

NOAA CIOERT Report

Characterization of the Mesophotic Coral Reefs in the Florida Keys National Marine Sanctuary

**University of Miami R/V *F.G. Walton Smith* Cruise
UNCW *Mohawk* ROV
Leg 1
August 12-20, 2019**

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INTRODUCTION

A 17-day research cruise was conducted to the Florida Keys National Marine Sanctuary (FKNMS), August 12-29, 2019 by the Cooperative Institute for Ocean Exploration, Research, and Technology (CIOERT) at Harbor Branch Oceanographic Institute, Florida Atlantic University (HBOI-FAU) aboard the University of Miami ship R/V *F.G. Walton Smith*.

Two legs of the expedition were conducted. Leg 1 (August 13-20, 2019) consisted of *Mohawk* remotely operated vehicle (ROV) dives with the primary objective to document and characterize the benthic habitats, benthic communities, and fish assemblages of the mesophotic (30-100 m) coral ecosystems and deep rariphotic (>100 m) zones within and adjacent to the protected areas within the jurisdiction of the Florida Keys National Marine Sanctuary (FKNMS) (Figs. 1-3, Table 1). Additional dives that are not included herein were made on some shallow reefs (<30 m) within the Tortugas Ecological Reserve (TER) and also in Pulley Ridge HAPC in the Gulf of Mexico. Leg 2 consisted of technical scuba dives conducted within the FKNMS and TER to collect corals and sponges for population genetics studies and are not included in this report. The first report related to these coral connectivity assessments can be found in Sturm et al. 2021.

The Florida Keys National Marine Sanctuary (FKNMS) was established in 1990 includes 13 sanctuaries and two marine monuments within the 3,800 square miles designation. Restrictions vary within the region but include sea floor impact (e.g., mining, bottom impact fishing, anchoring) and large shipping traffic (Florida Keys National Marine Sanctuary and Protection Act, Pub. L. 101-605; 16 U.S.C. 1433 note; <https://safmc.net/newsletters/proposed-changes-to-florida-keys-national-marine-sanctuary/>). The Tortugas Ecological Reserve is made up of the northern TER encompassing Sherwood Forest and the southern TER encompassing Riley's Hump and part of Miller's Ledge. The regulations in the TERs include the same restrictions as the overall NMS but

are expanded to include ship discharge, and all fishing and diving and snorkeling are prohibited in the southern TER (<https://floridakeys.noaa.gov/zones/ers/welcome.html>).

This report is a step towards the characterization of a highly diverse and poorly known component of these unique deep-water benthic communities in the mesophotic zone. In addition, the accompanying publication (Reed et al., 2021; Photo Identification Guide of the Benthic Taxa Inhabiting the Mesophotic Reefs of the Florida Keys National Marine Sanctuary) represents the first taxonomic identification photo guide to the most common benthic taxa observed while exploring the mesophotic reefs of the FKNMS. From 2011 to 2019, NOAA Fisheries and HBOI-FAU CIOERT also surveyed with ROV the shelf-edge and deep-water Marine Protected Areas (MPAs) and deep-water Habitat Areas of Particular Concern (HAPCs) of the southeastern US extending from South Florida to North Carolina at depths of 48 to 1240 m. This resulted in a photographic field guide of the sponges associated with these reefs (Diaz et al., 2021). Many of these species are within the mesophotic and rariphotic depth zones. We also have three photographic field guides for the mesophotic reefs of Cuba, including a sponge guide (Diaz et al., 2019), a macroalgal guide (Martínez-Daranas et al., 2018), and fish guide (David et al., 2018). Some of these species will overlap with what we have found on the FK mesophotic reefs.

The data from this 2019 cruise establish current 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 are made available to the FKNMS, SAFMC, NOAA Fisheries, NOAA Deepsea Coral Research and Technology Program (DSCRTP), NOAA Coral Reef Conservation Program (CRCP), NOAA Mesophotic Reef Ecosystem Program, and NOAA National Marine Sanctuaries program to assist management of these habitats and key species.

