; UNCW 721; 13-VI-19-2

Dive Imagery:



Figure 1: 32°33.347'N;78°34.5002'W: -102.9 m
Scorpionfish (*Scorpaenidae*) and coral (*Madracis myriaster*)

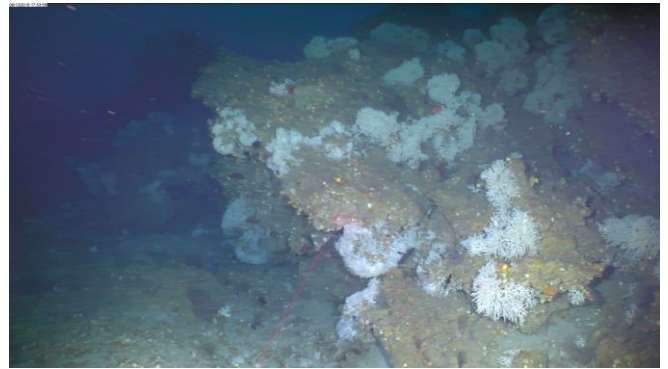


Figure 2: 32°33.3347'N;78°34.4686'W: -96.5 m
Thickets of coral (*Oculina varicosa* or *Madracis myriaster*- need specimen to id)



Figure 3: 32°33.327'N;78°34.441'W: -95.9 m
Unid. octocoral



Figure 4: 32°33.3248'N;78°34.4391'W: -96.6 m
Scrawled cowfish (*Acanthostracion quadricornis*), black coral

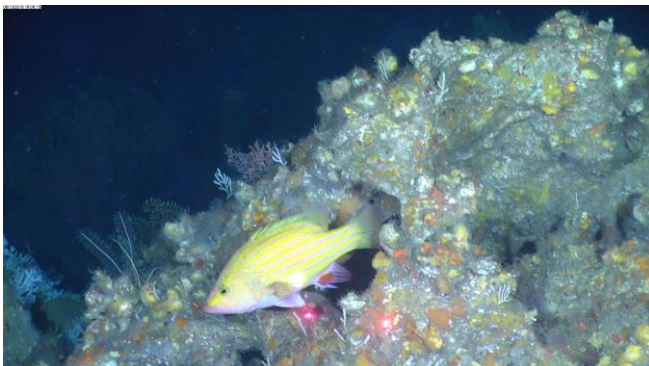


Figure 5: 32°33.3201'N;78°34.4293'W: -94.8 m
Spanish flag (*Gonioplectrus hispanus*)



Figure 6: 32°33.2907'N;78°34.3312'W: -86.5 m
Various sponges and octocorals

Dive Site: South Carolina, Devil's Hole SMZ; DH-03; 100 m; ROV 19-15; UNCW 721; 13-VI-19-2

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 13-VI-19-2; ROV 19-15, UNCW Dive 721; South Carolina, Devil's Hole SMZ, 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 86- 106.5 m

MB map shows northern escarpment of plateau, top 88 m, bottom 98 m, 2 m resolution; ROV heading S along escarpment. MB looks like gentle slope, ROV shows steep rugged rock.

Weather- Sunny, seas 2-3 ft from SW, wind 13 kn from 244 dg, air- 26.48 C, surface water- 27.07 C, salinity- 33.27 PSU, current- 0.5 kn to 31 dg.

17:37 - Launch

17:44- On bottom- 106.5 m; visibility- 5 m, current- 0; near WP, at base of escarpment, large irregular rocks 3 m tall, 15 cm white *Oculina/Madracis*, rocks covered w/ bivalves, Ye encrusting Verongida, long spined urchin *Centrostephanus*, *Antipathes atlantica*, anthiids, 20 cm white coral on vertical rock, 18.9 C, possible *Oculina*, branching not tapering, crinoid, 10 cm ye gorgonacea, sparse branched, coral very common 10- 30 cm, wrasse bass, purple 10 cm gorgonian, hd SE upslope, scamp.

17:51- 100 m, 30- 45 dg slope, rugged ½ m boulders, w/ dense coral, red porgy, rock boulder covered with 30 cm white coral, black urchins abundant, oystreidae? On rock, lionfish.

17:57- 90 m, hd N; 3 m rugged boulders, *Isostichopus*, 20 cm zoanthid?, cowfish.

18:03- 96.4 m, rock boulder slope; MB top of plateau.

Dive Site: South Carolina, Devil's Hole SMZ; DH-03; 100 m; ROV 19-15; UNCW 721; 13-VI-19-2

Sample 1- Zoanthidae, bushes 10- 20 cm, tan, large polyps, common, Bin 3.

Antipathes furcata, scamp common, spanish flag, coral still abundant, rough tongue bass, braided anchor line.
18:12- *Tanacetipathes*, *Comactinia meridionalis*, yellow and green crinoid, 1-2 m boulders, top edge, 91 m, abundant coral, amberjack schools, yellow encrusting sponges, bank butterflyfish, 3 m rugged boulders, photo xs across flat top rock with coral for mosaic, 87 m; red barbiere schools, lot of sponge diversity- unknown sp., *Stichopathes luetkeni*, dense bushy tan zoanthids.

18:22- 86 m, top edge of escarpment, hd N downslope, 1-2 m rugged boulders, white coral.

18:34- 98 m, top of boulder.

Sample 2- *Madracis myriaster* (looked like *Oculina varicosa* but under scope only has 10 septa), 10 cm, white, thick tips like *Oculina*; 19.6 C- Suction 2.

18:40- 98 m, end xs, end dive.

Dominant Benthic Macrobiota:

Scleractinia coral- *Madracis myriaster* (dense, 1+ m colonies covering boulders), *Oculina varicosa* (difficult to tell apart in video)

Antipatharia coral- *Antipathes atlantica* (dense), *Stichopathes luetkeni*, *Antipathes furcata*, *Tanacetipathes*

Gorgonia coral- 10 cm Plexauridae, orange;

Zoanthidae- 30 cm bushy tan (abundant)

Porifera- small encrusting, *Spirastrella*, ye encrusting *Verongida*

Echinodermata- *Centrostephanus*, *Isostichopus*, *Comactinia meridionalis*

Mollusca- bivalves, Ostreidae?

Samples: 2

Zoanthidae, *Madracis myriaster*

Human Debris:

Anchor line

CPCe Percent Cover Analysis:

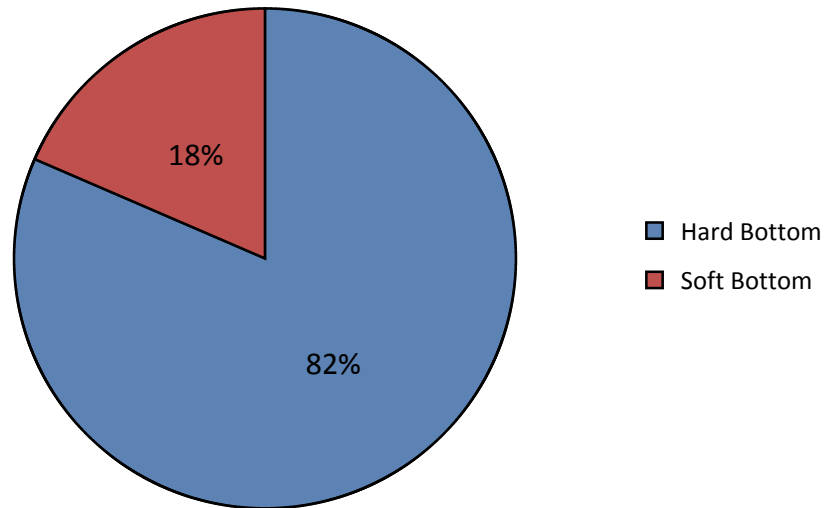
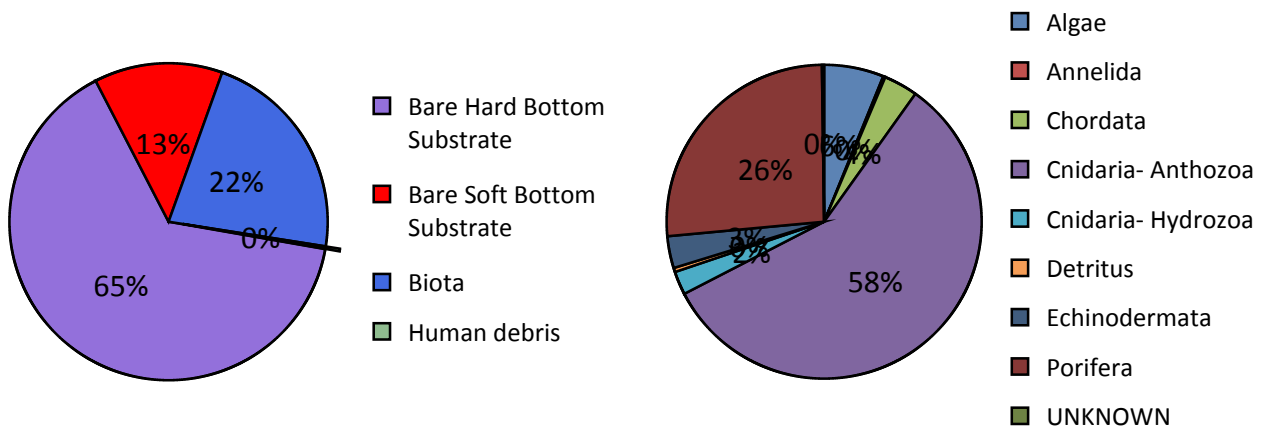


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-15. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

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

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: South Carolina, Devil's Hole SMZ; DH-03; 100 m; ROV 19-15; UNCW 721; 13-VI-19-2

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-15.

	%	Notes	Samp.
Biota	22.01%	X	X
Algae	1.35%		
Algae- Unid.	0.05%		
Rhodophyta	1.30%		
Corallinales	1.30%		
Porifera	5.78%	X	
Demospongiae	5.78%	X	
<i>Chondrilla</i> sp.	0.05%		
Demospongiae	5.15%	X	
Poecilosclerida	0.05%		
Spirastrellidae	0.53%		
Verongiida		X	
Cnidaria- Hydrozoa	0.53%		
Hydrozoa	0.53%		
Hydroidolina	0.53%		
Cnidaria- Anthozoa	12.67%	X	X
Alcyonacea - Alcyoniina	0.14%		
Octocorallia	0.14%		
Alcyonacea - gorgonian	0.24%	X	
Alcyonacea- gorgonian	0.05%	X	
Plexauridae- MPA1	0.19%		
Anthozoa - Non Coral	1.25%		X
Zoanthidae	1.25%		X
Antipatharia	2.75%	X	
Antipatharia	0.24%	X	
<i>Antipathes atlantica</i> Gray, 1857	1.01%	X	
<i>Antipathes furcata</i> Gray, 1857	0.82%	X	
<i>Stichopathes luetkeni</i> Brook, 1889	0.10%		
Tanacetipathes sp.	0.58%		
Coral- Scleractinia	8.29%	X	X
<i>Madracis myriaster</i> (Milne Edwards & Haime, 1850)	8.19%	X	X
Scleractinia- unid colonial		X	
Scleractinia- unid cup	0.10%		
Annelida	0.05%		
Polychaeta	0.05%		
Serpulidae	0.05%		

Dive Site: South Carolina, Devil's Hole SMZ; DH-03; 100 m; ROV 19-15; UNCW 721; 13-VI-19-2

Mollusca		X
Bivalvia		X
Pinnidae		X
Echinodermata	0.72%	X
Crinoidea	0.72%	X
<i>Analcidometra armata</i> (Pourtalès, 1869)		X
<i>Comactinia meridionalis</i> (L. Agassiz, 1865)		X
Crinoidea	0.05%	
<i>Davidaster</i> sp.	0.67%	
Echinoidea		X
<i>Centrostephanus longispinus</i> (Philippi, 1845)		X
Holothuroidea		X
<i>Isostichopus badionotus</i> (Selenka, 1867)		X
Chordata	0.77%	
Chordata - Vertebrate	0.77%	
Actinopterygii	0.77%	
Detritus	0.10%	
UNKNOWN	0.05%	
Human debris	0.29%	X
Human debris	0.29%	X
Human debris- Fishing Gear	0.29%	X
Human debris- anchor line	0.24%	X
Human debris- fish line/gear	0.05%	
Habitat	77.70%	
Bare Hard Bottom Substrate	64.64%	
Dead Coral	1.78%	
Bare coral rubble	1.20%	
dead standing Scleractinia (habitat)	0.58%	
Hard bottom	62.86%	
Bare rock, pavement, boulder, ledge	41.18%	
Bare rubble/cobble	21.68%	
Bare Soft Bottom Substrate	13.05%	
Grand Total	100.00%	

Dive Site: South Carolina, Devil's Hole SMZ; DH-03; 100 m; ROV 19-15; UNCW 721; 13-VI-19-2

Density of Fish:

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

Class/Order/Family/Taxa Author - Common Name	ROV 19-15
Actinopterygii	
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	1.43
<i>Plectrypops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish	4.00
Perciformes	
Apogonidae	
<i>Apogon</i> sp. - Cardinalfish	2.85
Carangidae	
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	1.43
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	4.85
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	1.71
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	2.00
<i>Prognathodes aculeatus</i> (Poey, 1860) - Longsnout Butterflyfish	0.29
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	3.14
Haemulidae	
<i>Haemulon aurolineatum</i> Cuvier, 1830 - Tomtate Grunt	14.84
<i>Haemulon</i> sp. - Grunt	11.42
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	0.86
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	2.57
Lutjanidae	
<i>Lutjanus buccanella</i> (Cuvier, 1828) - Blackfin Snapper	1.14
<i>Rhomboplites aurorubens</i> (Cuvier, 1829) - Vermilion Snapper	14.27
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	1.71
Priacanthidae	
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	0.57
Sciaenidae	
<i>Parques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	2.57
Serranidae/Anthiaginae	
Anthiaginae - Sea Bass: Groupers And Fairy Basslets (Fam.)	992.01
<i>Plectranthias garrupellus</i> Robins & Starck, 1961 - Apricot Bass	0.29
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	0.57

Dive Site: South Carolina, Devil's Hole SMZ; DH-03; 100 m; ROV 19-15; UNCW 721; 13-VI-19-2

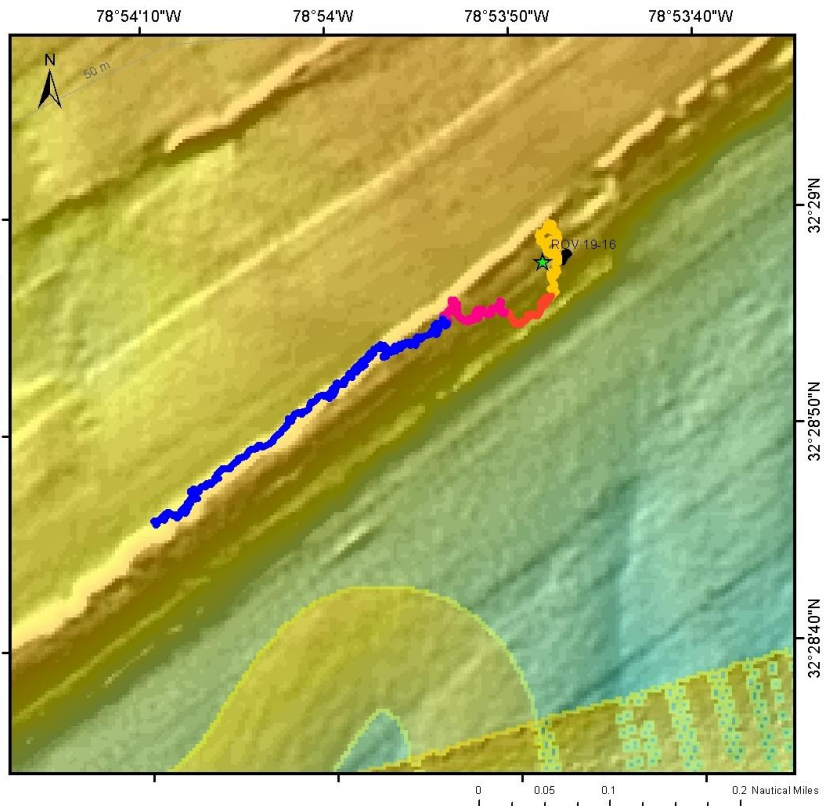
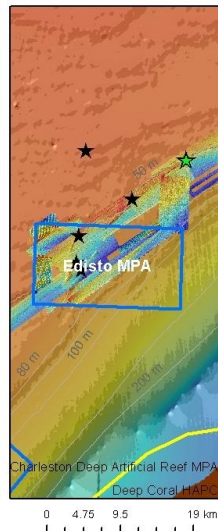
<i>Gonioplectrus hispanus</i> (Cuvier, 1828) - Spanish Flag	1.71
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	7.42
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	5.14
Serranidae/Serraninae	
<i>Centropristis ocyurus</i> (Jordan & Evermann, 1887) - Bank Sea Bass	0.29
<i>Serranus phoebe</i> Poey, 1851 - Tattler	2.28
Sparidae	
<i>Calamus</i> sp. - Porgy	0.57
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	2.28
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	13.70
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	0.29
Tetraodontiformes	
Ostraciidae	
<i>Acanthostracion quadricornis</i> (Linnaeus, 1758) - Scrawled Cowfish	0.57
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	1.43

Dive Site: South Carolina, Outside Edisto; ED-03; 100 m; ROV 19-16; UNCW 722; 14-VI-19-1

General Location and Dive Track:

South Carolina, Outside Edisto; ED-03;
100 m; ROV 19-16; UNCW 722

- ★ ROV 19-16
- ★ Mohawk ROV
- 201906141 - Transect 01
- 201906141 - Transect 02
- 201906141 - Transect 03
- 201906141 - Transect 04
- DiveTracks
- Oculina HAPC
- MPA
- Deep Coral HAPC
- Bathymetry



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Sedberry_OEBlock10_5m_UT M17N_MB

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/14/2019

Specimens: 4

Digital Photos: 186

No. DVD: 2

Hard Drive No.: 1

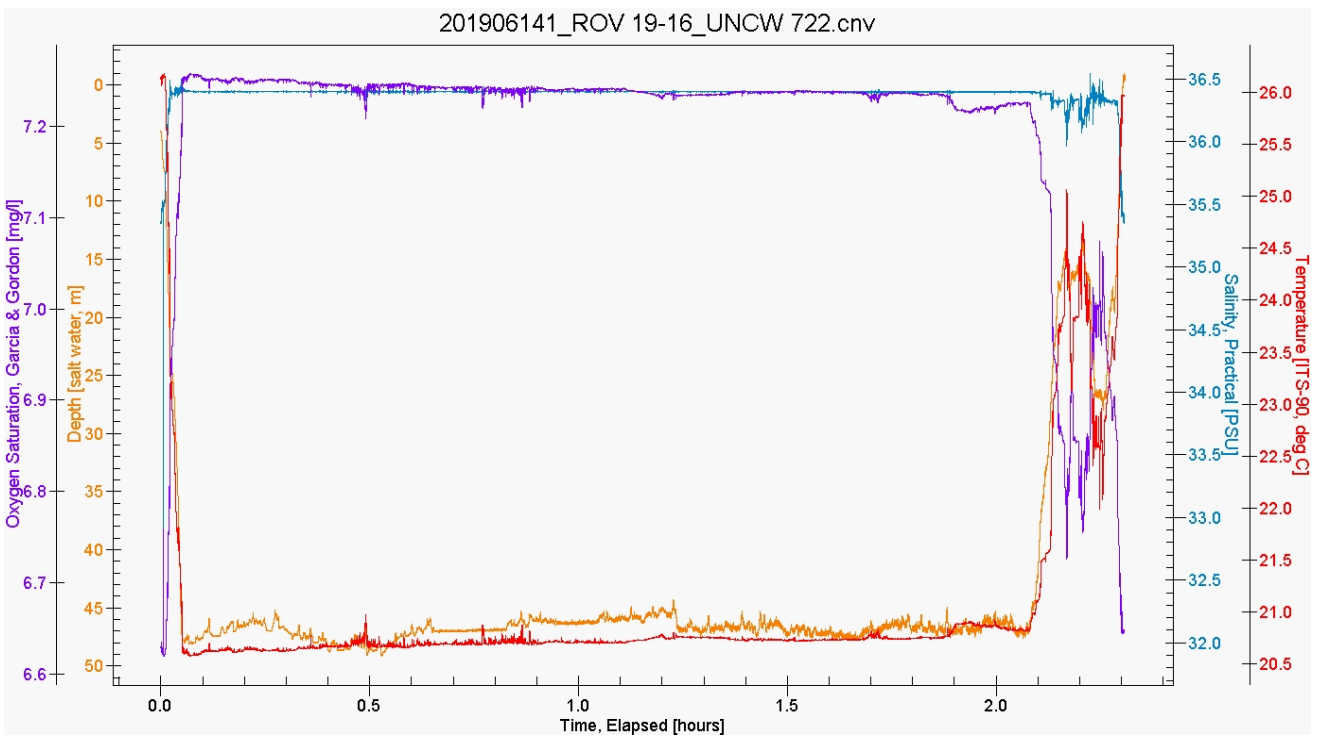
Dive Site: South Carolina, Outside Edisto; ED-03; 100 m; ROV 19-16; UNCW 722; 14-VI-19-1

Dive Data:

Minimum Bottom Depth (m): -45.7	Total Transect Length (km): 0.969
Maximum Bottom Depth (m): -50	Surface Current (kn): 0.4
On Bottom (Time- EDST): 7:07	On Bottom (Lat/Long): 32.4828°N; -78.8965°W
Off Bottom (Time- EDST): 9:09	Off Bottom (Lat/Long): 32.4793°N; -78.9028°W
Physical (bottom); Temp (°C): 21.3	Salinity: 36.42 Visibility (m): N/A Current (kn): N/A

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-16 are as follows: Depth Maximum: 49.1 m, Temperature: 20.58-21.33 °C, Salinity: 36.4-36.5 PSU, Oxygen Saturation: 7.2-7.3 mg/l.

Dive Site: South Carolina, Outside Edisto; ED-03; 100 m; ROV 19-16; UNCW 722; 14-VI-19-1

Dive Imagery:



Figure 1: 32°28.9645'N;78°53.8011'W: -48.5 m
Spotted moray (*Gymnothorax moringa*)

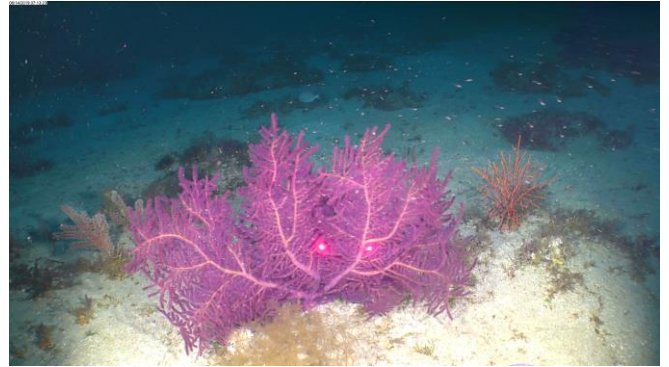


Figure 2: 32°28.9678'N;78°53.8042'W: -48.2 m
Purple sea fan (*Muricia pendula*)



Figure 3: 32°28.9214'N;78°53.8642'W: -48 m
Porgy (*Calamus* sp), *Swiftia exserta* gorgonian



Figure 4: 32°28.9202'N;78°53.8852'W: -47.5 m
Barrel demersal sponge (*Cliona* cf. *tumula*)



Figure 5: 32°28.8418'N;78°54.0388'W: -48.7 m
Bushy octocoral (*Carijoa* sp.)



Figure 6: 32°28.8143'N;78°54.0805'W: -48.5 m
Spotted moray (*Gymnothorax moringa*), Tomtate (*Haemulon aurolineatum*)

Dive Site: South Carolina, Outside Edisto; ED-03; 100 m; ROV 19-16; UNCW 722; 14-VI-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 14-VI-19-1; ROV 19-16, UNCW Dive 722; South Carolina, outside Edisto MPA, 50 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 47- 50 m

MB map shows NE-SW ridge, 20 km long, 46 m top, 50 m S base, 48.7 m N base, 158 m wide; ROV dive along ridge slope, heading SW; 50 nmi offshore.

Weather- Pt/cloudy, seas 3-4 ft from NE, wind 23 kn from 358 dg, air- 25.08 C, surface water- 26.38 C, salinity- 19.47 PSU (Fastcat 36.2 surf sal), current- 0.4 kn to 116 dg.

7:02 - Launch

7:07- On bottom- 49 m; visibility- 8 m, current- 0.1; on bottom near WP, on slope of ridge; flat, 25 cm outcrops, sediment, 50% HB, dense cover of algae and gorgonians.

7:14- 48 m, flat rock boulders 25 cm relief, pavement, sediment; *Swiftia exserta* abundant 20- 40 cm, *Ircinia campana*, Muricea, porgy, bigeye, reef butterflyfish, *Stichopathes luetkeni*, *Carijoa*, 10 cm bushy green, *Diodogorgia*, Paguridae, soapfish, thin encrusting yellow sponges, *Ellisella elongata* whip (syn, *E. barbadensis*).

7:21- 48 m, near top; change hd to SW down face of slope. Flat sand, low relief rock and pavement; Sargassum, *Swiftia* common, 80% sand; blue angelfish, fishing line, *Filogana*;

7:26- 50 m ½ way down slope; 80% soft bottom, low relief rock, pavement, *Muricea*, and *Swiftia* dominant; *Ircinia campana*, cowfish, grey triggerfish.

Dive Site: South Carolina, Outside Edisto; ED-03; 100 m; ROV 19-16; UNCW 722; 14-VI-19-1

7:30- 49.5 m, base of slope, flat sand, 25 cm relief boulders.

Carijoa- 25 cm bushy, tan, white polyps. No sample, unable to station keep.

7:35- Hd W along base of ridge, 49.5 m. 25 cm flat rock and sand, flat; tomtate, spotfin hogfish, bushy hydroids, jackknife fish, 50 cm *Muricea*, *Sargassum*, soapfish.

7:40- 48.5 m; going back up slope, same habitat; dense *Swiftia*, tattler.

7:44- 48 m, flat pavement, sand.

Sample 1- 30 cm *Muricea*, purple fan, abundant, Bin 3.

7:53- 48 m, cont NW along slope. 47.5 m- near top edge. 25 cm rock and ledges, pavement, 50% hard bottom.

8:01- 47.4, near top, low relief pavement. 5 cm bushy green *Dictyota*.

Sample 2- 10 cm cake sponge, tan, 3-5 mm apical oscules, starlet pattern on sfc, tan- DMST demosponge; common. Bin 1.

8:08- Purple finger *Aplysina*, yellow sphere demosponge, *Callyspongia vaginalis*, *Swiftia*, *Muricea*, DMST common.

8:19- 48 m, north slope of ridge; 48 m, 1-2 m relief boulders, ledges, undercut ledges, sand at bottom 48.7 m. dense tomtates, vermilion snapper, dense *Swiftia*, *Muricea*, *Carijoa*, DMST, *Diodogorgia*, encrusting orange and yellow sponges, *Dictyota* bushy green, *E. barbadensis*, *Antipathes atlantica*, undercut ledges, *Stichopathes*, *Halopteris carinata* hydroid, lionfish, scorpionfish, amberjack.

8:31- Cont hd W along N slope of ridge, 1-2 m relief, rugose, narrow drop off, undercut ledges 1-2 m. Scamp (only few), grey *Eudostoma* ascidian, short bigeye.

8:38- 48.7 m, face of boulder on N slope.

Sample 3- *Telesto*? (spicules not *Carijoa*), 30 cm bushy, white polyps, common.

Sample 4- cup coral found with sample 2

8:46- continue along N ridge, same habitat. CCA, spotted moray eel, hydroid w/ zoanthids, *Agelas clathrodes*, bigeye, goatfish, cowfish.

9:00- 49 m, cont. on N face of ridge, still 1-2 m relief, boulders ledges, high rugosity; yellow branched Axinellid, dense tomtates, vermilion snapper, lionfish common, cornetfish, squirrelfish, yellow lobate finger demosponge.

9:09- 49 m, on N slope of ridge in MB; end xs, end dive.

Dominant Benthic Macrobiota:

Antipatharia coral- *Stichopathes luetkeni*, *Antipathes atlantica*

Gorgonia coral- *Diodogorgia*, *Ellisella elongata* (syn. *E. barbadensis*) whip, *Swiftia exserta* (abundant), *Muricea* sp., *Carijoa*

Hydroida- *Halopteris carinata*, other spp.

Porifera- *Ircinia campana*, Spirastrellidae, orange and yellow encrusting, *Agelas clathrodes*, DMST starlet demosponge, *Callyspongia vaginalis*, purple finger *Aplysina*, yellow sphere demosponge, yellow finger Axinellidae

Annelida- *Filograna*

Decapoda- Paguridae

Ascidiacea- *Eudistoma*

Algae- *Dictyota*, CCA, *Sargassum*

Samples: 4

Muricea, DMST starlet Demospongiae, *Telesto*?, cup coral

Human Debris:

Fishing line

CPCe Percent Cover Analysis:

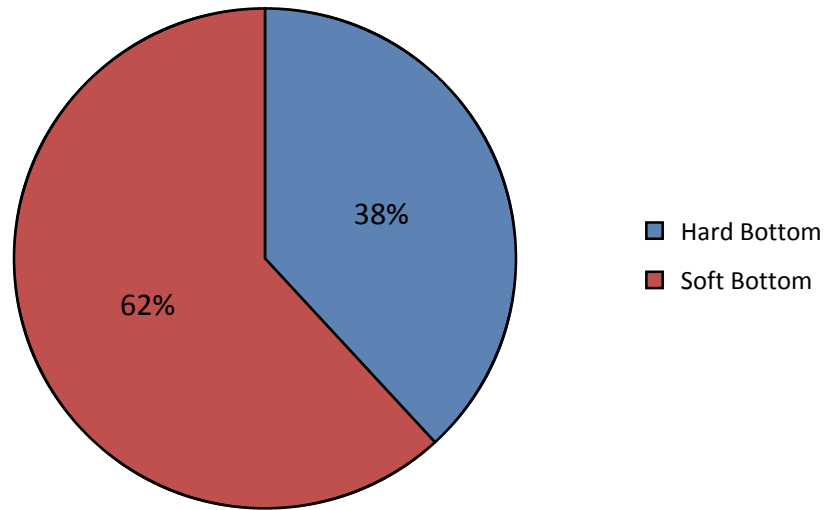
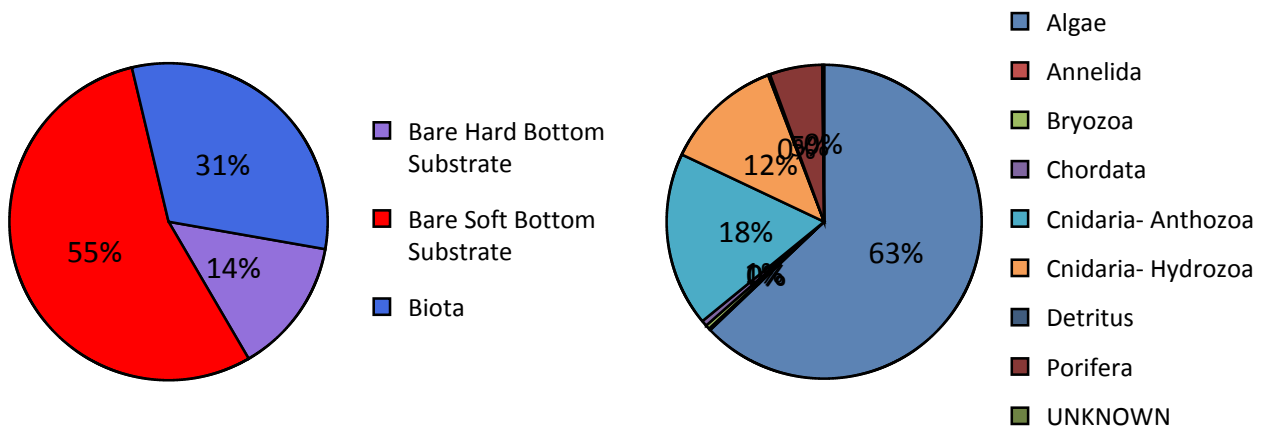


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-16. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-16.

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

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Samples, Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-16.

	%	Notes	Samp.
Biota	31.49%	X	X
Algae	19.80%	X	
Algae	0.38%		
Cyanobacteria	0.19%		
Chlorophyta	0.06%	X	
Ochrophyta	14.52%	X	
<i>Dictyota</i> sp.	11.88%	X	
Ochrophyta	2.01%		
<i>Sargassum</i> sp.	0.63%	X	
Rhodophyta	4.65%	X	
Corallinales	1.70%	X	
Rhodophyta	2.95%	X	
Porifera	1.70%	X	X
Demospongiae	1.70%	X	X
<i>Agelas clathrodes</i> (Schmidt, 1870)	0.31%	X	
<i>Aiolochoira crassa</i> (Hyatt, 1875)	0.06%		
<i>Aplysina</i> sp.		X	
Axinellidae		X	
<i>Callyspongia</i> sp.		X	
<i>Cliona</i> cf. <i>tumula</i> Friday, Poppell & Hill, 2013	0.13%	X	X
Demospongiae	0.94%	X	
Demospongiae- Ye sphere (MPA)	0.13%	X	
<i>Geodia neptuni</i> (Sollas, 1886)		X	
<i>Ircinia campana</i> (Lamarck, 1814)		X	
<i>Ircinia</i> sp.	0.13%		
Cnidaria- Hydrozoa	3.83%	X	
Hydrozoa	3.83%	X	
<i>Halopteris carinata</i> Allman, 1877		X	
Hydroidolina	3.83%	X	
<i>Solanderia</i> sp.		X	
Cnidaria- Anthozoa	5.66%	X	X
Alcyonacea - Alcyoniina	0.13%		
Octocorallia	0.13%		
Alcyonacea - gorgonian	5.41%	X	X
Alcyonacea- gorgonian	0.38%	X	
Clavulariidae		X	

<i>Diodogorgia</i> sp.	0.31%	X	
<i>Ellisella barbadensis</i> (Pallas, 1766)		X	
<i>Ellisella</i> sp.	0.19%	X	
<i>Muricea</i> sp.	0.94%	X	X
<i>Swiftia exserta</i> (Ellis & Solander, 1786)	3.58%	X	
<i>Telesto</i> sp.			X
Anthozoa - Non Coral		X	
Zoanthidae		X	
Antipatharia	0.13%	X	
<i>Antipathes atlantica</i> Gray, 1857		X	
<i>Stichopathes luetkeni</i> Brook, 1889	0.06%	X	
<i>Tanacetipathes</i> sp.	0.06%		
Coral- Scleractinia			X
Scleractinia- unid cup			X
Annelida	0.06%	X	
Polychaeta	0.06%	X	
<i>Filograna</i> sp.	0.06%	X	
Arthropoda		X	
Crustacea		X	
<i>Diogenes</i> sp.		X	
Bryozoa	0.13%		
Chordata	0.19%	X	
Chordata - Invertebrate		X	
<i>Eudistoma</i> sp.		X	
Chordata - Vertebrate	0.19%		
Actinopterygii	0.19%		
Detritus	0.06%		
UNKNOWN	0.06%		
Human debris		X	
Human debris		X	
Human debris- Fishing Gear		X	
Human debris- fishing line		X	
Human debris- other		X	
Bare Hard Bottom Substrate	13.83%	X	
Bare Hard Bottom Substrate	13.83%	X	
Burrow		X	
Octopus garden		X	
Dead Coral	0.13%		
Bare coral rubble	0.13%		
Hard bottom	13.70%		
Bare rock, pavement, boulder, ledge	12.70%		
Bare rubble/cobble	1.01%		



Bare Soft Bottom Substrate	54.68%		
Grand Total	100.00%	X	X

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-16.

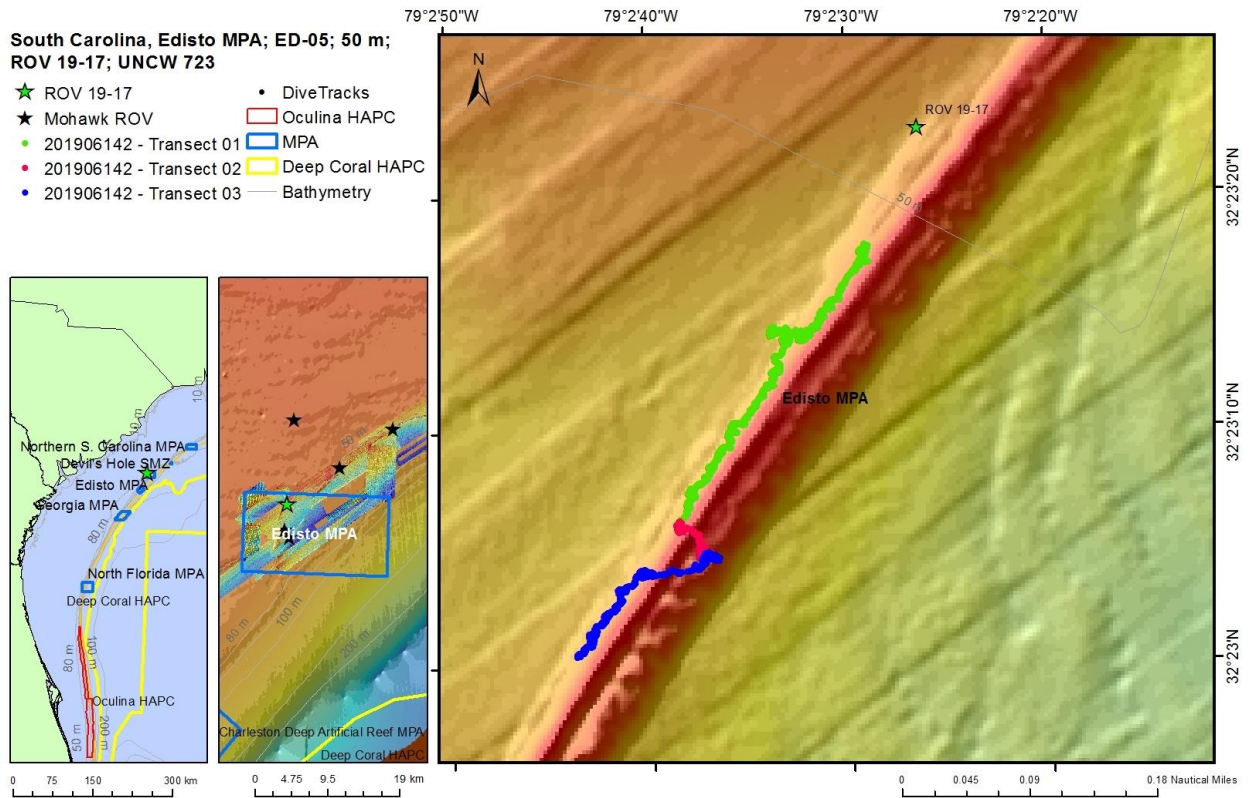
Class/Order/Family/Taxa Author - Common Name	ROV 19-16
Actinopterygii	
Anguilliformes	
Muraenidae	
<i>Gymnothorax moringa</i> (Cuvier, 1829) - Spotted Moray	0.41
Muraenidae - Moray Eels (Fam.)	0.14
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	4.26
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	4.67
<i>Holocentrus rufus</i> (Walbaum, 1792) - Longspine Squirrelfish	0.27
<i>Myripristis jacobus</i> Cuvier, 1829 - Blackbar Soldierfish	5.08
<i>Plectrypops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish	0.55
Gadiformes	
Phycidae	
Phycidae - Phycid Hakes (Fam.)	0.14
Perciformes	
Acanthuridae	
<i>Acanthurus chirurgus</i> (Bloch, 1787) - Doctorfish	0.14
<i>Acanthurus</i> sp. - Surgeonfish	0.14
Apogonidae	
<i>Apogon pseudomaculatus</i> Longley, 1932 - Twospot Cardinalfish	0.27
<i>Apogon</i> sp. - Cardinalfish	2.88
Carangidae	
<i>Decapterus</i> sp. - Scad	274.57
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	0.55
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	1.78
<i>Seriola</i> sp. - Amberjack	0.27
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	2.88
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	15.38
<i>Prognathodes aculeatus</i> (Poey, 1860) - Longsnout Butterflyfish	0.27
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	0.41
Haemulidae	
<i>Haemulon aurolineatum</i> Cuvier, 1830 - Tomtate Grunt	1443.57
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	0.55
<i>Haemulon striatum</i> (Linnaeus, 1758) - Striped Grunt	43.25

Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	10.85
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	1.10
<i>Halichoeres cyanocephalus</i> (Bloch, 1791) - Yellowcheek Wrasse	0.41
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	7.83
<i>Halichoeres</i> sp. - Wrasse	7.55
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	0.27
Lutjanidae	
<i>Lutjanus buccanella</i> (Cuvier, 1828) - Blackfin Snapper	0.55
<i>Lutjanus</i> sp. - Snapper	0.14
<i>Rhomboplites aurorubens</i> (Cuvier, 1829) - Vermilion Snapper	1290.50
Mullidae	
<i>Mulloidichthys martinicus</i> (Cuvier, 1829) - Yellow Goatfish	0.14
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	4.81
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	7.14
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	0.27
<i>Pomacanthus arcuatus</i> (Linnaeus, 1758) - Gray Angelfish	0.55
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	0.27
Pomacentridae	
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reeffish	7.55
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	37.75
<i>Chromis scotti</i> Emery, 1968 - Purple Reeffish	26.77
<i>Chromis</i> sp. - Damselfish/chromis	11.39
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damselfish	1.24
Priacanthidae	
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	2.88
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	3.57
Scaridae	
<i>Sparisoma atomarium</i> (Poey, 1861) - Greenblotch Parrotfish	0.14
Sciaenidae	
<i>Equetus lanceolatus</i> (Linnaeus, 1758) - Jack-knifefish	1.37
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	6.59
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	2.33
<i>Epinephelus adscensionis</i> (Osbeck, 1765) - Rock Hind	0.14
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	1.10
<i>Mycteroperca microlepis</i> (Goode & Bean, 1879) - Gag	0.14
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	0.82
<i>Paranthias furcifer</i> (Valenciennes, 1828) - Creole-fish	0.14
Serranidae/Grammistinae	
<i>Rypticus maculatus</i> Holbrook, 1855 - Whitespotted Soapfish	1.24

<i>Rypticus saponaceus</i> (Bloch & Schneider, 1801) - Greater Soapfish	0.69
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	1.24
<i>Serranus baldwini</i> (Evermann & Marsh, 1899) - Lantern Bass	0.55
<i>Serranus phoebe</i> Poey, 1851 - Tattler	5.35
<i>Serranus tigrinus</i> (Bloch, 1790) - Harlequin Bass	0.27
Sparidae	
<i>Calamus</i> sp. - Porgy	6.45
<i>Diplodus holbrookii</i> (Bean, 1878) - Spottail Seabream	0.41
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	1.24
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	11.26
<i>Scorpaena plumieri</i> Bloch, 1789 - Spotted Scorpionfish	0.41
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	0.27
Syngnathiformes	
Aulostomidae	
<i>Aulostomus maculatus</i> Valenciennes, 1841 - Atlantic Trumpetfish	0.41
Fistulariidae	
<i>Fistularia tabacaria</i> Linnaeus, 1758 - Bluespotted cornetfish	0.55
Tetraodontiformes	
Balistidae	
<i>Balistes capriscus</i> Gmelin, 1789 - Grey Triggerfish	0.41
Ostraciidae	
<i>Acanthostracion polygonius</i> Poey, 1876 - Honeycomb Cowfish	0.27
<i>Acanthostracion quadricornis</i> (Linnaeus, 1758) - Scrawled Cowfish	0.41
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	30.07
UNKNOWN Biota	2.88

Dive Site: South Carolina, Edisto MPA; ED-05; 50 m; ROV 19-17; UNCW 723; 14-VI-19-2

General Location and Dive Track:



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Sedberry_OEBlock345_5m_UTM17N_MB

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/14/2019

Specimens: 0

Digital Photos: 166

No. DVD: 2

Hard Drive No.: 1

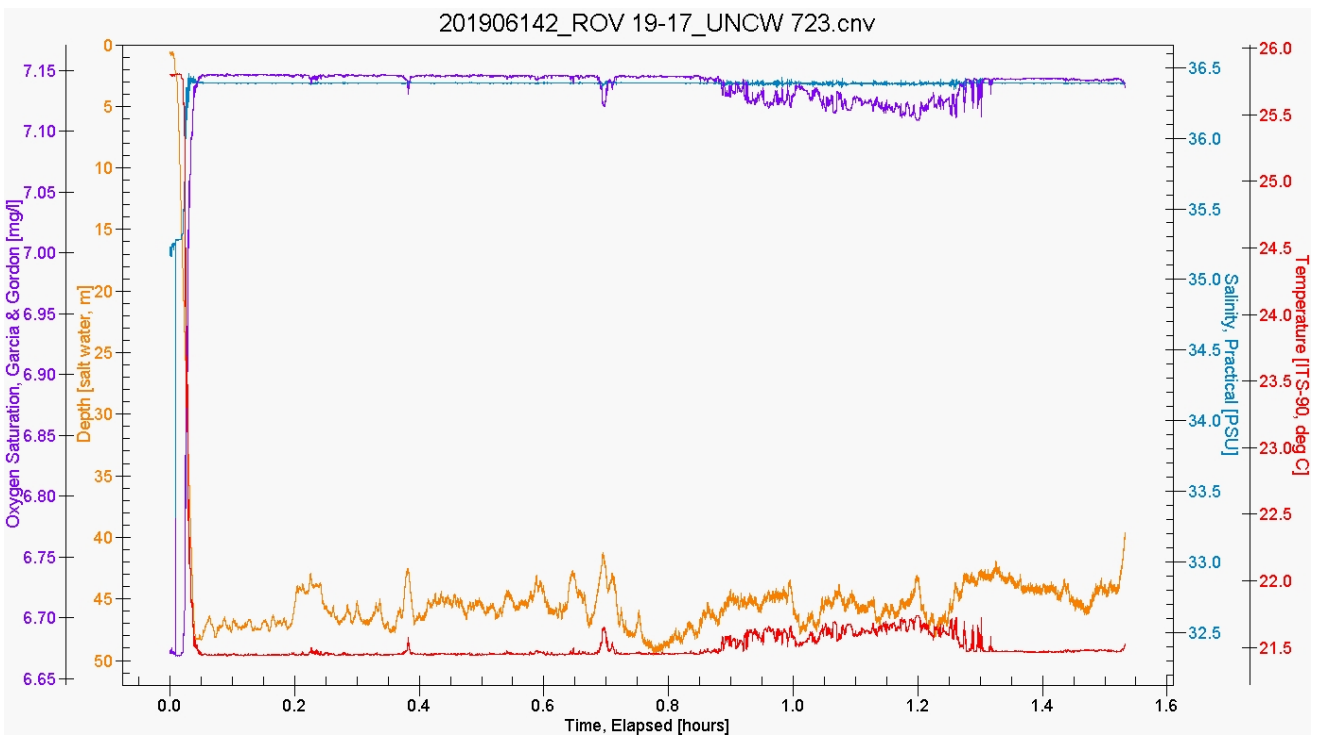
Dive Site: South Carolina, Edisto MPA; ED-05; 50 m; ROV 19-17; UNCW 723; 14-VI-19-2

Dive Data:

Minimum Bottom Depth (m): -43.2	Total Transect Length (km): 0.768
Maximum Bottom Depth (m): -51	Surface Current (kn): 0.6
On Bottom (Time- EDST): 10:45	On Bottom (Lat/Long): 32.3892°N; -79.0405°W
Off Bottom (Time- EDST): 12:34	Off Bottom (Lat/Long): 32.3835°N; -79.0455°W
Physical (bottom); Temp (°C): 22.2	Salinity: 36.4 Visibility (m): N/A Current (kn): 0

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-17 are as follows: Depth Maximum: 49.4 m, Temperature: 21.44-22.27 °C, Salinity: 36.3-36.4 PSU, Oxygen Saturation: 7-7.1 mg/l.

Dive Site: South Carolina, Edisto MPA; ED-05; 50 m; ROV 19-17; UNCW 723; 14-VI-19-2

Dive Imagery:



Figure 1: 32°23.2346'N;79°2.548'W: -49.5 m
French angelfish (*Pomacanthus paru*), Tomate (*Haemulon aurolineatum*)



Figure 2: 32°23.185'N;79°2.5791'W: -47.8 m
Slipper lobster (*Scyllaridae*)



Figure 3: 32°23.1217'N;79°2.6341'W: -49.2 m
Southern stingray (*Dasyatis americana*)



Figure 4: 32°23.1007'N;79°2.6432'W: -45.4 m
Hydroid (*Halopteris carinata?*)

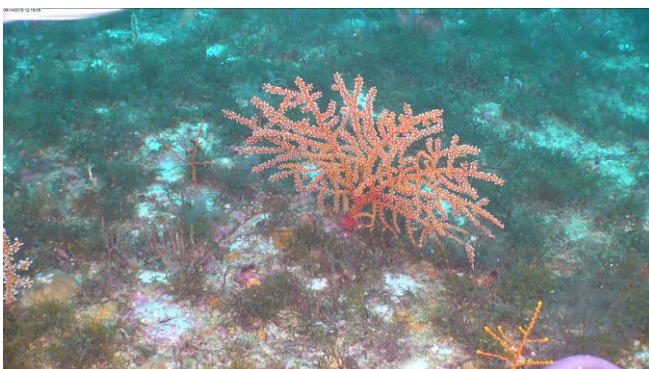


Figure 5: 32°23.065'N;79°2.6705'W: -45.3 m
Swifia exserta



Figure 6: 32°23.0319'N;79°2.7074'W: -48.1 m
Tomate (*Haemulon aurolineatum*), Vermilion snapper (*Rhomboplites aurorubens*), Aplysina sponges

Dive Site: South Carolina, Edisto MPA; ED-05; 50 m; ROV 19-17; UNCW 723; 14-VI-19-2

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 14-VI-19-2; ROV 19-17, UNCW Dive 723; South Carolina, Edisto MPA, 50 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 45- 50 m

MB map shows NE-SW ridge, 5 km long, 125 m wide, top- 45 m, east base- 51 m, west base- 51 m; 5 m resolution; ROV xs along ridge heading SW.

Weather- Cloudy, seas 3-5 ft from NE, wind 20 kn from 26 dg, air- 24.08 C, surface water- 25.91 C, salinity- 34.09, current- 0.6 kn to 190 dg.

10:41- Launch

10:45- On bottom- 49 m; visibility- 15 m, current- 0, 21.4 C; 181 m N of WP; on west slope of ridge; west slope, >15 m wide slope, 1-2 flat rock boulders, 30 dg slope, high rugosity, undercut ledges 1-2 m wide, high rugosity, stair step ledges from top to base with fractured rock slabs; 49 m near base, top- 45.4 m, flat pavement, 95% cover of biota; dense tomtate, vermilion snapper; 20-40 cm *Swiftia exseta* abundant, *Spirastrella*, *Diodogorgia*, DMST sponge, *Callyspongia vaginalis*, *Halopteris carinata*, *Carijoa*, *Antipathes atlantica*, 100% hard bottom, bushy hydroids, greyhead scamp, lionfish.

10:56- West slope, purple hollow tube *Aplysina*, dense fish, finger purple *Aplysina*, *Ircinia campana*, encrusting yellow and orange demosponges, stalked finger orange Axinellidae- *Ptilocaulis*, blue angelfish, *Muricea*, amberjack, spotfin hogfish, white grunt.

11:04- 2 sandbar? Sharks.

Dive Site: South Carolina, Edisto MPA; ED-05; 50 m; ROV 19-17; UNCW 723; 14-VI-19-2

11:21- 47 m, west slope, same habitat/biota.

11:39- 47.8 m. west slope, 3 m relief ledge, undercut stair-step slabs. Jagged, slipper lobster scamp.

11:49- 48 m, west slope, 3' sharptail eel, same habitat/biota, spotfin butterflyfish, *Agelas clathrodes*, *Stichopathes luetkeni*, lionfish, big school amberjack, hundreds, scamp, southern stingray 1m, purple tube *Aplysina*, dense tomtate, vermilion.

11:59- change hd to SE to east slope of ridge. Top- 45 m, flat rock, 100% hard bottom, 100% cover biota; *Dictyota*, *Halopteris* hydroid, *Macrorhynchia* hydroid, *Swiftia*, DMST, *Ptilocaulis*? Erect branching Axinellidae.

12:08- ½ way down slope on MB, 46 m; pavement, ½ m rock ledges, same biota, 1 m flat rock slabs.

12:10- east escarpment, 1 m flat rock slabs, undercut ledges, 10 dg slope, less rugosity and relief than west face. Dense *Swiftia* zone.

12:14- lost power, and video.

12:16- power back. 10 m off bottom.

12:20- on bottom on west slope; same as before, 45 dg slope, rugose, dense fish; 4 scamp, pink yellow and orange encrusting sponges, red snapper.

12:27- *Aplysina* fingers large colony, french angelfish, yellow lobate- *Erylus* or *Chondrosia*.

12:30- near base of slope, 50 m, 45. 3 m top; ~5 m total relief; light yellow lobate- *Aiolochoiria crassa*?

12:35- 50 m, end xs, end dive.

Dominant Benthic Macrobiota:

Antipatharia coral- *Stichopathes luetkeni*, *Antipathes atlantica*

Gorgonia coral- *Diodogorgia*, *Swiftia exserta* (common), *Muricea* sp., *Carijoa* (dense)

Hydroida- *Halopteris carinata* (dense), *Macrorhynchia* (dense)

Porifera- *Ircinia campana*, Spirastrellidae, orange and yellow encrusting, *Agelas clathrodes*, DMST starlet demosponge, *Callyspongia vaginalis*, purple finger *Aplysina*, yellow finger Axinellidae, *Ptilocaulis*?, *Erylus* or *Chondrosia*- yellow lobate, *Aiolochoiria crassa*?- yellow lobate, papillose surface.

Algae- *Dictyota*, CCA

Human Debris:

None

Dive Site: South Carolina, Edisto MPA; ED-05; 50 m; ROV 19-17; UNCW 723; 14-VI-19-2

CPCe Percent Cover Analysis:

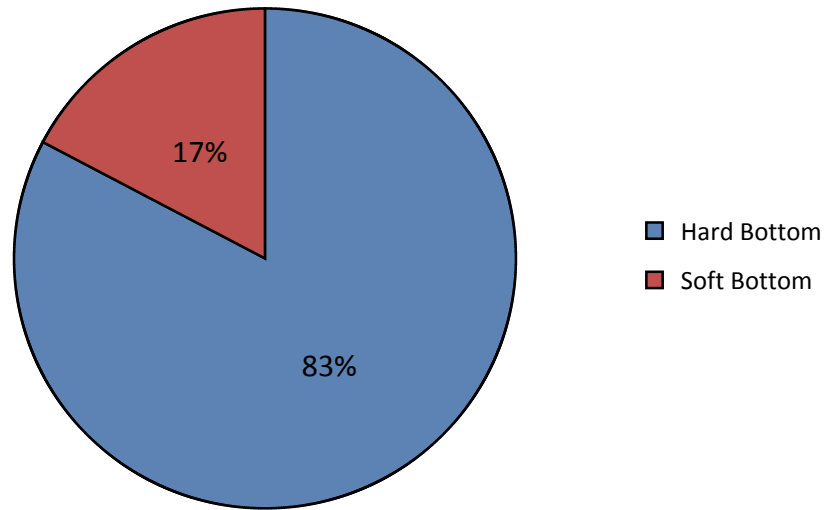
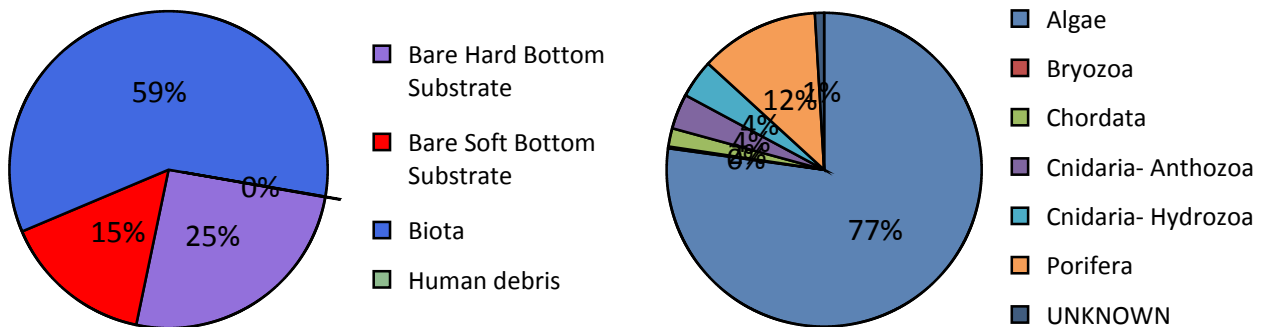


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-17. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-17. A. CPCe percent cover of biota and bare substrate (hard or soft bottom). B. Relative CPCe percent cover of biota and human debris.

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-17.

	%	Notes
Biota	59.10%	X
Algae	45.63%	X
Algae	0.25%	
Cyanobacteria	0.97%	
Ochrophyta	25.99%	X
<i>Dictyota</i> sp.	21.62%	X
Ochrophyta	4.37%	
Rhodophyta	18.41%	X
Corallinales	5.49%	X
Rhodophyta	12.92%	
Porifera	7.22%	X
Demospongiae	7.22%	X
<i>Agelas clathrodes</i> (Schmidt, 1870)	0.10%	X
<i>Agelas</i> sp.	0.05%	
<i>Aiolochoxia crassa</i> (Hyatt, 1875)	0.20%	X
<i>Aplysina</i> sp.	0.20%	X
<i>Callyspongia (Cladochalina) vaginalis</i> (Lamarck, 1814)	0.05%	X
<i>Chondrosia</i> sp.	0.20%	
<i>Chondrosia</i> sp.- lobate gray (MPA)	0.10%	
<i>Cliona</i> cf. <i>tumula</i> Friday, Poppell & Hill, 2013	0.51%	X
Demospongiae	4.68%	X
<i>Erylus</i> sp.		X
<i>Geodia neptuni</i> (Sollas, 1886)	0.15%	
<i>Geodia</i> sp.	0.31%	
<i>Ircinia campana</i> (Lamarck, 1814)	0.15%	X
<i>Ircinia</i> sp.	0.05%	X
<i>Ircinia strobilina</i> (Lamarck, 1816)	0.15%	
<i>Ptilocaulis</i> sp.		X
Spirastrellidae	0.25%	X
<i>Xestospongia muta</i> (Schmidt, 1870)	0.05%	
Cnidaria- Hydrozoa	2.34%	X
Hydrozoa	2.34%	X
<i>Halopteris carinata</i> Allman, 1877		X
Hydroidolina	2.34%	X
<i>Macrorhynchia</i> sp.		X
Cnidaria- Anthozoa	2.14%	X

Alcyonacea - gorgonian	1.42%	X
Alcyonacea- gorgonian	0.20%	
Clavulariidae		X
<i>Diodogorgia</i> sp.	0.25%	X
<i>Ellisella barbadensis</i> (Pallas, 1766)		X
<i>Muricea</i> sp.		X
<i>Swiftia exserta</i> (Ellis & Solander, 1786)	0.97%	X
Anthozoa - Non Coral	0.05%	
Zoanthidae	0.05%	
Antipatharia	0.66%	X
<i>Antipathes atlantica</i> Gray, 1857	0.61%	X
<i>Antipathes furcata</i> Gray, 1857	0.05%	
Arthropoda		X
Crustacea		X
Scyllaridae		X
Bryozoa	0.10%	
Chordata	1.12%	
Chordata - Invertebrate	0.05%	
Ascidiacea	0.05%	
Chordata - Vertebrate	1.07%	
Actinopterygii	1.07%	
UNKNOWN	0.56%	
Human debris	0.05%	
Human debris	0.05%	
Human debris- Fishing Gear	0.05%	
Human debris- fish line/gear	0.05%	
Bare Hard Bottom Substrate	25.48%	
Bare Hard Bottom Substrate	25.48%	
Hard bottom	25.48%	
Bare rock, pavement, boulder, ledge	24.42%	
Bare rubble/cobble	1.07%	
Bare Soft Bottom Substrate	15.36%	
Grand Total	100.00%	X

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-17.

Class/Order/Family/Taxa Author - Common Name	ROV 19-17
Actinopterygii	
Anguilliformes	
Muraenidae	
<i>Muraena retifera</i> Goode & Bean, 1882 - Reticulate Moray	0.25
Muraenidae - Moray Eels (Fam.)	0.50
Ophichthidae	
<i>Myrichthys breviceps</i> (Richardson, 1848) - Sharptail Eel	0.25
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	0.75
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	15.30
<i>Myripristis jacobus</i> Cuvier, 1829 - Blackbar Soldierfish	16.30
<i>Plectrypops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish	0.50
Perciformes	
Acanthuridae	
<i>Acanthurus</i> sp. - Surgeonfish	1.50
Apogonidae	
<i>Apogon</i> sp. - Cardinalfish	0.25
Carangidae	
<i>Carangoides bartholomaei</i> (Cuvier, 1833) - Yellow Jack	0.75
<i>Decapterus</i> sp. - Scad	300.98
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	0.25
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	7.52
<i>Seriola</i> sp. - Amberjack	25.08
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	4.77
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	20.07
<i>Prognathodes aculeatus</i> (Poey, 1860) - Longsnout Butterflyfish	0.25
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	2.01
Haemulidae	
<i>Haemulon aurolineatum</i> Cuvier, 1830 - Tomtate Grunt	4341.61
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	3.51
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	18.31
<i>Bodianus rufus</i> (Linnaeus, 1758) - Spanish Hogfish	0.75
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	2.26
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	2.51

<i>Halichoeres</i> sp. - Wrasse	1.50
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	0.75
Lutjanidae	
<i>Lutjanus griseus</i> (Linnaeus, 1758) - Grey Snapper	3.01
<i>Rhomboplites aurorubens</i> (Cuvier, 1829) - Vermilion Snapper	6320.54
Mullidae	
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	1.00
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	22.32
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	0.75
<i>Pomacanthus arcuatus</i> (Linnaeus, 1758) - Gray Angelfish	0.50
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	1.00
Pomacentridae	
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reeffish	0.25
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	3.76
<i>Chromis scotti</i> Emery, 1968 - Purple Reeffish	33.11
<i>Chromis</i> sp. - Damselfish/chromis	13.29
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damselfish	0.75
Priacanthidae	
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	5.02
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	2.01
Scaridae	
<i>Sparisoma aurofrenatum</i> (Valenciennes, 1840) - Redband Parrotfish	0.25
Sciaenidae	
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	10.79
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	9.78
<i>Epinephelus adscensionis</i> (Osbeck, 1765) - Rock Hind	0.25
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	2.76
<i>Mycteroperca interstitialis</i> (Poey, 1860) - Yellowmouth Grouper	0.25
<i>Mycteroperca microlepis</i> (Goode & Bean, 1879) - Gag	0.75
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	5.02
Serranidae/Grammistinae	
<i>Rypticus saponaceus</i> (Bloch & Schneider, 1801) - Greater Soapfish	1.00
<i>Rypticus</i> sp. - Soapfish	1.00
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	0.75
<i>Serranus baldwini</i> (Evermann & Marsh, 1899) - Lantern Bass	0.50
<i>Serranus phoebe</i> Poey, 1851 - Tattler	1.00
Sparidae	
<i>Calamus</i> sp. - Porgy	12.29
<i>Diplodus holbrookii</i> (Bean, 1878) - Spottail Seabream	0.25

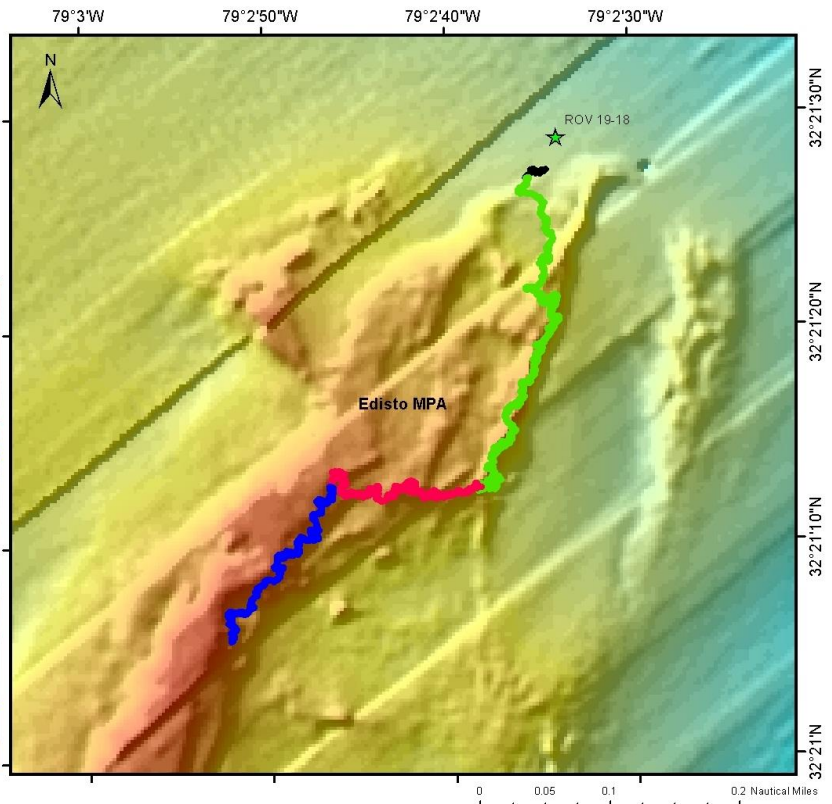
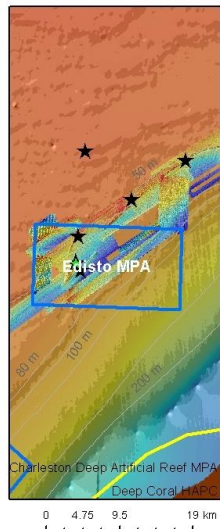
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	4.26
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	36.87
<i>Scorpaena plumieri</i> Bloch, 1789 - Spotted Scorpionfish	0.75
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	0.25
Syngnathiformes	
Aulostomidae	
<i>Aulostomus maculatus</i> Valenciennes, 1841 - Atlantic Trumpetfish	1.50
Tetraodontiformes	
Balistidae	
<i>Balistes capriscus</i> Gmelin, 1789 - Grey Triggerfish	0.75
Monacanthidae	
<i>Cantherhines pullus</i> (Ranzani, 1842) - Orangespotted Filefish	0.25
<i>Stephanolepis hispidus</i> (Linnaeus, 1766) - Planehead Filefish	0.25
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	17.06
<i>Sphoeroides spengleri</i> (Bloch, 1785) - Bandtail Puffer	2.51
Elasmobranchii	
Carcharhiniformes	
Carcharhinidae	
<i>Carcharhinus plumbeus</i> (Nardo, 1827) - Sandbar Shark	0.50
Myliobatiformes	
Dasyatidae	
<i>Dasyatis</i> sp. - Stingray	0.50
UNKNOWN Biota	0.50

Dive Site: South Carolina, Edisto MPA; ED-02; 55 m; ROV 19-18; UNCW 724; 14-VI-19-3

General Location and Dive Track:

South Carolina, Edisto MPA; ED-02;
55 m; ROV 19-18; UNCW 724

- ★ ROV 19-18
- ★ Mohawk ROV
- 201906143 - Transect 01
- 201906143 - Transect 02
- 201906143 - Transect 03
- DiveTracks
- Oculina HAPC
- MPA
- Deep Coral HAPC
- Bathymetry



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Sedberry_OEBlock345_5m_UTM17N_MB

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/14/2019

Specimens: 1

Digital Photos: 145

No. DVD: 2

Hard Drive No.: 1

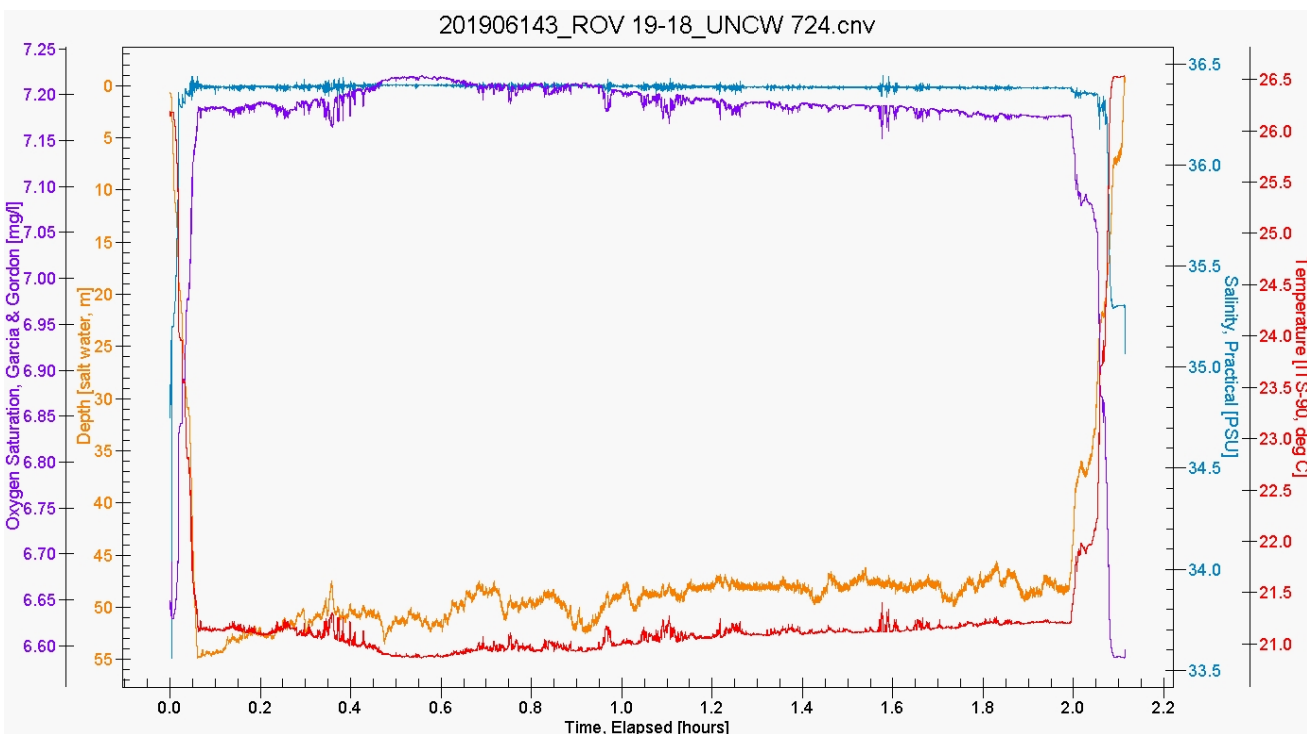
Dive Site: South Carolina, Edisto MPA; ED-02; 55 m; ROV 19-18; UNCW 724; 14-VI-19-3

Dive Data:

Minimum Bottom Depth (m): -48.4	Total Transect Length (km): 1.148
Maximum Bottom Depth (m): -56.1	Surface Current (kn): 0.5
On Bottom (Time- EDST): 13:31	On Bottom (Lat/Long): 32.3575°N; -79.043°W
Off Bottom (Time- EDST): 15:27	Off Bottom (Lat/Long): 32.3515°N; -79.0478°W
Physical (bottom); Temp (°C): 21.5	Salinity: 36.4 Visibility (m): N/A Current (kn): N/A

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-18 are as follows: Depth Maximum: 54.8 m, Temperature: 20.87-21.56 °C, Salinity: 36.3-36.4 PSU, Oxygen Saturation: 7.1-7.2 mg/l.

Dive Site: South Carolina, Edisto MPA; ED-02; 55 m; ROV 19-18; UNCW 724; 14-VI-19-3

Dive Imagery:

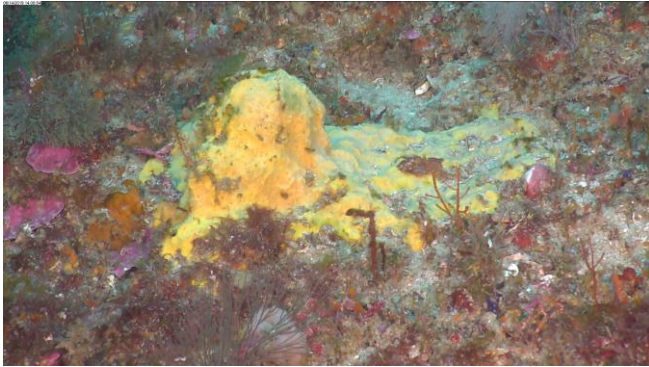


Figure 1: 32°21.3179'N;79°2.5846'W: -52.6 m
Unid. demosponge

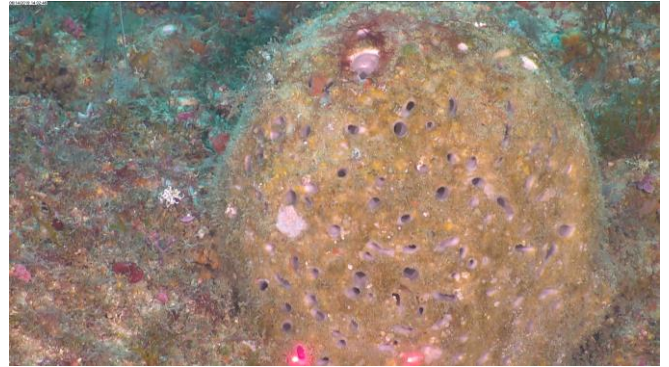


Figure 2: 32°21.3068'N;79°2.5881'W: -53.8 m
Gastropod sponge (*Spongosorites siliquaria*)



Figure 3: 32°21.2153'N;79°2.6227'W: -54.1 m
Rough-tail stingray (*Dasyatis centroura*)

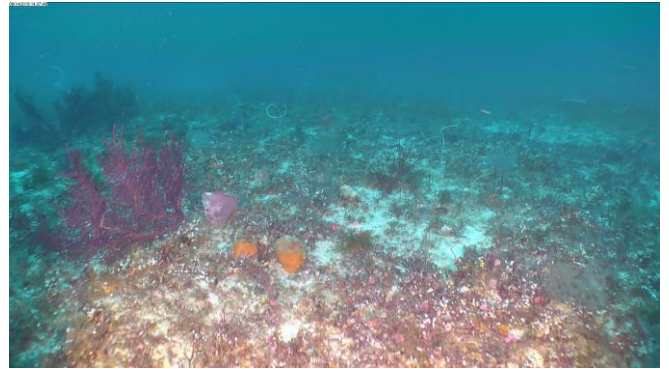


Figure 4: 32°21.207'N;79°2.7038'W: -50.3 m
Low relief rock bottom; *Muricea* sp., sponges, algae cover



Figure 5: 32°21.2047'N;79°2.7433'W: -51.6 m
Hogfish (*Lachnolaimus maximus*), Porgy (*Calamus* sp.)



Figure 6: 32°21.1174'N;79°2.8531'W: -51.1 m
Scamp (*Mycteroperca phenax*) on low relief hard bottom

Dive Site: South Carolina, Edisto MPA; ED-02; 55 m; ROV 19-18; UNCW 724; 14-VI-19-3

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 14-VI-19-3; ROV 19-18, UNCW Dive 724; South Carolina, Edisto MPA, 55 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 50- 56 m

MB map shows irregular NE-SW escarpment on east side of plateau, 3 km long, 48 m top, 57 m base. ROV heading S along escarpment.

Weather- Sunny, seas 4-6 ft from NE, wind 16 kn from 33 dg, air- 23.72 C, surface water- 26.29 C, salinity- 34.65, current- 0.5 kn to 332 dg.

13:27- Launch

13:32- On bottom- 56 m; visibility-15 m, current- 0.1, 20.9 C; 100 m N of WP; hd to WP.

13:46- on xs, on top of ridge hd SW; 53 m, 80% hard bottom, flat, low relief, rock pavement, <25 cm; Dictyota, *Swiftia exserta*, *Stichopathes luetkeni*, bushy hydroids, 1 m rock outcrop, *Ircinia campana*; low relief rock pavement, ½ m relief rock and ledges; DMST sponge, *Callyspongia vaginalis*, *Antipathes atlantica*, *Macrorhynchia* bushy hydroid, dead green tint *Filograna*. Low rugosity, 30 dg slope, base 54.9 m, flat sand to east; lionfish, *Swiftia* common, blue angelfish, reef butterflyfish, encrusting orange sponge- Spirastrellidae, yellow encrusting, yellow lobate sponge egg yolk sponge.

14:02- 54 m, hd S along east face of escarpment, 50 cm *Geodia neptuni*, purple finger Aplysina, squirrelfish, tomtate, no big schools of fish, *Halopteris carinata* white hairy hydroids, *Tanacetipathes*, cornetfish, Didemnidae, scamp, spotfin hogfish, *Muricea*.

Dive Site: South Carolina, Edisto MPA; ED-02; 55 m; ROV 19-18; UNCW 724; 14-VI-19-3

14:14- 53 m, top edge of escarpment, hd S; 3-4 m relief escarpment, but low rugosity, few undercut ledges, few large fish; 1 ledge 2 m undercut; *Carijoa*, occasional 2 m undercut ledges.

14:21- 6 ft rough-tail stingray *Dasyatis*. At WP 2,

14:29- 52 m, change hd to W to WP 3, 230 m.

14:38- 50.3 m, flat plateau, hardbottom.

Sample 1- 10 cm spherical orange Demospongiae, smooth surface, no visible oscules (some other specimens have several ½-1 cm oscules or pseudo-oscules on top), attached to sediment and rubble; uncommon; Bin 3.

14:47- cont xs to WP 3. Bank butterflyfish, 2 m rock, gag, tomtate, dense *Macrorhynchia*, spotfin butterflyfish, bank butterflyfish, porgy, *Swiftia*, wrasse bass, anchor line, *Schizoporella*, *Ellisella barbadensis* whip.

15:02- 50 m, 2 *Corallimorpharia*, black w/ white rim. At Wp 3, head S along N-S escarpment on MB. Flat pavement w/ sediment. MB- on top of escarpment; ROV- 2 m slope, 30 dg, smooth rock; 2 m relief under cut ledges, 10 m wide slope then sand at bottom, base- 52.0 m, top 50 m; *Stichopathes*, DMST sponges, *Ircinia campana*, algae, *Macrorhynchia*, *Swiftia*, tomtate, greyhead scamp, lionfish, *Muricea*, cubbyu, scamp.

15:18- slope, hogfish.

15:25- 50 m, 2 m relief escarpment, boulders and undercut ledges; same biota.

15:27- 50 m; end xs, end dive.

Dominant Benthic Macrobiota:

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

Gorgonia coral- *Diodogorgia*, *Swiftia exserta* (common), *Muricea* sp., *Carijoa*

Hydroidea- *Halopteris carinata*, *Macrorhynchia*

Corallimorpharia

Porifera- *Ircinia campana*, Spirastrellidae, orange and yellow encrusting, DMST starlet demosponge, *Callyspongia vaginalis*, purple finger *Aplysina*, *Geodia neptuni*; spherical orange demosponge

Annelida- *Filograna*

Bryozoa- *Schizoporella*

Asciacea- Didemnidae

Algae- *Dictyota*

Sample: 1

Demospongiae, orange sphere

Human Debris:

Anchor line- 2

CPCe Percent Cover Analysis:

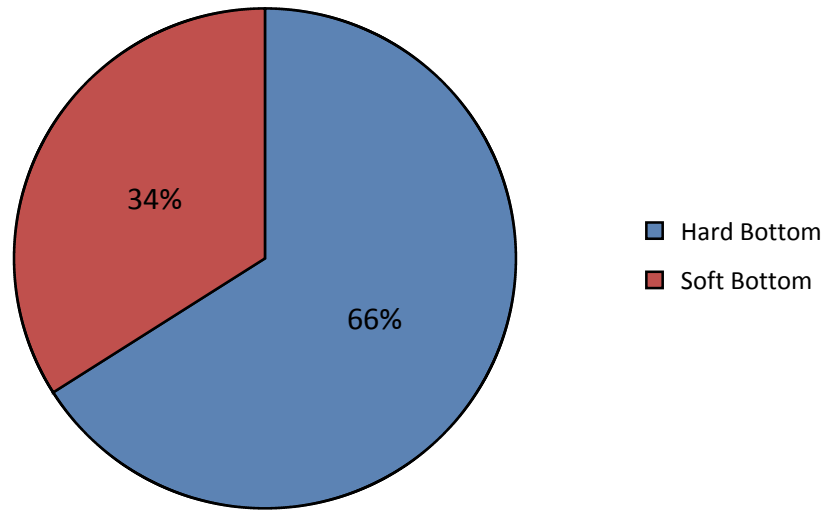
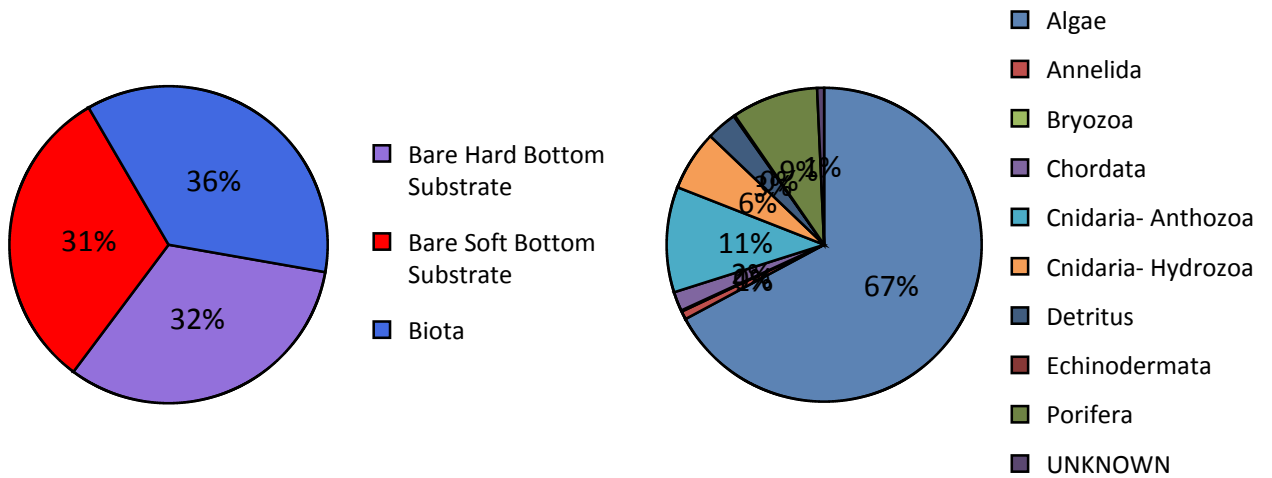


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-18. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-18.

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

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Samples, Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-18.

	%	Notes	Samp.
Biota	36.16%	X	X
Algae	24.27%	X	
Algae	3.37%		
Cyanobacteria	2.45%		
Ochrophyta	5.97%	X	
<i>Dictyota</i> sp.	3.26%	X	
Ochrophyta	2.70%		
Rhodophyta	12.49%	X	
Corallinales	3.26%	X	
Rhodophyta	9.23%	X	
Porifera	3.21%	X	X
Demospongiae	3.21%	X	X
<i>Aptos</i> sp. MPA-01			X
<i>Agelas clathrodes</i> (Schmidt, 1870)		X	
<i>Callyspongia (Cladochalina) vaginalis</i> (Lamarck, 1814)	0.05%	X	
<i>Cliona cf. tumula</i> Friday, Poppell & Hill, 2013	0.46%	X	
Demospongiae	2.14%	X	
Demospongiae- Ye sphere (MPA)		X	
<i>Geodia neptuni</i> (Sollas, 1886)		X	
<i>Ircinia campana</i> (Lamarck, 1814)		X	
<i>Ircinia</i> sp.	0.31%		
<i>Niphates</i> sp.	0.10%		
Verongiida	0.15%		
Cnidaria- Hydrozoa	2.24%	X	
Hydrozoa	2.24%	X	
<i>Halopteris carinata</i> Allman, 1877		X	
Hydroidolina	2.24%	X	
<i>Macrorhynchia</i> sp.		X	
Cnidaria- Anthozoa	3.93%	X	
Alcyonacea - gorgonian	2.14%	X	
Alcyonacea- gorgonian	0.46%		
Clavulariidae		X	
<i>Diodogorgia</i> sp.	0.15%	X	
<i>Ellisella barbadensis</i> (Pallas, 1766)		X	
<i>Ellisella</i> sp.	0.66%	X	
Ellisellidae	0.15%	X	

<i>Muricea</i> sp.	0.05%	X
Plexauridae- MPA1	0.15%	
<i>Swiftia exserta</i> (Ellis & Solander, 1786)	0.51%	X
Anthozoa - Non Coral		X
Corallimorpharia		X
Antipatharia	1.78%	X
Antipatharia	0.15%	X
<i>Antipathes atlantica</i> Gray, 1857	0.51%	X
<i>Antipathes furcata</i> Gray, 1857	0.10%	X
<i>Stichopathes luetkeni</i> Brook, 1889	0.15%	X
<i>Tanacetipathes</i> sp.	0.87%	X
Annelida	0.31%	X
Polychaeta	0.31%	X
<i>Filograna</i> sp.	0.31%	X
Arthropoda		X
Crustacea		X
Scyllaridae		X
Bryozoa	0.05%	X
Echinodermata	0.05%	
Crinoidea	0.05%	
<i>Davidaster</i> sp.	0.05%	
Chordata	0.71%	X
Chordata - Invertebrate	0.61%	X
Ascidiacea	0.31%	
Didemnidae	0.31%	X
Chordata - Vertebrate	0.10%	
Actinopterygii	0.10%	
Detritus	1.12%	
UNKNOWN	0.25%	
Human debris		X
Human debris		X
Human debris- Fishing Gear		X
Human debris- anchor line		X
Bare Hard Bottom Substrate	32.43%	
Bare Hard Bottom Substrate	32.43%	
Dead Coral	0.05%	
Bare coral rubble	0.05%	
Hard bottom	32.38%	
Bare rock, pavement, boulder, ledge	29.58%	
Bare rubble/cobble	2.80%	
Bare Soft Bottom Substrate	31.41%	



Grand Total

100.00%

X

X

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-18.

Class/Order/Family/Taxa Author - Common Name	ROV 19-18
Actinopterygii	
Anguilliformes	
Muraenidae	
<i>Gymnothorax moringa</i> (Cuvier, 1829) - Spotted Moray	0.18
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	3.17
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	7.23
Perciformes	
Acanthuridae	
<i>Acanthurus</i> sp. - Surgeonfish	1.59
Carangidae	
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	0.18
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	2.29
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	2.82
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	30.86
<i>Chaetodon striatus</i> Linnaeus, 1758 - Banded Butterflyfish	0.18
<i>Prognathodes aculeatus</i> (Poey, 1860) - Longsnout Butterflyfish	0.35
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	2.82
Haemulidae	
<i>Haemulon aurolineatum</i> Cuvier, 1830 - Tomtate Grunt	88.18
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	0.88
<i>Haemulon striatum</i> (Linnaeus, 1758) - Striped Grunt	87.30
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	7.76
<i>Halichoeres cyanocephalus</i> (Bloch, 1791) - Yellowcheek Wrasse	0.35
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	3.88
<i>Halichoeres</i> sp. - Wrasse	22.05
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	0.53
Lutjanidae	
<i>Lutjanus analis</i> (Cuvier, 1828) - Mutton Snapper	0.35
Mullidae	
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	4.23
Pomacanthidae	
<i>Centropyge argi</i> Woods & Kanazawa, 1951 - Cherubfish	1.23
<i>Holocanthus</i> sp. - Angelfish	8.11

<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	0.88
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	0.35
Pomacentridae	
<i>Chromis enchrysur</i> a Jordan & Gilbert, 1882 - Yellowtail Reeffish	10.23
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	44.09
<i>Chromis scotti</i> Emery, 1968 - Purple Reeffish	10.23
<i>Chromis</i> sp. - Damselfish/chromis	123.10
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damselfish	1.23
Priacanthidae	
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	0.71
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	0.71
Scaridae	
<i>Sparisoma atomarium</i> (Poey, 1861) - Greenblotch Parrotfish	0.53
<i>Sparisoma aurofrenatum</i> (Valenciennes, 1840) - Redband Parrotfish	0.71
Sciaenidae	
<i>Equetus lanceolatus</i> (Linnaeus, 1758) - Jack-knifefish	0.35
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	7.41
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	3.53
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	3.70
<i>Mycteroperca microlepis</i> (Goode & Bean, 1879) - Gag	0.35
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	1.59
<i>Paranthias furcifer</i> (Valenciennes, 1828) - Creole-fish	1.06
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	6.53
<i>Serranus baldwini</i> (Evermann & Marsh, 1899) - Lantern Bass	6.17
<i>Serranus phoebe</i> Poey, 1851 - Tattler	4.76
<i>Serranus tigrinus</i> (Bloch, 1790) - Harlequin Bass	0.35
Sparidae	
<i>Calamus</i> sp. - Porgy	2.29
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	13.76
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	0.18
Syngnathiformes	
Fistulariidae	
<i>Fistularia tabacaria</i> Linnaeus, 1758 - Bluespotted cornetfish	0.35
Tetraodontiformes	
Balistidae	
<i>Balistes capriscus</i> Gmelin, 1789 - Grey Triggerfish	0.18
<i>Balistes</i> sp. - Triggerfish	0.18
Ostraciidae	

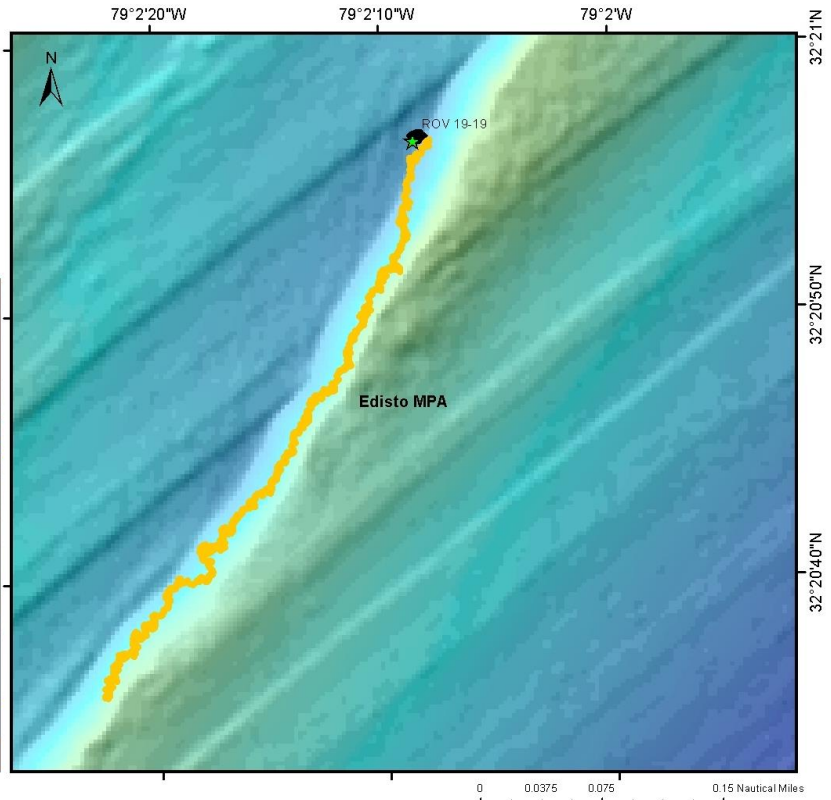
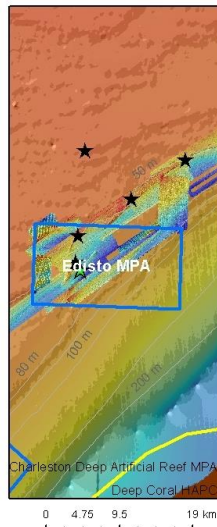
<i>Acanthostracion quadricornis</i> (Linnaeus, 1758) - Scrawled Cowfish	0.18
Ostraciidae - Boxfishes (Fam.)	0.18
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	25.22
<i>Sphoeroides spengleri</i> (Bloch, 1785) - Bandtail Puffer	0.35
Elasmobranchii	
Myliobatiformes	
Dasyatidae	
<i>Dasyatis centroura</i> (Mitchill, 1815) - Roughtail Stingray	0.18
UNKNOWN Biota	0.88

Dive Site: South Carolina, Edisto MPA; ED-06; 60 m; ROV 19-19; UNCW 725; 14-VI-19-4

General Location and Dive Track:

South Carolina, Edisto MPA; ED-06;
60 m; ROV 19-19; UNCW 725

- ★ ROV 19-19
- ★ Mohawk ROV
- 201906144 - Transect 01
- DiveTracks
- Oculina HAPC
- MPA
- Deep Coral HAPC
- Bathymetry



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Sedberry_OEBlock345_5m_UTM17N_MB

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/14/2019

Specimens: 3

Digital Photos: 151

No. DVD: 1

Hard Drive No.: 1

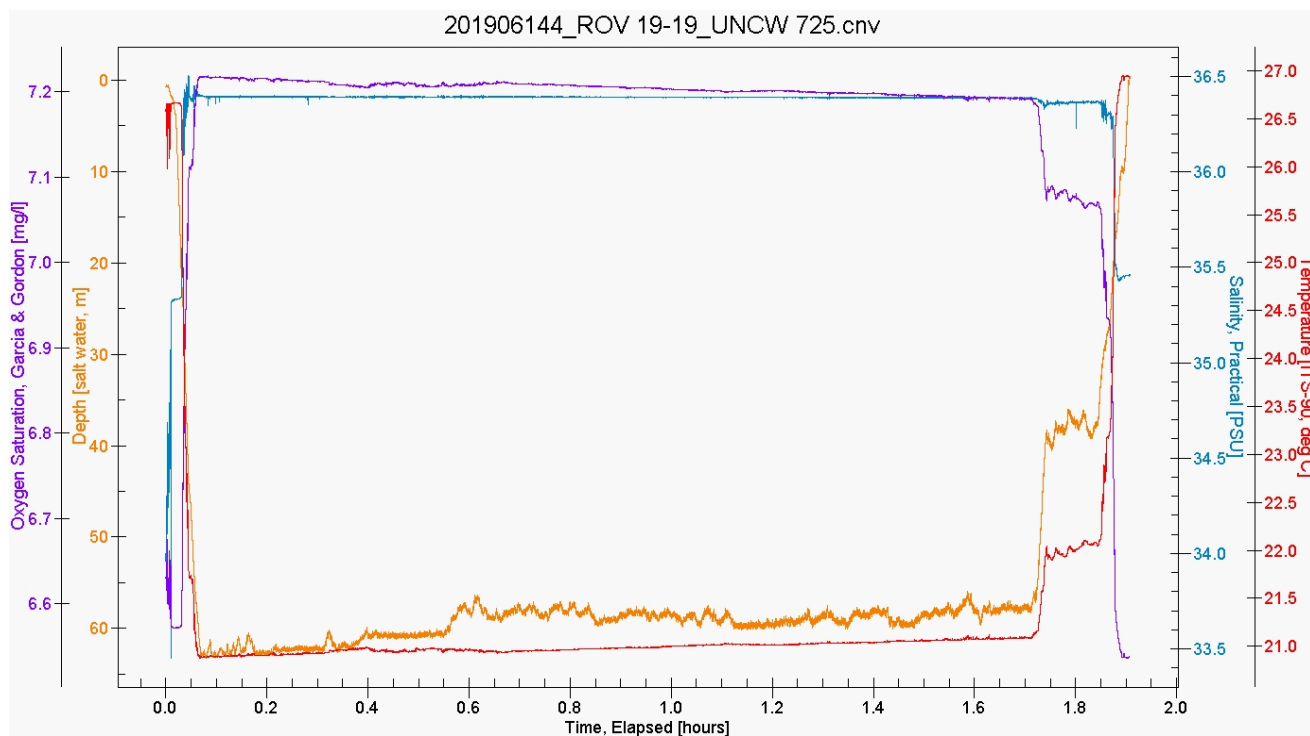
Dive Site: South Carolina, Edisto MPA; ED-06; 60 m; ROV 19-19; UNCW 725; 14-VI-19-4

Dive Data:

Minimum Bottom Depth (m): -58.8	Total Transect Length (km): 0.815
Maximum Bottom Depth (m): -65	Surface Current (kn): 0.5
On Bottom (Time- EDST): 16:16	On Bottom (Lat/Long): 32.349°N; -79.0357°W
Off Bottom (Time- EDST): 17:54	Off Bottom (Lat/Long): 32.3433°N; -79.0397°W
Physical (bottom); Temp (°C): 20.9	Salinity: 36.4 Visibility (m): 15 Current (kn): N/A

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-19 are as follows: Depth Maximum: 63.2 m, Temperature: 20.88-21.11 °C, Salinity: 36.4-36.4 PSU, Oxygen Saturation: 7.2-7.2 mg/l.

Dive Site: South Carolina, Edisto MPA; ED-06; 60 m; ROV 19-19; UNCW 725; 14-VI-19-4

Dive Imagery:



Figure 1: 32°20.8905'N;79°2.1508'W: -62.8 m
Swiftia exserta, Ircinia sponge



Figure 2: 32°20.8184'N;79°2.1902'W: -60.8 m
Spotted trunkfish (*Lactophrys bicaudalis*)



Figure 3: 32°20.8024'N;79°2.1932'W: -60.4 m
Spotted scorpionfish (*Scorpaena plumieri*)



Figure 4: 32°20.7758'N;79°2.2194'W: -61.2 m
Planehead filefish (*Stephanolepis hispidus*)



Figure 5: 32°20.7685'N;79°2.2225'W: -60.5 m
Horse conch (*Pleuroploca gigantea*)



Figure 6: 32°20.7289'N;79°2.2505'W: -61.8 m
Scamp (*Mycteroperca phenax*), Tomate (*Haemulon aurolineatum*) on boulder habitat

Dive Site: South Carolina, Edisto MPA; ED-06; 60 m; ROV 19-19; UNCW 725; 14-VI-19-4

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 14-VI-19-4; ROV 19-19, UNCW Dive 725; South Carolina, Edisto MPA, 60 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 59- 63 m

MB map shows NE-SW linear ridge, 4 km long, 160 m wide; top- 59 m, west base- 64 m; west slope appears steep, east slope gradual; ROV transect hd SW along west face of ridge.