Previous Studies of the Deep-water Reefs of Florida Keys

The first published study of the mesophotic reefs within the current region of the FKNMS was made with the HBOI research submersible, *Johnson-Sea-Link I* in 1979 (Jameson 1981). This was before the term “mesophotic ecosystems” was coined. Several studies in the 1970s and 1980s provide details of various reefs along the Florida Key reef tract. In the early 1970s, Harbor Branch Foundation had a field station in Key Largo which provided some of the earliest studies of the reefs in the upper keys; Antonius (1972) made the first surveys of the reefs in and around Pennekamp Coral Reef State Park (now part of the FKNMS). Although most of these studies have been on the shallow water reef systems, Voss et al. (2002; first published 1983) detailed the reefs off Key Largo and mentioned the deep (mesophotic) reefs off Molasses Reef. Bohnsack (2002; first published 1983) detailed Looe Key reefs but these do not extend beyond 30 m. Dustan (1988) described the changes of the reef community at Carysfort Reef (off Key Largo) between 1975 and 1983. Dustan’s study compared 21 permanent transects at depths between 0 and 22 m showed decrease in coral abundance due to sedimentation and disease.

Previously, HBOI-CIOERT surveyed with ROV the region between the TER South and the western border of the FKNMS (Reed et al., 2016, 2017). These dives only found mostly soft bottom habitat, along with some hard bottom reef habitat primarily at depths less than 30 m in this region. The western region of the northern TER is also shallow reef habitat (Reed et al., 2016, 2017), but the west facing fore reef slope of TER N abruptly ends in flat sand around 30- 35 m. We also have described ROV and submersible dives within the rariphotic zone of the southern

region of TER South, primarily along Miller's Ledge south of Riley's Hump (Reed et al., 2016, 2017). Weaver et al. (2006) first described the deep-water reef fishes and multibeam bathymetry of this region of Miller's Ledge. Seaward of the Florida Keys reef tract and mesophotic reefs is the Pourtalès Terrace which is an exposed hard-bottom platform at depths of 200-450 m and consists of high-relief mounds, rocky escarpments, deep-water sinkholes and the only known deep-water *Lophelia* coral reef off the Florida Keys (Reed et al., 2005; Reed et al., 2006; Reed et al. 2012; Reed et al., 2014; Walker et al. 2021). This diverse deep-sea coral ecosystem is dominated by stylasterid hydrocorals, octocorals, and sponges that supports recreational and commercial fisheries.

METHODS

ROV Operations

The *Mohawk* ROV was used. ROV transect locations were selected by three 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.

The ROV was equipped with a high-definition digital video camera (using fiber optic cable) mounted on tilt bar, a fixed digital still camera, and a Sea-Bird Scientific SBE 49 FastCAT CTD. The ROV was outfitted with a collection skid and manipulator for collections of benthic species.

ROV Survey Protocol

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

1. Video transects were used for analysis of fish populations. Video transects kept the ROV as close to the bottom as possible ($< \frac{1}{2}$ - 1 m) with a speed over ground of $\sim \frac{1}{4}$ knot.
2. Still images captured from the photo transects were analyzed to determine relative percent cover of benthic biota and habitat types.
3. Underwater video was viewed in real time on the support vessel by scientists familiar with the local deep-water fauna; annotations describing habitat, benthic biota, and fish were recorded using programmable X-keyboards into the HBOI-FAU CIOERT At-Sea Database.

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 2.38 mega pixels, HD 1080p). The camera was typically angled down $\sim 30^\circ$ to view both near and far to the horizon for fish aggregations and habitat, with 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 were taken for additional photo images of habitat and species, and to document fish species. A second standard definition video copy was also recorded to a hard 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.

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.

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) which provides the ROV operator and the support vessel’s bridge with real time tracking display of the ROV and ship for navigation. 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 text file. Geo-referenced TIFF files obtained from multibeam sonar are entered into Hypack as background files to display target sites and features of interest to aid in ROV and support vessel navigation. Hypack also exports ROV data via RS232 communication protocol in real time as a NMEA data string which contains ROV position. All data documentation (digital images, HD video, dive annotations, and specimen collections) are geo-referenced to ROV position and depth by matching the time and date to the ROV navigation files.