Weather- Sunny, seas 3-4 ft from NE, wind 15 kn from 59 dg, air- 24.34 C, surface water- 26.74 C, salinity- 34.17, current- 0.5 kn to 318 dg.

16:11- Launch

16:15- On bottom- 64.5 m; visibility- 15, current- 0.25 fr SW, 20.8 C; 50 m NW of WP, west base of ridge, flat sand, scattered 25 cm boulders, 25% hard bottom; hd to WP; scamp, *Swiftia exserta*, *Stichopathes luetkeni*, amberjack, yellow thick encrusting *Spongosorites?*, Spirastrellidae, *Diodogorgia*, yellowtail reef fish, tattler, bigeye.

16:26- 64.2 m, flat sand, cobble.

Sample 1- NO Sample- LOST, *Diodogorgia*, 5 cm, purple, on cobble, w/ *Antipathes atlantica*, orange encrusting sponge on rock. No collection.

Sample 2- NO Sample- LOST, *Antipathes atlantica*, 5 cm, white. No collection.

16:30- start xs, hd south along base of escarpment. Flat sand and cobble, lionfish, white tubular *Aplysina*, *Holothuria badionotus?*

Dive Site: South Carolina, Edisto MPA; ED-06; 60 m; ROV 19-19; UNCW 725; 14-VI-19-4

16:36- MB lower part of escarpment, 63 m, 25 cm boulders, 50% hard bottom.

16:39- 62.8 m, flat rubble, cobble.

Sample 1- 15 cm amorphous, lobate, large 4 cm ostia on top, dark brown on surface, tan interior, crumbly, rare, Demospongiae MPA-01= *Neofibularia nolitangere*, fire sponge.

16:45- MB on escarpment. 30 dg slope, 2-3 m relief, ½ to 1 m boulders, 1 m ledge at top edge, 1 m undercut ledge, rugose, dense tomtates, top- 59.1 m, flat pavement; 4 m relief overall.

16:50- 15 cm, white/pink, coral, *Madracis myriaster*? On vertical rock, 60 m; bank butterflyfish, spotfin hogfish, *Geodia neptuni*, *Antipathes atlantica*, *Swiftia*, Spirastrellidae, scamp, rock hind, squirrelfish, bud light, trunkfish, *Zyssa*?, Spirastrellidae, scorpionfish, lionfish, *Macrorhynchia* bushy hydroid, rock beauty, orange and yellow encrusting demosponges, filefish.

17:07- 60.6 m, large horse conch, drum, blue angelfish.

17:24- 62.2 m, rock slope, cobble

Sample 2- 10 cm *Diodogorgia*; purple w/ dark purple calyces;

Sample 3- 2nd more reddish but same morphology beside S1= *Muricea*.

17:42- 61.5 m, west slope, < ½ m rock, flat, bank butterflyfish, *Geodia neptuni*, *Swiftia* common.

17:48- 61.8 m, west base of slope; ½ m boulders on slope, *Swiftia*, *Antipathes atlantica*, yellow amorphous *Verongida*, dense tomtate schools, lionfish.

17:54- 61.5 m, end xs, end dive.

Dominant Benthic Macrobiota:

Scleractinia- *Madracis myriaster*?

Antipatharia coral- *Strichopathes luetkeni*, *Antipathes atlantica*, *Tanacetipathes*

Gorgonia coral- *Diodogorgia*, *Swiftia exserta* (common), *Muricea* sp.

Hydroida- *Macrorhynchia*

Porifera- *Ircinia campana*, Spirastrellidae, orange and yellow encrusting demosponges, Spongosorites?, yellow *Verongida*, white tube *Aplysina*, Demospongiae MPA-01, white encrusting sponge- *Zyssa*?, (*Neofibularia*?), *Geodia neptuni*, yellow erect branching Axinellidae

Echinodermata- *Holothuria badionotus*?

Mollusc- horse conch- *Triplofusus papillosus* (syn. *Pleuroploca gigantia*)

Algae- Dictyota, CCA

Samples: 3

Neofibularia nolitangere, *Diodogorgia*, *Muricea*

Human Debris:

None

CPCe Percent Cover Analysis:

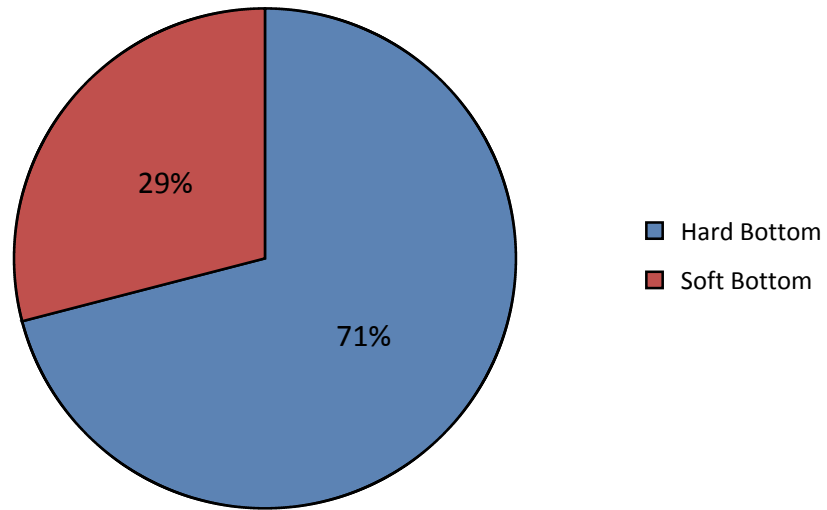
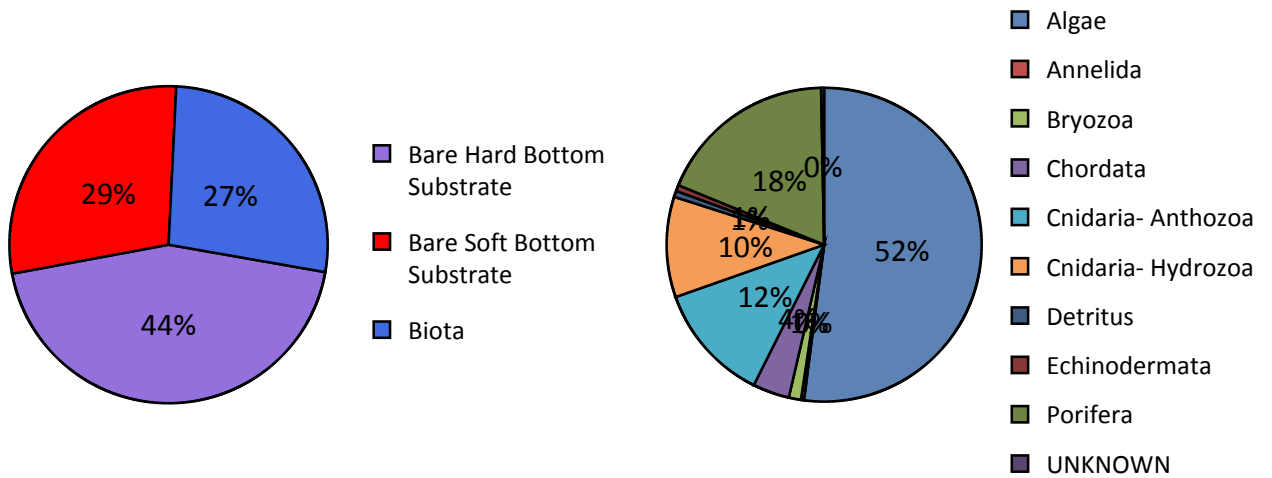


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-19. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

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

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

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Samples, Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-19.

	%	Notes	Samp.
Biota	27.01%	X	X
Algae	14.06%	X	
Algae	0.85%		
Cyanobacteria	2.62%		
Chlorophyta	0.51%		
Ochrophyta	0.42%		
Rhodophyta	9.65%	X	
Corallinales	5.50%	X	
Rhodophyta	4.15%		
Porifera	5.00%	X	X
Demospongiae	5.00%	X	X
<i>Agelas</i> sp.	0.08%		
<i>Aplysina</i> sp.		X	
Axinellidae		X	
<i>Cinachyrella</i> sp.	0.08%	X	
<i>Cliona</i> cf. <i>tumula</i> Friday, Poppell & Hill, 2013	0.08%	X	
Demospongiae	3.90%	X	
<i>Geodia neptuni</i> (Sollas, 1886)		X	
<i>Ircinia campana</i> (Lamarck, 1814)		X	
<i>Ircinia</i> sp.	0.08%		
<i>Neofibularia nolitangere</i> (Duchassaing & Michelotti, 1864)			X
<i>Niphates</i> sp.	0.08%		
<i>Placospongia</i> sp.	0.25%		
Spirastrellidae	0.42%	X	
<i>Spongosorites</i> sp.		X	
Verongiida		X	
<i>Zyzya</i> sp.		X	
Cnidaria- Hydrozoa	2.79%	X	
Hydrozoa	2.79%	X	
Hydroidolina	2.79%		
<i>Macrorhynchia</i> sp.		X	
Cnidaria- Anthozoa	3.30%	X	X
Alcyonacea - gorgonian	1.02%	X	X
Alcyonacea- gorgonian	0.25%		
<i>Diodogorgia nodulifera</i> (Hargitt & Rogers, 1901)			X
<i>Diodogorgia</i> sp.		X	
<i>Ellisella</i> sp.	0.08%		

Ellisellidae	0.08%	
<i>Muricea</i> sp.		X
Plexauridae- MPA1	0.25%	
<i>Swiftia exserta</i> (Ellis & Solander, 1786)	0.34%	X
Antipatharia	2.29%	X
<i>Antipathes atlantica</i> Gray, 1857	1.69%	X
<i>Antipathes furcata</i> Gray, 1857	0.25%	
<i>Stichopathes luetkeni</i> Brook, 1889	0.17%	X
<i>Tanacetipathes</i> sp.	0.17%	
Coral- Scleractinia		X
<i>Madracis myriaster</i> (Milne Edwards & Haime, 1850)		X
Annelida	0.08%	
Polychaeta	0.08%	
<i>Filograna</i> sp.	0.08%	
Mollusca		X
Bivalvia		X
<i>Spondylus</i> sp.		X
Gastropoda		X
<i>Triplofusus giganteus</i> (Kiener, 1840)		X
Arthropoda		X
Crustacea		X
<i>Panulirus argus</i> (Latreille, 1804)		X
Bryozoa	0.34%	
Echinodermata	0.17%	X
Asteroidea	0.17%	
Asteroidea	0.17%	
Holothuroidea		X
<i>Holothuria (Vaneyothuria) lentiginosa enodis</i> Miller & Pawson, 1979		X
Chordata	1.02%	
Chordata - Invertebrate	0.08%	
Ascidiacea	0.08%	
Chordata - Vertebrate	0.93%	
Actinopterygii	0.93%	
Detritus	0.17%	
UNKNOWN	0.08%	
Bare Hard Bottom Substrate	44.28%	
Bare Hard Bottom Substrate	44.28%	
Hard bottom	44.28%	
Bare rock, pavement, boulder, ledge	40.47%	
Bare rubble/cobble	3.81%	
Bare Soft Bottom Substrate	28.70%	

Grand Total

100.00%

X

X

Density of Fish:

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

Class/Order/Family/Taxa Author - Common Name	ROV 19-19
Actinopterygii	
Anguilliformes	
Muraenidae	
<i>Gymnothorax moringa</i> (Cuvier, 1829) - Spotted Moray	0.25
<i>Muraena robusta</i> Osório, 1911 - Stout Moray	0.25
Aulopiformes	
Synodontidae	
<i>Synodus</i> sp. - Lizardfish	0.25
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	10.72
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	5.98
<i>Plectrypops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish	1.99
Perciformes	
Acanthuridae	
<i>Acanthurus</i> sp. - Surgeonfish	0.75
Apogonidae	
<i>Apogon pseudomaculatus</i> Longley, 1932 - Twospot Cardinalfish	0.25
Carangidae	
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	1.25
<i>Seriola fasciata</i> (Bloch, 1793) - Lesser Amberjack	7.48
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	8.22
<i>Seriola</i> sp. - Amberjack	1.50
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	1.74
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	10.96
<i>Prognathodes aculeatus</i> (Poey, 1860) - Longsnout Butterflyfish	2.24
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	4.24
Haemulidae	
<i>Haemulon aurolineatum</i> Cuvier, 1830 - Tomtate Grunt	2566.66
<i>Haemulon striatum</i> (Linnaeus, 1758) - Striped Grunt	93.45
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	9.72
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	0.25
<i>Halichoeres</i> sp. - Wrasse	0.25
Lutjanidae	
<i>Rhomboplites aurorubens</i> (Cuvier, 1829) - Vermilion Snapper	34.89
Mullidae	

<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	5.48
Pomacanthidae	
<i>Centropyge argi</i> Woods & Kanazawa, 1951 - Cherubfish	0.25
<i>Holacanthus</i> sp. - Angelfish	7.23
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	1.74
Pomacentridae	
<i>Chromis enchrysur</i> a Jordan & Gilbert, 1882 - Yellowtail Reef fish	3.74
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	41.12
<i>Chromis scotti</i> Emery, 1968 - Purple Reef fish	18.19
<i>Chromis</i> sp. - Damselfish/chromis	10.96
Priacanthidae	
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	0.50
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	1.25
Sciaenidae	
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	67.28
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	6.23
<i>Epinephelus adscensionis</i> (Osbeck, 1765) - Rock Hind	0.50
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	3.99
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	4.24
Serranidae/Grammistinae	
<i>Rypticus</i> sp. - Soapfish	0.25
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	5.73
<i>Serranus phoebe</i> Poey, 1851 - Tattler	4.24
Sparidae	
<i>Calamus</i> sp. - Porgy	3.24
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	0.25
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	8.22
<i>Scorpaena plumieri</i> Bloch, 1789 - Spotted Scorpionfish	0.50
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	1.00
Syngnathiformes	
Aulostomidae	
<i>Aulostomus maculatus</i> Valenciennes, 1841 - Atlantic Trumpetfish	2.49
Fistulariidae	
<i>Fistularia tabacaria</i> Linnaeus, 1758 - Bluespotted cornetfish	1.25
Tetraodontiformes	
Diodontidae	
<i>Chilomycterus</i> sp. - Burrfish	0.75

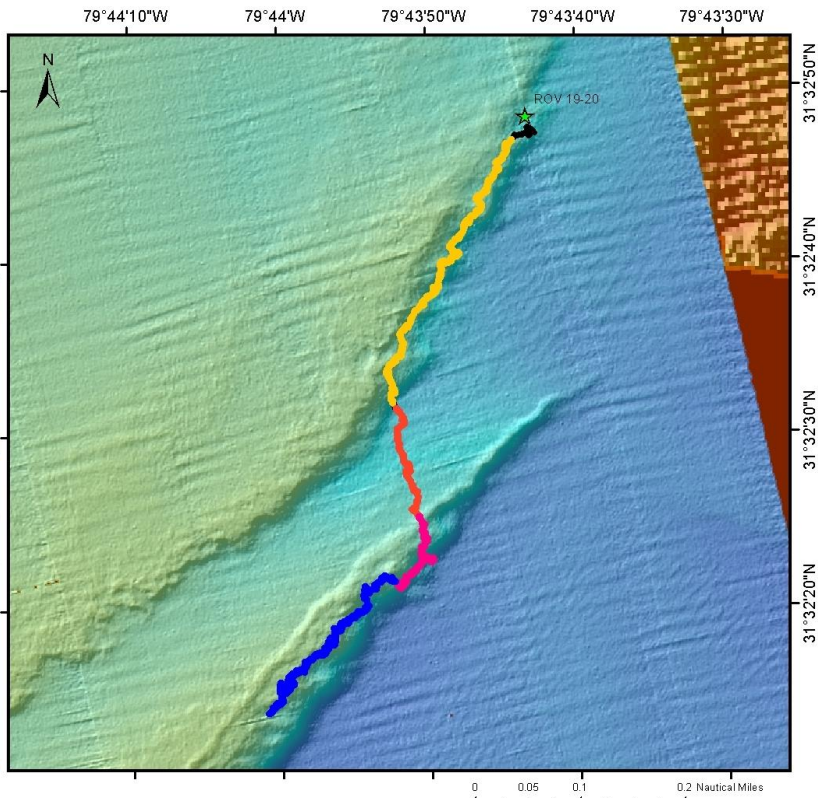
Monacanthidae		
	<i>Stephanolepis hispidus</i> (Linnaeus, 1766) - Planehead Filefish	0.25
Ostraciidae		
	<i>Lactophrys bicaudalis</i> (Linnaeus, 1758) - Spotted trunkfish	0.25
Tetraodontidae		
	<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	23.17
	<i>Sphoeroides spengleri</i> (Bloch, 1785) - Bandtail Puffer	0.50
	UNKNOWN Biota	0.25

Dive Site: Georgia, Outside GA MPA; GA-01; 60 m; ROV 19-20; UNCW 726; 15-VI-19-1

General Location and Dive Track:

Georgia, Outside GA MPA; GA-01;
60 m; ROV 19-20; UNCW 726

- ★ ROV 19-20
- ★ Mohawk ROV
- 201906151 - Transect 04
- 201906151 - Transect 03
- 201906151 - Transect 02
- 201906151 - Transect 01
- DiveTracks
- Oculina HAPC
- MPA
- Deep Coral HAPC
- Bathymetry



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: NancyFoster_10_15_Georgia East_bag.bag

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/15/2019

Specimens: 2

Digital Photos: 185

No. DVD: 3

Hard Drive No.: 1

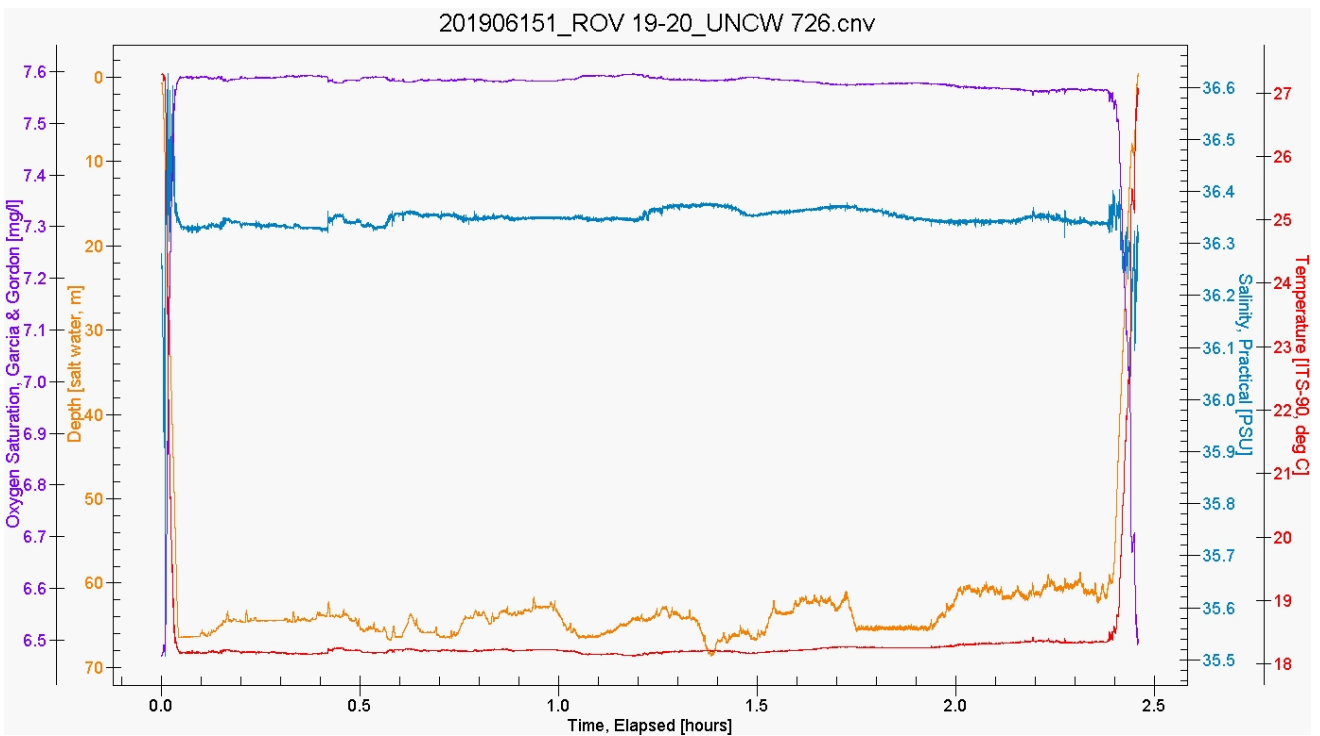
Dive Site: Georgia, Outside GA MPA; GA-01; 60 m; ROV 19-20; UNCW 726; 15-VI-19-1

Dive Data:

Minimum Bottom Depth (m): -60.8	Total Transect Length (km): 1.342
Maximum Bottom Depth (m): -69.9	Surface Current (kn): 0.4
On Bottom (Time- EDST): 7:09	On Bottom (Lat/Long): 31.5465°N; -79.7287°W
Off Bottom (Time- EDST): 9:29	Off Bottom (Lat/Long): 32.5206°N; -79.7337°W
Physical (bottom); Temp (°C): 18.3	Salinity: 36.35 Visibility (m): 5 Current (kn): N/A

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-20 are as follows: Depth Maximum: 68.6 m, Temperature: 18.13-18.42 °C, Salinity: 36.3-36.4 PSU, Oxygen Saturation: 7.6-7.6 mg/l.

Dive Site: Georgia, Outside GA MPA; GA-01; 60 m; ROV 19-20; UNCW 726; 15-VI-19-1

Dive Imagery:



Figure 1: 31°32.7021'N;79°43.7876'W: -65.5 m
Slipper lobster (*Scyllaridae*, *Scyllarides nodifer*)



Figure 2: 31°32.6731'N;79°43.8'W: -67.8 m
Flying gurnard (*Dactylopterus volitans*)



Figure 3: 31°32.6239'N;79°43.8392'W: -65.2 m
Unid. sphere demosponge



Figure 4: 31°32.6202'N;79°43.8452'W: -64.8 m
Unid. tube demosponge



Figure 5: 31°32.5652'N;79°43.8788'W: -64 m
Eudistoma sp.



Figure 6: 31°32.3131'N;79°43.9405'W: -62.2 m
Muricea octocoral on low relief hard bottom

Dive Site: Georgia, Outside GA MPA; GA-01; 60 m; ROV 19-20; UNCW 726; 15-VI-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 15-VI-19-1; ROV 19-20, UNCW Dive 726; Georgia, outside Georgia MPA, 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 62.5- 68 m

MB map shows escarpment NE-SW along south rim of plateau; top of plateau- 61 m, base- 67 m; m resolution, 63 nmi to shore.

Weather- Sunny, seas 1 ft from NE, wind 5 kn from 75 dg, air- 26.68 C, surface water- 27.32 C, salinity- 35.89, current- 0.4 kn to 239 dg.

7:07- Launch

7:09- On bottom- 67.6 m; visibility- 5- 10 m, current- 0.1- 0.5 fr N, 18.2 C, sediment in water, poor visibility, silty bottom; ROV near WP, flat rock pavement, 25 cm relief rocks, sediment; yellow bushy axinellid sponges, stalked bushy red-orange sponges- Clathria, 15 cm bushy tall polyps hydroids- *Thyroscyphus ramosus*, Spirastrellidae, Didemnidae.

7:21- 65.5 m, flat pavement.

Sample 1- 10 cm, bright yellow, stalked, bushy, spikey sphere, yellow exudate, rubbery, resilient, Axinellidae; Bin 3.

7:27- 66 m, MB on slope of escarpment; ROV shows flat rock pavement, no slope, 15 cm orange spherical sponge, Spirastrella luetkeni, bigeye, hake, burrfish, *Ircinia campana*, blue angelfish, lionfish, Scyllaridae, reef butterflyfish, *Antipathes atlantica*, tattler,

Dive Site: Georgia, Outside GA MPA; GA-01; 60 m; ROV 19-20; UNCW 726; 15-VI-19-1

7:35- 65.5 m, 2 slipper lobsters side by side on rock, fishing line, red snapper, *Ircinia* sp. spherical white, flying gurnard, 18 red snapper, bank butterflyfish.

7:50- 67.5, flat pavement, sediment, 10 cm white egg case- *Murex?*, *Schizoporella*, Yellow thick encrusting conulose some purple sponge- *Aiolochoira?*, *Ircinia strobilina* white, spotfin hogfish.

8:00- 65 m, flat pavement, same biota, MB- on south slope. *Filograna*, dark purple lobate *Eudistoma* tunicate, red snapper, scamp, grey triggerfish schooling together, *Zyza?* White encrusting sponge.

8:09- Change heading to south to NE-SW linear ridge, flat sediment between, 212 m wide. 67.7 m, sediment, some pavement with bigeye holes, 66.5 m, MB shows 66.1 m.

8:23- 65.5 m, west slope of ridge on MB; top of ridge on MB, 65 m- flat pavement, 10 cm relief; 8:26- east slope of ridge: 10-20 cm eroded rock, 65.5 m, 5 dg slope; *Stichopathes*, *Schizoporella*, *Thyroscyphus*, lionfish, bigeye, spotfin butterflyfish, fewer sponges.

8:29- east base of ridge, 69.7 m, sediment over rock pavement, rubble. Hd back to slope to cont xs.

8:31- 68.3 m, east slope, pavement, 10-25 cm relief eroded, rock, 5-10 dg slope; mostly hydroids and *Stichopathes*, sediment on rocks, barren. Human debris- plastic sheet, *Filograna*, saddle bass, yellow thick sponge- *Aiolochoira?*, *Ircinia*, tattler, Spirastrellidae, reef butterflyfish, red snapper, regular bigeye school >25,

8:39- 65.5 m, xs SW along upper slope of ridge; 4 m total relief but not apparent with the ROV, no ledges or dropoffs; 30 cm *Muricea*, long nose butterflyfish, lionfish; rocks covered with encrusting light pink sponge; school of vermilion snapper, scorpionfish.

8:49- 65 m, 10-30 dg slope, eroded rock 10-25 cm, *Stichopathes*, *Ircinia campana*, hydroids, porgy, li-ye encrusting sponges.

Sample 2- NO Sample- LOST. 67 m, bright yellow thin encrusting, surface conulose, Demospongiae- *Poecilosclerida?*; may have a minuscule piece in Bucket 5.

9:01- cont xs SW along slope. Scamp, 2 gag, blackbar drum, ½ m relief, crevices;

9:08- field of *Muricea*, 62.5 m top of ridge, flat pavement; edge, 30 dg slope, eroded rock ½ m relief, rugose, frogfish, red snapper.

9:22- 63 m, top edge of slope, 25 cm eroded rock, pavement, all bottom very silty; top- 62.5 m, flat pavement, silty bottom.

9:29- 63.5 m, end xs, end dive.

Dominant Benthic Macrobiota:

Antipatharia coral- *Stichopathes luetkeni*, *Antipathes atlantica*

Gorgonia coral- *Muricea*

Hydroida- *Thyroscyphus ramosus*

Porifera- Spirastrellidae, yellow and orange and yellow and pink encrusting sponges, yellow bushy axinellids, red-orange bushy- *Clathria?*, *Aiolochoira?*, *Ircinia strobilina*, *Ircinia campana*

Mollusca- *Murex?* egg case

Decapoda- Scyllaridae

Bryozoa- *Schizoporella*

Ascidiacea- Didemnidae, *Eudistoma*

Algae- None

Samples: 1

Axinellidae- stalked, bushy sphere

Human Debris:

Fishing line, plastic sheet, unid.

CPCe Percent Cover Analysis:

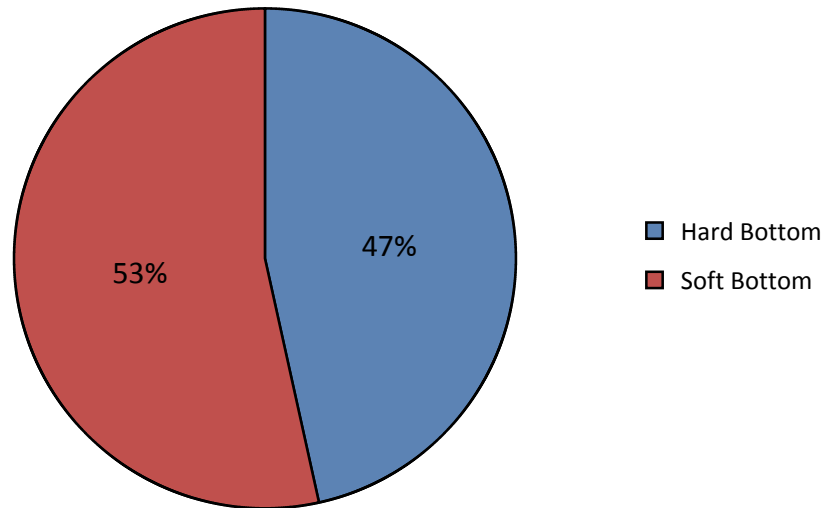
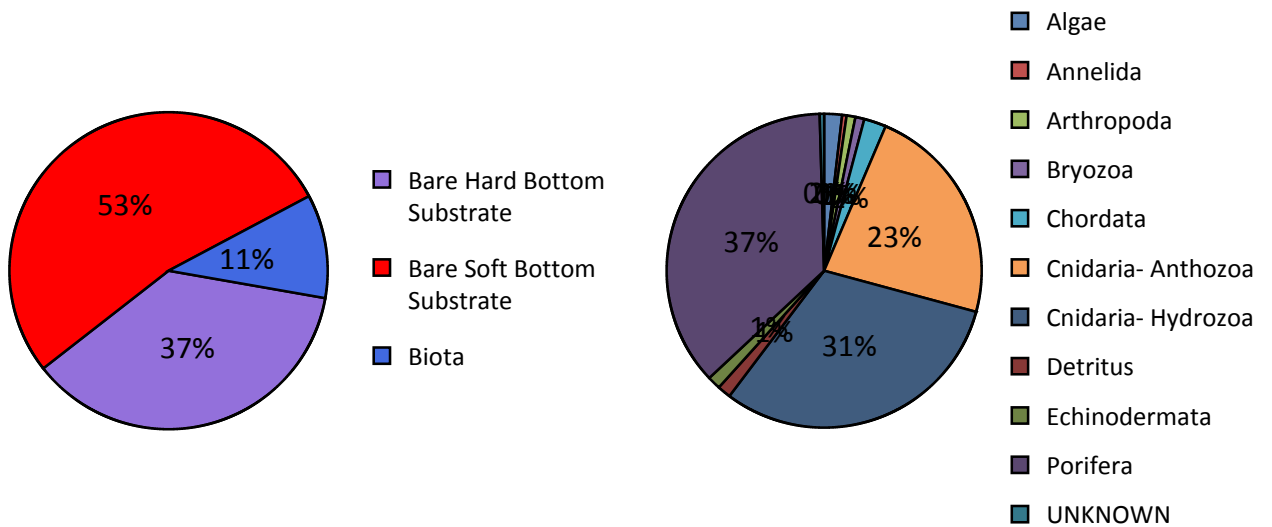


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-20. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-20.

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: Georgia, Outside GA MPA; GA-01; 60 m; ROV 19-20; UNCW 726

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Samples, dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-20.

	%	Notes	Samp.
Biota	10.56%	X	X
Algae	0.19%		
Rhodophyta	0.19%		
Corallinales	0.19%		
Porifera	3.86%	X	X
Demospongiae	3.86%	X	X
<i>Aiolochoxia crassa</i> (Hyatt, 1875)		X	
Axinellidae		X	
<i>Cinachyrella</i> sp.	0.05%		
<i>Clathria</i> (C.) sp. MPA-01			X
<i>Clathria</i> sp.	0.05%		
<i>Cliona</i> cf. <i>tumula</i> Friday, Poppell & Hill, 2013		X	
Demospongiae	2.27%	X	X
Demospongiae- orange encrusting porous		X	
Demospongiae- Ye sphere (MPA)		X	
<i>Ircinia campana</i> (Lamarck, 1814)		X	
<i>Ircinia</i> sp.		X	
<i>Ircinia strobilina</i> (Lamarck, 1816)	0.05%		
Microcionidae		X	
Spirastrellidae	1.35%		
Verongiida	0.10%		
<i>Zyzya</i> sp.		X	
Cnidaria- Hydrozoa	3.28%	X	
Hydrozoa	3.28%	X	
Hydroidolina	3.28%	X	
<i>Thyroscyphus ramosus</i> Allman, 1877		X	
Cnidaria- Anthozoa	2.41%	X	
Alcyonacea - gorgonian	0.24%	X	
Alcyonacea- gorgonian	0.05%		
<i>Diodogorgia</i> sp.	0.14%	X	
<i>Ellisella</i> sp.	0.05%		
<i>Muricea</i> sp.		X	
Antipatharia	1.93%	X	
Antipatharia	1.21%		
<i>Antipathes atlantica</i> Gray, 1857	0.10%	X	
<i>Antipathes furcata</i> Gray, 1857	0.05%	X	
<i>Stichopathes luetkeni</i> Brook, 1889	0.58%	X	

Dive Site: Georgia, Outside GA MPA; GA-01; 60 m; ROV 19-20; UNCW 726

Coral- Scleractinia	0.24%	X
Scleractinia- unid cup	0.24%	X
Annelida	0.05%	X
Polychaeta	0.05%	X
<i>Filograna</i> sp.	0.05%	X
Mollusca		X
Bivalvia		X
Plicatulidae		X
Gastropoda		X
<i>Murex</i> sp.		X
Arthropoda	0.10%	X
Crustacea	0.10%	X
Anomura		X
Scyllaridae	0.10%	X
Bryozoa	0.10%	X
Gymnolaemata	0.10%	X
<i>Schizoporella</i> sp.	0.10%	X
Echinodermata	0.14%	
Echinoidea	0.14%	
Cidaroidea	0.10%	
<i>Eucidaris tribuloides</i> (Lamarck, 1816)	0.05%	
Chordata	0.24%	X
Chordata - Invertebrate	0.05%	X
Ascidiacea	0.05%	
Didemnidae		X
<i>Eudistoma</i> sp.		X
Chordata - Vertebrate	0.19%	
Actinopterygii	0.19%	
Detritus	0.14%	
UNKNOWN	0.05%	
Human debris		X
Human debris		X
Human debris- Fishing Gear		X
Human debris- fishing line		X
Human debris- other		X
Habitat	89.44%	
Bare Hard Bottom Substrate	36.66%	
Hard bottom	36.66%	
Bare rock, pavement, boulder, ledge	32.56%	
Bare rubble/cobble	4.10%	
Bare Soft Bottom Substrate	52.77%	

Dive Site: Georgia, Outside GA MPA; GA-01; 60 m; ROV 19-20; UNCW 726

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-20.

Class/Order/Family/Taxa Author - Common Name	ROV 19-20
Actinopterygii	
Anguilliformes	
Muraenidae	
<i>Gymnothorax moringa</i> (Cuvier, 1829) - Spotted Moray	0.15
<i>Muraena retifera</i> Goode & Bean, 1882 - Reticulate Moray	0.15
Muraenidae - Moray Eels (Fam.)	0.31
Batrachoidiformes	
Batrachoididae	
<i>Opsanus</i> sp. - Toadfish	0.15
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	0.62
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	0.62
<i>Plectrypops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish	0.46
Gadiformes	
Phycidae	
Phycidae - Phycid Hakes (Fam.)	0.15
Lophiiformes	
Antennariidae	
<i>Fowlerichthys ocellatus</i> (Bloch & Schneider, 1801) - Ocellated frogfish	0.15
Perciformes	
Acanthuridae	
<i>Acanthurus</i> sp. - Surgeonfish	1.70
Carangidae	
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	0.15
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	1.39
<i>Seriola</i> sp. - Amberjack	0.31
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	8.81
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	12.99
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	3.56
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	2.78
<i>Decodon puellaris</i> (Poey, 1860) - Red Hogfish	0.15
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	0.62
<i>Halichoeres</i> sp. - Wrasse	6.96
Lutjanidae	

Dive Site: Georgia, Outside GA MPA; GA-01; 60 m; ROV 19-20; UNCW 726

<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper	4.02
<i>Lutjanus griseus</i> (Linnaeus, 1758) - Grey Snapper	0.15
<i>Rhomboplites aurorubens</i> (Cuvier, 1829) - Vermilion Snapper	18.09
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	3.56
Pomacentridae	
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reef fish	6.96
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	1.86
<i>Chromis scotti</i> Emery, 1968 - Purple Reef fish	7.58
Priacanthidae	
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	4.95
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	5.26
Sciaenidae	
<i>Pareques iwamotoi</i> Miller & Woods, 1988 - Blackbar Drum	0.62
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	62.63
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	0.31
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	1.70
<i>Mycteroperca microlepis</i> (Goode & Bean, 1879) - Gag	0.46
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	1.39
Serranidae/Grammistinae	
<i>Rypticus maculatus</i> Holbrook, 1855 - Whitespotted Soapfish	0.15
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	4.33
<i>Serranus baldwini</i> (Evermann & Marsh, 1899) - Lantern Bass	0.62
<i>Serranus phoebe</i> Poey, 1851 - Tattler	4.02
Sparidae	
<i>Calamus</i> sp. - Porgy	1.39
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	0.77
Sparidae - Porgies (Fam.)	0.62
Scorpaeniformes	
Dactylopteridae	
<i>Dactylopterus volitans</i> (Linnaeus, 1758) - Flying Gurnard	0.15
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	8.66
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	0.15
Tetraodontiformes	
Balistidae	
<i>Balistes capriscus</i> Gmelin, 1789 - Grey Triggerfish	1.39
<i>Balistes vetula</i> Linnaeus, 1758 - Queen Triggerfish	0.15
Diodontidae	
<i>Chilomycterus antillarum</i> Jordan & Rutter, 1897 - Web Burrfish	0.46

Dive Site: Georgia, Outside GA MPA; GA-01; 60 m; ROV 19-20; UNCW 726

Tetraodontidae

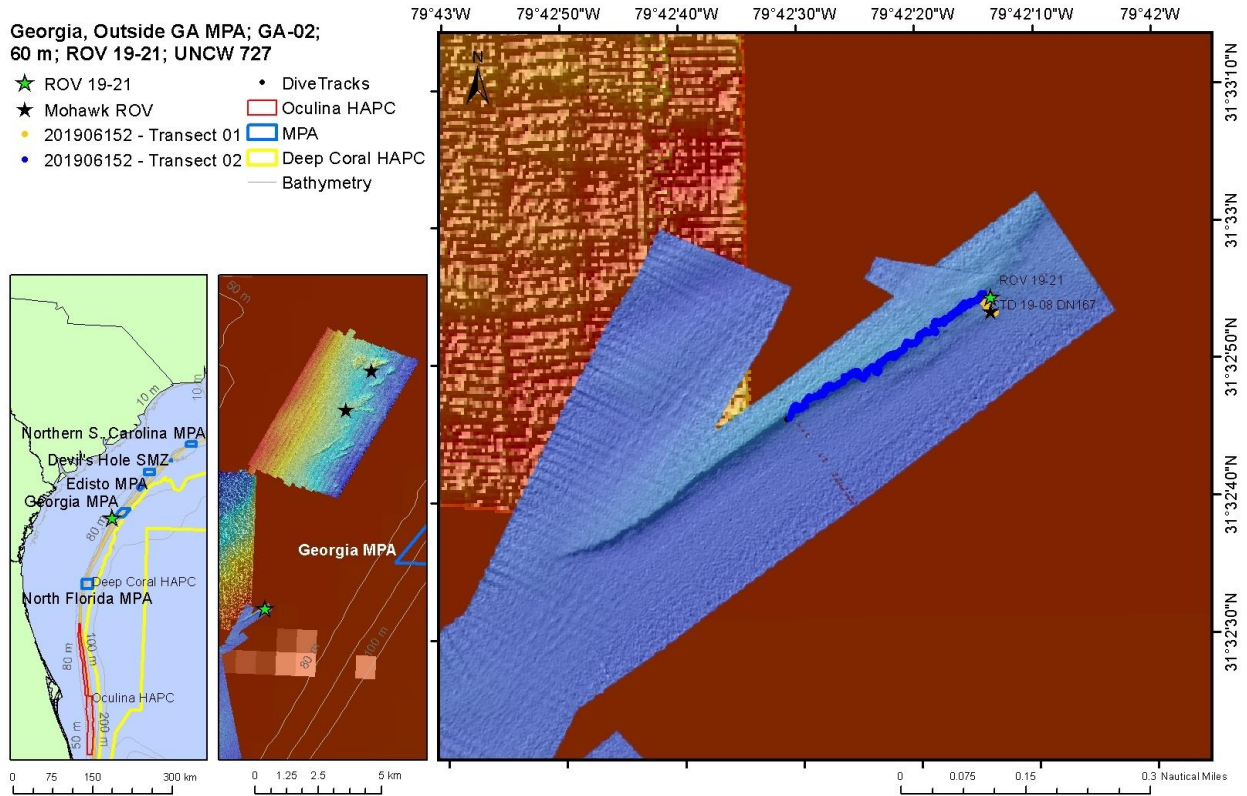
Canthigaster sp. - Sharpnose Puffer Sp. 6.96

Sphoeroides spengleri (Bloch, 1785) - Bandtail Puffer 0.15

UNKNOWN Biota 0.31

Dive Site: Georgia, Outside GA MPA; GA-02; 60 m; ROV 19-21; UNCW 727; 15-VI-19-2

General Location and Dive Track:



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: NancyFoster_10_15_Georgia East_bag.bag

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/15/2019

Specimens: 1

Digital Photos: 126

No. DVD: 2

Hard Drive No.: 1

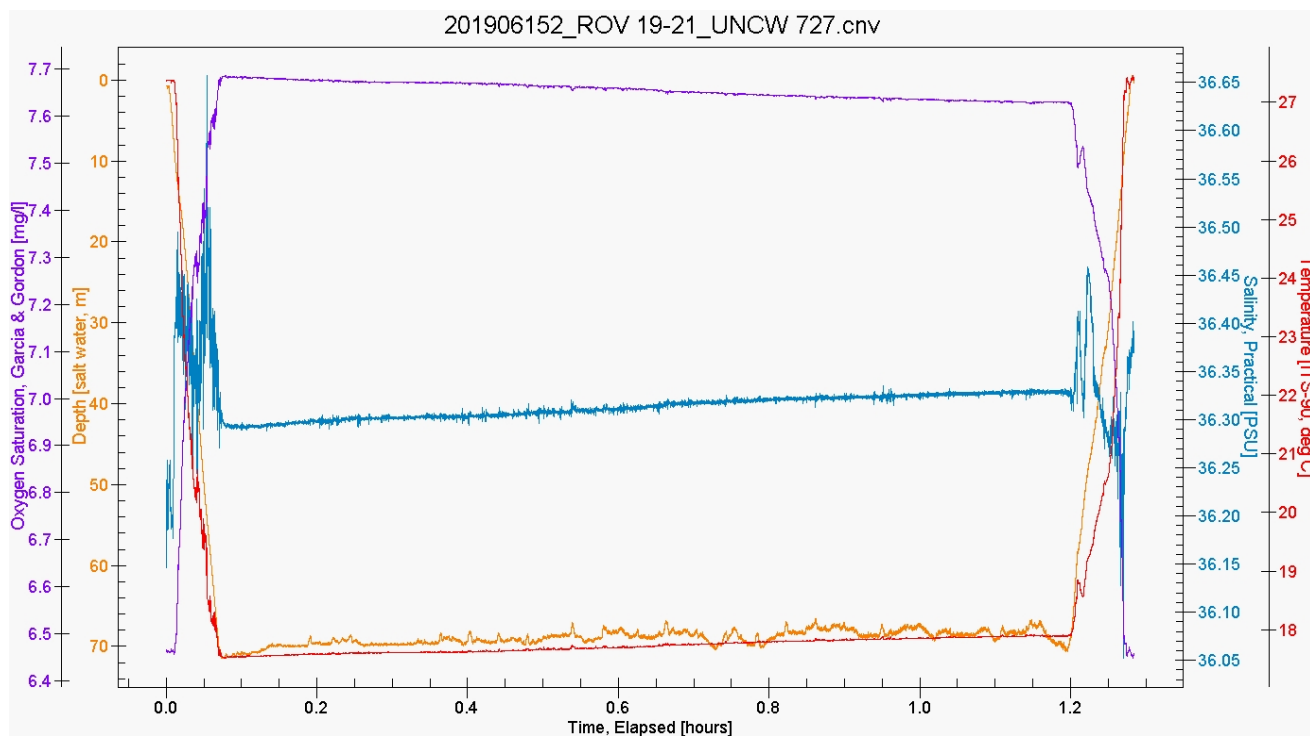
Dive Site: Georgia, Outside GA MPA; GA-02; 60 m; ROV 19-21; UNCW 727; 15-VI-19-2

Dive Data:

Minimum Bottom Depth (m): -68.8	Total Transect Length (km): 0.586
Maximum Bottom Depth (m): -73.6	Surface Current (kn): 0.7
On Bottom (Time- EDST): 10:14	On Bottom (Lat/Long): 31.5482°N; -79.7039°W
Off Bottom (Time- EDST): 11:21	Off Bottom (Lat/Long): 31.5459°N; -79.7085°W
Physical (bottom); Temp (°C): 17.7	Salinity: 36.35 Visibility (m): N/A Current (kn): 0.2

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-21 are as follows: Depth Maximum: 71.4 m, Temperature: 17.52-17.92 °C, Salinity: 36.3-36.4 PSU, Oxygen Saturation: 7.6-7.7 mg/l.

Dive Site: Georgia, Outside GA MPA; GA-02; 60 m; ROV 19-21; UNCW 727; 15-VI-19-2

Dive Imagery:



Figure 1: 31°32.9094'N;79°42.2443'W: -71.5 m
Spherical colonial tunicate (Didemnidae), Orangeback bass (*Serranus annularis*)



Figure 2: 31°32.8577'N;79°42.3337'W: -71.2 m
Human trash



Figure 3: 31°32.84'N;79°42.3652'W: -70.9 m
Encrusting demersal sponge

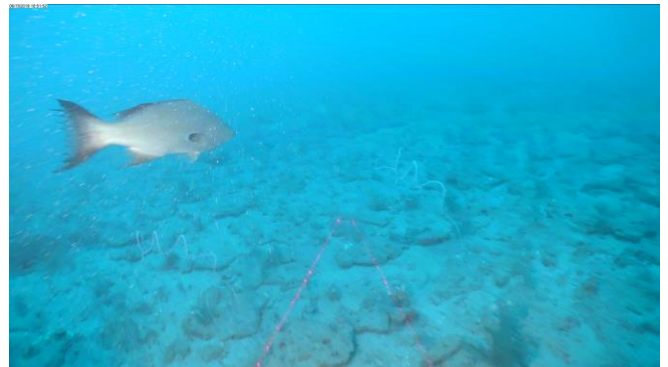


Figure 4: 31°32.8381'N;79°42.3781'W: -69.9 m
Scamp (*Mycteroperca phenax*) on low relief hard bottom



Figure 5: 31°32.8077'N;79°42.4407'W: -70.8 m
Bank butterflyfish (*Prognathodes aya*)



Figure 6: 31°32.7766'N;79°42.5037'W: -70.4 m
Knobby anemone (*Corallimorpharia*)

Dive Site: Georgia, Outside GA MPA; GA-02; 60 m; ROV 19-21; UNCW 727; 15-VI-19-2

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 15-VI-19-2; ROV 19-21, UNCW Dive 727; Georgia, outside Georgia MPA, 70 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 70- 73.5 m

MB map shows NE-SW ridge, 1 km long, 40 m wide, top- 68 m , N base- 69 m , S base- 70 m; ROV xs heading SW along ridge.

Weather- Sunny, seas 1 ft from NE, wind 9 kn from 86 dg, air- 27.46 C, surface water- 27.48 C, salinity- 35.5, current- 0.7 kn to 188 dg.

10:09- Launch

10:15- On bottom- 73.5 m; visibility- 10 m, current- 0.2 from N; 17.5 C; flat sand, rubble, cobble, flat rock, sticks, 50 m south of WP at base of ridge. Porgy, red snapper.

10:18- 72 m, lower slope; flat pavement, flat rock 10 cm, silty bottom; Didemnidae on sponge, hydroids, *Antipathes atlantica*, 15 cm white bushy Didemnid or sponge; *Sertularella diaphana* pinnate hydroid.

10:26- 71.5 m, near top ridge, flat sediment, rubble.

Sample 1- 5 cm bushy, honeycomb, white Didemnidae? rubbery, resilient, common; Bin 3.