CTD

Temperature (°C), depth (m), nitrogen (mL/L), oxygen (mL/L) and salinity (PSU) profiles were collected with a Sea-Bird Scientific SBE 49 FastCAT attached to the ROV for each dive.

Specimen Collections

The *Mohawk* ROV was equipped with a collection skid that consists of a 5-function manipulator, five suction buckets (2 L each), and a bin with removable partitions (61 cm x 23 cm x 17 cm). Benthic macrobiota (primarily, corals, octocorals, sponges, and algae) were collected with the ROV on some dives; these samples were used for museum (taxonomic reference) specimens, taxonomic identification, genetic analysis, and coral population studies.

Each specimen was given a unique sample number, and stored in glass jars which were bar coded with chemical resistant labels. Invertebrate specimens were preserved in 95% ethanol and macroalgae in 5% formalin. Specimens were photographed *in situ* when possible, prior to

collection, photographed in the lab, and data entered into the HBOI-FAU CIOERT At-Sea Database.

Taxonomic Information

In a separate Photo Field Guide (Reed et al., 2021), each species is presented with the following data: an *in situ* and/or lab image, the lowest identifiable scientific name, species author/date, higher taxonomy, depth and location of the specimen, taxonomic identifier, and the image file name. The species authority and scientific names reflect the most current classification provided in the World Porifera Database (Van Soest et al. 2021). If a specimen was collected, a lab and/or *in situ* image is included with the HBOI sample number at the bottom right of the image (e.g., 24-VIII-19-1-003). Photo and video identifications for analyses in this field guide and for this report were made by the following: Porifera- María Cristina Díaz, Shirley A. Pomponi, John Reed; macroalgae- M. Dennis Hanisak, Kate Beckett; corals- John Reed, Joshua Voss, Michael Studivan, Alexis Sturm; Bryozoa- Judy Winston; misc. taxa- J. Reed, Stephanie Farrington.

Fish Analyses

All fish were identified to the lowest taxonomic level from the video for each dive. Counts were made for commercially/recreationally important species (primarily grouper and snapper) and lionfish.

Benthic Community 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). CPCe area analysis (ARA) was used to determine density of scleractinian corals. 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. Fifty random points overlaid on each image were identified as substrate type and benthic taxa. All macro-benthic biota (usually >3 cm) were identified to the lowest taxa level possible.

Multivariate analyses were used to determine differences in benthic biota among the mesophotic and rariphotic reefs. All analyses were conducted in PRIMER 6 and based on guidelines of Clarke and Warwick (2001) and Clarke and Gorley (2006). The CPCe percent cover data were averaged by dive (e.g., ROV 19-01, 19-02, etc). Then these data were square-root transformed to reduce the dominate influences of copious species to the similarity matrix. Similarities between samples of benthic biota were then calculated using S17 Bray-Curtis similarity. A non-metric multidimensional scaling ordination (MDS) plot was created showing the results of a concurrently run SIMPROF 'similarities profile'. This plot shows statistically different grouping of benthic communities among and between sites. 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 photic zone. ANOSIM tests the null hypothesis that there are no community differences between groups or in this case photic zone.

RESULTS

Study Areas

Two legs of the expedition were conducted. Leg 1 (August 13-20, 2019) consisted of ROV dives with the primary objective to document and characterize the benthic habitats, benthic communities, and fish assemblages of the mesophotic coral reefs and deep rariphotic (30-122 m) zones within and adjacent to the Florida Keys National Marine Sanctuary (FKNMS) (Figs. 1-3, Table 1). Additional dives that are not included herein were made on some shallow reefs (<30 m) within the Tortugas Ecological Reserve (TER) and also mesophotic reefs in Pulley Ridge HAPC in the Gulf of Mexico. Leg 2 consisted of technical scuba dives conducted within the FKNMS and TER to collect corals and sponges for population genetics not included of this ROV-focused report.

Table 1. *Mohawk* ROV dive sites within mesophotic (30-65 m) and deep rariphotic (90-120 m) zones of the Florida Keys National Marine Sanctuary (FKNMS) and adjacent areas during the HBOI-FAU CIOERT expedition on the R/V *F.G. Walton Smith*, August 13-20, 2019.