10:30- 71.3 m, top edge of slope on MB; 10 dg slope, 1m diameter flat rock slabs, 10-20 cm relief, Spirastrellidae, red bush Clathria, sparse biota, lionfish, *Stichopathes luetkeni*, *Thyroscyphus ramosus* hydroid, 10 cm spherical white didemnid tunicates common, bushy yellow axinellid sponge, Christmas tree

Dive Site: Georgia, Outside GA MPA; GA-02; 60 m; ROV 19-21; UNCW 727; 15-VI-19-2

worm- *Spirobranchus giganteus*, *Eucidaris tribuloides*, yellow encrusting sponge, Barq's rootbeer can, 20 cm yellow *Aiolochoia crassa*, lionfish, bank butterflyfish, *Sargassum*,

10:51- 70.5 m, upper slope, 10 cm relief rock slabs, 5 dg slope, pavement, sediment; sparse biota; scamp, Filograna, wrasse bass, white lobate *Chondrosia?*, several scamp, blackbar drum, pile of anchor line, orange asteroid, 20 cm bushy hydroids abundant- *Macrorhynchia?*, pvc pipe, fishing line, spotted moray eel, white lobate *Chondrilla?*

11:07- 70 m, top edge, plastic bag, flat rock slabs, 10 cm relief, *Stichopathes*, hydroids, *Ircinia campana*, few sponges, white hollow tubes- *Aplysina*, fishing line, spotted cowery with mantle covering, lionfish, *Clathria*, fishing line, school of red porgy.

11:17- 70.5 m, top edge, Corallimorpharia- white tip knobs, frogfish, fishing line.

11:21- 72 m, end xs, end dive.

Dominant Benthic Macrobiota:

Antipatharia coral- *Stichopathes luetkeni*, *Antipathes atlantica*

Gorgonia coral- none

Corallimorpharia

Hydroida- *Thyroscyphus ramosus*, *Sertularella diaphana*, *Macrorhynchia*

Annelida- *Spirobranchus giganteus*

Porifera- Spirastrellidae, *Clathria*, *Aiolochoia crassa*, *Chondrilla?*, *Ircinia campana*, hollow tube white *Aplysina*

Echinodermata- *Eucidaris tribuloides*, orange Asteroidea

Ascidiacea- 10 cm spherical Didemnidae,

Algae- *Sargassum* (may be detritus)

Samples: 1

Didemnidae- white sphere, porous

Human Debris:

Fishing line- numerous, anchor line, cans, pvc pipe

CPCe Percent Cover Analysis:

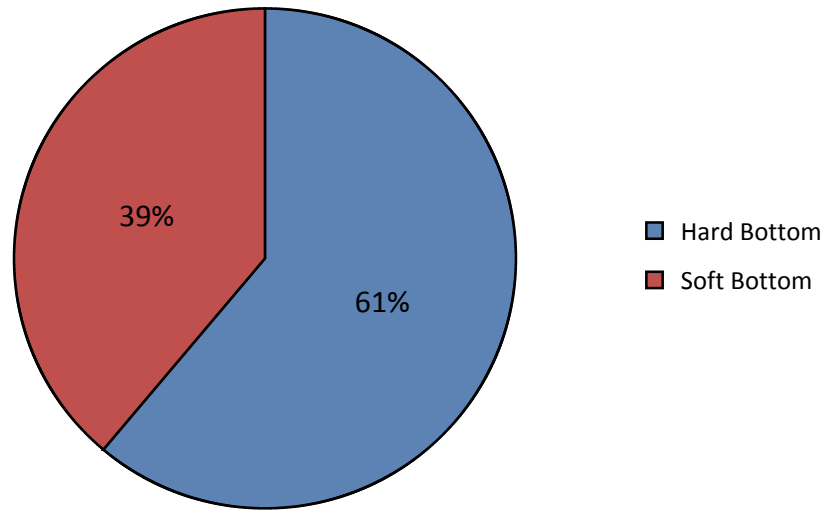
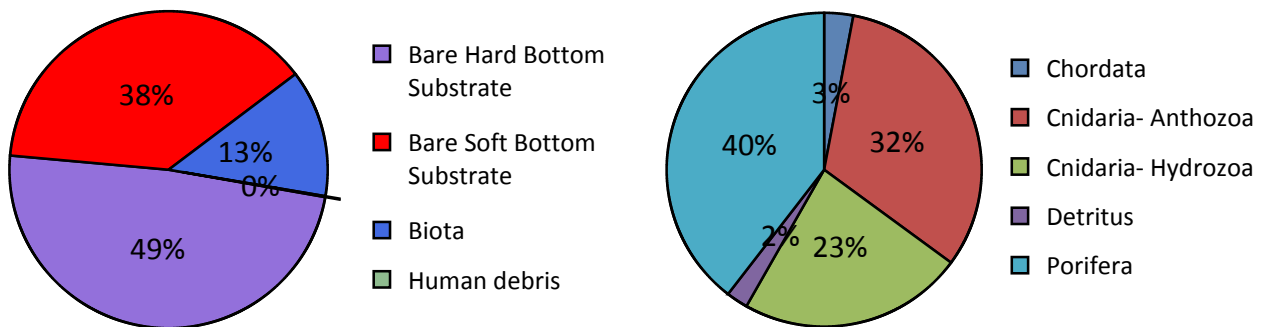


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-21. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-21.

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: Georgia, Outside GA MPA; GA-02; 60 m; ROV 19-21; UNCW 727

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Samples, dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-21.

	%	Notes	Samp.
Biota	12.98%	X	X
Algae		X	
Ochrophyta		X	
<i>Sargassum</i> sp.		X	
Porifera	5.14%	X	
Demospongiae	5.14%	X	
<i>Aiolochoxia crassa</i> (Hyatt, 1875)	0.39%	X	
<i>Aplysina</i> sp.		X	
Axinellidae		X	
<i>Chondrilla</i> sp.		X	
<i>Chondrosia</i> sp.- lobate gray (MPA)	0.10%		
Demospongiae	4.07%	X	
<i>Ircinia campana</i> (Lamarck, 1814)		X	
Microcionidae		X	
Spirastrellidae	0.58%	X	
Cnidaria- Hydrozoa	3.00%	X	
Hydrozoa	3.00%	X	
Hydroidolina	3.00%	X	
<i>Macrorhynchia</i> sp.		X	
<i>Sertularella diaphana</i> (Allman, 1885)		X	
<i>Thyroscyphus ramosus</i> Allman, 1877		X	
Cnidaria- Anthozoa	4.17%	X	
Anthozoa - Non Coral		X	
Actiniaria		X	
Corallimorpharia		X	
Antipatharia	4.17%	X	
Antipatharia	3.29%		
<i>Antipathes atlantica</i> Gray, 1857	0.48%	X	
<i>Stichopathes luetkeni</i> Brook, 1889	0.39%	X	
Annelida		X	
Polychaeta		X	
<i>Filograna</i> sp.		X	
<i>Spirobranchus giganteus</i> (Pallas, 1766)		X	
Mollusca		X	
Gastropoda		X	
Cypraeidae		X	

Dive Site: Georgia, Outside GA MPA; GA-02; 60 m; ROV 19-21; UNCW 727

Arthropoda		X	
Crustacea		X	
<i>Stenorhynchus seticornis</i> (Herbst, 1788)		X	
Echinodermata		X	
Asteroidea		X	
Echinoidea		X	
<i>Eucidaris tribuloides</i> (Lamarck, 1816)		X	
Chordata	0.39%	X	X
Chordata - Invertebrate	0.19%	X	X
Didemnidae	0.19%	X	X
Chordata - Vertebrate	0.19%		
Actinopterygii	0.19%		
Detritus	0.29%		
Human debris	0.10%	X	
Human debris	0.10%	X	
Human debris- Fishing Gear	0.10%	X	
Human debris- anchor line		X	
Human debris- fish line/gear	0.10%		
Human debris- other		X	
Human debris- Trash		X	
Human debris- cans/bottles		X	
Habitat	86.92%		
Bare Hard Bottom Substrate	48.64%		
Hard bottom	48.64%		
Bare rock, pavement, boulder, ledge	38.57%		
Bare rubble/cobble	10.08%		
Bare Soft Bottom Substrate	38.28%		
Grand Total	100.00%		

Dive Site: Georgia, Outside GA MPA; GA-02; 60 m; ROV 19-21; UNCW 727

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-21.

Class/Order/Family/Taxa Author - Common Name	ROV 19-21
Actinopterygii	
Anguilliformes	
Muraenidae	
<i>Gymnothorax moringa</i> (Cuvier, 1829) - Spotted Moray	0.40
<i>Muraena retifera</i> Goode & Bean, 1882 - Reticulate Moray	0.40
Lophiiformes	
Antennariidae	
<i>Fowlerichthys ocellatus</i> (Bloch & Schneider, 1801) - Ocellated frogfish	0.40
Perciformes	
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	11.29
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	12.51
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	11.70
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	2.02
<i>Decodon puellaris</i> (Poey, 1860) - Red Hogfish	0.40
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	5.65
<i>Halichoeres</i> sp. - Wrasse	2.02
Lutjanidae	
<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper	2.42
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	8.87
Pomacentridae	
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reef fish	31.46
Priacanthidae	
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	3.63
Sciaenidae	
<i>Parques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	3.63
Serranidae/Epinephelinae	
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	5.65
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	2.42
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	4.84
<i>Serranus phoebe</i> Poey, 1851 - Tattler	10.08
Sparidae	
<i>Calamus</i> sp. - Porgy	0.81
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	15.73

Dive Site: Georgia, Outside GA MPA; GA-02; 60 m; ROV 19-21; UNCW 727

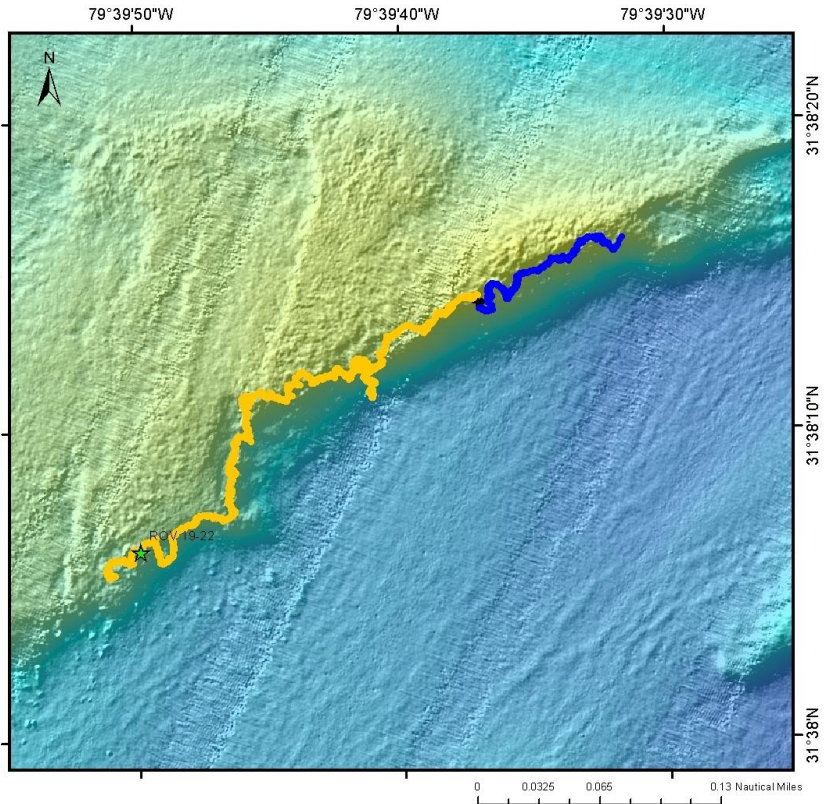
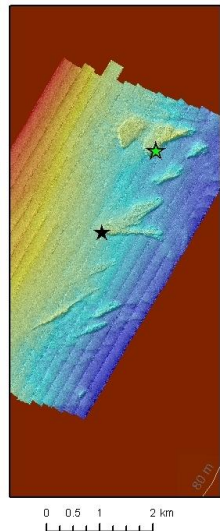
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	11.29
Syngnathiformes	
Fistulariidae	
<i>Fistularia tabacaria</i> Linnaeus, 1758 - Bluespotted cornetfish	0.40
Tetraodontiformes	
Balistidae	
<i>Balistes caprisicus</i> Gmelin, 1789 - Grey Triggerfish	1.21
Diodontidae	
<i>Chilomycterus schoepfii</i> (Walbaum, 1792) - Striped Burrfish	0.40
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	8.47
<i>Sphoeroides spengleri</i> (Bloch, 1785) - Bandtail Puffer	15.33
Tetraodontidae - Puffers (Fam.)	1.21
UNKNOWN Biota	0.81

Dive Site: Georgia, Outside GA MPA; 70 m; ROV 19-22; UNCW 728; 15-VI-19-3

General Location and Dive Track:

Georgia, Outside GA MPA; 70 m;
ROV 19-22; UNCW 728

- ★ ROV 19-22
- ★ Mohawk ROV
- 201906153 - Transect 01
- 201906153 - Transect 02
- DiveTracks
- Oculina HAPC
- MPA
- Deep Coral HAPC
- Bathymetry



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: NancyFoster_14_08_MPA_G A

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/15/2019

Specimens: 0

Digital Photos: 95

No. DVD: 2

Hard Drive No.: 1

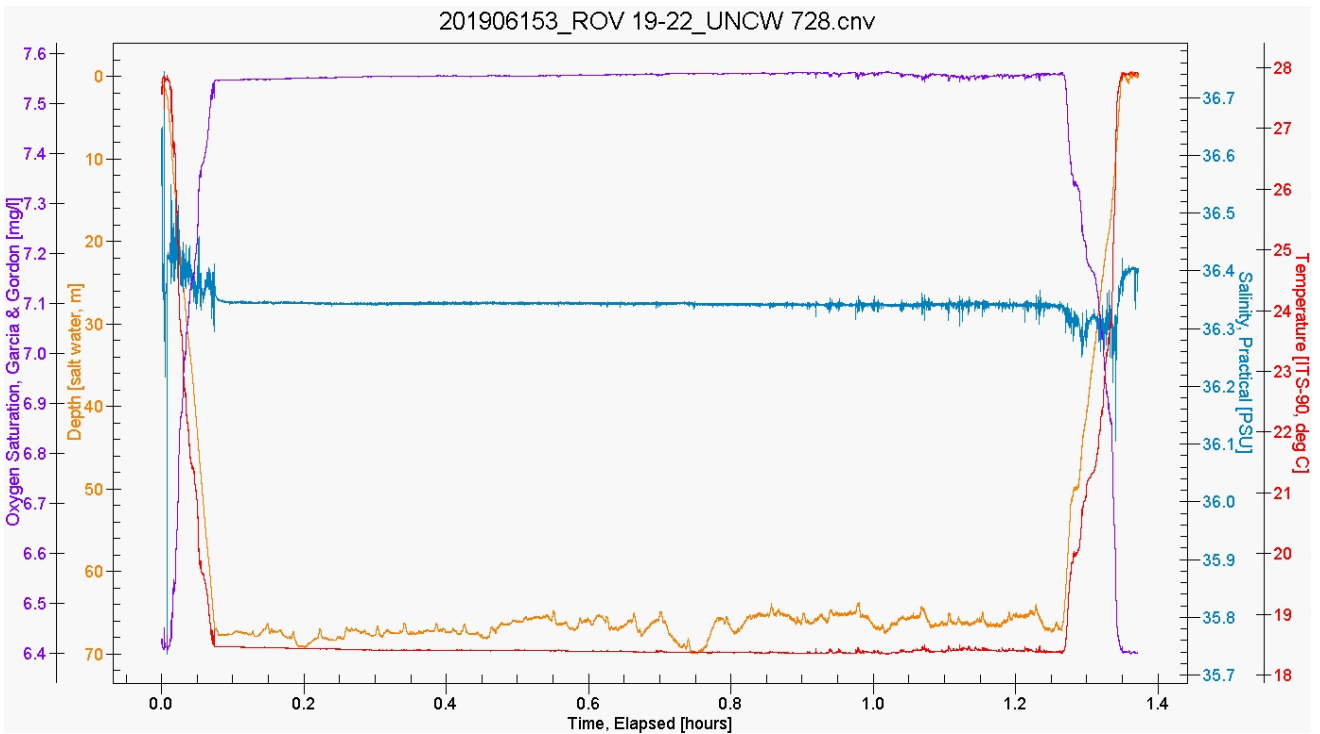
Dive Site: Georgia, Outside GA MPA; 70 m; ROV 19-22; UNCW 728; 15-VI-19-3

Dive Data:

Minimum Bottom Depth (m): -65.5	Total Transect Length (km): 0.754
Maximum Bottom Depth (m): -71.3	Surface Current (kn): 0.9
On Bottom (Time- EDST): 13:35	On Bottom (Lat/Long): 31.6348°N; -79.6642°W
Off Bottom (Time- EDST): 14:45	Off Bottom (Lat/Long): 31.6378°N; -79.6588°W
Physical (bottom); Temp (°C): 18.5	Salinity: 36.37 Visibility (m): N/A Current (kn): N/A

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-22 are as follows: Depth Maximum: 70 m, Temperature: 18.35-18.7 °C, Salinity: 36.3-36.4 PSU, Oxygen Saturation: 7.5-7.6 mg/l.

Dive Site: Georgia, Outside GA MPA; 70 m; ROV 19-22; UNCW 728; 15-VI-19-3

Dive Imagery:



Figure 1: 31°38.1043'N;79°39.8333'W: -68.9 m
Hermit crab in whelk shell



Figure 2: 31°38.157'N;79°39.7745'W: -68.8 m
Stink sponge (*Ircinia campana*) on flat pavement

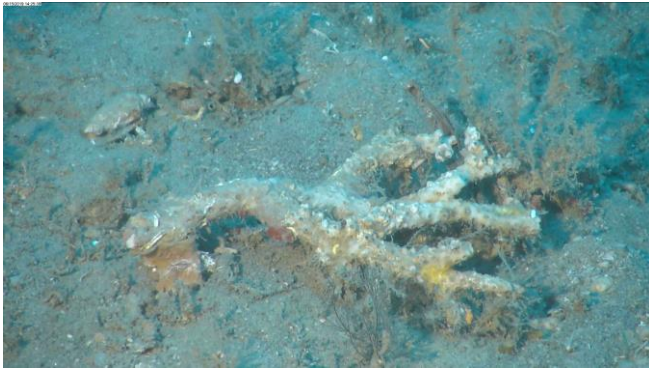


Figure 3: 31°38.2236'N;79°39.6518'W: -67.7 m
Dead sponge knocked over



Figure 4: 31°38.2322'N;79°39.6362'W: -66.8 m
Bigeye (*Priacanthus arenatus*) finds shelter in small rock pits



Figure 5: 31°38.2579'N;79°39.5669'W: -68.2 m
Wrasse bass (*Liopropoma eukrines*)



Figure 6: 31°38.2659'N;79°39.5564'W: -67.2 m
Knobby anemone (*Corallimorpharia*)

Dive Site: Georgia, Outside GA MPA; 70 m; ROV 19-22; UNCW 728; 15-VI-19-3

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 15-VI-19-3; ROV 19-22, UNCW Dive 728; Georgia, outside Georgia MPA, 70 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV. Shipboard salinity and depth sensors were inaccurate on occasion.

Site Description/Habitat/Biota (observations during dive):

Depth range: 69- 71 m

MB map shows scattered low relief terraces. 1 m resolution. ROV xs NE along southern escarpment of terrace, 1 km long x 375 m wide; top of terrace- 67 m, south base- 71.6 m.

Weather- Sunny, seas 1-3 ft from SE, wind 11 kn from 117 dg, air- 27.65 C, surface water- 27.96 C, salinity- 35.31, current- 1.0 kn to 237 dg.

13:29- Launch

13:35- On bottom- 69.5 m; visibility- 10 m, current- 0.25 dg fr NE; on bottom 30 m SW of WP, <25 cm outcrops, pavement, sediment, school of 11 red snapper, Didemnidae encrusting on rock, orange ball sponge, hydroids, *Stichopathes luetkeni*.

13:40- at WP, 69 m, flat rock pavement, low relief. ROV depth matches MB depth. 71 m- base of slope on MB, ROV only showed flat rock pavement, no apparent slope. Elliselid orange branching gorgonian, 10% hard bottom; top edge 69 m, flat pavement; mostly *Stichopathes* and hydroids, low density and diversity, *Filigrana*, short bigeye.

13:49- edge of terrace turns N; cont xs along top edge (not visible on video). *Eucidaris*, *Stenorhynchus*, lionfish, spotfin, bank butterflyfish, squirrelfish, can, Spirastrellidae, 30 cm eroded *Ircinia campana*, *Titanideum frauenfeldi* orange, 69.5 m top edge on MB (flat on ROV), *Diodogorgia*, school blackbar drum,

Dive Site: Georgia, Outside GA MPA; 70 m; ROV 19-22; UNCW 728; 15-VI-19-3

blue angelfish, scamp.

14:03- Top edge of slope curves to NE; top edge- 69 m; flat rock pavement, burrfish, $\frac{1}{2}$ m relief, undercut at edge.

14:15- transect, base 71.2 m; all flat sand and pavement, unlike MB which shows 3 m scarp. High school of fish 10 m thick on fathometer- appear to be Vermilion snapper, another dense school of fish in ROV and fathometer, *Ircinia campana*.

14:26- 67.5 m, top edge, same habitat, flat pavement, sediment, 10 cm relief rock, bigeye in rock holes, hog snapper, plastic bag; $\frac{1}{4}$ m ledge- lionfish, blackbar drum, hog snapper, *Sargassum* detritus, encrusting didemnid abundant, hake, 1 6" piece of dead thick *Oculina* branch.

14:40- 67 m, top edge, same flat pavement, sand, occasional 10 cm rock ledges; *Stichopathes*, didemnidae, hydroids, white knobbed anemone, *Corallimorpharia*, 67m.

14:45- 69 m, top edge of slope, rock pavement; end xs, end dive.

Dominant Benthic Macrobiota:

Antipatharia coral- *Stichopathes luetkeni*

Gorgonia coral- *Diodogorgia*, *Titanideum frauenfeldii*, Ellisellidae

Corallimorpharia

Hydroida

Porifera- Spirastrellidae, *Ircinia campana*

Annelida- *Filograna*

Echinodermata- *Eucidaris tribuloides*

Ascidiacea- encrusting Didemnidae abundant

Algae- *Sargassum* (may be detritus)

Human Debris:

Anchor line, can, plastic bag, tube

CPCe Percent Cover Analysis:

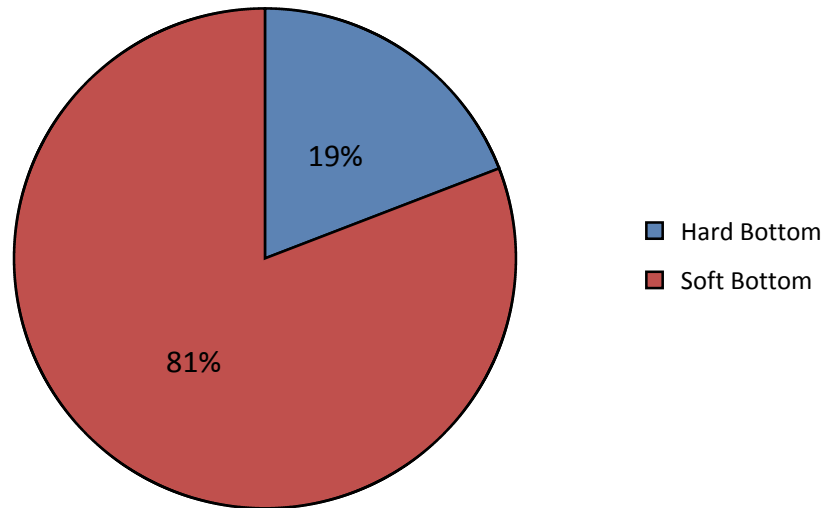
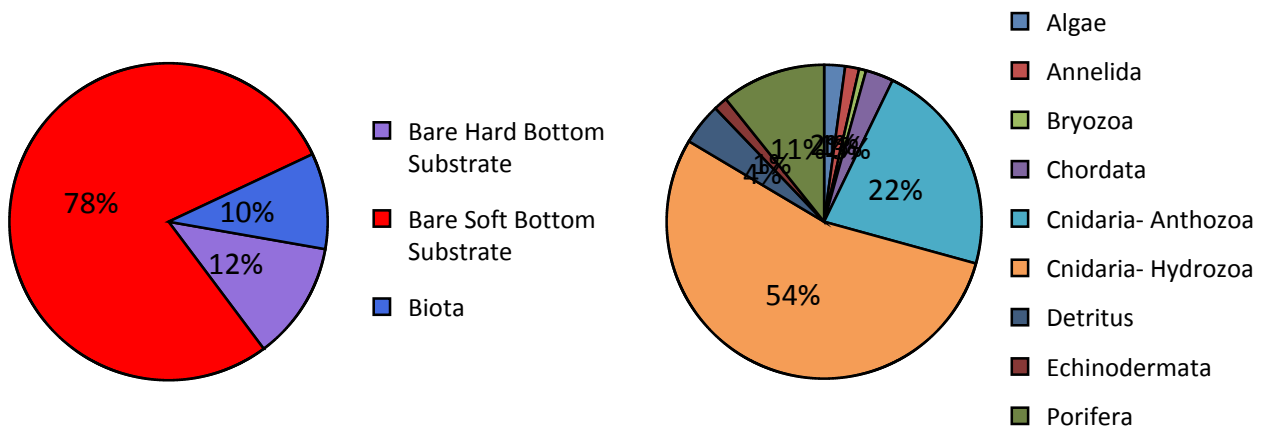


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-22. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-22.

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: Georgia, Outside GA MPA; 70 m; ROV 19-22; UNCW 728

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-22.

	%	Notes
Biota	9.78%	X
Algae	0.21%	X
Ochrophyta	0.14%	X
<i>Sargassum</i> sp.	0.14%	X
Rhodophyta	0.07%	
Porifera	1.05%	X
Demospongiae	1.05%	X
Demospongiae	1.05%	X
<i>Ircinia campana</i> (Lamarck, 1814)		X
Cnidaria- Hydrozoa	5.31%	X
Hydrozoa	5.31%	X
Hydroidolina	5.31%	X
Cnidaria- Anthozoa	2.16%	X
Alcyonacea - gorgonian	0.35%	X
<i>Diodogorgia</i> sp.	0.28%	X
<i>Ellisella</i> sp.		X
Plexauridae	0.07%	
<i>Titanideum frauenfeldii</i> (Kölliker, 1865)		X
Anthozoa - Non Coral		X
<i>Condylactis gigantea</i> (Weinland, 1860)		X
Corallimorpharia		X
Antipatharia	1.82%	X
<i>Stichopathes luetkeni</i> Brook, 1889	1.82%	X
Annelida	0.14%	X
Polychaeta	0.14%	X
<i>Filograna</i> sp.	0.14%	X
Mollusca		X
Gastropoda		X
<i>Triplofusus giganteus</i> (Kiener, 1840)		X
Arthropoda		X
Crustacea		X
Anomura		X
<i>Stenorhynchus seticornis</i> (Herbst, 1788)		X
Bryozoa	0.07%	
Echinodermata	0.14%	X
Asteroidea	0.14%	X

Dive Site: Georgia, Outside GA MPA; 70 m; ROV 19-22; UNCW 728

Asteroidea		X
<i>Narcissia trigonaria</i> Sladen, 1889	0.14%	
Echinoidea		X
<i>Eucidaris tribuloides</i> (Lamarck, 1816)		X
Chordata	0.28%	X
Chordata - Invertebrate	0.28%	X
Didemnidae	0.28%	X
Detritus	0.42%	X
Human debris		X
Human debris		X
Human debris- Fishing Gear		X
Human debris- anchor line		X
Human debris- other		X
Human debris- Trash		X
Human debris- cans/bottles		X
Human debris- plastic		X
Habitat	90.22%	
Bare Hard Bottom Substrate	12.01%	
Hard bottom	12.01%	
Bare rock, pavement, boulder, ledge	10.20%	
Bare rubble/cobble	1.82%	
Bare Soft Bottom Substrate	78.21%	
Grand Total	100.00%	

Dive Site: Georgia, Outside GA MPA; 70 m; ROV 19-22; UNCW 728

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-22.

Class/Order/Family/Taxa Author - Common Name	ROV 19-22
Actinopterygii	
Beryciformes	
Holocentridae	
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	1.04
<i>Plectrypops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish	0.52
Gadiformes	
Phycidae	
Phycidae - Phycid Hakes (Fam.)	0.52
Perciformes	
Apogonidae	
<i>Apogon pseudomaculatus</i> Longley, 1932 - Twospot Cardinalfish	1.56
Carangidae	
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	1.04
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	3.12
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	9.35
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	7.79
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	2.08
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	1.56
<i>Decodon puellaris</i> (Poey, 1860) - Red Hogfish	0.52
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	3.12
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	1.56
Lutjanidae	
<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper	10.91
<i>Rhomboplites aurorubens</i> (Cuvier, 1829) - Vermilion Snapper	155.84
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	8.31
Pomacentridae	
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reef fish	12.99
<i>Chromis scotti</i> Emery, 1968 - Purple Reef fish	1.56
Priacanthidae	
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	3.12
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	4.68
Sciaenidae	
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	60.26

Dive Site: Georgia, Outside GA MPA; 70 m; ROV 19-22; UNCW 728

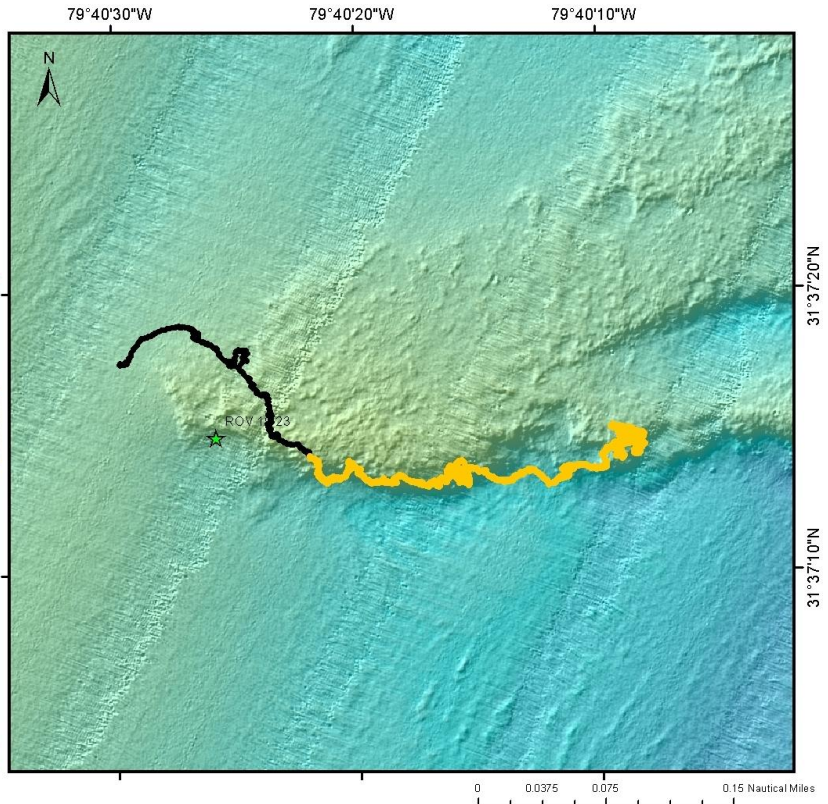
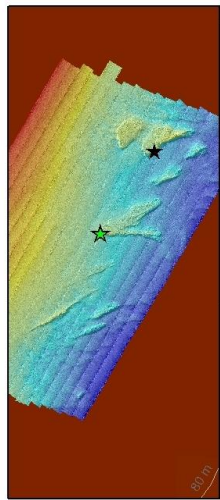
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	0.52
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	0.52
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	3.64
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	1.04
<i>Serranus phoebe</i> Poey, 1851 - Tattler	6.23
Sparidae	
<i>Calamus</i> sp. - Porgy	2.60
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	21.30
Tetraodontiformes	
Balistidae	
<i>Balistes capriscus</i> Gmelin, 1789 - Grey Triggerfish	1.04
Diodontidae	
<i>Chilomycterus schoepfii</i> (Walbaum, 1792) - Striped Burrfish	0.52
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	4.16

Dive Site: Georgia, Outside GA MPA; 70 m; ROV 19-23; UNCW 729; 15-VI-19-4

General Location and Dive Track:

Georgia, Outside GA MPA; 70 m;
ROV 19-23; UNCW 729

- ★ ROV 19-23
- ★ Mohawk ROV
- 201906154 - Transect 01
- DiveTracks
- Oculina HAPC
- MPA
- Deep Coral HAPC
- Bathymetry



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: NancyFoster_14_08_MPA_G A

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/15/2019

Specimens: 1

Digital Photos: 73

No. DVD: 2

Hard Drive No.: 1

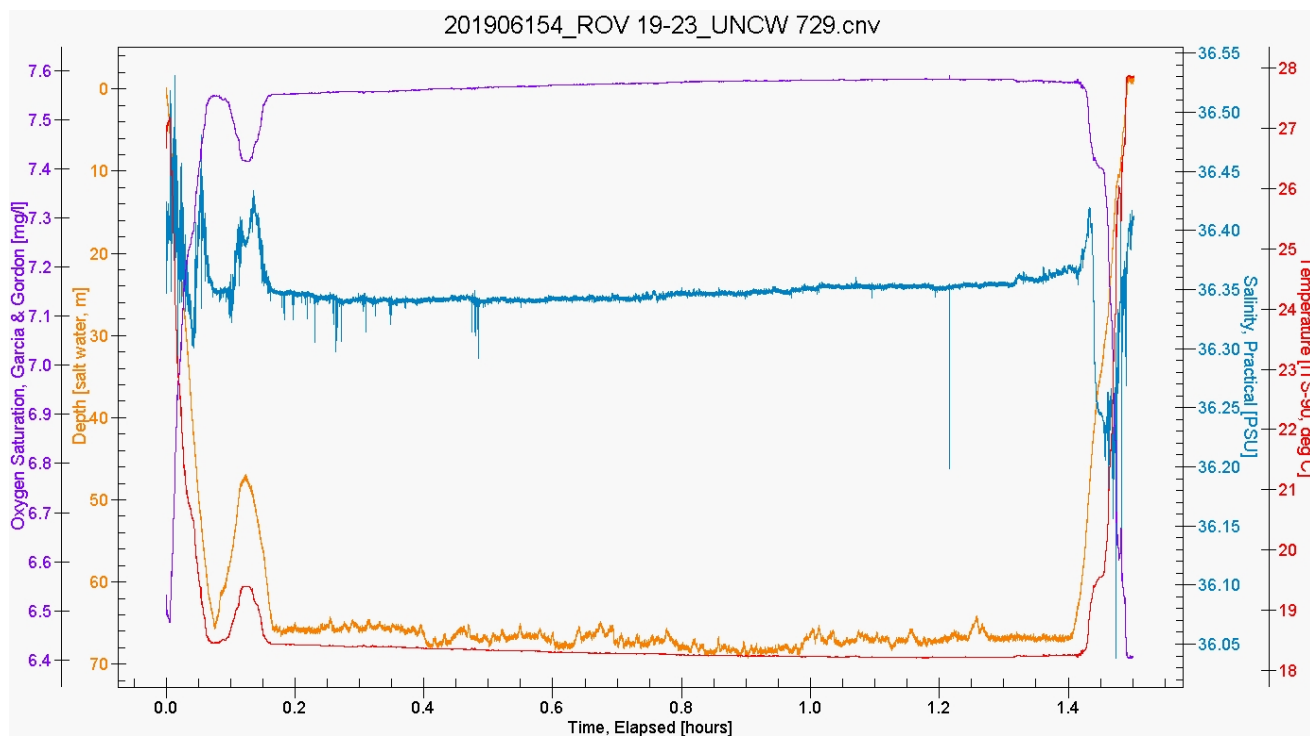
Dive Site: Georgia, Outside GA MPA; 70 m; ROV 19-23; UNCW 729; 15-VI-19-4

Dive Data:

Minimum Bottom Depth (m): -51	Total Transect Length (km): 0.791
Maximum Bottom Depth (m): -71.5	Surface Current (kn): 0.9
On Bottom (Time- EDST): 16:04	On Bottom (Lat/Long): 31.6215°N; -79.675°W
Off Bottom (Time- EDST): 17:24	Off Bottom (Lat/Long): 31.6209°N; -79.6693°W
Physical (bottom); Temp (°C): 18.5	Salinity: 36.36 Visibility (m): 10 Current (kn): 0.2

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-23 are as follows: Depth Maximum: 69.2 m, Temperature: 18.21-19.4 °C, Salinity: 36.3-36.4 PSU, Oxygen Saturation: 7.4-7.6 mg/l.

Dive Site: Georgia, Outside GA MPA; 70 m; ROV 19-23; UNCW 729; 15-VI-19-4

Dive Imagery:



Figure 1: 31°37.2727'N;79°40.3994'W: -68.7 m
Colonial ascidian (*Didemniidae*)



Figure 2: 31°37.2603'N;79°40.3964'W: -68.7 m
Short bigeye (*Pristigenys alta*)



Figure 3: 31°37.249'N;79°40.3904'W: -68.7 m
Encrusting sponges on low relief rock boulders



Figure 4: 31°37.2206'N;79°40.3189'W: -69.5 m
Vase sponge (*Ircinia campana*) on rock pavement



Figure 5: 31°37.2269'N;79°40.2601'W: -70 m
Scamp (*Mycteroperca phenax*)

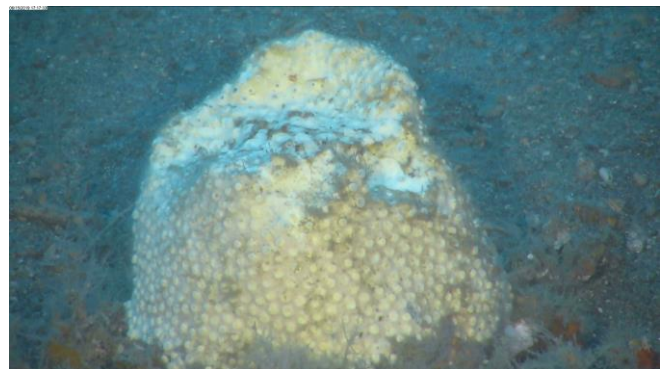


Figure 6: 31°37.251'N;79°40.1552'W: -69.5 m
Bubble wrap sponge (*Ridleya cf. dendyi*); specimen was collected

Dive Site: Georgia, Outside GA MPA; 70 m; ROV 19-23; UNCW 729; 15-VI-19-4

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 15-VI-19-4; ROV 19-23, UNCW Dive 729; Georgia, outside Georgia MPA, 70 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV. Shipboard salinity and depth sensors were inaccurate on occasion. Search for Hadromerida bubble wrap sponge.

Site Description/Habitat/Biota (observations during dive):

Depth range: 68.8-69.9 m

MB map shows low relief terrace; ROV xs along southern escarpment, top- 70 m, base- 73 m.

Weather- Sunny, seas 1-2 ft from SE, wind 14 kn from 107 dg, air- 27.58 C, surface water- 27.97 C, salinity- 34.76, current- 1.0 kn to 275 dg.

15:57- Launch

16:05- drifted off site, 18 m off bottom, drifting; 270 m west of WP, over flat sand.

16:10- On bottom- 69.5 m; visibility- 5 m, current- 0.2 fr 45 dg, 18.3 C; flat sand, 85 m N of WP.

16:18- 69 m, north of ridge; sand, some excavated rock with short bigeye, *Diodogorgia*; 68.5 m, near top edge of MB escarpment; *Filograna*, lumpy yellow sponge- *Chondrilla?*, reef butterflyfish, spotfin butterflyfish.

16:23- WP 1, 68.8 m, MB top edge of slope; flat sand, occasional scour rock with bigeye, white *Ircinia campana*, start photo xs; 70.5 m- near bottom on MB, flat sand; bank butterflyfish, lionfish.

16:36- south slope on MB, 70.6 m, flat sand, rubble, *Filograna*, hydroids; human debris; Captain is driving ROV. *Diodogorgia*, 2 scamp, *Stichopathes luetkeni*, 20 cm scoured ledge, white *Cerianthidae*, gag grouper, scamp, amberjack.

17:17- 69.9 m, flat sediment, pavement. Red snapper.

Sample 1- *Homoscleromorpha* (syn. *Hadromerida*), 15 cm, white, surface warty, yellow inside, rare; Bin 2, 3.

Dive Site: Georgia, Outside GA MPA; 70 m; ROV 19-23; UNCW 729; 15-VI-19-4

Same specimen photographed in 2014 and 2018.
17:24- end dive.

Dominant Benthic Macrobiota:

Antipatharia coral- *Stichopathes luetkeni*

Cerianthidae

Gorgonia coral- *Diodogorgia*

Porifera- *Ircinia campana*, *Chondrilla?*, Homoscleromorpha Bubble Wrap sponge

Echinodermata- *Eucidaris tribuloides*

Samples: 1

Homoscleromorpha (syn. Order- *Hadromerida*) Bubble Wrap sponge

Human Debris:

Plastic

CPCe Percent Cover Analysis:

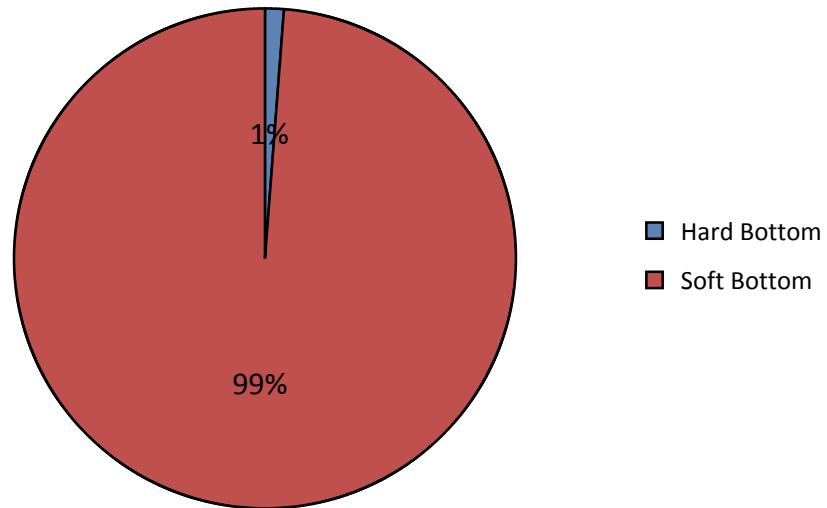
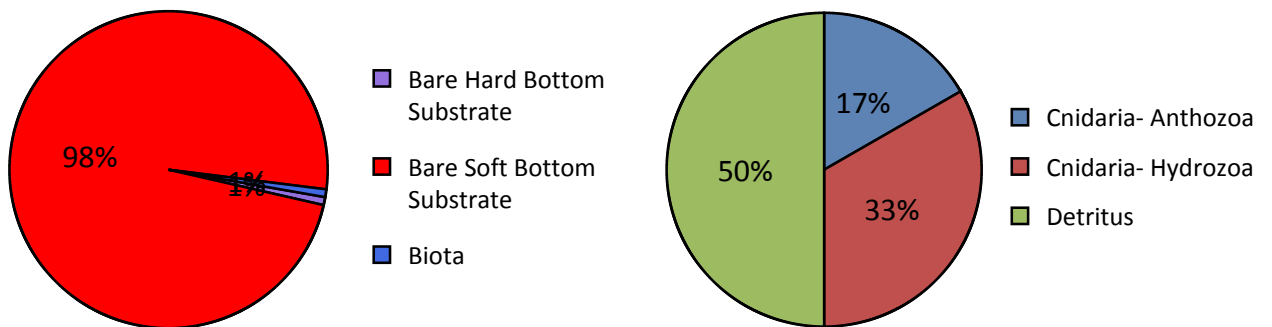


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-23. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-23.

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: Georgia, Outside GA MPA; 70 m; ROV 19-23; UNCW 729

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-23.

	%	Notes	Samp.
Biota	0.81%	X	X
Porifera		X	X
Demospongiae		X	X
<i>Chondrilla</i> sp.		X	
<i>Cliona</i> aff. <i>celata</i> Grant, 1826		X	X
Demospongiae		X	
Dictyoceratida		X	
<i>Ircinia campana</i> (Lamarck, 1814)		X	
Cnidaria- Hydrozoa	0.27%	X	
Hydrozoa	0.27%	X	
Hydroidolina	0.27%	X	
Cnidaria- Anthozoa	0.13%	X	
Alcyonacea - gorgonian	0.13%	X	
<i>Diodogorgia</i> sp.	0.13%	X	
Anthozoa - Non Coral		X	
Cerianthidae		X	
Antipatharia		X	
<i>Stichopathes luetkeni</i> Brook, 1889		X	
Annelida		X	
Polychaeta		X	
<i>Filograna</i> sp.		X	
Chordata		X	
Chordata - Invertebrate		X	
Didemnidae		X	
Detritus	0.40%		
Human debris		X	
Human debris		X	
Human debris- Trash		X	
Human debris- plastic		X	
Habitat	99.19%		
Bare Hard Bottom Substrate	0.81%		
Hard bottom	0.81%		
Bare rock, pavement, boulder, ledge	0.40%		
Bare rubble/cobble	0.40%		
Bare Soft Bottom Substrate	98.38%		
Grand Total	100.00%		

Dive Site: Georgia, Outside GA MPA; 70 m; ROV 19-23; UNCW 729

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-23.

Class/Order/Family/Taxa Author - Common Name	ROV 19-23
Actinopterygii	
Anguilliformes	
Muraenidae	
Muraenidae - Moray Eels (Fam.)	0.40
Gadiformes	
Phycidae	
Phycidae - Phycid Hakes (Fam.)	0.40
Perciformes	
Apogonidae	
<i>Apogon pseudomaculatus</i> Longley, 1932 - Twospot Cardinalfish	0.40
Carangidae	
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	1.19
<i>Seriola</i> sp. - Amberjack	0.40
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	3.98
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	2.39
Chaetodontidae - Butterflyfishes (Fam.)	0.80
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	2.78
Labridae	
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	5.57
Lutjanidae	
<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper	3.18
Microdesmidae	
<i>Ptereleotris calliura</i> (Jordan & Gilbert, 1882) - Blue Goby	0.40
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	3.18
Pomacentridae	
<i>Chromis scotti</i> Emery, 1968 - Purple Reef fish	0.40
Priacanthidae	
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	10.34
Sciaenidae	
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	2.39
Serranidae/Anthiadae	
<i>Hyporthodus niveatus</i> (Valenciennes, 1828) - Snowy Grouper	0.40
Serranidae/Epinephelinae	
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	0.40
<i>Mycteroperca microlepis</i> (Goode & Bean, 1879) - Gag	1.59

Dive Site: Georgia, Outside GA MPA; 70 m; ROV 19-23; UNCW 729

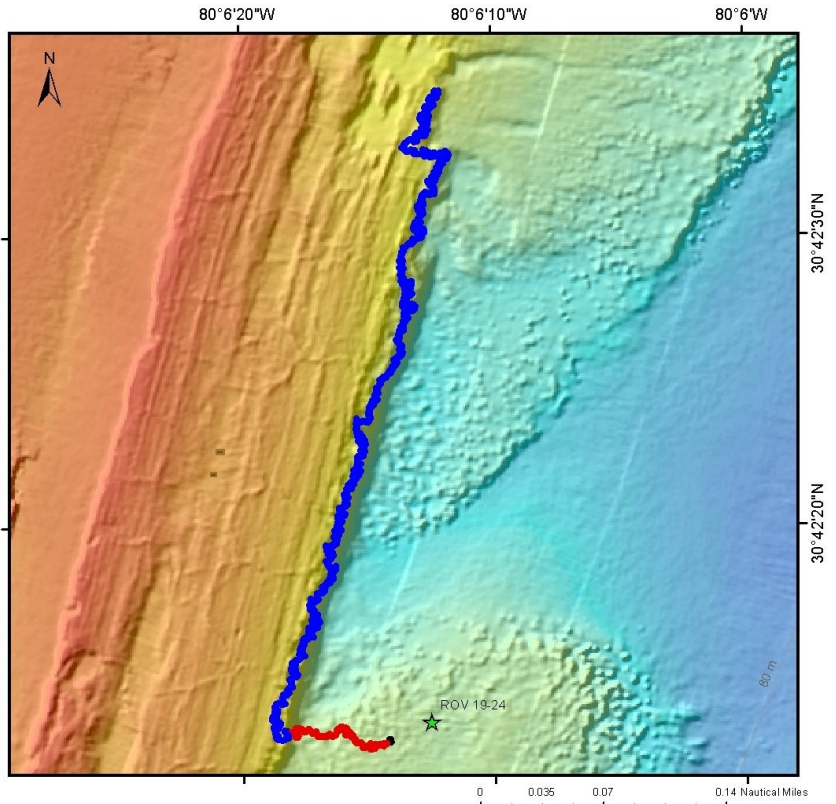
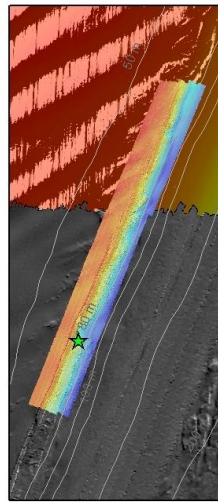
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	1.99
Serranidae/Serraninae	
<i>Centropristis ocyurus</i> (Jordan & Evermann, 1887) - Bank Sea Bass	0.40
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	0.40
<i>Serranus notospilus</i> Longley, 1935 - Saddle Bass	2.39
<i>Serranus phoebe</i> Poey, 1851 - Tattler	1.99
<i>Serranus</i> sp. - Sea Bass	0.40
Sparidae	
<i>Calamus</i> sp. - Porgy	0.80
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	0.40
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	7.96
Tetraodontiformes	
Balistidae	
<i>Balistes capriscus</i> Gmelin, 1789 - Grey Triggerfish	1.19
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	2.78
UNKNOWN Biota	0.40

Dive Site: Florida, Outside North Florida MPA Fernandina; 60 m; ROV 19-24; UNCW 730; 16-VI-19-1

General Location and Dive Track:

Florida, Outside North Florida MPA
Fernandina; 60 m; ROV 19-24; UNCW 730

- ★ ROV 19-24
- ★ Mohawk ROV
- 201906161 - Transect 01
- 201906161 - Transect 02
- DiveTracks
- Oculina HAPC
- MPA
- Deep Coral HAPC
- Bathymetry



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: NancyFoster_14_08_MPA_Fernandina

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/16/2019

Specimens: 1

Digital Photos: 84

No. DVD: 2

Hard Drive No.: 1

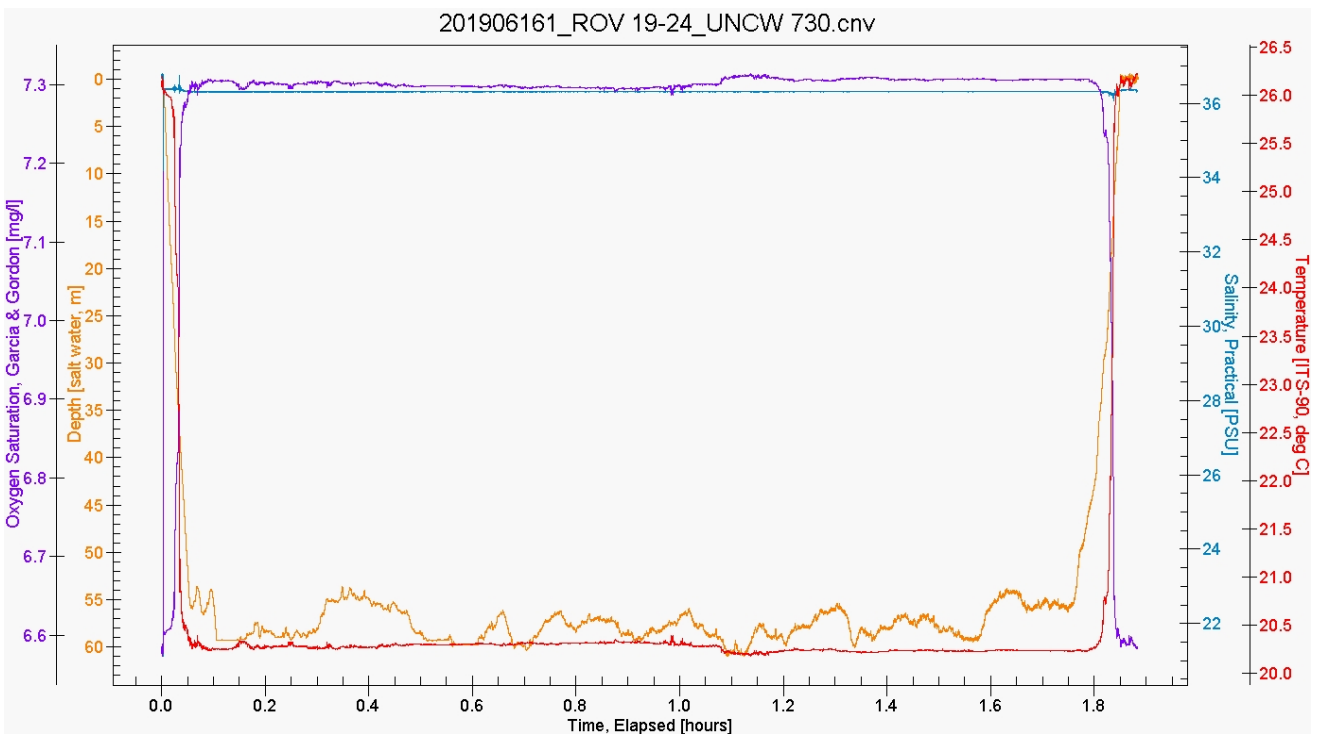
Dive Site: Florida, Outside North Florida MPA Fernandina; 60 m; ROV 19-24; UNCW 730; 16-VI-19-1

Dive Data:

Minimum Bottom Depth (m): -54.7	Total Transect Length (km): 0.922
Maximum Bottom Depth (m): -62.1	Surface Current (kn): 0.7
On Bottom (Time- EDST): 12:10	On Bottom (Lat/Long): 30.7035°N; -80.104°W
Off Bottom (Time- EDST): 13:49	Off Bottom (Lat/Long): 30.7098°N; -80.1034°W
Physical (bottom); Temp (°C): 20.2	Salinity: 36.31 Visibility (m): 4 Current (kn): 0.3

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-24 are as follows: Depth Maximum: 60.9 m, Temperature: 20.19-20.39 °C, Salinity: 36.3-36.3 PSU, Oxygen Saturation: 7.3-7.3 mg/l.

Dive Site: Florida, Outside North Florida MPA Fernandina; 60 m; ROV 19-24; UNCW 730; 16-VI-19-1

Dive Imagery:

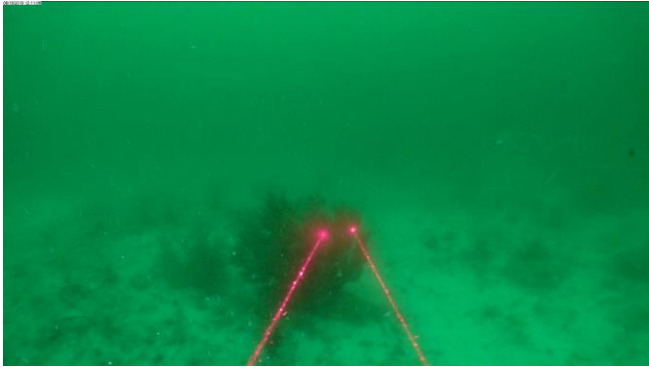


Figure 1: 30°42.2092'N;80°6.2373'W: -60.7 m
10 cm laser in low visibility

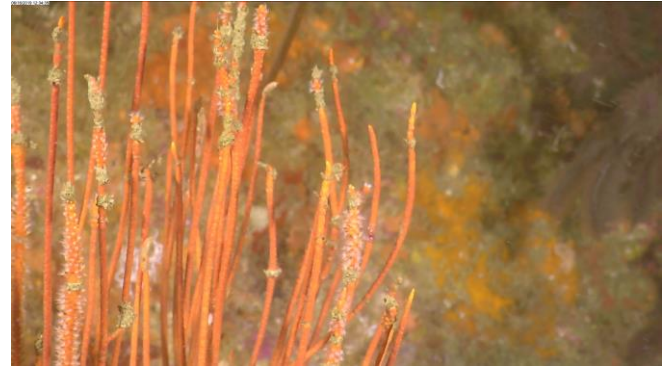


Figure 2: 30°42.2731'N;80°6.2897'W: -60.4 m
Ellisella sp. octocoral



Figure 3: 30°42.2762'N;80°6.286'W: -59.9 m
Large bushy black coral (*Tanacetipathes* sp.)



Figure 4: 30°42.3093'N;80°6.275'W: -59.3 m
Scamp (*Mycteroperca phenax*), wire black coral (*Stichopathes luetkeni*)



Figure 5: 30°42.4315'N;80°6.2293'W: -62 m
Bushy black coral (*Tanacetipathes* sp.)



Figure 6: 30°42.514'N;80°6.2147'W: -59.5 m
Ellisella elongata with exsert polyps

Dive Site: Florida, Outside North Florida MPA Fernandina; 60 m; ROV 19-24; UNCW 730; 16-VI-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 16-VI-19-1; ROV 19-24, UNCW Dive 730; Florida, Fernandina, Outside North Florida MPA, 60 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV.

Site Description/Habitat/Biota (observations during dive):

Depth range: 56- 60 m

MB map shows N-S oriented narrow ridge, >22 nmi long, 275 m wide, top- 57 m, east base- 64 m, west base- 56 m, 2 m resolution; 78 nmi offshore; ROV transect N along east slope of ridge.

Weather- Sunny, seas calm, wind 6 kn from 153 dg, air- 28.81 C, surface water- 26.42 C, salinity- 34.86, current- 0.7 kn to 182 dg.

12:02- Launch

48 m- turbid zone, video and still camera look green; large monitor blue

12:09- On bottom- 61 m; no vis, green; visibility- <5 m, very turbid, current- 0.25 kn fr east, 20.2 C; 100 m east of WP. Problem with video and still, looks green. Flat, pavement, *Muricea*, *Stichopathes luetkeni*, Didemnidae encrusting, *Tanacetipathes*.

12:21- 60 m, east base, flat rock slabs, 2-3 m wide, 1 m relief boulders, 4 m overall relief, 45 dg slope, rugose; Spirastrellidae, *Stichopathes*, *Ircinia campana*, *Diodogorgia*, *Muricea*, *Tanacetipathes*, large stingray, tomtate, spotfin hogfish

12:23- 56 m, top of ridge, flat pavement, xs N along east slope. Hydroids, pink encrusting sponge- *Poecilosclerida*?, reef butterflyfish, large 30 cm *Ircinia*, 30 cm *Tanacetipathes* abundant; dense and diverse cover.

12:35- 60.4 m, on boulder.

Dive Site: Florida, Outside North Florida MPA Fernandina; 60 m; ROV 19-24; UNCW 730; 16-VI-19-1

Sample 1- 20 cm tall orange, erect branching, orange stalk, large white polps, *Elliselidae*, spicules verified, rare at site; Bin 3.

12:40- cont xs along slope, rugose, boulders, 50 cm *Tanacetipathes*, lionfish, CCA, amorphous lumpy orange sponges, yellow sponges, white lobate, *Antipathes atlantica*, green dead *Filolgrana*.

13:00- 60 m, on east slope, same habitat/biota. White *Chondrilla*, blue angelfish, *Aplysina* fingers, school amberjack, spotfin butterflyfish, yellow sphere Demosponge, fishing line, *Aiolochoiria crassa*.

13:22- 58 m, east slope, same habitat; *Ellisella elongata* erect branching orange, DMST starlet sponge.

13:39- 57.5 m, top of ridge, ledge takes jog to west then north on MB. Flat pavement, sand on top, *Muricea*, more barren, hydroids, fishing line, squirrelfish.

13:49- 57.5 m, end xs, end dive.

Dominant Benthic Macrobiota:

Antipatharia coral- *Stichopathes luetkeni*, *Antipathes atlantica*, *Tanacetipathes* (50 cm, abundant)

Gorgonia coral- *Muricea*, *Ellisella elongata*, *Diodogorgia*

Hydroida

Porifera- *Ircinia campana*, DMST, *Aiolochoiria crassa*, Spirastrellidae, Axinellida, encrusting pink, orange, yellow, white Demospongiae, *Chondrilla?*, Poecilosclerida?, orange and yellow sphere Demospongiae

Annelida- *Filograna*

Asciacea- Didemnidae encrusting

Algae- CCA

Sample: 1

Elliselidae

Human Debris:

Fishing line- few

CPCe Percent Cover Analysis:

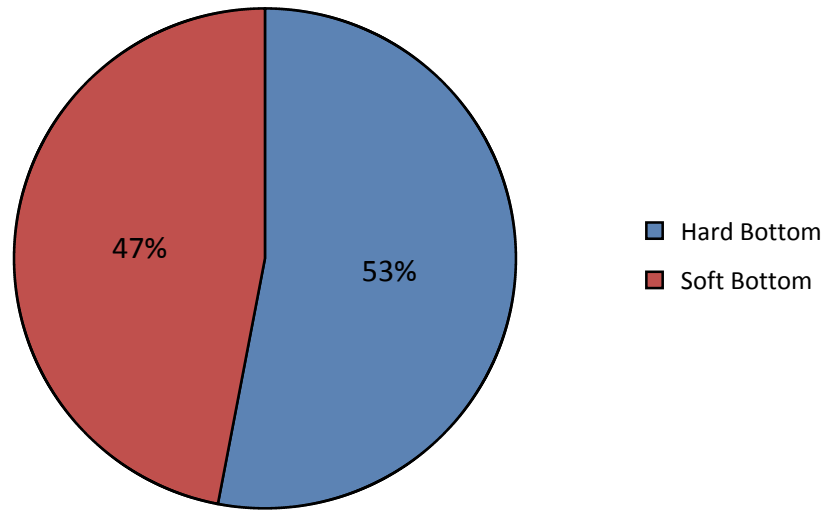
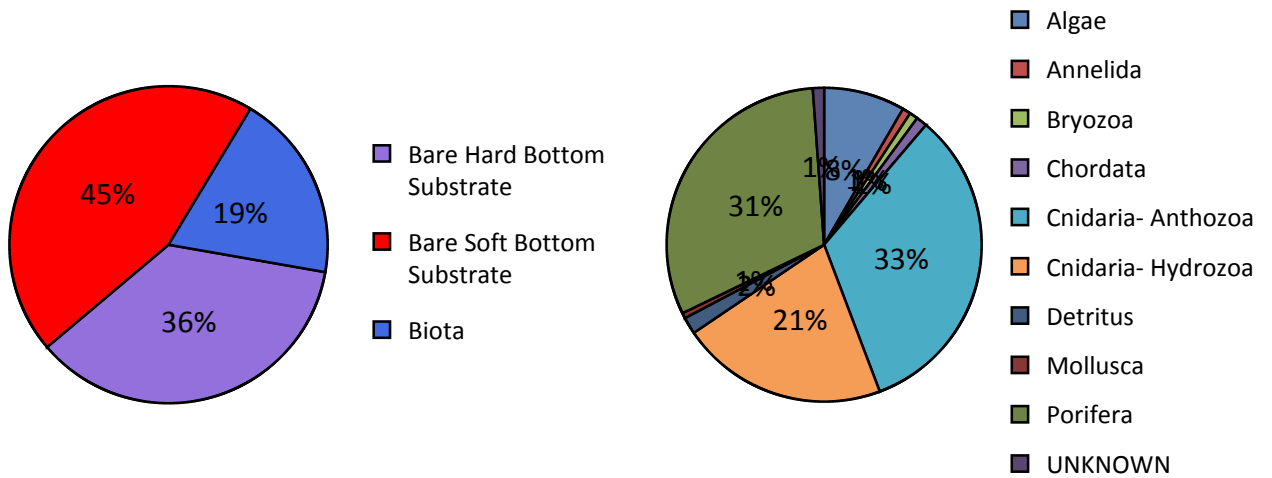


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-24. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-24.

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

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Samples, dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-24.

	%	Notes	Samp.
Biota	19.17%	X	X
Algae	1.60%	X	
Algae	0.11%		
Ochrophyta	0.17%	X	
<i>Dictyota</i> sp.	0.06%		
Ochrophyta	0.11%	X	
Rhodophyta	1.32%	X	
Corallinales	1.10%	X	
Rhodophyta	0.22%		
Porifera	5.95%	X	
Demospongiae	5.95%	X	
<i>Aiolochoxia crassa</i> (Hyatt, 1875)		X	
<i>Aplysina</i> sp.		X	
<i>Chondrilla</i> sp.		X	
<i>Cliona</i> cf. <i>tumula</i> Friday, Poppell & Hill, 2013	0.28%	X	
Demospongiae	5.23%	X	
Demospongiae- Ye sphere (MPA)	0.06%	X	
<i>Geodia</i> sp.		X	
<i>Ircinia campana</i> (Lamarck, 1814)	0.06%	X	
<i>Ircinia</i> sp.	0.17%		
<i>Ircinia strobilina</i> (Lamarck, 1816)	0.06%		
Poecilosclerida		X	
Spirastrellidae	0.11%	X	
Cnidaria- Hydrozoa	4.08%		
Hydrozoa	4.08%		
Hydroidolina	4.08%		
Cnidaria- Anthozoa	6.34%	X	X
Alcyonacea - gorgonian	0.28%	X	X
Alcyonacea- gorgonian	0.06%		
<i>Diodogorgia</i> sp.		X	
<i>Ellisella barbadensis</i> (Pallas, 1766)		X	
Ellisellidae			X
<i>Muricea</i> sp.	0.22%	X	
Antipatharia	6.06%	X	
Antipatharia	1.87%		
<i>Antipathes atlantica</i> Gray, 1857	0.28%	X	
<i>Antipathes furcata</i> Gray, 1857	0.39%	X	

<i>Stichopathes luetkeni</i> Brook, 1889	1.93%	X	
<i>Tanacetipathes</i> sp.	1.60%	X	
Annelida	0.17%	X	
Polychaeta	0.17%	X	
<i>Filograna</i> sp.	0.17%	X	
Mollusca	0.11%		
Gastropoda	0.11%		
Gastropoda	0.11%		
Bryozoa	0.17%		
Chordata	0.22%	X	
Chordata - Invertebrate	0.06%	X	
Ascidiacea	0.06%		
Didemnidae		X	
Chordata - Vertebrate	0.17%		
Actinopterygii	0.17%		
Detritus	0.33%		
UNKNOWN	0.22%		
Human debris		X	
Human debris		X	
Human debris- Fishing Gear		X	
Human debris- anchor line		X	
Human debris- Trash		X	
Human debris- cans/bottles		X	
Bare Hard Bottom Substrate	36.03%		
Bare Hard Bottom Substrate	36.03%		
Hard bottom	36.03%		
Bare rock, pavement, boulder, ledge	28.82%		
Bare rubble/cobble	7.22%		
Bare Soft Bottom Substrate	44.79%		
Grand Total	100.00%	X	X

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-24.

Class/Order/Family/Taxa Author - Common Name	ROV 19-24
Actinopterygii	
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	3.57
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	2.14
<i>Myripristis jacobus</i> Cuvier, 1829 - Blackbar Soldierfish	4.29
Perciformes	
Carangidae	
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	14.30
<i>Seriola</i> sp. - Amberjack	0.71
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	1.43
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	12.87
<i>Prognathodes aculeatus</i> (Poey, 1860) - Longsnout Butterflyfish	0.36
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	2.86
Haemulidae	
<i>Haemulon aurolineatum</i> Cuvier, 1830 - Tomtate Grunt	441.39
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	4.29
<i>Decodon puellaris</i> (Poey, 1860) - Red Hogfish	0.36
<i>Halichoeres cyanocephalus</i> (Bloch, 1791) - Yellowcheek Wrasse	0.36
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	0.71
<i>Halichoeres</i> sp. - Wrasse	0.36
Lutjanidae	
<i>Lutjanus analis</i> (Cuvier, 1828) - Mutton Snapper	0.36
<i>Lutjanus buccanella</i> (Cuvier, 1828) - Blackfin Snapper	0.36
<i>Rhomboplites aurorubens</i> (Cuvier, 1829) - Vermilion Snapper	35.74
Mullidae	
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	0.71
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	3.93
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	0.36
<i>Pomacanthus</i> sp. - Angelfish	0.36
Pomacentridae	
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reef fish	1.43
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	2.86
<i>Chromis scotti</i> Emery, 1968 - Purple Reef fish	1.07
Sciaenidae	

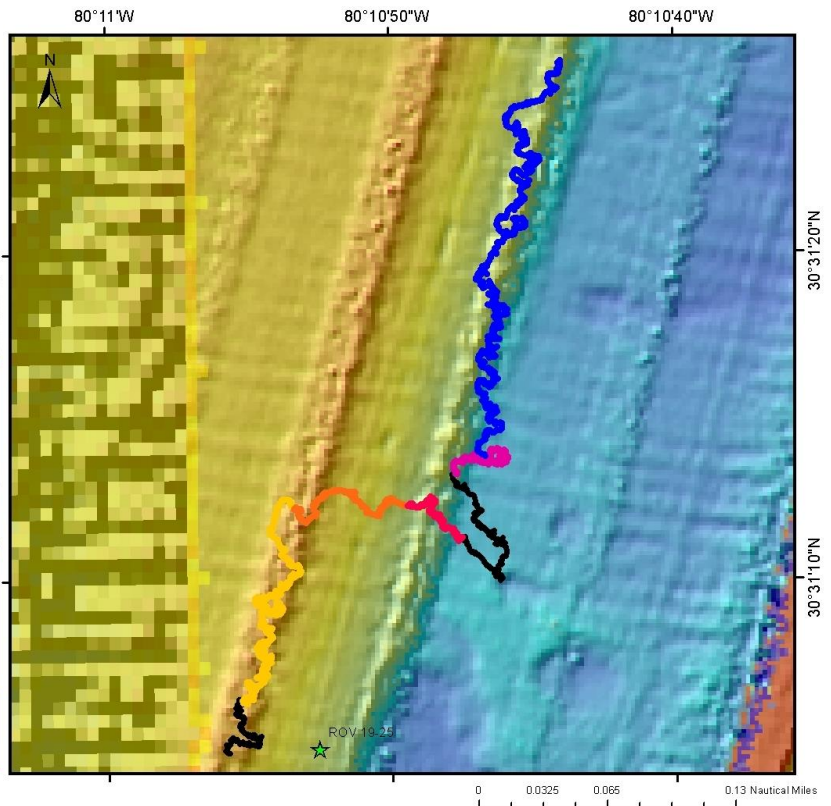
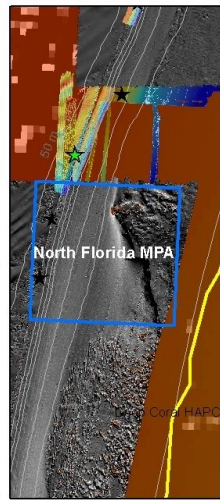
<i>Equetus lanceolatus</i> (Linnaeus, 1758) - Jack-knifefish	1.79
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	0.36
Serranidae/Epinephelinae	
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	0.36
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	0.36
Serranidae/Grammistinae	
<i>Rypticus saponaceus</i> (Bloch & Schneider, 1801) - Greater Soapfish	0.36
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	3.93
<i>Serranus baldwini</i> (Evermann & Marsh, 1899) - Lantern Bass	0.36
<i>Serranus phoebe</i> Poey, 1851 - Tattler	2.14
<i>Serranus tigrinus</i> (Bloch, 1790) - Harlequin Bass	0.36
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	9.29
Syngnathiformes	
Aulostomidae	
<i>Aulostomus maculatus</i> Valenciennes, 1841 - Atlantic Trumpetfish	0.71
Fistulariidae	
<i>Fistularia tabacaria</i> Linnaeus, 1758 - Bluespotted cornetfish	0.36
Tetraodontiformes	
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	16.08
<i>Sphoeroides spengleri</i> (Bloch, 1785) - Bandtail Puffer	1.43
Elasmobranchii	
Myliobatiformes	
Dasyatidae	
<i>Dasyatis</i> sp. - Stingray	0.36
UNKNOWN Biota	1.43

Dive Site: Florida, Outside North Florida MPA; 51 m; ROV 19-25; UNCW 731; 16-VI-19-2

General Location and Dive Track:

Florida, Outside North Florida MPA;
51 m; ROV 19-25; UNCW 731

- ★ ROV 19-25
- ★ Mohawk ROV
- 201906162 - Transect 01
- 201906162 - Transect 02
- 201906162 - Transect 03
- 201906162 - Transect 04
- 201906162 - Transect 05
- DiveTracks
- Oculina HAPC
- MPA
- Deep Coral HAPC
- Bathymetry



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Pisces_2018_NFL_MPA_4m_Grid

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/16/2019

Specimens: 1

Digital Photos: 67

No. DVD: 2

Hard Drive No.: 1

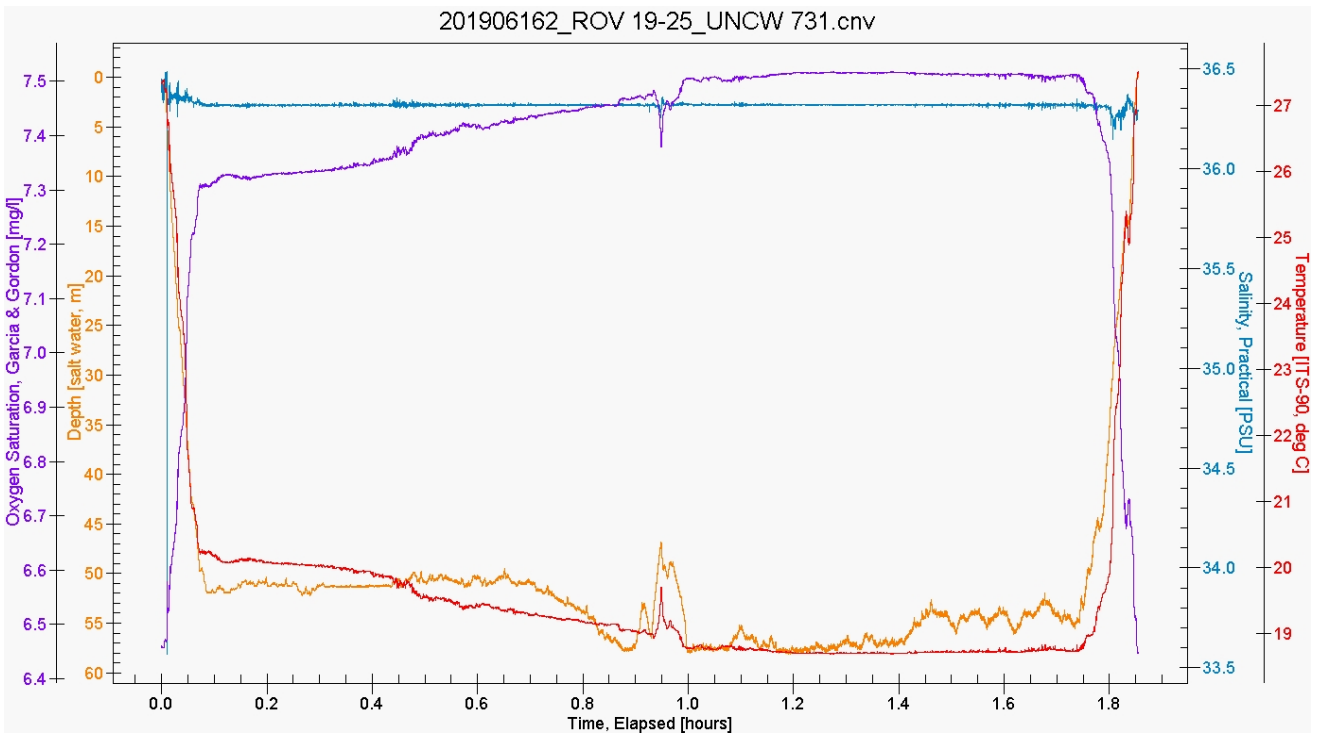
Dive Site: Florida, Outside North Florida MPA; 51 m; ROV 19-25; UNCW 731; 16-VI-19-2

Dive Data:

Minimum Bottom Depth (m): -48.3	Total Transect Length (km): 1.109
Maximum Bottom Depth (m): -59.6	Surface Current (kn): 0.9
On Bottom (Time- EDST): 16:04	On Bottom (Lat/Long): 30.518°N; -80.1822°W
Off Bottom (Time- EDST): 17:44	Off Bottom (Lat/Long): 30.5239°N; -80.179°W
Physical (bottom); Temp (°C): 20.2	Salinity: 36.33 Visibility (m): 10 Current (kn): 0.3

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-25 are as follows: Depth Maximum: 58.1 m, Temperature: 18.69-20.26 °C, Salinity: 36.3-36.4 PSU, Oxygen Saturation: 7.3-7.5 mg/l.

Dive Site: Florida, Outside North Florida MPA; 51 m; ROV 19-25; UNCW 731; 16-VI-19-2

Dive Imagery:



Figure 1: 30°31.1033'N;80°10.9238'W: -52.7 m
Panulirus argus lobster



Figure 2: 30°31.206'N;80°10.8794'W: -52.4 m
Bushy black coral (*Tanacetipathes* sp.), covered with bittlestars?



Figure 3: 30°31.1972'N;80°10.8044'W: -58.3 m
Muricea pendula octocoral



Figure 4: 30°31.2273'N;80°10.7928'W: -58.2 m
Didemnid tunicate encrusting



Figure 5: 30°31.3156'N;80°10.7747'W: -56.5 m
Ghost net



Figure 6: 30°31.4151'N;80°10.7406'W: -56.8 m
Scrawled cowfish (*Acanthostracion quadricornis*)

Dive Site: Florida, Outside North Florida MPA; 51 m; ROV 19-25; UNCW 731; 16-VI-19-2

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 16-VI-19-2; ROV 19-25, UNCW Dive 731; Florida, Outside North Florida MPA, 50 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV.

Site Description/Habitat/Biota (observations during dive):

Depth range: 52.6- 59.5 m

MB map shows a NE-SW oriented ledge, 22 nmi long, 50 m wide, top- 52 m, E base- 54 m, W base- 53.5 m; ROV heading N along ledge.

Weather- Sunny, 1ft from SE, wind 10 kn from 122 dg, air- 28.28 C, surface water- 27.19 C, salinity- 35.57, current- 0.9 to 264.

15:58- Launch

Nepheloid layer at 43 m, then cleared up.

16:04- On bottom- 53.8 m; visibility- 5- 10 m, current- 0.2 from E, 19.7 C; at east base of ridge 150 m north of WP; hd N along ridge slope; rock pavement, ½- 1m relief rock slabs, <10 dg slope, sand, small undercut ledges; 2 lobster, *Muricia*, encrusting sponges, *Tanacetipathes*, *Isostichopus badionotus?*, *Ircinia campana*, *Eudistoma*, *Stichopathes luetkeni*, hydroids, *Thyroscyphus ramosus* hydroid, DMST, Spirastrellidae, algae.

16:15- 53.5 m, 1 m ledge, not undercut, rock boulders, sand, flat; tomtate, blue angelfish, Didemnidae.

16:18- 52.6 m, flat pavement.

Sample 1- 10 spherical, smooth sfc, couple 2 mm oscules, yellow, reddish thin layer on top surface, yellow exudate when squeezed, Demospongiae, common; Bin 3.

16:27- Cont. NE, tattler, low relief, low slope, low rugosity, ½ m relief, flat, 50- 80% hard bottom, squirrelfish, *Muricea*, *Stichopathes*, large purple, *Ircinia campana*, *Titanideum fraenfeldii*, stalked finger orange

Dive Site: Florida, Outside North Florida MPA; 51 m; ROV 19-25; UNCW 731; 16-VI-19-2

Axinellidae, tomtate, grey triggerfish, spotfin butterflyfish, lionfish.

16:35- 52.6 m, sand at base of west slope. ½ m relief ledge, not undercut, along base, very distinct bottom.

16:39- hd E 90 m to second ledge system, top- 55 m, 59 m at east base. *Tanacetipathes* infested with small brittlestars, blue angelfish.

16:45- ½ way across valley between two ledge systems, flat pavement with sediment veneer, hard bottom, <10 cm relief, algae, hydroids, *Muricea*, sponges, Didemnidae, 20 cm orange sphere Demosponge, *Titanideum*.

16:47- west base of ridge 2; 56 m, 25 cm flat rock, *Stichopathes*.

16:50- eastern slope, ½ m boulders, sand, flat.

16:52- 59 m, east base, sand, pavement; east slope ½ m relief boulders, no undercut ledges, low slope, low rugosity; *Muricea*, *Stichopathes*.

16:55- pulled off bottom, ship heading away from xs line for unknown reason.

17:00- 59 m, 50 m east of ridge, flat sand, pavement, low relief rock, same biota.

17:03- base of east slope, 59.5 m, Hd N again along east slope. ½ -1 m boulders, flat, low rugosity; *Muricea*, *Stichopathes*, *Tanacetipathes*, *Antipathes furcata*, *A. atlantica*, tattler, hydroids, DMST.

17:11- trouble station keeping, pulled off reef; *Halopteris carinata* hydroids; back on reef; reef butterflyfish, *Ircinia*, jackknife fish.

17:26- large trawl net on rock

17:44- 57 m, end xs, end dive, rock ledge habitat

Dominant Benthic Macrobiota:

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

Gorgonia coral- *Muricea*, *Diodogorgia*, *Titanideum frauenfeldii*

Hydroida- *Halopteris carinata*, *Thyroscyphus ramosus*

Porifera- *Ircinia campana*, DMST, Spirastrellidae, yellow sphere Demosponge, Axinellida

Annelida- *Filograna*

Decapoda- *Panularis argus*

Echinodermata- *Isostichopus badionotus*?

Bryozoa- *Schizoporella*

Ascidiacea- Didemnidae encrusting

Sample: 1

Yellow spherical Demospongiae

Human Debris:

Anchor line, trawl net

Dive Site: Florida, Outside North Florida MPA; 51 m; ROV 19-25; UNCW 731; 16-VI-19-2

CPCe Percent Cover Analysis:

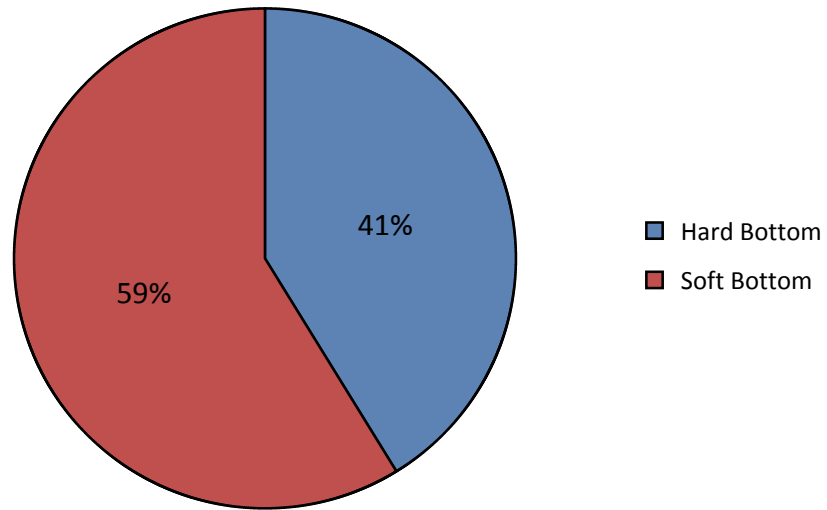
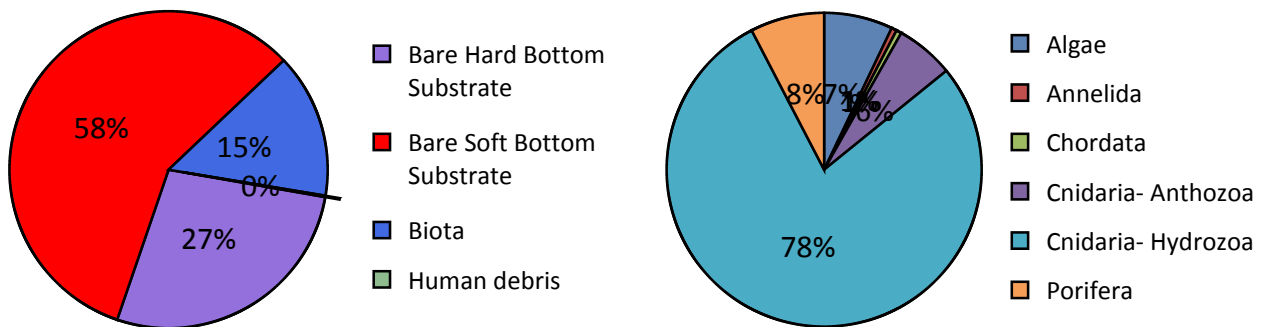


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-25. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-25.

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: Florida, Outside North Florida MPA; 51 m; ROV 19-25; UNCW 731

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Samples, dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-25.

	%	Notes	Samp.
Biota	14.73%	X	X
Algae	1.04%		
Cyanobacteria	0.16%		
Ochrophyta	0.16%		
Ochrophyta	0.16%		
Rhodophyta	0.72%		
Corallinales	0.16%		
Rhodophyta	0.56%		
Porifera	1.12%	X	X
Demospongiae	1.12%	X	X
<i>Aptos</i> sp. MPA-01			X
<i>Aplysina</i> sp.		X	
Axinellidae		X	
<i>Cliona</i> cf. <i>tumula</i> Friday, Poppell & Hill, 2013		X	
Demospongiae	0.96%	X	
Demospongiae- Ye sphere (MPA)		X	
<i>Ircinia campana</i> (Lamarck, 1814)		X	
Spirastrellidae	0.16%	X	
Cnidaria- Hydrozoa	11.53%	X	
Hydrozoa	11.53%	X	
<i>Halopteris carinata</i> Allman, 1877		X	
Hydroidolina	11.53%	X	
<i>Thyrosocyphus ramosus</i> Allman, 1877		X	
Cnidaria- Anthozoa	0.88%	X	
Alcyonacea - gorgonian	0.64%	X	
Alcyonacea- gorgonian		X	
<i>Diodogorgia</i> sp.	0.16%	X	
<i>Muricea</i> sp.	0.40%	X	
<i>Nicella</i> sp.	0.08%		
<i>Titanideum frauenfeldii</i> (Kölliker, 1865)		X	
Antipatharia	0.24%	X	
<i>Antipathes atlantica</i> Gray, 1857		X	
<i>Antipathes furcata</i> Gray, 1857	0.24%		
<i>Stichopathes luetkeni</i> Brook, 1889		X	
<i>Tanacetipathes</i> sp.		X	

Dive Site: Florida, Outside North Florida MPA; 51 m; ROV 19-25; UNCW 731

Annelida	0.08%	
Annelida	0.08%	
Arthropoda		X
Crustacea		X
<i>Panulirus argus</i> (Latreille, 1804)		X
Bryozoa		X
Gymnolaemata		X
<i>Schizoporella</i> sp.		X
Echinodermata		X
Holothuroidea		X
Holothuroidea		X
<i>Isostichopus badionotus</i> (Selenka, 1867)		X
Chordata	0.08%	X
Chordata - Invertebrate	0.08%	X
Didemnidae	0.08%	X
<i>Eudistoma</i> sp.		X
Human debris	0.16%	X
Human debris	0.16%	X
Human debris- Fishing Gear	0.16%	X
Human debris- anchor line	0.16%	X
Human debris- trawl net		X
Habitat	85.11%	
Bare Hard Bottom Substrate	27.46%	
Hard bottom	27.46%	
Bare rock, pavement, boulder, ledge	20.34%	
Bare rubble/cobble	7.13%	
Bare Soft Bottom Substrate	57.65%	
Grand Total	100.00%	

Dive Site: Florida, Outside North Florida MPA; 51 m; ROV 19-25; UNCW 731

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-25.

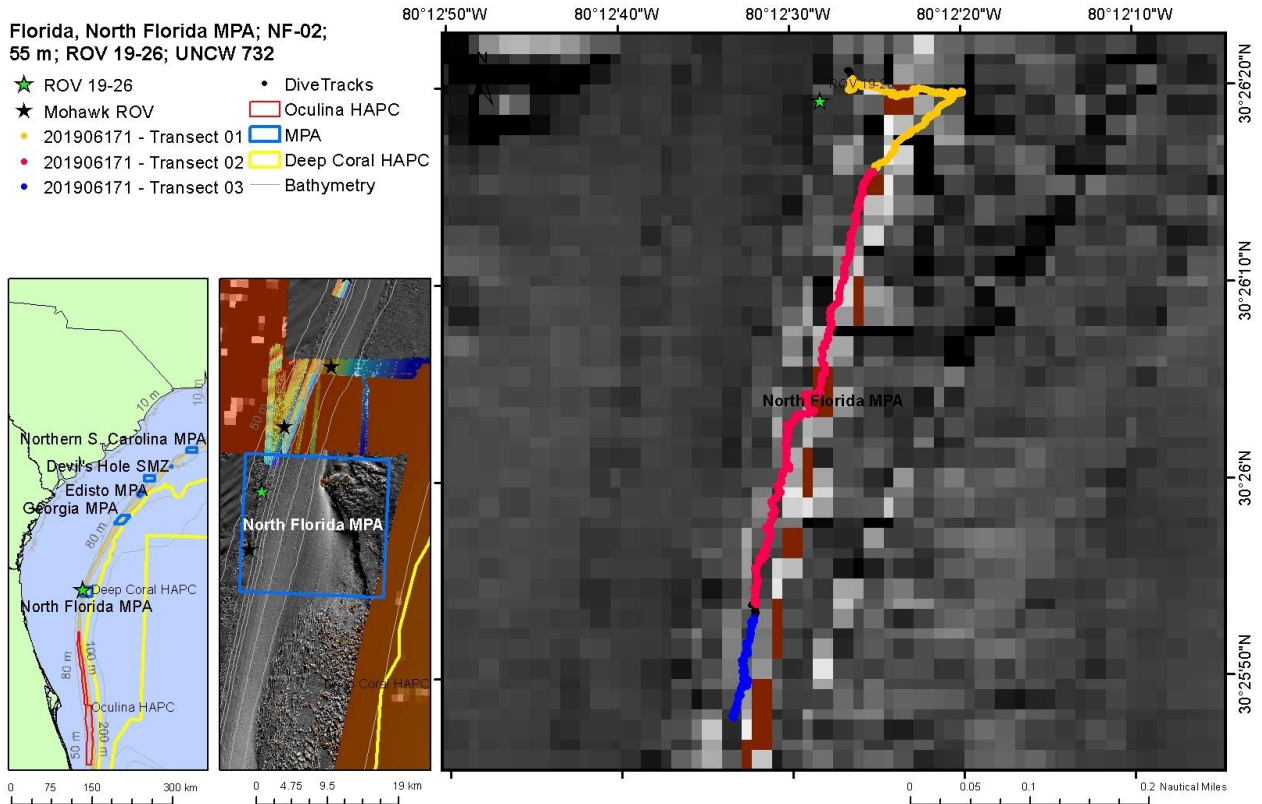
Class/Order/Family/Taxa Author - Common Name	ROV 19-25
Actinopterygii	
Aulopiformes	
Synodontidae	
<i>Synodus</i> sp. - Lizardfish	0.23
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	0.47
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	3.50
<i>Myripristis jacobus</i> Cuvier, 1829 - Blackbar Soldierfish	3.26
Perciformes	
Acanthuridae	
<i>Acanthurus</i> sp. - Surgeonfish	0.70
Carangidae	
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	0.23
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	0.47
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	1.87
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	16.32
<i>Chaetodon</i> sp. - Butterflyfish Gen.	0.47
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	0.47
Haemulidae	
<i>Haemulon aurolineatum</i> Cuvier, 1830 - Tomtate Grunt	43.60
<i>Haemulon striatum</i> (Linnaeus, 1758) - Striped Grunt	17.49
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	3.26
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	1.17
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	0.47
<i>Halichoeres</i> sp. - Wrasse	3.96
Lutjanidae	
<i>Lutjanus analis</i> (Cuvier, 1828) - Mutton Snapper	0.23
<i>Lutjanus</i> sp. - Snapper	0.23
<i>Rhomboplites aurorubens</i> (Cuvier, 1829) - Vermilion Snapper	0.23
Mullidae	
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	0.23
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	6.53
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	0.23

Dive Site: Florida, Outside North Florida MPA; 51 m; ROV 19-25; UNCW 731

<i>Pomacanthus arcuatus</i> (Linnaeus, 1758) - Gray Angelfish	0.23
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	0.70
Pomacentridae	
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reef fish	10.49
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	6.99
<i>Chromis scotti</i> Emery, 1968 - Purple Reef fish	2.33
<i>Chromis</i> sp. - Damselfish/chromis	1.17
Priacanthidae	
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	0.23
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	1.63
Sciaenidae	
<i>Equetus lanceolatus</i> (Linnaeus, 1758) - Jack-knifefish	1.40
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	1.63
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	0.70
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	1.17
<i>Paranthias furcifer</i> (Valenciennes, 1828) - Creole-fish	0.23
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	3.50
<i>Serranus baldwini</i> (Evermann & Marsh, 1899) - Lantern Bass	0.47
<i>Serranus phoebe</i> Poey, 1851 - Tattler	8.86
<i>Serranus</i> sp. - Sea Bass	0.23
Sparidae	
<i>Calamus</i> sp. - Porgy	0.23
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	6.99
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	0.70
Tetraodontiformes	
Balistidae	
<i>Balistes capriscus</i> Gmelin, 1789 - Grey Triggerfish	1.40
Ostraciidae	
<i>Acanthostracion quadricornis</i> (Linnaeus, 1758) - Scrawled Cowfish	0.23
Tetraodontidae	
Canthigaster sp. - Sharpnose Puffer Sp.	22.38
<i>Sphoeroides spengleri</i> (Bloch, 1785) - Bandtail Puffer	0.47
UNKNOWN Biota	2.56

Dive Site: Florida, North Florida MPA; NF-02; 55 m; ROV 19-26; UNCW 732; 17-VI-19-1

General Location and Dive Track:



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Navy_2011_CONFIDENTIAL_USWTR_Tif

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/17/2019

Specimens: 2

Digital Photos: 109

No. DVD: 2

Hard Drive No.: 1

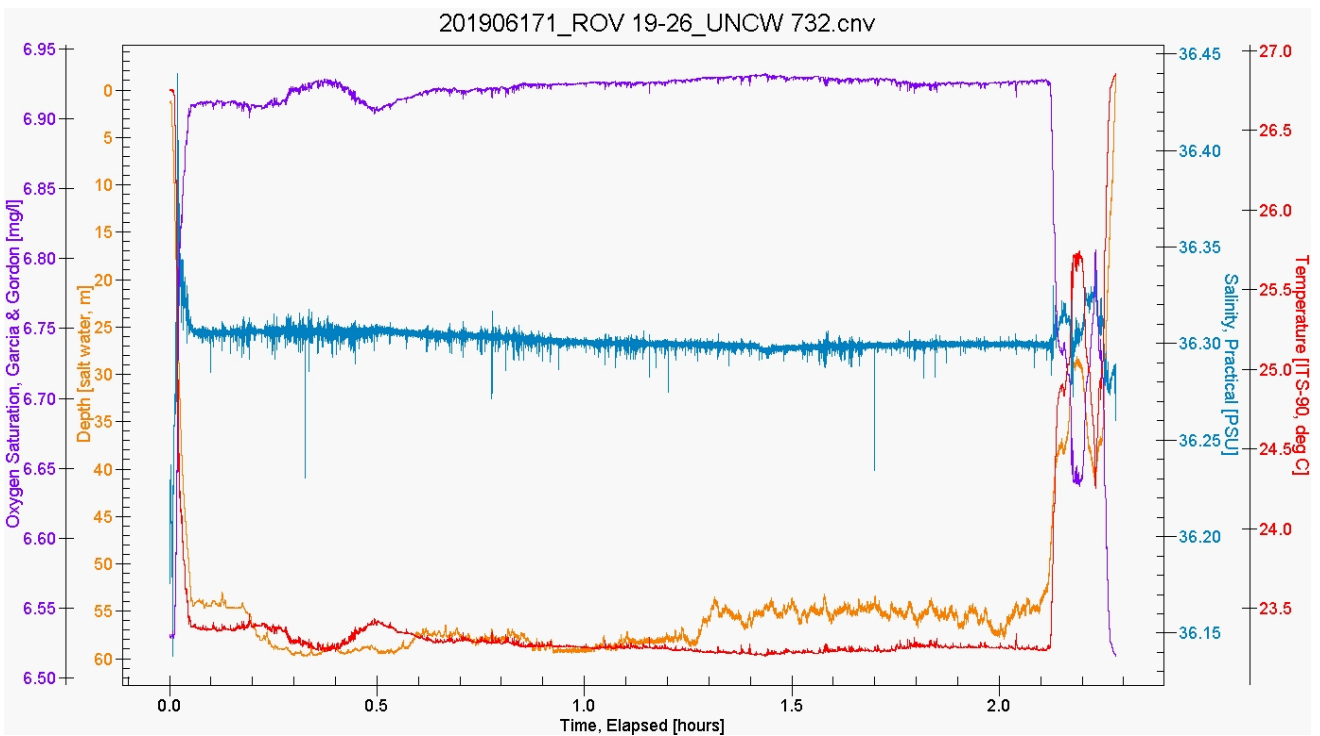
Dive Site: Florida, North Florida MPA; NF-02; 55 m; ROV 19-26; UNCW 732; 17-VI-19-1

Dive Data:

Minimum Bottom Depth (m): -54.1	Total Transect Length (km): 1.282
Maximum Bottom Depth (m): -60.8	Surface Current (kn): 0.7
On Bottom (Time- EDST): 7:04	On Bottom (Lat/Long): 30.4391°N; -80.2074°W
Off Bottom (Time- EDST): 9:06	Off Bottom (Lat/Long): 30.4299°N; -80.2094°W
Physical (bottom); Temp (°C): 23.4	Salinity: 36.31 Visibility (m): 10 Current (kn): 1.1

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-26 are as follows: Depth Maximum: 59.7 m, Temperature: 23.2-23.47 °C, Salinity: 36.3-36.3 PSU, Oxygen Saturation: 6.9-6.9 mg/l.

Dive Site: Florida, North Florida MPA; NF-02; 55 m; ROV 19-26; UNCW 732; 17-VI-19-1

Dive Imagery:



Figure 1: 30°26.2654'N;80°12.4155'W: -60 m
Bushy black coral (*Tanacetipathes* sp.)



Figure 2: 30°26.2309'N;80°12.432'W: -58.8 m
Unid. demosponge

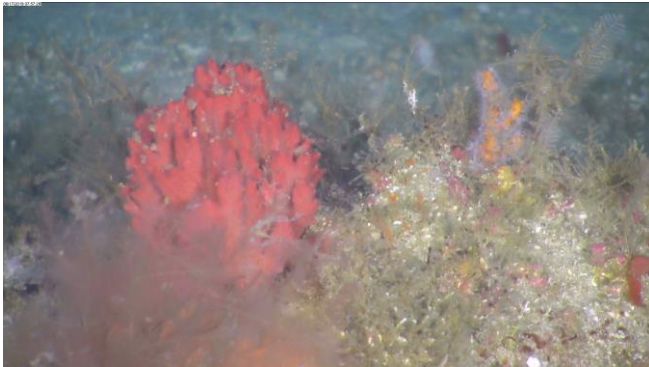


Figure 3: 30°26.113'N;80°12.4663'W: -60.7 m
Red bush sponge (*Clathria* sp.)



Figure 4: 30°26.0737'N;80°12.4718'W: -59.9 m
Hermit crab in whelk shell



Figure 5: 30°25.973'N;80°12.5163'W: -58.2 m
Carijoa sp. octocoral



Figure 6: 30°25.9328'N;80°12.5316'W: -57 m
Mass of serpulid worm tubes (*Filograna* sp.)

Dive Site: Florida, North Florida MPA; NF-02; 55 m; ROV 19-26; UNCW 732; 17-VI-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 17-VI-19-1; ROV 19-26, UNCW Dive 732; Florida, North Florida MPA, 60 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV.

Site Description/Habitat/Biota (observations during dive):

Depth range: 55.6- 60.6 m

MB map shows N-E ridge, >20 nmi long, 105 m wide, black/white 30 m resolution Navy MB, 60 nmi from shore; ROV xs hd S.

Weather- Sunny, 1-2 ft from SW, wind 5 kn from 211 dg, air- 27.15 C, surface water- 26.75 C, salinity- 35.22, current- 0.7- 1.1 kn to 330.

7:00- Launch

48 m- neptoid POM in water.

7:04- On bottom- 55.6 m; visibility- 5-15 m (low vis at beginning), current- 0.5 fr S, on WP, on west slope of MB, 55.7 m at west base, flat sand. Slope flat rock <25 cm, *Muricea*, hydroids, 25 cm relief flat rock slabs. Hd east to go to top. *Stichopathes*, *Ircinia*, Spirastrellidae, thick encrusting white demosponges, lionfish, grey triggerfish, DMST.

7:13- Hd E, 59 m, near top of MB ledge. Hd S along ridge, bushy yellow and orange axinellids, *Ircinia campana*, low relief rectangular slabs, sand/shell, pavement, 50% hard bottom.

7:18- hd east across MB ledge; 60.4 m, flat pavement, *Stichopathes*, barren.

7:24- 60 m, 1/3 way across MB ledge; flat pavement, sand; change hd to SW to rocks.

7:33- 60 m, MB shows top of ridge; ROV shows flat sand, rubble.

7:35- 60 m, heading S along ridge slope; MB shows west slope; flat rock slabs, < ½ m relief, 1-2 m rectangular

Dive Site: Florida, North Florida MPA; NF-02; 55 m; ROV 19-26; UNCW 732; 17-VI-19-1

blocks, sand; *Stichopathes luetkeni*, hydroids, *Diodogorgia*, *Ircinia campana*, 50% HB, some undercut, low rugosity, spotfin butterflyfish, depth 58.7 m, tomtate, 20 cm yellow shere Demospongiae, 2-3 mm oscules, undercut slabs, ½ m relief, 59 m, black bar soldierfish, tattler, didemnidae, DMST, squirrelfish, rock beauty, spotfin hogfish, sand tilefish, *Tanacetipathes*, lionfish, cluster hollow tube white *Aplysina*, wrasse bass, flying gurnard, *Geodia neptuni*.

7:57- 60.6 m, boulders, sediment.

Sample 1- 10 cm, red-orange, sphere, rugose, stalked Axinellidae; Bin 3.

8:02- Hd S along west slope; *Titanideum frauenfeldii*, tilefish burrow pile of rubble, *Macrorhynchia* hydroid, hog snapper, blue angelfish, Didemnidae encrusting.

8:08- 60 m, sand/pavement

Sample 2- Paguridae- *Petrochirus diogenes*? for Smithsonian aquarium, 23.2 C.

8:13- Hd S along west slope, flat sand shell hash, lost ridge.

8:18- 59 m, on reef, 10-20 dg slope, ½ m boulders, slabs, *Muricea*, hydroids, encrusting sponges, orange axinellids; 57 m, 1 m relief boulders, 2-3 m wide, scamp, scattered boulders on sand, *Aiolochoiria crassa*, *Chondrilla*, DMST 20 cm common,

8:30- 58 m, lobster, branching red algae, 30 cm white Telesto, graysby, 30 dg slope, *Thyroscyphus ramosus* hydroids, *Filograna*, bushy green algae.

8:49- 59 m, hd S on west slope, boulder habitat, 30 dg slope, rugose, jumbled 1 m relief boulders, slope width about 15 m wide, 2 m total relief, jackknife fish, fishing line, blackbar drum, bank butterflyfish.

9:02- 60 m, sand near base of west slope; on rock boulder slope, same biota.

9:06- 57.5 m, end xs, end dive.

Dominant Benthic Macrobiota:

Antipatharia coral- *Stichopathes luetkeni*, *Tanacetipathes*

Gorgonia coral- *Muricea*, *Diodogorgia*, *Titanideum frauenfeldii*, *Telesto*

Hydroida- *Thyroscyphus ramosus*, *Macrorhynchia*

Porifera- *Ircinia campana*, DMST, Spirastrellidae, yellow sphere Demosponge, red orange sphere, Axinellida orange and yellow, white hollow tube *Aplysina*, *Geodia neptuni*, *Chondrilla*, *Aiolochoiria crassa*

Annelida- *Filograna*

Decapoda- Paguridae- *Petrochirus diogenes*?, *Panularis argus*

Ascidiacea- Didemnidae encrusting

Algae- bushy sphere green, thin branching Rhodophyta

Sample: 2

Petrochirus diogenes?- for Smithsonian aquarium- *Oculina* exhibit and Axinellidae

Human Debris:

Fishing line

CPCe Percent Cover Analysis:

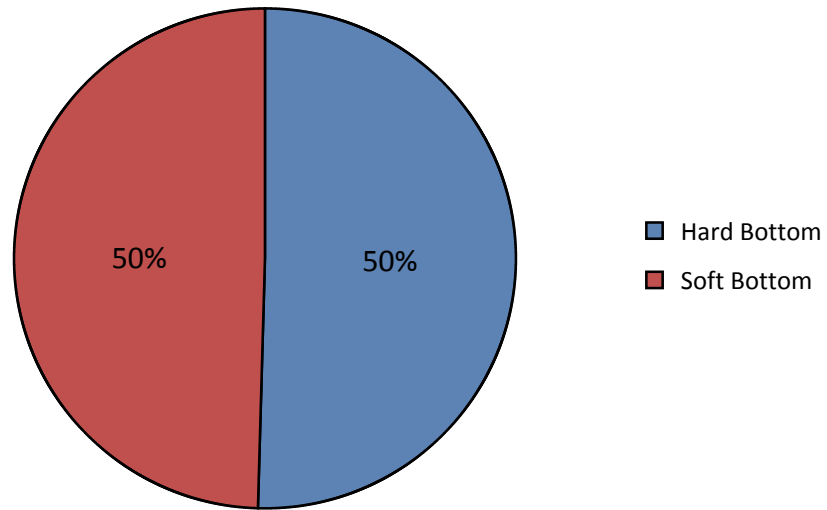
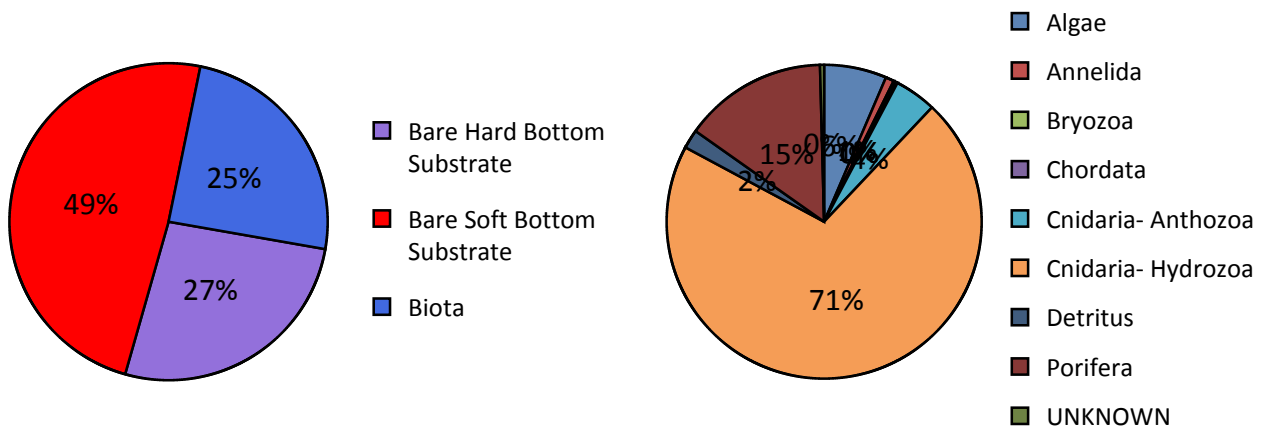


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-26. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-26.

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: Florida, North Florida MPA; NF-02; 55 m; ROV 19-26; UNCW 732

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Samples, dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-26.

	%	Notes	Samp.
Biota	24.57%	X	X
Algae	1.58%	X	
Algae	0.05%		
Cyanobacteria	0.16%		
Chlorophyta		X	
Ochrophyta	0.05%		
Rhodophyta	1.32%	X	
Corallinales	1.00%		
Rhodophyta	0.32%	X	
Porifera	3.63%	X	X
Demospongiae	3.63%	X	X
<i>Aiolochoxia crassa</i> (Hyatt, 1875)		X	
<i>Aplysina</i> sp.		X	
Axinellidae		X	
<i>Chondrilla</i> sp.		X	
<i>Clathria (Clathria) foliacea</i> Topsent, 1889			X
<i>Clathria</i> sp.	0.16%		
<i>Cliona</i> cf. <i>tumula</i> Friday, Poppell & Hill, 2013	0.37%	X	
Demospongiae	2.16%	X	
Demospongiae- Ye sphere (MPA)	0.21%	X	
<i>Geodia neptuni</i> (Sollas, 1886)		X	
<i>Ircinia campana</i> (Lamarck, 1814)	0.11%	X	
<i>Ircinia</i> sp.	0.26%		
Poecilosclerida	0.05%		
<i>Polymastia</i> sp.	0.11%		
Spirastrellidae	0.16%	X	
Tetractinellida	0.05%	X	
Cnidaria- Hydrozoa	17.41%	X	
Hydrozoa	17.41%	X	
Hydroidolina	17.41%	X	
<i>Macrorhynchia</i> sp.		X	
<i>Thyroscyphus ramosus</i> Allman, 1877		X	
Cnidaria- Anthozoa	1.05%	X	
Alcyonacea - gorgonian	0.26%	X	
<i>Bebryce</i> sp.		X	

Dive Site: Florida, North Florida MPA; NF-02; 55 m; ROV 19-26; UNCW 732

Clavulariidae		X
<i>Diodogorgia</i> sp.	0.21%	X
<i>Ellisella</i> sp.	0.05%	
<i>Muricea</i> sp.		X
<i>Titanideum frauenfeldii</i> (Kölliker, 1865)		X
Antipatharia	0.79%	X
<i>Antipathes atlantica</i> Gray, 1857		X
<i>Antipathes furcata</i> Gray, 1857	0.05%	
<i>Stichopathes luetkeni</i> Brook, 1889	0.53%	X
<i>Tanacetipathes</i> sp.	0.21%	X
Annelida	0.21%	X
Polychaeta	0.21%	X
<i>Filograna</i> sp.	0.21%	X
Arthropoda		X
Crustacea		X
<i>Petrochirus diogenes</i> (Linnaeus, 1758)		X
Bryozoa	0.05%	
Gymnolaemata	0.05%	
<i>Schizoporella</i> sp.	0.05%	
Chordata	0.05%	X
Chordata - Invertebrate		X
Didemnidae		X
Chordata - Vertebrate	0.05%	
Actinopterygii	0.05%	
Detritus	0.47%	
UNKNOWN	0.11%	
Human debris		X
Human debris		X
Human debris- Fishing Gear		X
Human debris- fishing line		X
Habitat	75.43%	
Bare Hard Bottom Substrate	26.62%	
Hard bottom	26.62%	
Bare rock, pavement, boulder, ledge	18.62%	
Bare rubble/cobble	8.00%	
Bare Soft Bottom Substrate	48.82%	
Grand Total	100.00%	

Dive Site: Florida, North Florida MPA; NF-02; 55 m; ROV 19-26; UNCW 732

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-26.

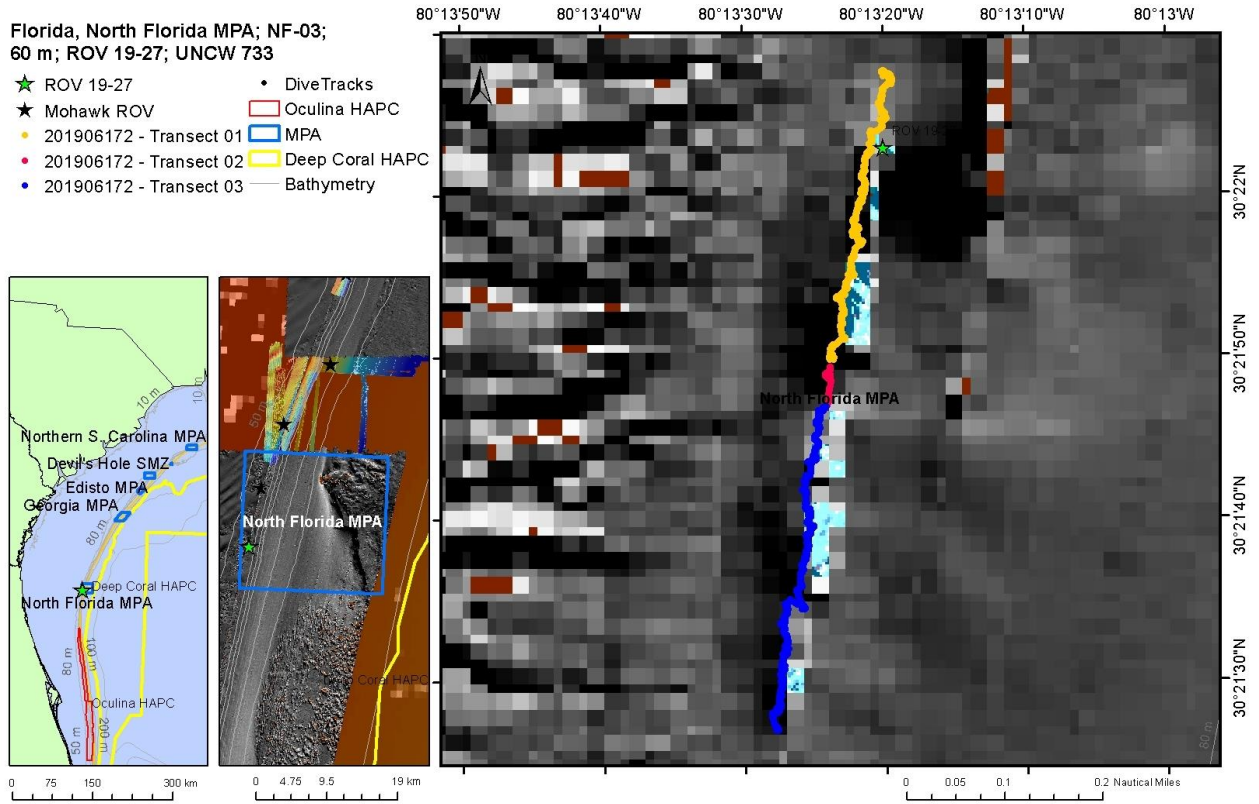
Class/Order/Family/Taxa Author - Common Name	ROV 19-26
Actinopterygii	
Aulopiformes	
Synodontidae	
<i>Synodus</i> sp. - Lizardfish	0.79
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	1.31
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	9.42
<i>Myripristis jacobus</i> Cuvier, 1829 - Blackbar Soldierfish	27.48
<i>Plectrypops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish	0.52
Perciformes	
Acanthuridae	
<i>Acanthurus</i> sp. - Surgeonfish	0.26
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	0.52
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	17.27
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	1.05
Haemulidae	
<i>Haemulon aurolineatum</i> Cuvier, 1830 - Tomtate Grunt	194.45
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	13.09
<i>Bodianus rufus</i> (Linnaeus, 1758) - Spanish Hogfish	0.26
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	4.19
<i>Halichoeres cyanocephalus</i> (Bloch, 1791) - Yellowcheek Wrasse	0.52
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	1.31
<i>Halichoeres</i> sp. - Wrasse	16.23
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	0.52
Lutjanidae	
<i>Lutjanus synagris</i> (Linnaeus, 1758) - Lane snapper	0.52
<i>Rhomboplites aurorubens</i> (Cuvier, 1829) - Vermilion Snapper	37.16
Malacanthidae	
<i>Malacanthus plumieri</i> (Bloch, 1786) - Sand Tilefish	0.26
Mullidae	
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	0.52
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	7.07

Dive Site: Florida, North Florida MPA; NF-02; 55 m; ROV 19-26; UNCW 732

<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	0.52
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	0.26
Pomacentridae	
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reefish	18.32
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	20.15
<i>Chromis scotti</i> Emery, 1968 - Purple Reefish	21.46
<i>Chromis</i> sp. - Damselfish/chromis	14.13
Sciaenidae	
<i>Equetus lanceolatus</i> (Linnaeus, 1758) - Jack-knifefish	1.57
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	7.07
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	2.36
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	2.62
<i>Mycteroperca microlepis</i> (Goode & Bean, 1879) - Gag	0.26
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	0.52
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	4.97
<i>Serranus baldwini</i> (Evermann & Marsh, 1899) - Lantern Bass	0.52
<i>Serranus phoebe</i> Poey, 1851 - Tattler	4.71
Sparidae	
<i>Calamus</i> sp. - Porgy	0.52
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	0.26
Scorpaeniformes	
Dactylopteridae	
<i>Dactylopterus volitans</i> (Linnaeus, 1758) - Flying Gurnard	0.52
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	17.80
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	0.26
Tetraodontiformes	
Balistidae	
<i>Balistes caprisacus</i> Gmelin, 1789 - Grey Triggerfish	2.09
Diodontidae	
<i>Diodon holacanthus</i> Linnaeus, 1758 - Longspined Porcupinefish	0.26
Ostraciidae	
Ostraciidae - Boxfishes (Fam.)	0.26
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	29.84
<i>Sphoeroides spengleri</i> (Bloch, 1785) - Bandtail Puffer	0.26
UNKNOWN Biota	2.09

Dive Site: Florida, North Florida MPA; NF-03; 60 m; ROV 19-27; UNCW 733; 17-VI-19-2

General Location and Dive Track:



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Pisces_2011_NorthFlorida_MPA_2A_2011_MB_TIF

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/17/2019

Specimens: 3

Digital Photos: 167

No. DVD: 2

Hard Drive No.: 1

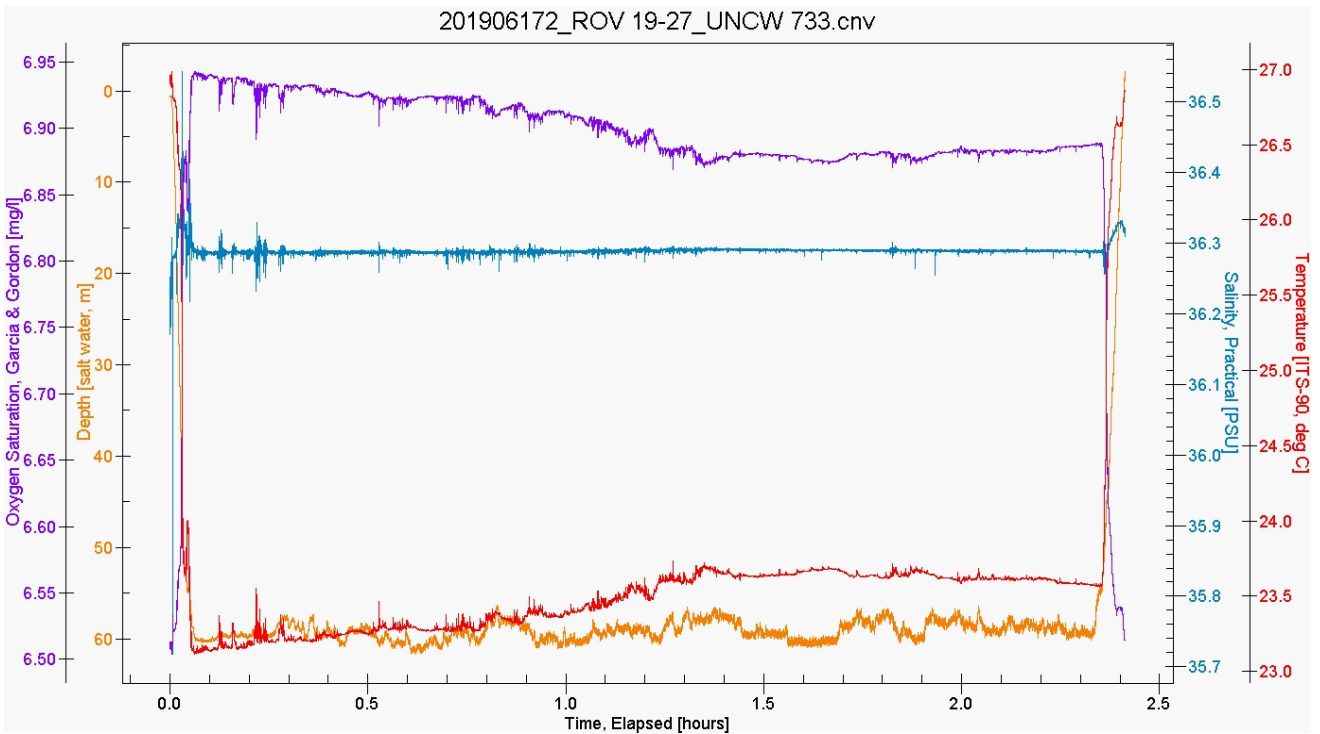
Dive Site: Florida, North Florida MPA; NF-03; 60 m; ROV 19-27; UNCW 733; 17-VI-19-2

Dive Data:

Minimum Bottom Depth (m): -58.7	Total Transect Length (km): 1.386
Maximum Bottom Depth (m): -63.6	Surface Current (kn): 0.9
On Bottom (Time- EDST): 10:10	On Bottom (Lat/Long): 30.3686°N; -80.2221°W
Off Bottom (Time- EDST): 12:24	Off Bottom (Lat/Long): 30.3575°N; -80.2244°W
Physical (bottom); Temp (°C): 23.2	Salinity: 36.31 Visibility (m): 10 Current (kn): 0.5

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-27 are as follows: Depth Maximum: 61.6 m, Temperature: 23.12-23.72 °C, Salinity: 36.3-36.3 PSU, Oxygen Saturation: 6.9-6.9 mg/l.

Dive Site: Florida, North Florida MPA; NF-03; 60 m; ROV 19-27; UNCW 733; 17-VI-19-2

Dive Imagery:



Figure 1: 30°21.9914'N;80°13.3582'W: -61 m
Boulders with sponges and black corals



Figure 2: 30°21.9508'N;80°13.3626'W: -62.7 m
Cake sponge (*Zyzyza?* sp.)



Figure 3: 30°21.9358'N;80°13.3688'W: -63.1 m
Human debris, wire corals (*Stichopathes* sp.)



Figure 4: 30°21.6538'N;80°13.4231'W: -61.2 m
Red snapper (*Lutjanus campechanus*) on boulder slope

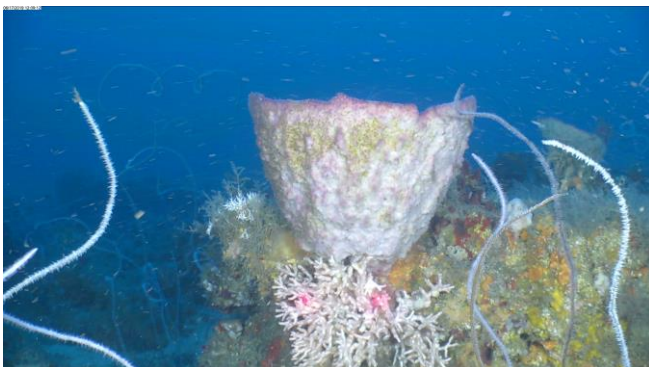


Figure 5: 30°21.5413'N;80°13.45'W: -61.8 m
Boulder with coral (*Madracis* or *Oculina* sp.), vase sponge (*Ircinia campana*), wire coral.



Figure 6: 30°21.5338'N;80°13.4506'W: -62.5 m
Rough-tail stingray (*Dasyatis centroura*), with several Cobia (*Rachycentron canadum*)

Dive Site: Florida, North Florida MPA; NF-03; 60 m; ROV 19-27; UNCW 733; 17-VI-19-2

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 17-VI-19-2; ROV 19-27, UNCW Dive 733; Florida, North Florida MPA, 60 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV.

Site Description/Habitat/Biota (observations during dive):

Depth range: 59.1- 62.5 m

MB map shows N-E ridge, 2 km long, 50 m wide, 5 m resolution Pisces 2011 MB- poor quality MB, 60 nmi from shore; ROV xs hd S.

Weather- Sunny, 1-2 ft from SW, wind 3 kn from 232 dg, air- 27.64 C, surface water- 26.98 C, salinity- 34.89, current- 1.2 kn to 9 dg.

10:06- Launch

10:10- On bottom- 62 m; visibility- 10 m, current- 0.5 fr NW; on bottom 100 m N of WP. Flat sand, 100% soft bottom. Hd S; amberjack, Didemnidae encrusting, Filograna.

10:22- 61.3 m, sand, base of ridge, 20 dg slope, ½- 1 m relief rectangular slabs, undercut, rugose; den *Stichopathes luetkeni*, *Muricea*, hydroid; 59.6 m top of slope, flat pavement; xs S along slope. Orange stalked axinellids sponges, *Ircinia campana*, *Telestoa*, yellow and orange encrusting sponges, *Tanacetipathes*, 10 cm orange sphere demosponge, tomtate, blue angelfish, yellow spikey axinellid, lionfish, spotfin hogfish, blackfin snapper.

10:32- 62.5 base, same rugose slope, 3-4 m total relief, *Shizoporella*, 2 corals- 50 cm and 30 cm, white with light brown zooxanthellae on top; second one- white and pink large branch tips, *Madracis/Oculina?* 23.25C. *Madracis/Oculina*- 30 cm, white, pink, vertical rock.

10:40- 62.3 m, west slope of ridge; fishing line, *Diodogorgia*, *Geodia neptuni*, *Shizoporella*, reef butterflyfish,

Dive Site: Florida, North Florida MPA; NF-03; 60 m; ROV 19-27; UNCW 733; 17-VI-19-2

Spirastrellidae, tomtate schools, human debris- box, orange spherical ball sponge, *Aplysina* white tubes, hydroids.

10:57- 59.1 m, plastic bag of drink cans, top of slope, 3.5 m total relief, 45 dg slope, plastic garbage bag w/ trash, red snapper, *Chondrilla*- white lobate encrusting.

11:09- 62 m, 10+ red snapper

11:12- 63 m, flat sediment; east slope of ridge edge, 62 m; rock boulders, same biota.

11:24- 61.5 m, east slope of ridge; same habitat/biota; *Madracis/Oculina*- white; packing strap, scamp, 20 cm white *Madracis/Oculina*

11:34- 62.2 m, rock boulders, *Ellisella elongata*, 1 m tall *Tanacetipathes*

Sample 1- 15 cm, white, fan, dense branching, no anastomosis, *Hypnogorgia*?

Sample 2- *Stichopathes*

Sample 201- rock

11:48- 62 m, east slope; 1 m diam white *Madracis/Oculina* on vertical rock; 10 cm white coral.

12:02- 61 m- east slope, *Telesto*, *Cobia*, *Antipathes furcata*, piles of *Sargassum* piled up; 15 cm white *Madracis/Oculina* on vertical rock, 61.8 m.

16:10- 62.5 m, rough-tail stingray laying on bottom with 6 cobia laying beside it

12:15- 62.2 m, large moray eel with tumors on mouth. 11 red snapper. 15 cm *Madracis/Oculina*.

12:23- end of ridge on MB, 62.6 m, flat sand, end dive.

Dominant Benthic Macrobiota:

Scleractinia- *Madracis/Oculina* (common; 10- 50 cm diameter, white, pink, one slightly brown; unable to ID without specimen in hand; found piece of dead *Oculina varicosa* on ROV skid)

Antipatharia coral- *Stichopathes luetkeni*, *Tanacetipathes*, *Antipathes furcata*

Gorgonia coral- *Muricea*, *Diodogorgia*, *Hypnogorgia*?, *Telesto*, *Ellisella elongata*

Hydrozoa

Porifera- *Ircinia campana*, DMST, Spirastrellidae, yellow sphere Demosponge, yellow and orange bushy Axinellida, *Geodia neptuni*, *Chondrilla*

Annelida- *Filograna*

Bryozoa- *Schizoporella*

Ascidiacea- Didemnidae encrusting

Sample: 3

Hypnogorgia?- white (small piece for museum; remainder live for Smithsonian Ecosystem Exhibit, *Oculina* tank); rock w/ encrusting orange sponge (live for Smithsonian *Oculina* tank), *Stichopathes luetkeni*

Human Debris:

Fishing line

CPCe Percent Cover Analysis:

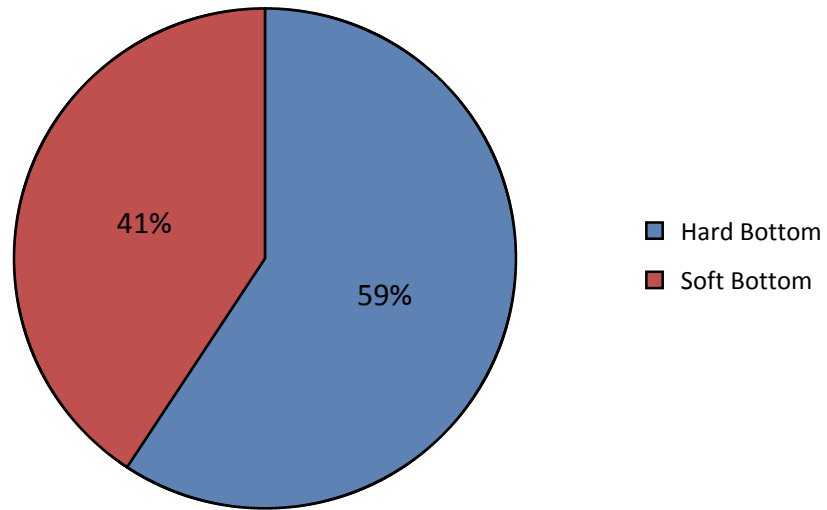
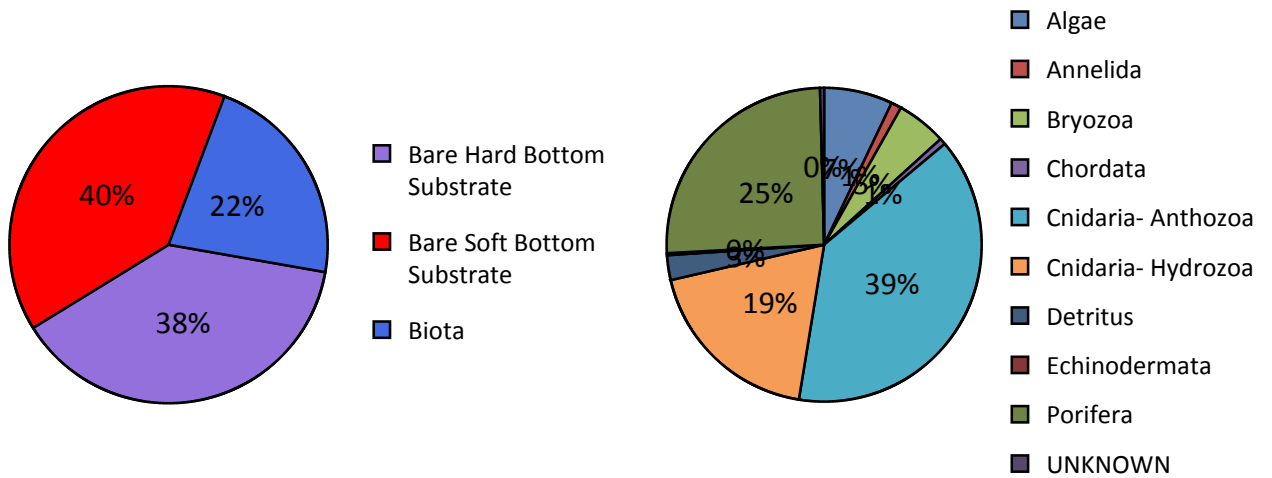


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-27. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-27.

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

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Samples, dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-27.

	%	Notes	Samp.
Biota	22.07%	X	X
Algae	1.56%	X	
Ochrophyta	0.38%		
<i>Sargassum</i> sp.	0.38%		
Rhodophyta	1.18%	X	
Corallinales	1.13%	X	
Rhodophyta	0.05%		
Porifera	5.61%	X	
Demospongiae	5.61%	X	
<i>Aiolochoira crassa</i> (Hyatt, 1875)	0.05%		
<i>Aplysina</i> sp.		X	
Axinellidae		X	
<i>Chondrosia</i> sp.	0.14%		
<i>Clathria</i> sp.	0.09%		
Demospongiae	5.04%	X	
Demospongiae- Ye sphere (MPA)		X	
<i>Geodia neptuni</i> (Sollas, 1886)		X	
<i>Geodia</i> sp.		X	
<i>Ircinia campana</i> (Lamarck, 1814)		X	
<i>Ircinia</i> sp.	0.14%		
Spirastrellidae	0.14%		
Cnidaria- Hydrozoa	4.15%	X	
Hydrozoa	4.15%	X	
Hydroidolina	4.15%	X	
Cnidaria- Anthozoa	8.53%	X	X
Alcyonacea - gorgonian	0.09%	X	X
Clavulariidae		X	
<i>Diodogorgia</i> sp.	0.09%	X	
<i>Hypnogorgia</i> sp.			X
<i>Muricea</i> sp.		X	
Antipatharia	8.44%	X	X
Antipatharia	0.05%	X	
<i>Antipathes furcata</i> Gray, 1857	0.05%	X	
<i>Stichopathes luetkeni</i> Brook, 1889	6.32%	X	
<i>Stichopathes</i> sp.			X
<i>Tanacetipathes</i> sp.	2.03%	X	
Coral- Scleractinia		X	

<i>Madracis myriaster</i> (Milne Edwards & Haime, 1850)		X	
Scleractinia- unid colonial		X	
Annelida	0.24%		
Polychaeta	0.24%		
<i>Filograna</i> sp.	0.24%		
Bryozoa	1.13%	X	
Echinodermata	0.05%		
Echinoidea	0.05%		
<i>Eucidaris tribuloides</i> (Lamarck, 1816)	0.05%		
Chordata	0.14%	X	
Chordata - Invertebrate	0.05%	X	
Didemnidae	0.05%	X	
Chordata - Vertebrate	0.09%		
Actinopterygii	0.09%		
Detritus	0.57%	X	
UNKNOWN	0.09%		
Human debris		X	
Human debris		X	
Human debris- Fishing Gear		X	
Human debris- fishing line		X	
Human debris- Trash		X	
Human debris- cans/bottles		X	
Bare Hard Bottom Substrate	38.43%		X
Bare Hard Bottom Substrate	38.43%		X
Hard bottom	38.43%		X
Bare rock, pavement, boulder, ledge	33.29%		
Bare rubble/cobble	5.14%		
rock			X
Bare Soft Bottom Substrate	39.51%		
Grand Total	100.00%	X	X

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-27.

Class/Order/Family/Taxa Author - Common Name	ROV 19-27
Actinopterygii	
Anguilliformes	
Muraenidae	
<i>Muraena robusta</i> Osório, 1911 - Stout Moray	0.16
Aulopiformes	
Synodontidae	
<i>Synodus</i> sp. - Lizardfish	0.16
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	4.09
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	1.47
<i>Myripristis jacobus</i> Cuvier, 1829 - Blackbar Soldierfish	3.60
<i>Plectrypops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish	0.33
Perciformes	
Carangidae	
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	0.49
<i>Seriola</i> sp. - Amberjack	0.33
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	1.47
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	13.58
<i>Chaetodon</i> sp. - Butterflyfish Gen.	0.49
<i>Prognathodes aculeatus</i> (Poey, 1860) - Longsnout Butterflyfish	0.16
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	4.42
Haemulidae	
<i>Haemulon aurolineatum</i> Cuvier, 1830 - Tomtate Grunt	384.62
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	1.47
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	10.64
<i>Clepticus parrae</i> (Bloch & Schneider, 1801) - Creole Wrasse	1.96
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	2.29
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	0.98
<i>Halichoeres</i> sp. - Wrasse	3.60
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	0.16
Lutjanidae	
<i>Lutjanus analis</i> (Cuvier, 1828) - Mutton Snapper	0.33
<i>Lutjanus apodus</i> (Walbaum, 1792) - Schoolmaster	0.33

<i>Lutjanus buccanella</i> (Cuvier, 1828) - Blackfin Snapper	1.15
<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper	4.26
<i>Lutjanus</i> sp. - Snapper	0.49
<i>Rhomboplites aurorubens</i> (Cuvier, 1829) - Vermilion Snapper	18.00
Mullidae	
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	0.49
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	7.20
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	0.33
Pomacentridae	
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reeffish	6.55
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	9.00
<i>Chromis scotti</i> Emery, 1968 - Purple Reeffish	6.06
<i>Chromis</i> sp. - Damsel/Chromis	14.73
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damsel	0.16
Rachycentridae	
<i>Rachycentron canadum</i> (Linnaeus, 1766) - Cobia	1.15
Sciaenidae	
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	4.58
Serranidae/Anthiinae	
<i>Pronotogrammus martinicensis</i> (Guichenot, 1868) - Roughtongue Bass	0.16
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	1.15
<i>Cephalopholis fulva</i> (Linnaeus, 1758) - Coney	0.16
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	2.78
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	1.15
<i>Paranthias furcifer</i> (Valenciennes, 1828) - Creole-fish	0.16
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	3.11
<i>Serranus baldwini</i> (Evermann & Marsh, 1899) - Lantern Bass	0.49
<i>Serranus phoebe</i> Poey, 1851 - Tattler	1.64
<i>Serranus tigrinus</i> (Bloch, 1790) - Harlequin Bass	0.33
Sparidae	
<i>Calamus</i> sp. - Porgy	0.98
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	10.47
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	0.16
Tetraodontiformes	
Balistidae	
<i>Balistes capriscus</i> Gmelin, 1789 - Grey Triggerfish	0.49
<i>Balistes</i> sp. - Triggerfish	0.16

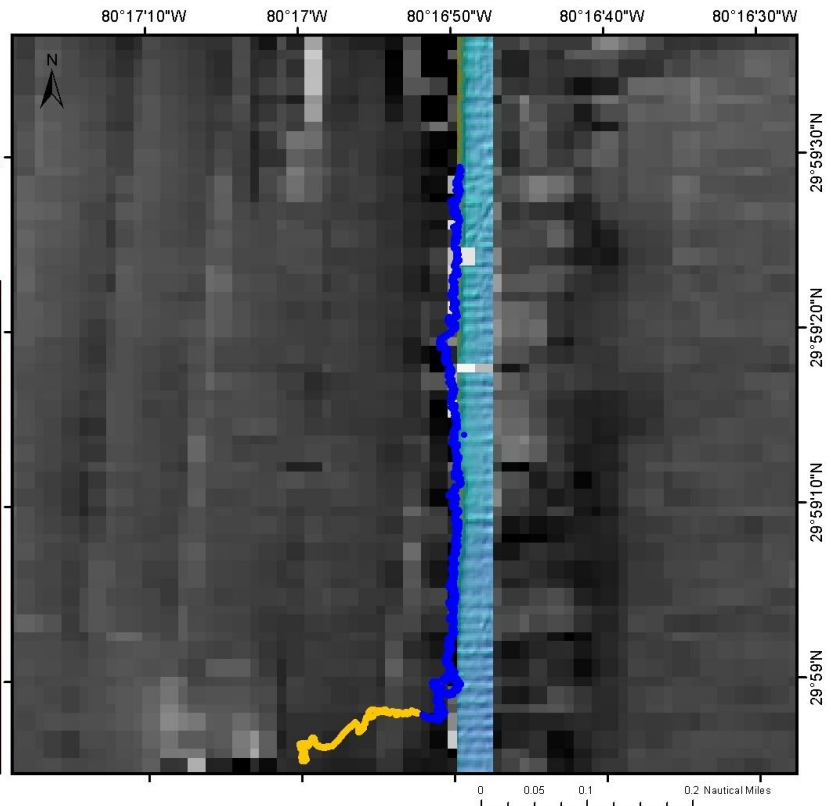
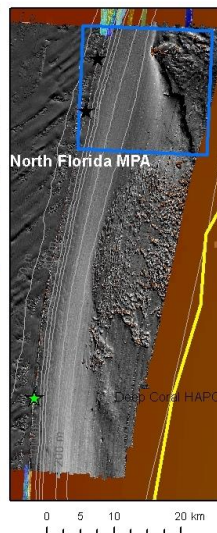
Ostraciidae	
<i>Acanthostracion quadricornis</i> (Linnaeus, 1758) - Scrawled Cowfish	0.16
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	22.75
Elasmobranchii	
Myliobatiformes	
Dasyatidae	
<i>Dasyatis centroura</i> (Mitchill, 1815) - Roughtail Stingray	0.16
UNKNOWN Biota	0.65

Dive Site: Florida, Outside North Florida MPA; NF-03; 60 m; ROV 19-28; UNCW 734; 17-VI-19-3

General Location and Dive Track:

Florida, Outside North Florida MPA;
NF-03; 60 m; ROV 19-28; UNCW 734

- ★ ROV 19-28
- ★ Mohawk ROV
- 201906173 - Transect 01
- 201906173 - Transect 02
- DiveTracks
- Oculina HAPC
- MPA
- Deep Coral HAPC
- Bathymetry



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Pisces_2018_SNFL_MPA_4m_Grid

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/17/2019

Specimens: 0

Digital Photos: 141

No. DVD:

Hard Drive No.:

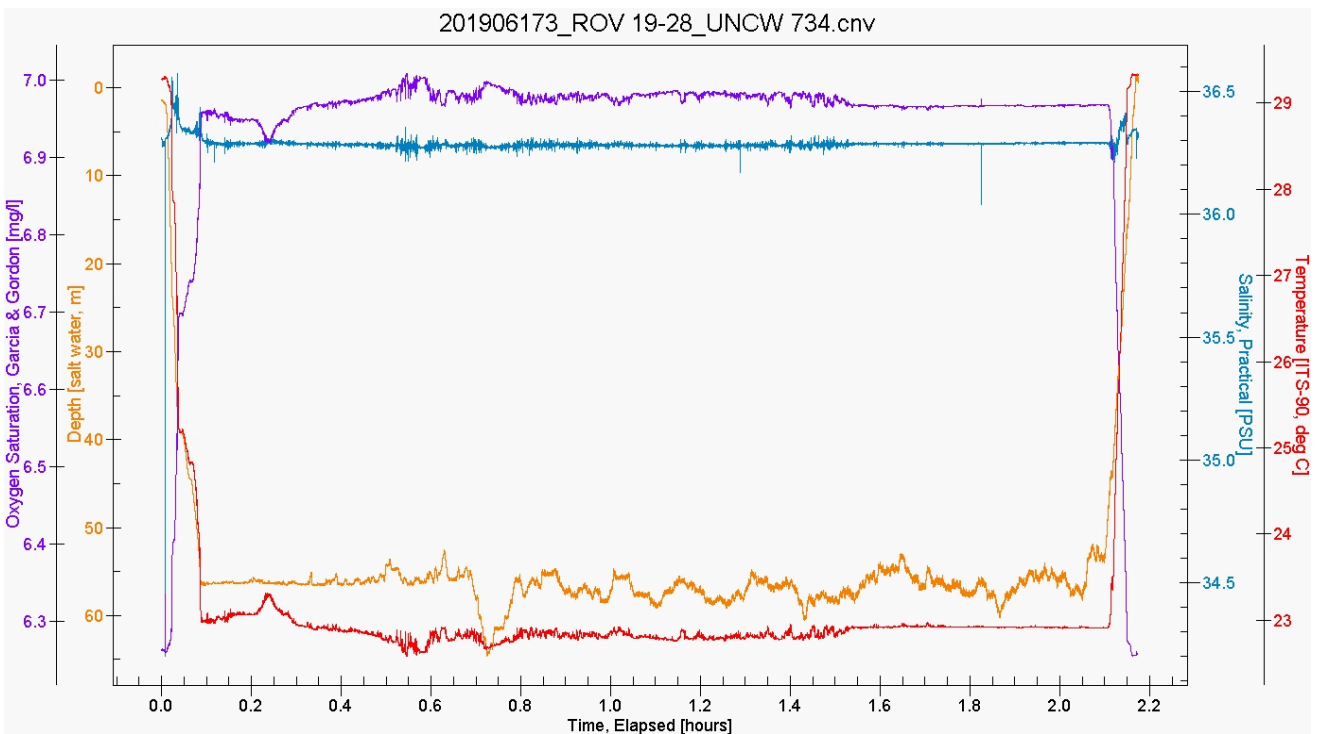
Dive Site: Florida, Outside North Florida MPA; NF-03; 60 m; ROV 19-28; UNCW 734; 17-VI-19-3

Dive Data:

Minimum Bottom Depth (m): -54	Total Transect Length (km): 1.376
Maximum Bottom Depth (m): -66	Surface Current (kn): 2.6
On Bottom (Time- EDST): 15:52	On Bottom (Lat/Long): 29.982°N; -80.2833°W
Off Bottom (Time- EDST): 17:51	Off Bottom (Lat/Long): 29.9915°N; -80.2806°W
Physical (bottom); Temp (°C): 24.1	Salinity: 36.34 Visibility (m): 5 Current (kn): 0.5

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-28 are as follows: Depth Maximum: 64.5 m, Temperature: 22.59-24.13 °C, Salinity: 36.1-36.4 PSU, Oxygen Saturation: 6.8-7 mg/l.

Dive Site: Florida, Outside North Florida MPA; NF-03; 60 m; ROV 19-28; UNCW 734; 17-VI-19-3

Dive Imagery:



Figure 1: 29°59.001'N;80°16.8334'W: -61.6 m
Unid. octocoral (*Hypnogorgia?* sp.)



Figure 2: 29°59.0167'N;80°16.8442'W: -57 m
Scamp (*Mycteroperca phenax*)

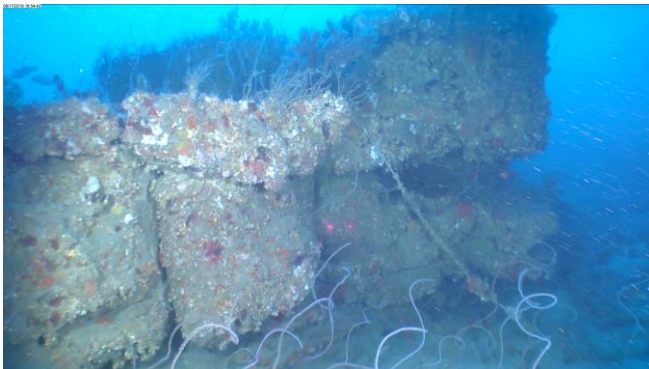


Figure 3: 29°59.0872'N;80°16.8337'W: -59.2 m
1 m rock boulders with fishing line



Figure 4: 29°59.0935'N;80°16.8337'W: -58.4 m
1 m boulder with hydroids, vase sponge and coral

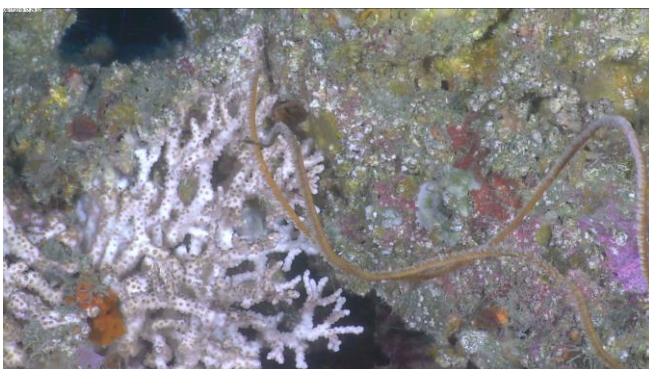


Figure 5: 29°59.3404'N;80°16.8364'W: -58.9 m
Scleractinian with slight coloration of zooxanthellae
(*Madracis myriaster* or *Oculina varicosa*)

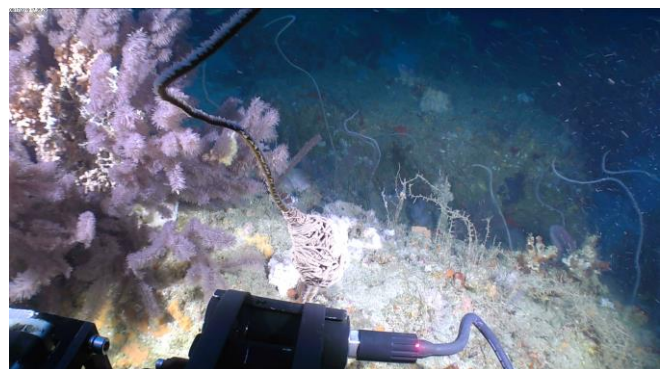


Figure 6: 29°59.374'N;80°16.832'W: -60 m
Front of ROV, black corals on rock

Dive Site: Florida, Outside North Florida MPA; NF-03; 60 m; ROV 19-28; UNCW 734; 17-VI-19-3

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 17-VI-19-3; ROV 19-28, UNCW Dive 734; Florida, Outside North Florida MPA, 55 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV.

Site Description/Habitat/Biota (observations during dive):

Depth range: 56.1- 66 m

MB map shows N-S oriented ridge, 2.8 km long, 90 m wide, 55.5 m top, 64 m east base, 57 m at W base; Pisces 2018 MB, 4 m resolution; ROV xs head N along ridge slope, 53 nmi to shore.

Weather- Sunny, 2-3 ft from SE, wind 11 kn from 142 dg, air- 28.09 C, surface water- 29.36 C, salinity- 35.54, current- 1.8- 2.6 kn to 359 dg.

15:43- Launch

15:53- On bottom- 58 m; visibility- 10 m, current- 0.5 fr S, 22.9 C; 180 m west of WP, flat sand. Hd to ridge.

16:12- 57.7 m, west base on MB, ROV shows flat sand. 57.5 m – on top of ridge of MB, nothing visible.

16:20- 57.5 m, top of ridge on MB, 25 cm flat rock outcrops, sand, *Stichopathes*. 1.5 m relief ledge facing W; top flat rock, 56.1 m *Muricea*, *Didemnidae*, *Ircinia campana*, hydroids, blue angelfish. At top of east edge, which matches the MB. East wall, 2 m ledge, layered undercut ledges, boulders at base. *Didemnidae* white sphere, hydroids, *Muricea*, *Stichopathes*; flat rock slabs at base; sand- 57.5 m. *Filograna*, *Aplysina*, yellow sphere sponge, fan gorgonian, *Tanacetipathes*, *Ircinia strobilina*.

16:24- 57.3 m, on top in MB; yellow ball ascidian, *Spirobranchus*, *Stichopathes*, school tomtate.

16:30- 66 m, base of east wall; total relief of 9 m; MB shows 64 m; flat sand/shell hash. XS N along east face of wall. 20- 60 dg slope, jumble of boulders, rugose, 30 cm *Hypnogorgia*, 50 cm *Tanacetipathes*, *Stichopathes*, 2-3 m boulder, vermilion, and tomtate school, *Muricea* 50 cm, rectangular slabs ½ - 1 m relief,

Dive Site: Florida, Outside North Florida MPA; NF-03; 60 m; ROV 19-28; UNCW 734; 17-VI-19-3

hi rugosity, scamp, grey snapper, *Diodogorgia*, amberjack, spotfin hogfish, blue angelfish, lionfish, reef butterfly, squirrelfish.

16:44- 60 m, cont along east slope, hd N; cup coral, Spirastrellidae, school of vermillin, spotfin butterflyfish, fishing line.

16:56- 59.6 m, 20 cm *Madracis/Oculina* white on vertical rock, french angelfish, fishing line wrapped over rock, 15 cm white *Madracis/Oculina*; more fishing line. Fishing long line, scamp, long line; 2 *Madracis/Oculina* colonies, white, blackbar drum, long line, *Hypnogorgia* white.

17:14- 60 m, east slope, same habitat, 2 long lines parallel along the face of the slope, gag, greyhead scamp.

17:24- 57.4, cont N along slope.

17:30- 25 cm *Madracis* w/ fishing line wrapped.

17:39- 5 red snapper.

17:45- 57.5 m, 15 cm white/brown *Madracis*, *Geodia neptuni*

17:51- 58 m, top edge, end of xs, end of dive.

Dominant Benthic Macrobiota:

Scleractinia- *Madracis/Oculina* (10- 50 cm diameter, white, pink, one slightly brown; unable to id without specimen in hand)

Antipatharia coral- *Stichopathes luetkeni*, *Tanacetipathes*, *Antipathes furcata*

Gorgonia coral- *Muricea*, *Diodogorgia*, *Hypnogorgia*, *Telesto*

Hydroida

Porifera- *Ircinia campana*, Spirastrellidae, yellow sphere Demosponge, *Geodia neptuni*, *Aplysina*

Annelida- *Filograna*, *Spirobranchus giganteus*

Ascidiacea- Didemnidae encrusting, yellow ascidiacea

Human Debris:

Fishing line, abundant long line on reef, fish line wrapped on *Madracis* coral

CPCe Percent Cover Analysis:

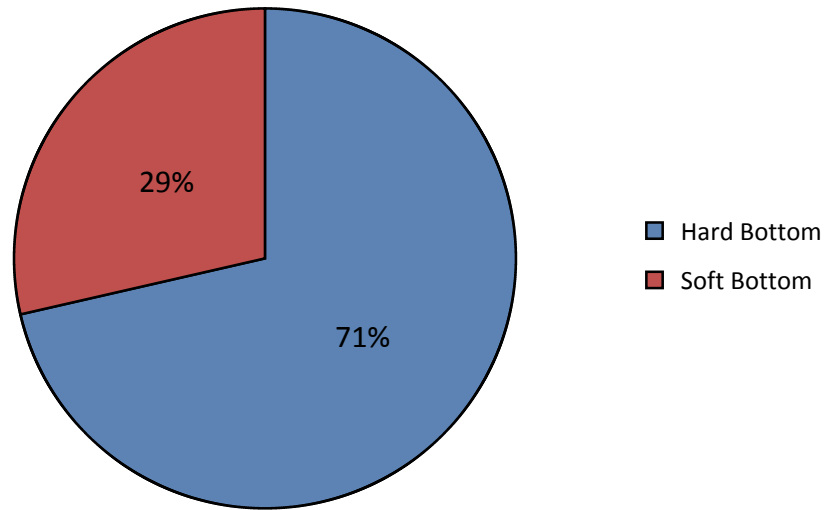
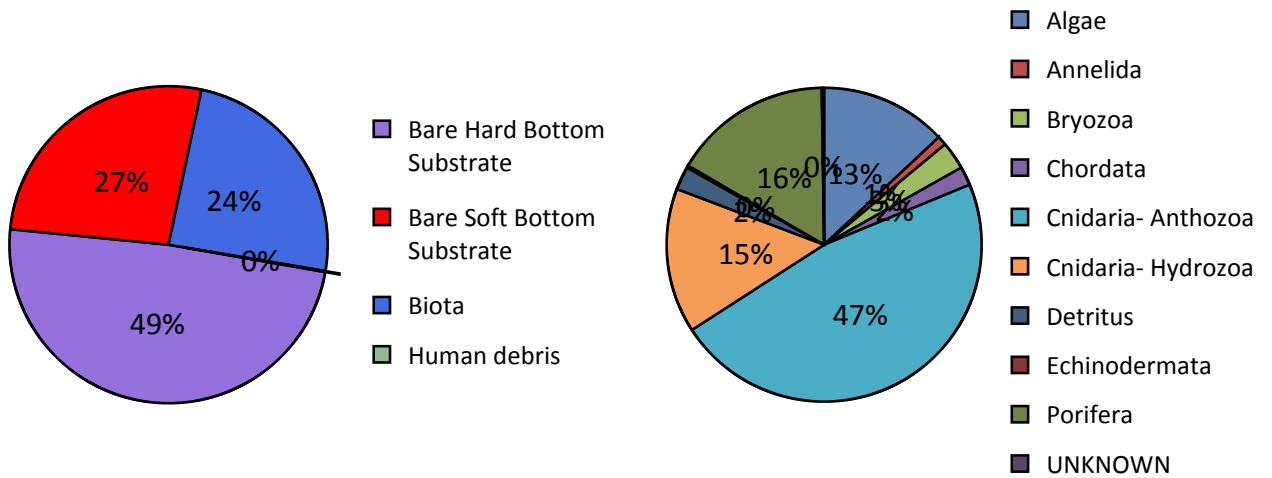


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-28. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-28.

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: Florida, Outside North Florida MPA; NF-03; 60 m; ROV 19-28; UNCW 734; 17-VI-19-3

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-28.

	%	Notes
Biota	24.33%	X
Algae	3.16%	
Ochrophyta	0.23%	
Ochrophyta	0.06%	
<i>Sargassum</i> sp.	0.18%	
Rhodophyta	2.92%	
Corallinales	2.81%	
Rhodophyta	0.12%	
Porifera	3.98%	X
Demospongiae	3.98%	X
<i>Aplysina</i> sp.	0.12%	X
<i>Clathria</i> sp.	0.06%	
Demospongiae	2.57%	
Demospongiae- Ye sphere (MPA)		X
<i>Geodia</i> sp.		X
<i>Ircinia campana</i> (Lamarck, 1814)	0.06%	X
<i>Ircinia strobilina</i> (Lamarck, 1816)		X
Spirastrellidae	1.17%	X
Cnidaria- Hydrozoa	3.63%	X
Hydrozoa	3.63%	X
Hydroidolina	3.63%	X
Cnidaria- Anthozoa	11.46%	X
Alcyonacea - gorgonian		X
<i>Diodogorgia</i> sp.		X
<i>Hypnogorgia</i> sp.		X
<i>Muricea</i> sp.		X
Anthozoa - Non Coral	0.06%	
Zoanthidae	0.06%	
Antipatharia	11.35%	X
Antipatharia	0.06%	
<i>Antipathes atlantica</i> Gray, 1857	0.06%	
<i>Antipathes furcata</i> Gray, 1857	0.23%	
<i>Stichopathes luetkeni</i> Brook, 1889	7.49%	X
<i>Tanacetipathes</i> sp.	3.51%	X
Coral- Scleractinia	0.06%	X
<i>Madracis myriaster</i> (Milne Edwards & Haime, 1850)		X

Dive Site: Florida, Outside North Florida MPA; NF-03; 60 m; ROV 19-28; UNCW 734; 17-VI-19-3

Scleractinia- unid colonial		X
Scleractinia- unid cup	0.06%	X
Annelida	0.23%	X
Polychaeta	0.23%	X
<i>Filograna</i> sp.	0.23%	X
<i>Spirobranchus giganteus</i> (Pallas, 1766)		X
Arthropoda		X
Crustacea		X
<i>Diogenes</i> sp.		X
Bryozoa	0.70%	
Gymnolaemata	0.70%	
<i>Schizoporella</i> sp.	0.70%	
Echinodermata	0.06%	X
Echinoidea	0.06%	
Cidaroidea	0.06%	
Ophiuroidea		X
Gorgonocephalidae		X
Chordata	0.47%	X
Chordata - Invertebrate	0.35%	X
Ascidiacea	0.06%	
Didemnidae	0.29%	X
<i>Eudistoma</i> sp.		X
Chordata - Vertebrate	0.12%	
Actinopterygii	0.12%	
Detritus	0.58%	
UNKNOWN	0.06%	X
Human debris	0.12%	X
Human debris	0.12%	X
Human debris- Fishing Gear	0.12%	X
Human debris- fishing line		X
Human debris- anchor line	0.12%	X
Human debris- long line		X
Habitat	75.56%	
Bare Hard Bottom Substrate	48.77%	
Dead Coral	0.06%	
Bare coral rubble	0.06%	
Hard bottom	48.71%	
Bare rock, pavement, boulder, ledge	43.86%	
Bare rubble/cobble	4.85%	
Bare Soft Bottom Substrate	26.78%	
Grand Total	100.00%	

Dive Site: Florida, Outside North Florida MPA; NF-03; 60 m; ROV 19-28; UNCW 734; 17-VI-19-3

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-28.

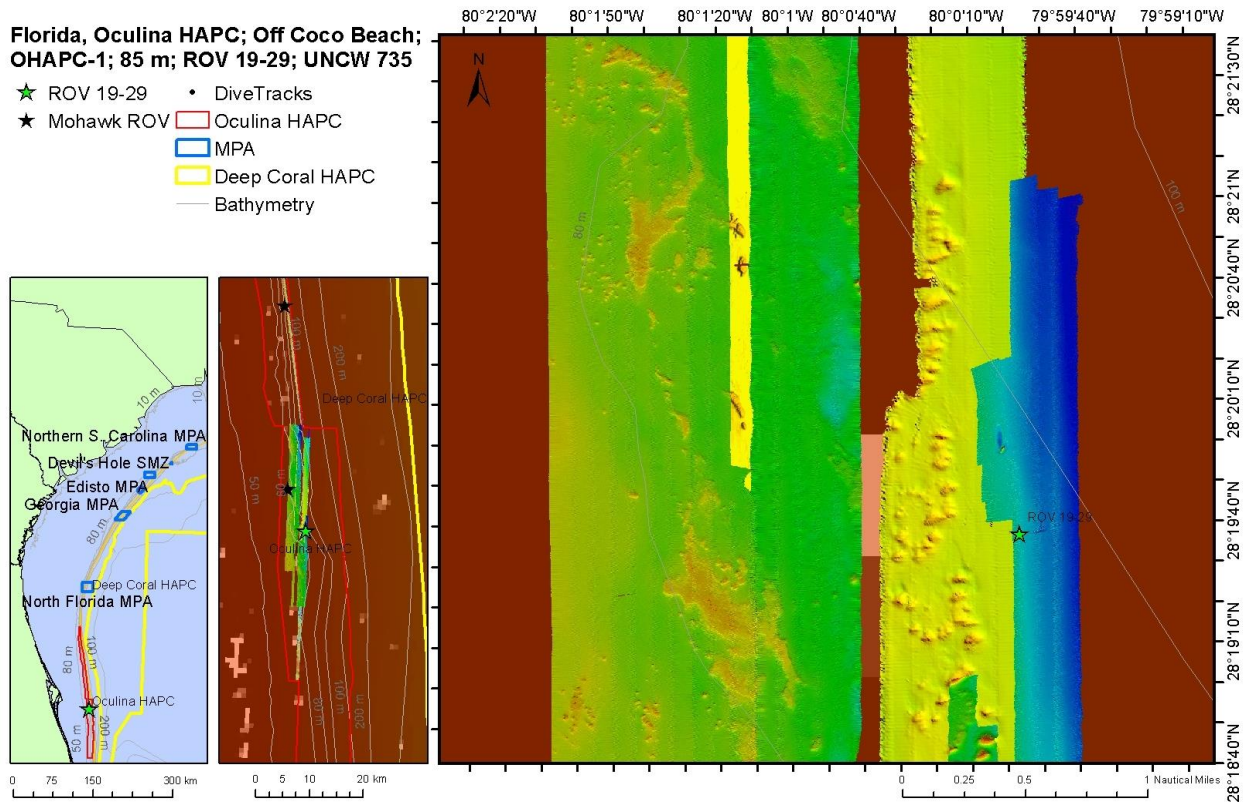
Class/Order/Family/Taxa Author - Common Name	ROV 19-28
Actinopterygii	
Anguilliformes	
Muraenidae	
Muraenidae - Moray Eels (Fam.)	0.15
Beryciformes	
Holocentridae	
Holocentridae - Squirrelfishes, Soldierfishes (Fam.)	0.61
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	4.70
<i>Myripristis jacobus</i> Cuvier, 1829 - Blackbar Soldierfish	1.52
<i>Plectrypops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish	0.45
Perciformes	
Acanthuridae	
<i>Acanthurus</i> sp. - Surgeonfish	0.15
Carangidae	
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	0.30
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	1.21
Chaetodontidae	
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	0.61
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	11.83
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	4.24
Haemulidae	
<i>Haemulon aurolineatum</i> Cuvier, 1830 - Tomtate Grunt	386.60
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	0.15
Labridae	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	5.31
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	1.21
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	0.15
Lutjanidae	
<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper	2.27
<i>Lutjanus griseus</i> (Linnaeus, 1758) - Grey Snapper	2.43
<i>Lutjanus</i> sp. - Snapper	0.15
<i>Rhomboplites aurorubens</i> (Cuvier, 1829) - Vermilion Snapper	226.65
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	9.70
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	0.30
Pomacentridae	
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reefish	23.95

Dive Site: Florida, Outside North Florida MPA; NF-03; 60 m; ROV 19-28; UNCW 734; 17-VI-19-3

<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	2.43
<i>Chromis scotti</i> Emery, 1968 - Purple Reeffish	13.80
<i>Chromis</i> sp. - Damselfish/chromis	8.19
Priacanthidae	
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	0.30
Sciaenidae	
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	4.24
Serranidae/-	
Serranidae - Sea Bass and Groupers	0.15
Serranidae/Epinephelinae	
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	0.30
<i>Gonioplectrus hispanus</i> (Cuvier, 1828) - Spanish Flag	0.15
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	0.91
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	1.52
<i>Paranthias furcifer</i> (Valenciennes, 1828) - Creole-fish	0.15
Serranidae/Serraninae	
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	0.76
<i>Serranus tigrinus</i> (Bloch, 1790) - Harlequin Bass	0.15
Sparidae	
<i>Calamus</i> sp. - Porgy	0.15
Sphyraenidae	
<i>Sphyraena barracuda</i> (Edwards, 1771) - Great Barracuda	0.45
Scorpaeniformes	
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	6.37
Tetraodontiformes	
Ostraciidae	
<i>Acanthostracion polygonius</i> Poey, 1876 - Honeycomb Cowfish	0.15
<i>Acanthostracion quadricornis</i> (Linnaeus, 1758) - Scrawled Cowfish	0.15
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	13.34

Dive Site: Florida, Oculina HAPC; Off Coco Beach; OHAPC-1; 85 m; ROV 19-29; UNCW 735; 18-VI-19-1

General Location and Dive Track:



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Shepard_2005_Oculina_2mD D

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/18/2019

Specimens: 0

Digital Photos: 0

No. DVD: 1

Hard Drive No.: 1

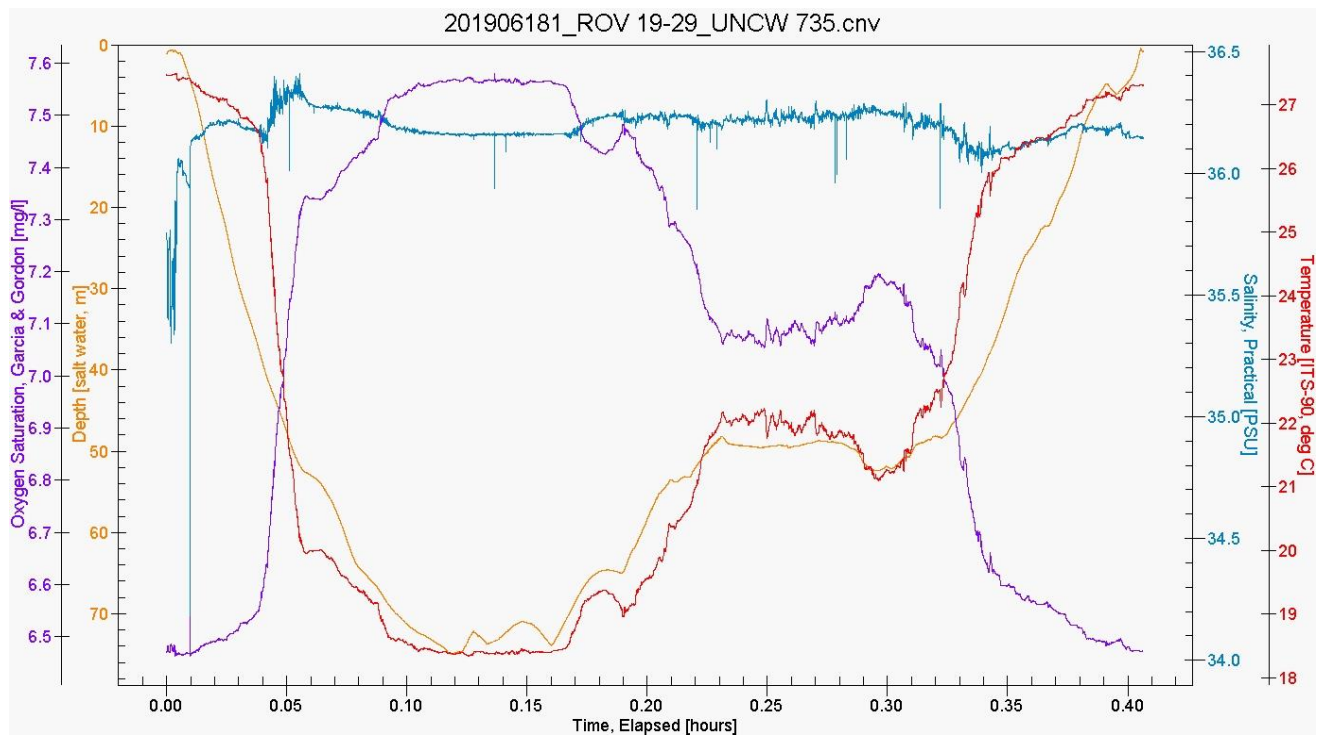
Dive Site: Florida, Oculina HAPC; Off Coco Beach; OHAPC-1; 85 m; ROV 19-29; UNCW 735; 18-VI-19-1

Dive Data:

Minimum Bottom Depth (m): -72.2	Total Transect Length (km):
Maximum Bottom Depth (m): -77.8	Surface Current (kn): 3.1
On Bottom (Time- EDST): 7:17	On Bottom (Lat/Long): N/A
Off Bottom (Time- EDST): 7:42	Off Bottom (Lat/Long): N/A
Physical (bottom); Temp (°C): 27.5	Salinity: 35.72 Visibility (m): N/A Current (kn): N/A

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-29 are as follows: Depth Maximum: 75 m, Temperature: 18.35-27.47 °C, Salinity: 34-36.4 PSU, Oxygen Saturation: 6.5-7.6 mg/l.

Dive Site: Florida, Oculina HAPC; Off Coco Beach; OHAPC-1; 85 m; ROV 19-29; UNCW 735; 18-VI-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 18-VI-19-1; ROV 19-29, UNCW Dive 735; Florida, Oculina HAPC, shipwreck off Cocoa Beach, 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV.

Site Description/Habitat/Biota (observations during dive):

Depth range: m

MB map shows shipwreck off oriented NE-SW, flat end to south, bow north, depth on top of wreck 77.7 m, south sand- 86.1 m, scour on north side, 91.5 m.

Weather- Sunny, 2-3 ft from SW, wind 13 kn from 207 dg, air- 26.66 C, surface water- 27.25 C, salinity- 35.25, current- 2.6- 3.2 kn to 359 dg.

7:17- Launch; launched 650 m south of wreck, ROV 15 m off bottom unable to get to bottom, Pisces drifted 198 m east of wreck, temp at 75 m- 18.5 C

7:28- abort dive.

Dive Site: Florida, Oculina HAPC; Off Coco Beach; OHAPC-1; 85 m; ROV 19-29; UNCW 735

Percent Cover of Benthic Macro-Biota and Substrate:

Camera failed, no images for Point Count analysis.

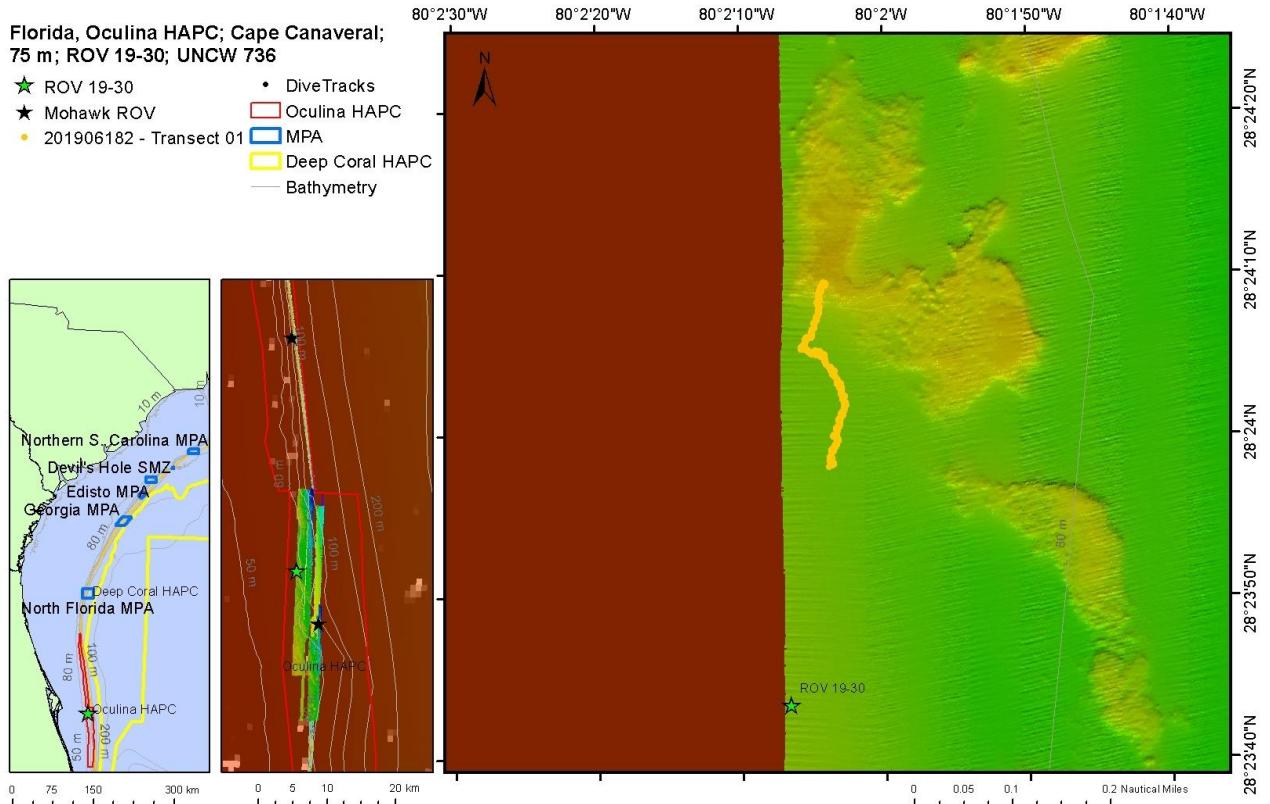
Dive Site: Florida, Oculina HAPC; Off Coco Beach; OHAPC-1; 85 m; ROV 19-29; UNCW 735

Density of Fish:

Fish analysis not completed.

Dive Site: Florida, Oculina HAPC; Cape Canaveral; 75 m; ROV 19-30; UNCW 736; 18-VI-19-2

General Location and Dive Track:



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Shepard_2005_Oculina_2mD D

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/18/2019

Specimens: 0

Digital Photos: 11

No. DVD: 1

Hard Drive No.: 1

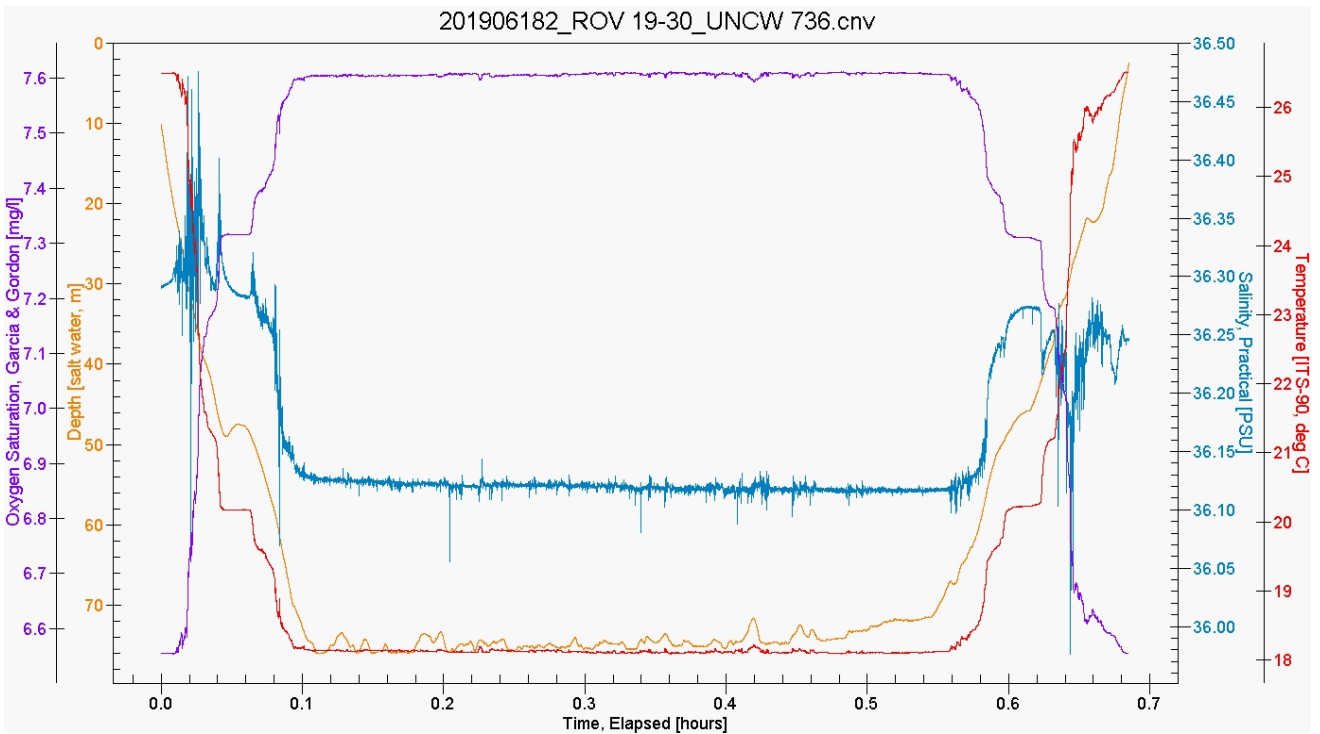
Dive Site: Florida, Oculina HAPC; Cape Canaveral; 75 m; ROV 19-30; UNCW 736; 18-VI-19-2

Dive Data:

Minimum Bottom Depth (m): -11.2	Total Transect Length (km): 0.375
Maximum Bottom Depth (m): -28.3	Surface Current (kn): 2.2
On Bottom (Time- EDST): 9:38	On Bottom (Lat/Long): 28.3995°N; -80.0344°W
Off Bottom (Time- EDST): 10:04	Off Bottom (Lat/Long): 28.4026°N; -80.0345°W
Physical (bottom); Temp (°C): 18.1	Salinity: 36.13 Visibility (m): 1 Current (kn): N/A

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-30 are as follows: Depth Maximum: 76 m, Temperature: 18.09-18.22 °C, Salinity: 36.1-36.1 PSU, Oxygen Saturation: 7.6-7.6 mg/l.

Dive Site: Florida, Oculina HAPC; Cape Canaveral; 75 m; ROV 19-30; UNCW 736; 18-VI-19-2

Dive Imagery:



Figure 1: 28°24.0471'N;80°2.0495'W: -75.8 m
Water column seen before the failed dive



Figure 2: 28°24.069'N;80°2.062'W: -75.5 m
Water column seen before the failed dive

Dive Site: Florida, Oculina HAPC; Cape Canaveral; 75 m; ROV 19-30; UNCW 736; 18-VI-19-2

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 18-VI-19-2; ROV 19-30, UNCW Dive 736; Florida, Oculina HAPC, low relief hard bottom, off Cape Canaveral, 75 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV.

Site Description/Habitat/Biota (observations during dive):

Depth range: 72- 78 m

MB map shows low relief flat top knolls west of high relief Oculina mounds, depth 75 m with 1-2 m relief knolls.

Weather- Sunny, 2-3 ft from SW, wind 14 kn from 202 dg, air- 26.94 C, surface water- 26.47 C, salinity- 35.76, current- 2.2 kn to 355 dg.

9:30- Launch

9:38- On bottom- 78 m; visibility- 1 m (nepheloid layer at 8 m above bottom), current- 0.5 kn from S , 18.1 C; 250 m sw of WP; flat sand.

9:53- 76.5 m, south of knoll; flat sand, shell.

10:00- 75.5 m, south base of knoll on MB, flat sand; 74m, 73.5 m, sand, rubble; top of knoll 72 m, sand, rubble, some algae (hard to see, low vis).

10:04- end dive, near zero vis.

Dive Site: Florida, Oculina HAPC; Cape Canaveral; 75 m; ROV 19-30; UNCW 736; 18-VI-19-2

CPCe Percent Cover Analysis:

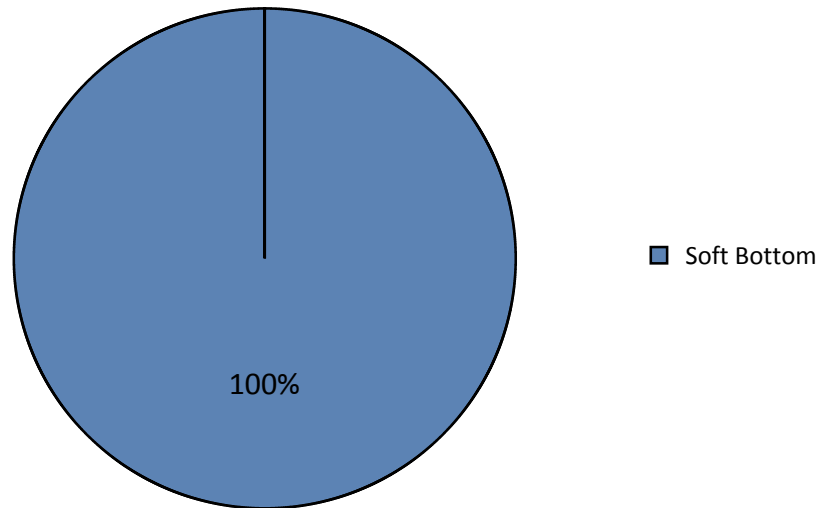
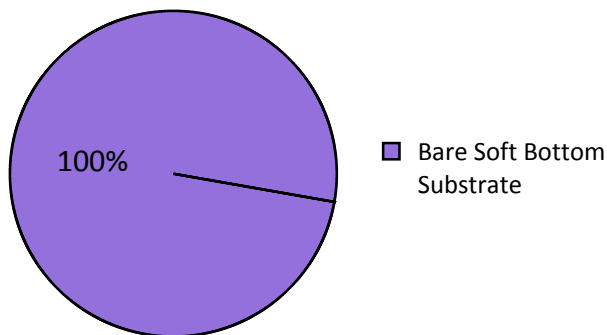


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-30. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-30. 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: Florida, Oculina HAPC; Cape Canaveral; 75 m; ROV 19-30; UNCW 736

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-30.

	%	Notes
Biota		X
Detritus		X
Habitat	100.00%	
Bare Soft Bottom		
Substrate	100.00%	
Grand Total	100.00%	

Dive Site: Florida, Oculina HAPC; Cape Canaveral; 75 m; ROV 19-30; UNCW 736

Density of Fish:

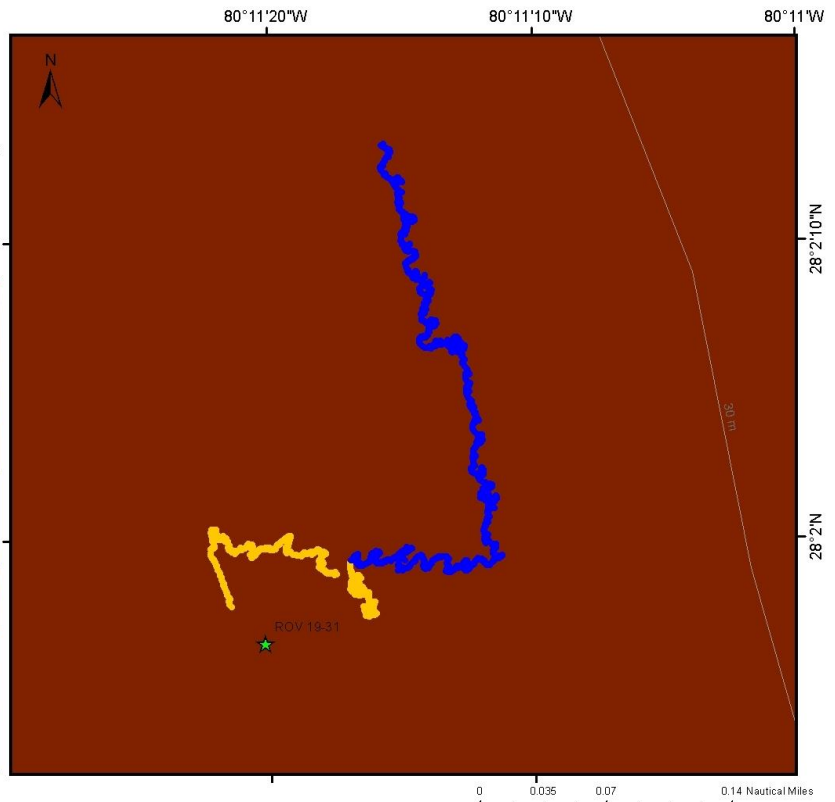
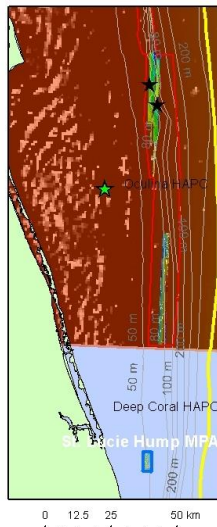
Fish analysis not completed for dive site ROV 19-30.

Dive Site: Florida, Outside OHAPC 90' Reef, Melbourne; 30 m; ROV 19-31; UNCW 737; 18-VI-19-3

General Location and Dive Track:

Florida, Outside OHAPC 90' Reef,
Melbourne; 30 m; ROV 19-31; UNCW 737

- ★ ROV 19-31
- ★ Mohawk ROV
- 201906183 - Transect 01
- 201906183 - Transect 02
- DiveTracks
- Oculina HAPC
- MPA
- Deep Coral HAPC
- Bathymetry



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: None Available

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/18/2019

Specimens: 2

Digital Photos: 104

No. DVD: 2

Hard Drive No.: 1

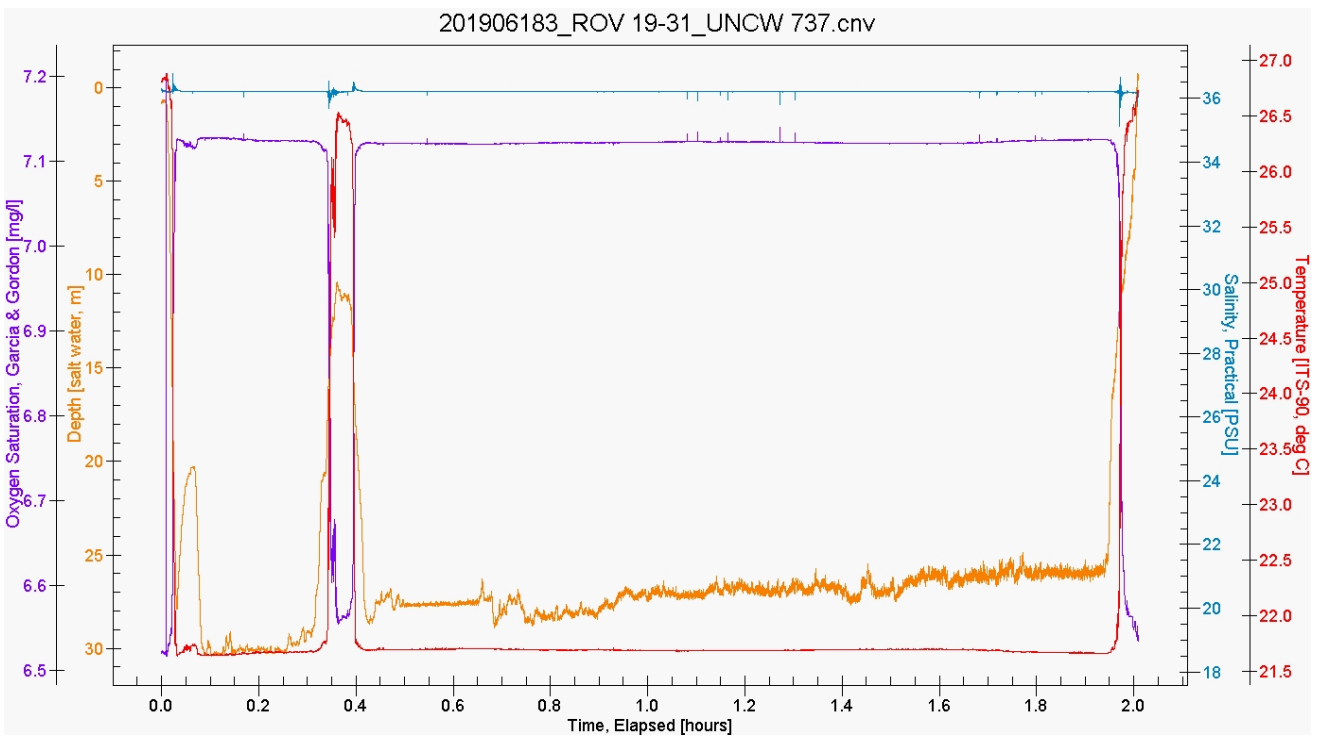
Dive Site: Florida, Outside OHAPC 90' Reef, Melbourne; 30 m; ROV 19-31; UNCW 737; 18-VI-19-3

Dive Data:

Minimum Bottom Depth (m): -26.9	Total Transect Length (km): 1.010
Maximum Bottom Depth (m): -29.9	Surface Current (kn): 0.6
On Bottom (Time- EDST): 13:51	On Bottom (Lat/Long): 28.0328°N; -80.1894°W
Off Bottom (Time- EDST): 15:46	Off Bottom (Lat/Long): 28.037°N; -80.1878°W
Physical (bottom); Temp (°C): 21.8	Salinity: 36.33 Visibility (m): 8 Current (kn): 0.1

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-31 are as follows: Depth Maximum: 30.4 m, Temperature: 21.64-26.53 °C, Salinity: 36-36.4 PSU, Oxygen Saturation: 6.6-7.1 mg/l.

Dive Site: Florida, Outside OHAPC 90' Reef, Melbourne; 30 m; ROV 19-31; UNCW 737; 18-VI-19-3

Dive Imagery:



Figure 1: 28°1.9586'N;80°11.2709'W: -28.6 m
Low relief hard bottom, sponges, octocorals, black corals



Figure 2: 28°2.0044'N;80°11.2006'W: -28.5 m
Bigeye (*Priacanthus arenatus*), Cubbyu (*Pareques umbrosus*)



Figure 3: 28°2.1056'N;80°11.2155'W: -29 m
Red grouper (*Epinephelus morio*)



Figure 4: 28°2.1065'N;80°11.2196'W: -28.7 m
Porgy (*Calamus* sp.) on low relief ledge habitat



Figure 5: 28°2.1075'N;80°11.222'W: -28.7 m
Yellowtail reeffish (*Chromis enchrysur*), various demosponges



Figure 6: 28°2.198'N;80°11.255'W: -28 m
Sea star (*Goniaster tessellatus*)

Dive Site: Florida, Outside OHAPC 90' Reef, Melbourne; 30 m; ROV 19-31; UNCW 737; 18-VI-19-3

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 18-VI-19-3; ROV 19-31, UNCW Dive 737; Florida, Outside OHAPC, 90 ft ledge off Melbourne Beach, 30 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV.

Site Description/Habitat/Biota (observations during dive):

Depth range: m

No multibeam; NOAA Regional Bathymetric Chart (NOAA Cape Canaveral 85.img) double ledge, facing west, west base 31 m, each ledge ~2 m, shallowest 27 m.

Weather- Sunny, 2 ft from SW, wind 12 kn from 171 dg, air- 27.33 C, surface water- 26.9 C, salinity- 35.83, current- 0.6 kn to 7 dg.

13:49- Launch

On bottom then floated up to 9 m off bottom.

13:54- On bottom- 32 m; visibility- 8 m, current- 0.1 fr SE, 21.6 C; 150 m west of reef, flat sand, shell hash, scallop shells, algae, scallop shells (dead) in E-W rows, clumps of brown algae.

14:09- west of reef, pulled of bottom.

14:14- on bottom, 29.5 m; west of reef; flat sand.

14:17- on reef, 28.5 m, flat pavement, 5 dg slope, covered with crinoids, sheep head, didemniidae.

14:20- 28.8 m, rock pavement. Thousands of black crinoids.

Sample 1- Black crinoids, Buckets 1-4.

14:28- xs along ridge, sheephead, grey trigger, layered rock, 20 dg slope, hd N; ½ m relief undercut ledge. Hd east to next ridge. 30 m- sand, N-S sand waves.

Dive Site: Florida, Outside OHAPC 90' Reef, Melbourne; 30 m; ROV 19-31; UNCW 737; 18-VI-19-3

14:46- 28.5 m low relief pavement ridge, no ledges, highhat, cyanobacteria, 28.5 m rock knoll, red blade algae.

14:54- 28.6 m, 25 cm ledge, didemnid, unid ascidian, hydroids, toadfish, highhat, cardinalfish, angelfish, hd north along contour where saw ledge on fathometer, rock knolls, 1 m relief, mostly algae, hydroids, bigeye, 10- 25 cm ledges, Polynices moon snail egg case, blue dartfish,

15:15- 29.1 m, 1 m ledge facing W, red grouper, lionfish, barnacles, *Stenorhynchus seticornis*, black sea bass, lobate brown sponge, reef butterflyfish, lionfish, horse conch with hermit crab, spiny starfish, *Halymenia* red blade algae, yellow didemndae.

15:30- 28.5 m, hd N, patchy hard bottom and low relief ledges, *Calamus* porgy.

15:38- 28 m, pavement knoll.

Sample- 2- *Goniaster*, spines on center, light yellow, 6 cm, (for Smithsonian Ecosystem Exhibit); Bin 1.

15:42- Continue N along 90' ridge system, very patchy.

15:46- 28 m, end dive.

Dominant Benthic Macrobiota:

Hydrioda

Porifera- brown lobate sponge- *Ircinia?*

Echinodermata- Crinoidea, spiny starfish, *Goniaster*

Decapoda- Paguridae, *Stenorhynchus seticornis*

Ascidiacea- Didemnidae, unid. spp.

Algae- Phaeophyta, red blade, *Halymenia*, cyanobacteria

Samples- 2

Crinoid, *Goniaster*

CPCe Percent Cover Analysis:

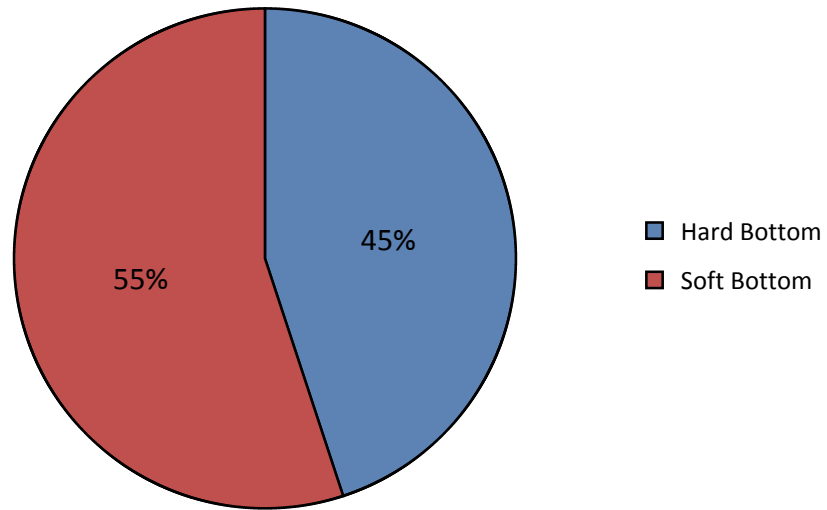
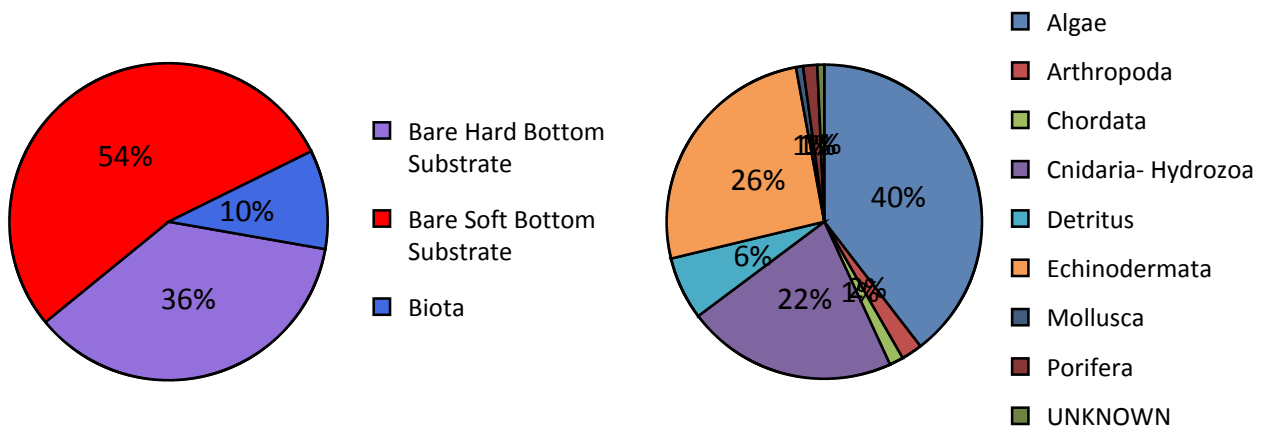


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-31. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-31. 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: Florida, Outside OHAPC 90' Reef, Melbourne; 30 m; ROV 19-31; UNCW 737; 18-VI-19-3

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Samples, dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-31.

	%	Notes	Samp.
Biota	10.47%	X	X
Algae	4.14%	X	
Cyanobacteria	3.47%		
Ochrophyta	0.08%	X	
Rhodophyta	0.60%	X	
<i>Halymenia</i> sp.		X	
Rhodophyta	0.60%		
Porifera	0.15%	X	
Demospongiae	0.15%	X	
Cnidaria- Hydrozoa	2.26%	X	
Hydrozoa	2.26%	X	
Hydroidolina	2.26%	X	
Mollusca	0.08%	X	
Gastropoda	0.08%	X	
Gastropoda	0.08%		
Naticidae- Egg Case		X	
Arthropoda	0.23%	X	
Crustacea	0.23%	X	
Anomura		X	
Cirripedia	0.23%		
<i>Stenorhynchus seticornis</i> (Herbst, 1788)		X	
Echinodermata	2.71%	X	X
Asteroidea		X	X
Asteroidea		X	
Goniasteridae			X
<i>Luidia</i> sp.		X	
Crinoidea	2.56%	X	X
<i>Comactinia meridionalis</i> (L. Agassiz, 1865)	2.56%		
Crinoidea		X	X
Echinoidea	0.15%		
<i>Arbacia punctulata</i> (Lamarck, 1816)	0.08%		
<i>Eucidaris tribuloides</i> (Lamarck, 1816)	0.08%		
Chordata	0.15%	X	
Chordata - Invertebrate	0.15%	X	
Ascidiacea		X	
Didemnidae	0.15%	X	

Dive Site: Florida, Outside OHAPC 90' Reef, Melbourne; 30 m; ROV 19-31; UNCW 737; 18-VI-19-3

Detritus	0.68%
UNKNOWN	0.08%
Habitat	89.53%
Bare Hard Bottom Substrate	37.68%
Hard bottom	37.68%
Bare rock, pavement, boulder, ledge	19.14%
Bare rubble/cobble	18.54%
Bare Soft Bottom Substrate	51.85%
Grand Total	100.00%

Dive Site: Florida, Outside OHAPC 90' Reef, Melbourne; 30 m; ROV 19-31; UNCW 737; 18-VI-19-3

Density of Fish:

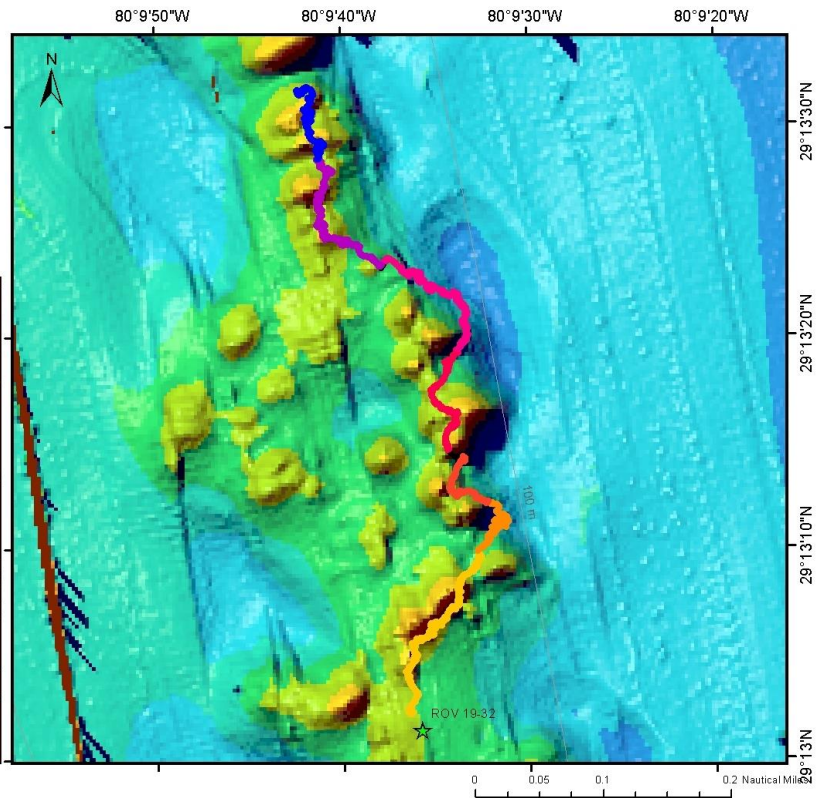
Table 2. Fish analysis no completed at dive site ROV 19-31.

Dive Site: Florida, OHAPC; 80 m ROV 19-32; UNCW 738; 19-VI-19-1

General Location and Dive Track:

Florida, OHAPC; 80 m ROV 19-32;
UNCW 738

- ★ ROV 19-32
- ★ Mohawk ROV
- 201906191 - Transect 01
- 201906191 - Transect 02
- 201906191 - Transect 03
- 201906191 - Transect 04
- 201906191 - Transect 05
- 201906191 - Transect 06
- 201906191 - Transect 07
- DiveTracks
- Oculina HAPC
- MPA
- Deep Coral HAPC
- Bathymetry



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: Pisces_2011_Oculina_Daytona_2_MB_TIF

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/19/2019

Specimens: 8

Digital Photos: 152

No. DVD: 1

Hard Drive No.: 1

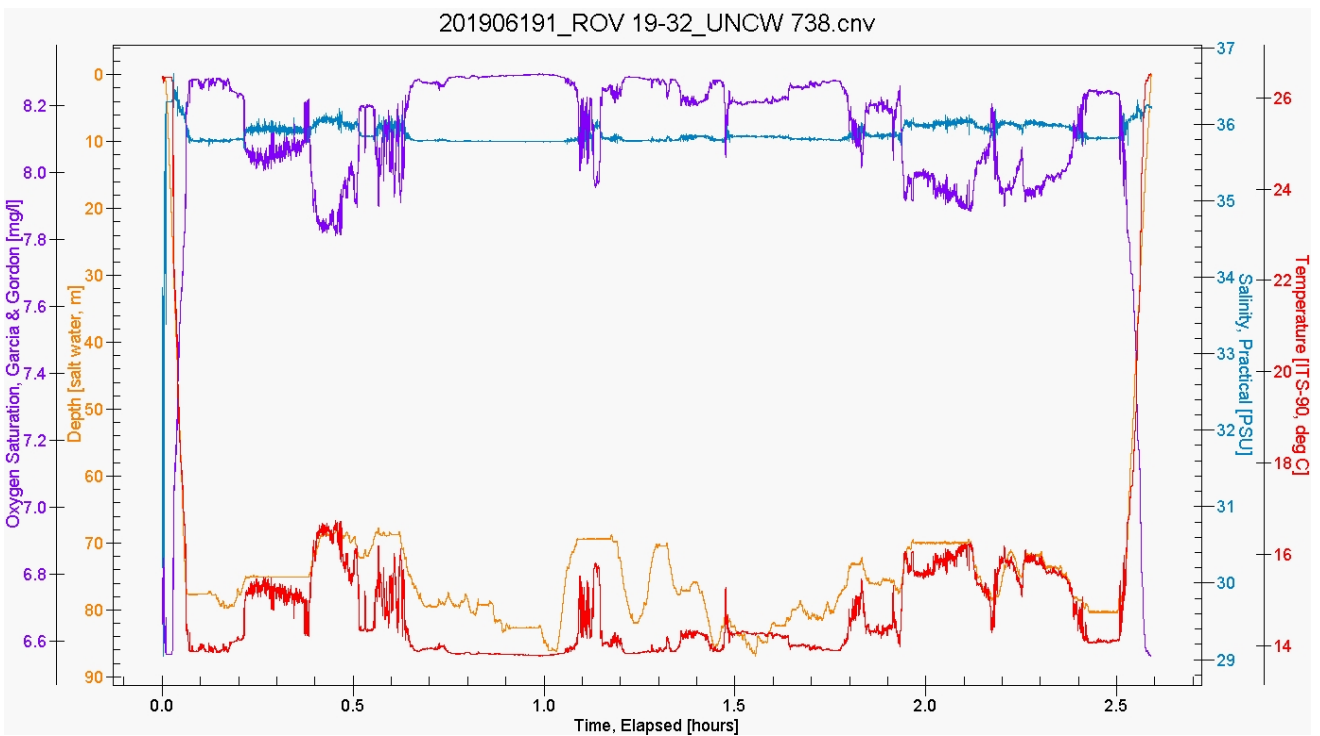
Dive Site: Florida, OHAPC; 80 m ROV 19-32; UNCW 738; 19-VI-19-1

Dive Data:

Minimum Bottom Depth (m): -68.8	Total Transect Length (km): 1.283
Maximum Bottom Depth (m): -88.2	Surface Current (kn): 0.3
On Bottom (Time- EDST): 7:14	On Bottom (Lat/Long): 29.2173°N; -80.1601°W
Off Bottom (Time- EDST): 9:40	Off Bottom (Lat/Long): 29.2254°N; -80.1617°W
Physical (bottom); Temp (°C): 16.6	Salinity: 36.11 Visibility (m): N/A Current (kn): 0.2

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-32 are as follows: Depth Maximum: 86.9 m, Temperature: 13.79-16.73 °C, Salinity: 35.7-36.2 PSU, Oxygen Saturation: 7.8-8.3 mg/l.

Dive Site: Florida, OHAPC; 80 m ROV 19-32; UNCW 738; 19-VI-19-1

Dive Imagery:



Figure 1: 29°13.0778'N;80°9.6037'W: -76.6 m
Basket starfish on dead coral



Figure 2: 29°13.1176'N;80°9.5681'W: -70.1 m
Cake sponge (*Ircinia* sp.)

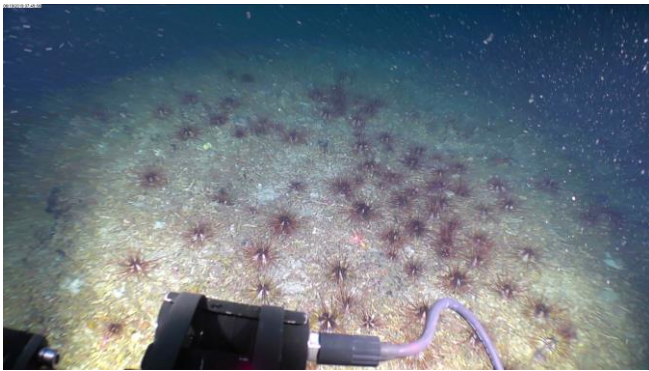


Figure 3: 29°13.1197'N;80°9.5659'W: -70.1 m
Spawning (?) aggregation of sea urchins (*Coelopleurus floridanus*) on top of *Oculina* mound



Figure 4: 29°13.366'N;80°9.5666'W: -86.1 m
Oculina coral rubble, hermit crab



Figure 5: 29°13.3732'N;80°9.5864'W: -83.8 m
Scamp (*Myxeroperca phenax*) with 'Cat Paw' color pattern on rock ledges of *Oculina* mound



Figure 6: 29°13.5099'N;80°9.6925'W: -75.3 m
Scamp (*Myxeroperca phenax*)

Dive Site: Florida, OHAPC; 80 m ROV 19-32; UNCW 738; 19-VI-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 19-VI-19-1; ROV 19-32, UNCW Dive 738; Florida, OHAPC, 80 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV.

Site Description/Habitat/Biota (observations during dive):

Depth range: 69.9- 86 m

MB map shows row of high relief *Oculina* mounds oriented N-S, the individual mounds are oblong shaped oriented E-W, peaks- , base- , scour areas- m; Multibeam- map offset to N 15- 20 m,

Weather- Sunny, 2 ft from SW, wind 10 kn from 231 dg, air- 25.86 C, surface water- 26.51 C, salinity- 35.0, current- 0.3 kn to 300 dg.

7:09- Launch

7:13- On bottom- 79.5 m; visibility- 10 m, current- 0.2 fr SE, 13.9 C; in valley between mounds, 100% coral rubble and worm tubes- Terebellidae, red snapper, tattler, Hd N. *Calappa* crab, Cerianthidae, *Eucidaris*.

7:24- 10 cm *Oculina* standing dead with basket star, 76.7 m.

Sample 1- *Oculina varicosa*, dead (for Smithsonian Ecosystem Exhibit- *Oculina* tank); Bin, Bucket 4.

Sample 2- Gorgocephalidae, on coral (for Smithsonian Ecosystem Exhibit- *Oculina* tank).

Sample 8- *Cocinasterias tenuispina* (for Smithsonian Ecosystem Exhibit- *Oculina* tank).

7:32- Cont xs, Mound 1- 73.3 m, upper slope, 4 live coral 10 cm, mounds of *Chondrilla* brown, zoanthidae, 2 live *Oculina*, 69.9 m top, several live coral, anemone, orange encrusting sponges, *Narcissia trigonaria*, *Goniaster*, flying gurnard, 2 live coral, standing dead, Spirastrellidae, yellow spherical sponge, 71 m on top, live coral, 15 cm *Dictyoceratida*, spawning aggregation, 70.1 m top, *Coelopleurus floridanus*, dozens, 69.9 m minimum depth, at east end of Mound 1 peak, 5 cm live *Oculina*, Cerianthidae.

Dive Site: Florida, OHAPC; 80 m ROV 19-32; UNCW 738; 19-VI-19-1

7:49- hd down NE slope, bigeye, *Stichopathes luetkeni*, base 80.8 m, rock outcrops, 15 cm live *Oculina*, bushy yellow Axinellid, toadfish, some 10-20 cm holes in rock, Almaco.

7:55- west base of Mound 2 on MB, 100% coral rubble, Paguridae, 80.5, several m rock outcrop, solution hole, S base of Mound 2, *Centrostephanus*, 1.5 m cave, scorpionfish, cubbyu, bank butterflyfish, red snapper-2.

8:00- HD video drive failed, hot temp signal, bank sea bass, still on smooth rock ledges, 84.5 m, 4 m relief, solution holes, standing dead coral.

8:10- 87 m, rock boulders, outcrops, base- 87.5 m, 100% coral rubble in valley, hd Mound 3.

8:13- east slope of Mound 3, hd NW upslope, 72.6 m near peak, 100% CR,

8:17- 70.6 m, near peak, 10 cm live coral.

Sample 3- *Oculina varicosa*, 10 cm white live (for Smithsonian Ecosystem Exhibit- *Oculina* tank).

8:21- top peak 3, 2- red snapper, no lionfish so far, hd down N slope. 81.5 m, NE base of Mound 3, 100% CR, Cerianthidae.

8:27- 75.5 m, N slope of Mound 4, dense population of *Centrostephanus*, standing dead, 10 cm live *Oculina*, *Chondrilla* brown encrusting, 71.7 m peak. Mound 4 and 5 merge together, ½ kn from SE.

8:32- 78.5 m, W slope of Mound 5; 100% CR, Cerianthidae, *Nidalia*, batfish, hd down NE slope of Mound 5 to large scour, 87 m at west edge of scour.

8:37- 87 m, 100% CR, hermit crab.

8:42- 87 m, east base of Mound 6, 100% CR; 86 m, NE lower slope, scamp, red porgy, red snapper, 83.8 m exposed smooth rock ledges, scamp, bank butterflyfish, snowy grouper, 25 cm ledges undercut, NE base of Mound 6, red snapper, anthiid, 2 snowy grouper, lionfish, 2 m relief rock, *Antipathes furcata*, solution holes, 83 m, hd NW along rock outcrop toward next *Oculina* mounds. 82 m another 2 m rock outcrop, *Stichopathes*.

8:55- 82.5 m still hd NW, 100% CR, hydroid, Terebellidae on coral rubble, SE base of Mound 7, several scamp, greyhead scamp.

9:00- east slope of Mound 7, 77.5 m, 100% CR, Corallimorpharia white knob, decorator crab, zoanthids, Polynices egg case, blue angelfish, standing dead coral, *Diodogorgia*, 15 cm live *Oculina*, 5 cm *Oculina*, 10 cm *Oculina*, *Tanacetipathes*, Mounds 7-12 all merge together, live *Oculina* 5 cm.

9:07- 72 m, Mound 8, several live white on top, *Nidalia*, *Chondrilla*, near peak Mound 8.

9:10- 72 m, *Pyncogonid*, *Cladocora*

Sample 4- *Pyncogonida*, Bucket 1 (DNA- Michelle Trautwein, Entomologist, California Academy of Science).

Sample 7- *Cladocora*

9:15- 71 m near peak, 100% dead coral

Sample 5- knobby nudibranch, orange, white (for Smithsonian Ecosystem Exhibit- *Oculina* tank), Bucket 2.

9:18- hd down NE slope of Mound 8. *Titanideum frauenfeldii*, Didemnidae; 80 m, NE base of Mound 8. 100% CR, standing dead coral, up south slope of Mound 9, *Chondrilla* mounds, zoanthids, near peak 73 m, amberjack, MB shows ROV on top of mound, actually 20 m north on slope.

9:26- 73.2 m near peak, aggregation of *Coelopluerus*, 50+, scamp, red snapper, gag grouper, school of amberjack, north slope of Mound 9, school of red snapper, scamp, greyhead scamp, 15.6 C, flat coral rubble, no ledge, 76 m NE slope, 80 m, rock outcrop, school of red snapper, scamp, smooth rock, undercut ledge.

9:36- 82 m, NE slope, *Eucidaris*, starfish

Sample 6- *Eucidaris tribuloides*, Bin 1; (for Smithsonian Ecosystem Exhibit- *Oculina* tank).

5 scamp in water column.

9:40- 82 m, end dive.

Dominant Benthic Macrobiota:

Scleractinia- *Oculina varicosa*- white, 5- 15 cm, common on upper slopes of some mounds; *Cladocora*

Antipatharia coral- *Stichopathes luetkeni*, *Tanacetipathes*, *Antipathes furcata*

Gorgonia coral- *Diodogorgia*, *Titanidium frauenfeldii*, *Nidalia*

Dive Site: Florida, OHAPC; 80 m ROV 19-32; UNCW 738; 19-VI-19-1

Corallimorpharia

Zoanthidae

Hydroida

Porifera- yellow sphere Demosponge, yellow bushy Axinellida, *Chondrilla*, Spirastrellidae, *Dictyoceratida*

Annelida- Terebellidae, Cerianthidae

Mollusca- *Polynices* egg case, Nudibranch

Echinodermata- *Eucidaris tribuloides*, *Cocinasterias tenuispina*, Gorgonocephalidae, *Narcissia trigonaria*, *Coelopleurus floridanus*

Decapoda- *Calappa* shame-face crab, Paguridae,

Pycnogonida

Ascidiacea- Didemnidae encrusting

Samples- 8

Live for Smithsonian Ecosystem Exhibit- Oculina tank: *Oculina varicosa* (live and dead specimens), Gorgonocephalidae, *Cocinasterias tenuispina*, *Eucidaris tribuloides*

Pycnogonida- (DNA- Michelle Trautwein, Entomologist, California Academy of Science).

Cladocora sp. - HBOM

CPCe Percent Cover Analysis:

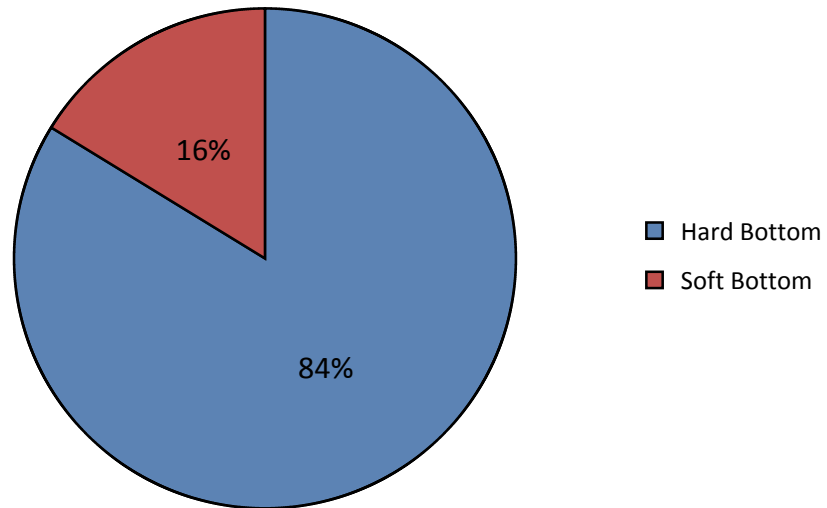
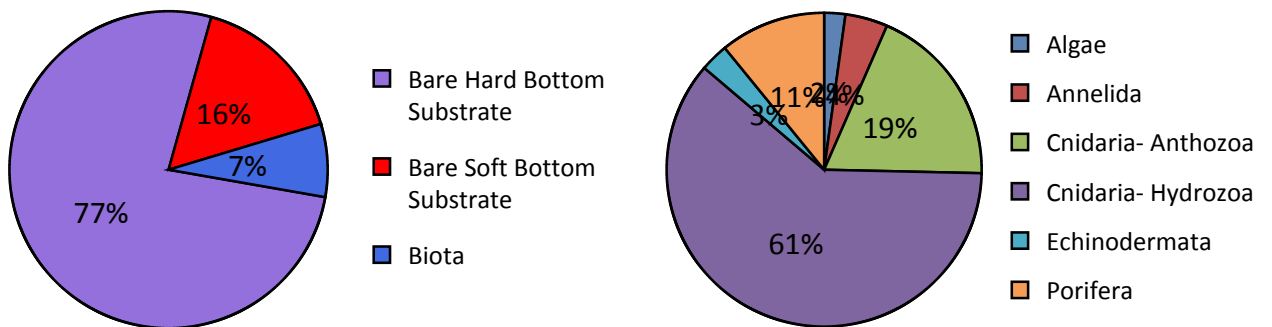


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-32. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-32.

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: Florida, OHAPC; 80 m ROV 19-32; UNCW 738

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-32.

	%	Notes	Samp.
Biota	7.44%	X	X
Algae	0.16%		
Rhodophyta	0.16%		
Corallinales	0.16%		
Porifera	0.81%	X	
Demospongiae	0.81%	X	
Axinellidae		X	
<i>Chondrilla</i> sp.	0.05%	X	
Demospongiae	0.75%	X	
Dictyoceratida		X	
Spirastrellidae		X	
Cnidaria- Hydrozoa	4.53%	X	
Hydrozoa	4.53%	X	
Hydroidolina	4.53%	X	
Cnidaria- Anthozoa	1.40%	X	X
Alcyonacea - Alcyoniina	0.05%	X	
<i>Nidalia occidentalis</i> Gray, 1835	0.05%		
<i>Nidalia</i> sp.		X	
Alcyonacea - gorgonian		X	
<i>Diodogorgia</i> sp.		X	
<i>Titanideum frauenfeldii</i> (Kölliker, 1865)		X	
Anthozoa - Non Coral	1.19%	X	
Actiniaria	0.11%		
Cerianthidae	0.22%	X	
Zoanthidae	0.86%	X	
Antipatharia		X	
<i>Antipathes furcata</i> Gray, 1857		X	
<i>Stichopathes luetkeni</i> Brook, 1889		X	
<i>Tanacetipathes</i> sp.		X	
Coral- Scleractinia	0.16%	X	X
<i>Cladocora</i> sp.	0.05%	X	X
<i>Oculina varicosa</i> Le Sueur, 1820		X	X
Scleractinia- unid cup	0.11%	X	
Annelida	0.32%	X	
Annelida	0.05%		
Polychaeta	0.27%	X	

Dive Site: Florida, OHAPC; 80 m ROV 19-32; UNCW 738

Terebellidae	0.27%	X	
Mollusca		X	X
Gastropoda		X	X
Naticidae- Egg Case		X	
Nudibranchia			X
Arthropoda		X	X
Chelicerata			X
<i>Anoplodactylus lentus</i> Wilson, 1878			X
Crustacea		X	
Anomura		X	
<i>Calappa</i> sp.			
		X	
Echinodermata	0.22%	X	X
Asteroidea		X	X
Asteroidea		X	
<i>Coscinasterias tenuispina</i> (Lamarck, 1816)			X
Goniasteridae		X	
<i>Narcissia trigonaria</i> Sladen, 1889		X	
Echinoidea	0.05%	X	X
<i>Centrostephanus longispinus</i> (Philippi, 1845)		X	
<i>Clypeaster</i> sp.		X	
<i>Coelopleurus floridanus</i> A. Agassiz, 1872		X	
<i>Eucidaris</i> sp.			X
<i>Eucidaris tribuloides</i> (Lamarck, 1816)	0.05%	X	
Ophiuroidea	0.16%		X
<i>Astrophyton muricatum</i> (Lamarck, 1816)			X
Ophiuroidea	0.16%		
Habitat	92.56%	X	X
Bare Hard Bottom Substrate	76.55%	X	X
Dead Coral	62.10%	X	X
Bare coral rubble	61.94%	X	
dead standing Scleractinia (habitat)	0.16%		
dead standing Oculina (habitat)		X	X
Hard bottom	14.45%		
Bare rock, pavement, boulder, ledge	11.11%		
Bare rubble/cobble	3.34%		
Bare Soft Bottom Substrate	16.01%		
Grand Total	100.00%		

Dive Site: Florida, OHAPC; 80 m ROV 19-32; UNCW 738

Density of Fish:

Table 2. Density (# individuals/1000 m²) of fish from video transects at dive site ROV 19-32.

Class/Order/Family/Taxa Author - Common Name	ROV 19-32
Actinopterygii	
Batrachoidiformes	
Batrachoididae	
<i>Opsanus</i> sp. - Toadfish	0.16
Lophiiformes	
Ogcocephalidae	
<i>Ogcocephalus</i> sp. - Batfish	0.33
Perciformes	
Carangidae	
<i>Seriola rivoliana</i> Valenciennes, 1833 - Longfin Yellowtail	0.16
<i>Seriola</i> sp. - Amberjack	1.15
Chaetodontidae	
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	4.61
Labridae	
<i>Decodon puellaris</i> (Poey, 1860) - Red Hogfish	0.66
<i>Halichoeres bathyphilus</i> (Beebe & Tee-Van, 1932) - Greenband Wrasse	0.82
<i>Halichoeres</i> sp. - Wrasse	11.37
Lutjanidae	
<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper	2.80
Pomacanthidae	
<i>Holacanthus</i> sp. - Angelfish	0.33
Pomacentridae	
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reef fish	1.32
Priacanthidae	
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	4.61
Sciaenidae	
<i>Pareques umbrosus</i> (Jordan & Eigenmann, 1889) - Cubbyu	8.24
Serranidae/Anthiadae	
Anthiadae - Sea Bass: Groupers And Fairy Basslets (Fam.)	0.82
<i>Hemanthias vivanus</i> (Jordan & Swain, 1885) - Red Barbier	3.79
<i>Hyporthodus niveatus</i> (Valenciennes, 1828) - Snowy Grouper	0.66
<i>Plectranthias garrupellus</i> Robins & Starck, 1961 - Apricot Bass	0.16
<i>Pronotogrammus martinicensis</i> (Guichenot, 1868) - Roughtongue Bass	1.98
Serranidae/Epinephelinae	
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	0.49
<i>Mycteroperca microlepis</i> (Goode & Bean, 1879) - Gag	0.16

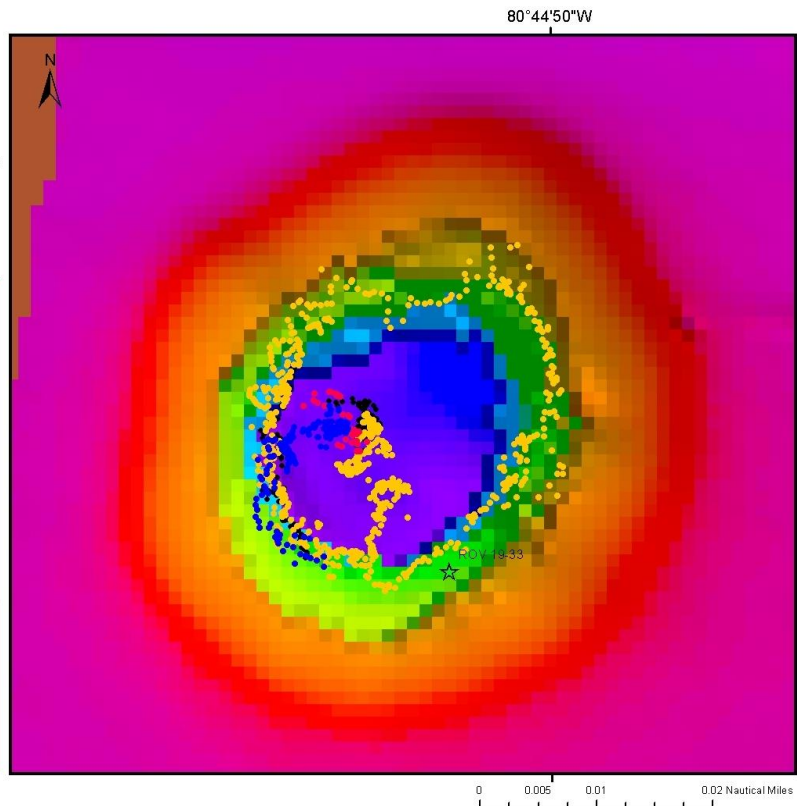
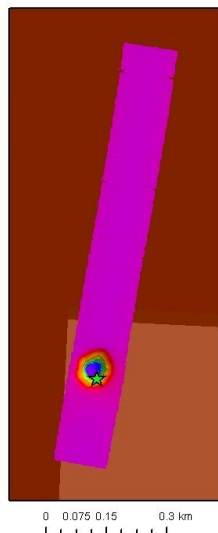
Dive Site: Florida, OHAPC; 80 m ROV 19-32; UNCW 738

<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	1.15
Serranidae/Serraninae	
<i>Centropristis ocyurus</i> (Jordan & Evermann, 1887) - Bank Sea Bass	2.14
<i>Serranus phoebe</i> Poey, 1851 - Tattler	9.06
Sparidae	
<i>Pagrus pagrus</i> (Linnaeus, 1758) - Red Porgy	0.49
Scorpaeniformes	
Dactylopteridae	
<i>Dactylopterus volitans</i> (Linnaeus, 1758) - Flying Gurnard	0.16
Scorpaenidae	
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	0.33
Scorpaenidae - Scorpionfishes Or Rockfishes (Fam.)	3.29
Tetraodontiformes	
Tetraodontidae	
<i>Canthigaster</i> sp. - Sharpnose Puffer Sp.	0.33

Dive Site: Florida, Red Snapper Sinkhole- St. Augustine; 30 m ROV 19-33; UNCW 739; 19-VI-19-2

General Location and Dive Track:

- Florida, Red Snapper Sinkhole-
St. Augustine; 30 m ROV 19-33; UNCW 739
- ★ ROV 19-33
 - ★ Mohawk ROV
 - 201906192 - Transect 01
 - 201906192 - Transect 02
 - 201906192 - Transect 03
 - DiveTracks
 - Oculina HAPC
 - MPA
 - Deep Coral HAPC
 - Bathymetry



Site Overview:

Project: MPA Grant

Principal Investigator: Stacey Harter

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

Scientific Observers: John Reed, Stephanie Farrington, Andrew W. David, Stacey Harter, Jason White, Eric Glidden, Kate Overly

ROV Navigation Data: TrackLink

Ship Position System: DGPS

Report Analyst: John Reed, Stephanie Farrington

Date Compiled: 8/12/2020

Data Management: Access Database

Dive Overview:

Vessel: NOAA Ship *Pisces* Cruise 19-02

Sonar Data: NF_EM710_RedSnapperSink_2m.tiff

Purpose: Survey the SAFMC Shelf Edge MPAs

Vehicle: Mohawk ROV

Sensors: Temperature (°C), Salinity (PSU), Dissolved Oxygen (% sat), Conductivity, Depth (m)

Date of Dive: 6/19/2019

Specimens: 0

Digital Photos: 101

No. DVD: 1

Hard Drive No.: 1

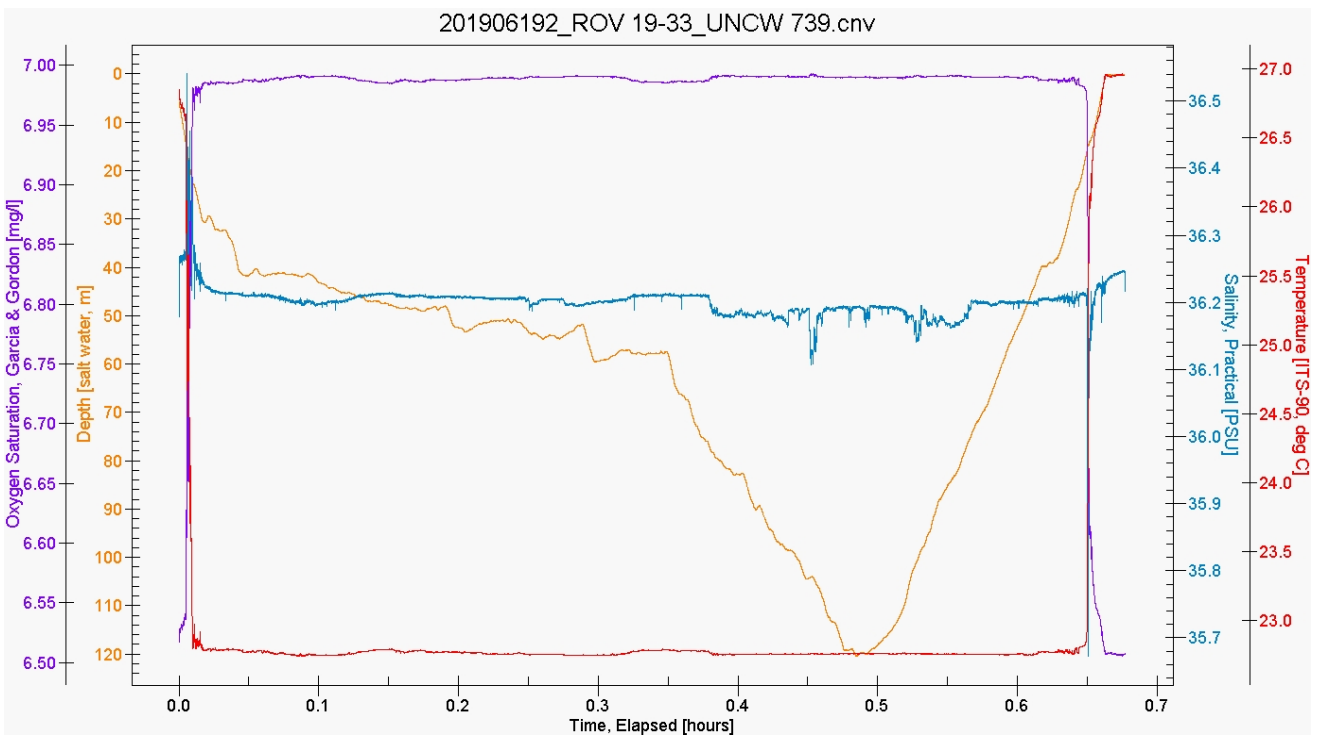
Dive Site: Florida, Red Snapper Sinkhole- St. Augustine; 30 m ROV 19-33; UNCW 739; 19-VI-19-2

Dive Data:

Minimum Bottom Depth (m): -34	Total Transect Length (km): 0.241
Maximum Bottom Depth (m): -121.9	Surface Current (kn): 0.3
On Bottom (Time- EDST): 14:18	On Bottom (Lat/Long): 29.7406°N; -80.7476°W
Off Bottom (Time- EDST): 14:54	Off Bottom (Lat/Long): 29.7406°N; -80.7477°W
Physical (bottom); Temp (°C): 22.8	Salinity: 36.21 Visibility (m): 10 Current (kn): N/A

Physical Environment:

Distance from Dive Site(km): 0.00



CTD data were collected with a SBE49 attached to the ROV (recording descent, bottom and ascent). The ranges of the water column data recorded during ROV 19-33 are as follows: Depth Maximum: 120.4 m, Temperature: 22.74-22.79 °C, Salinity: 36.1-36.2 PSU, Oxygen Saturation: 7-7 mg/l.

Dive Site: Florida, Red Snapper Sinkhole- St. Augustine; 30 m ROV 19-33; UNCW 739; 19-VI-19-2

Dive Imagery:

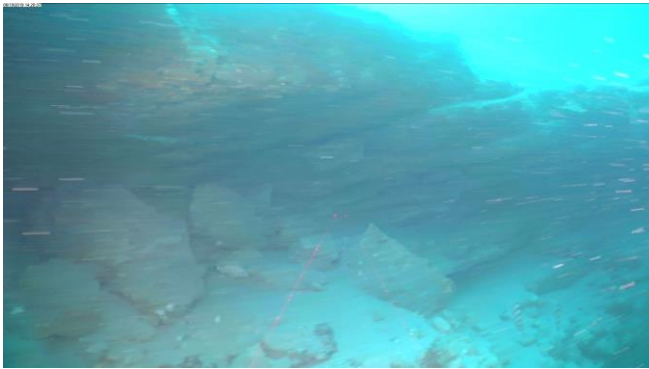


Figure 1: 29°44.44'N;80°44.8604'W: -43 m
Layered rock ledges at upper edge of sink hole

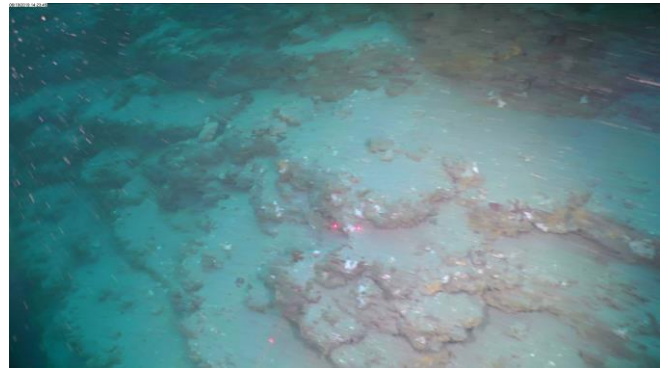


Figure 2: 29°44.4452'N;80°44.863'W: -46.6 m
Layered rock ledges on upper wall of sink hole

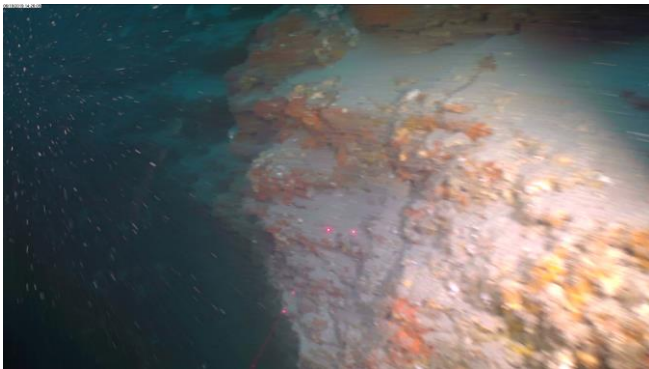


Figure 3: 29°44.4377'N;80°44.8444'W: -49.7 m
Vertical rock wall inside sink hole

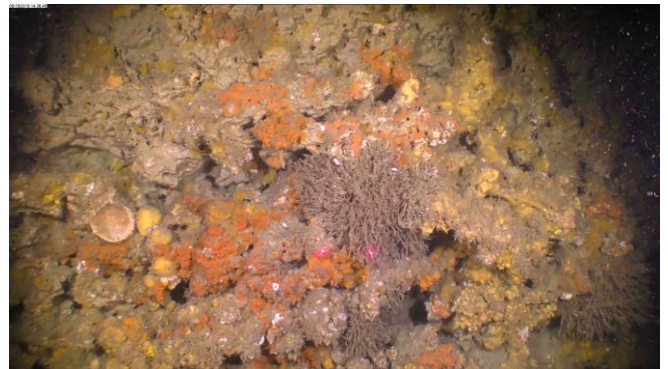


Figure 4: 29°44.4372'N;80°44.853'W: -59 m
Eroded rock wall encrusted with sponges



Figure 5: 29°44.449'N;80°44.852'W: -113.8 m
Rock wall with encrusting demosponges on lower part of sink hole



Figure 6: 29°44.446'N;80°44.8598'W: -60.4 m
Eroded rock wall of sink hole

Dive Site: Florida, Red Snapper Sinkhole- St. Augustine; 30 m ROV 19-33; UNCW 739; 19-VI-19-2

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 19-VI-19-2; ROV 19-33, UNCW Dive 739; Florida, Red Snapper Sinkhole, St. Augustine, 30 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 were recorded by Farrington/Reed (HBOI) directly into Access database. Fish data were recorded by Stacey Harter, Andy David, Kate Overly (NOAA Fisheries) in separate Access database which was compiled with the benthic database.

Video was recorded throughout each dive with an Insite Pacific Mini Zeus high-definition CMOS color zoom camera. Digital still images were taken with a Kongsberg OE14-408. Digital camera setup was P Mode, ISO 100, strobe on, auto focus, white balance- fluorescent bulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing straight down, ~1.3 m off bottom. XS down photos will have green lasers only. 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. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

ROV collection skid and Fastcat 49 CTD on ROV.

Site Description/Habitat/Biota (observations during dive):

Depth range: 30- 121.3 m

MB map shows circular sinkhole, 90 ft deep at top edge, deepest reported 147 m (482 ft), diameter at top- 100 m, inside diameter 38 m; Nancy Foster multibeam.

Weather- Sunny, 2 ft from SW, wind 13 kn from 174 dg, air- 27.74 C, surface water- 27.03 C, salinity- 35.03, current- 0.3- 0.5 kn to 65- 130 dg.

14:15- Launch

14:18- On bottom- 43 m; visibility- 10 m, current-0, 22.7 C, 36.2 salinity; inside edge of hole; layered limestone, undercut and rugged at top edge, undercut 1-2 m, vertical wall, layered rock; encrusting orange and yellow coral, lionfish, porkfish, sheephead, blue angelfish, grey snapper, almaco jack, tomtate.

14:25- 48 m, vertical wall with horizontal layering, sheephead and snapper, started at south rim.

14:28- East wall, 53 m, vertical wall, encrusting orange sponge, xs along 53 m NE side, rock is very porous, white encrusting Didemnid?, no big schools of fish. Fish schools ended around 50 m; NW wall, same.

14:34- drop down at NW wall, 60 m, rugged and eroded, porous, west wall, ye and or encrusting sponge, no change in salinity, 15 cm bushy bryozoan.

14:37- drop down on S wall, 68 m, pot mark rock, not eroded, 45 dg slope, smooth rock; 80 m. pot mark lithified limestone, 90 m- S wall, smooth rock,

105 m, near center of hole on MB, smooth rock, dense cover of orange encrusting,

Dive Site: Florida, Red Snapper Sinkhole- St. Augustine; 30 m ROV 19-33; UNCW 739; 19-VI-19-2

121.3 m- lionfish, flat sediment, fine clay/silt, no change in salinity.

14:46- hd upslope, squall.

14:53- upper rim, flat rock 40 m, sediment, rubble slope up to 30 m.

14:55- end dive. Squall.

Dominant Benthic Macrobiota:

Porifera- encrusting orange and yellow Demospongiae

Bryozoa- bushy

Asciacea- Didemnidae

CPCe Percent Cover Analysis:

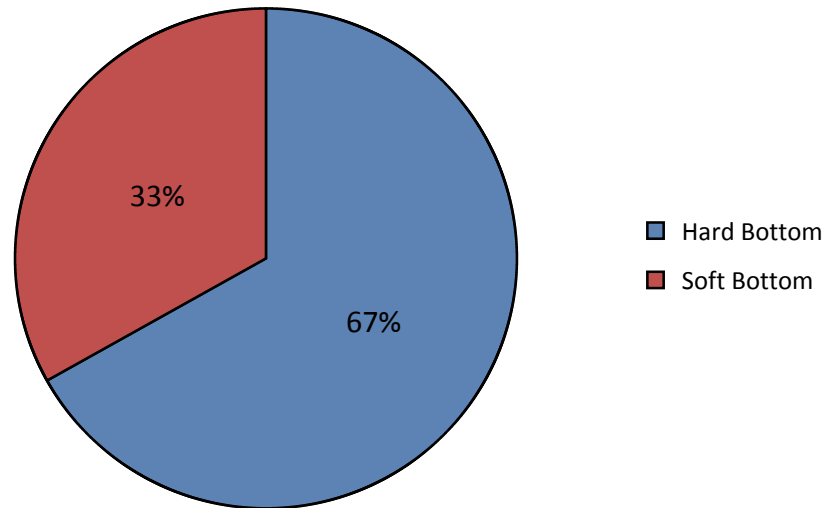
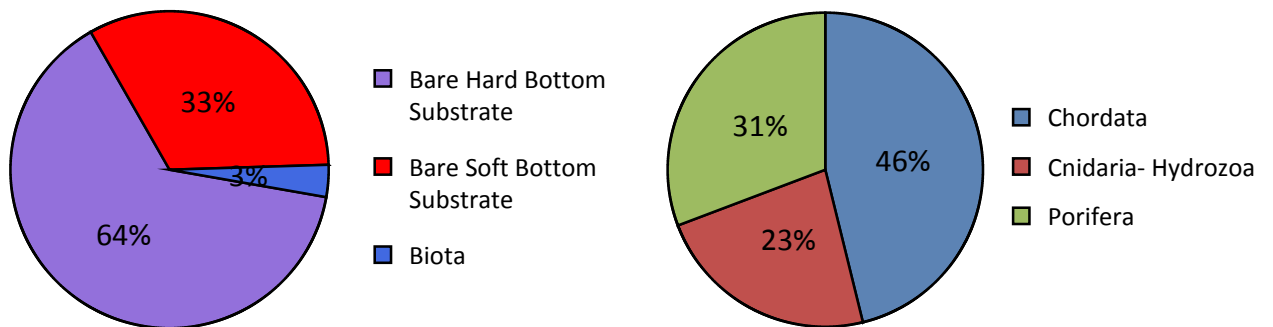


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-33. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



A

B

Figure 2. Percent cover of bare substrate and benthic macro-biota at dive site ROV 19-33.

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: Florida, Red Snapper Sinkhole- St. Augustine; 30 m ROV 19-33; UNCW 739

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. Dive notes and percent cover (CPCe analysis) of benthic macro-biota and substrate from photographic transects at dive site ROV 19-33.

	%	Notes
Biota	3.27%	X
Porifera	1.01%	X
Demospongiae	1.01%	X
Demospongiae	0.63%	X
Demospongiae- orange encrusting porous		X
Spirastrellidae	0.38%	
Cnidaria- Hydrozoa	0.76%	
Hydrozoa	0.76%	
Hydroidolina	0.76%	
Chordata	1.51%	X
Chordata - Invertebrate		X
Didemnidae		X
Chordata - Vertebrate	1.51%	
Actinopterygii	1.51%	
UNKNOWN		X
Habitat	96.73%	
Bare Hard Bottom Substrate	63.98%	
Hard bottom	63.98%	
Bare rock, pavement, boulder, ledge	61.71%	
Bare rubble/cobble	2.27%	
Bare Soft Bottom Substrate	32.75%	
Grand Total	100.00%	

Dive Site: Florida, Red Snapper Sinkhole- St. Augustine; 30 m ROV 19-33; UNCW 739

Density of Fish:

Table 2. No fish analysis do at dive site ROV 19-33.