Site #	ROV Dive #	Location	MPA Status	Latitude	Longitude	Depth (m)
13-VIII-19-1	19-01	Key Largo, E of South Carysfort Reef, Mesophotic Reef	FKNMS	25°13.0874'N	80°11.4900'W	28-38
14-VIII-19-1	19-02	Key Largo, NE of Elbow Reef, Mesophotic Reef	FKNMS	25°09.5510'N	80°13.1450'W	44-51
14-VIII-19-2	19-03	Key Largo, NE of Elbow Reef, Mini-Mound Mesophotic Reef	FKNMS	25°09.3570'N	80°13.9470'W	33-37
15-VIII-19-1	19-04	Key Largo, E of Grecian Rocks, Mesophotic Reef	FKNMS	25°06.5470'N	80°15.6880'W	44-53
15-VIII-19-2	19-05	Key Largo, E of French Reef, Mesophotic Reef	FKNMS	25°02.2570'N	80°19.1100'W	43-49
16-VIII-19-1	19-06	Cudjoe, SE of Looe Key, Deep-water Mound	FKNMS	24°29.9220'N	81°26.3900'W	90-91
16-VIII-19-2	19-07	S of Big Coppitt, Pelican Shoal Reef	FKNMS	24°29.5070'N	81°35.5650'W	17-38
17-VIII-19-1	19-08	Key West, SW of Sand Key, Deep-water Ridge	Outside FKNMS	24°24.0190'N	81°55.2870'W	114-122
17-VIII-19-2	19-09	Key West, SW of Sand Key, Deep-water Ridge	Outside FKNMS	24°24.0200'N	81°55.2630'W	112-121
17-VIII-19-3	19-10	SW of Marquesas, Deep-water Warsaw Sinkhole	Outside FKNMS	24°21.6050'N	82°19.4300'W	96-116

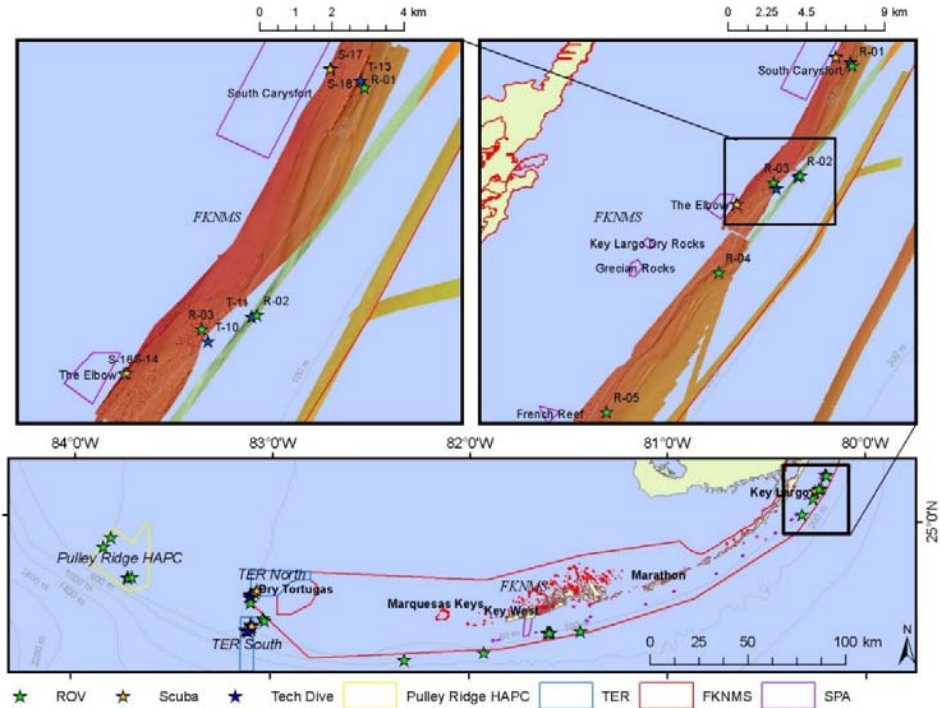


Figure 1. Mesophotic and rariphotic dive sites (30-120 m) off the upper keys in the Florida Keys National Marine Sanctuary (red polygon) made by HBOI-FAU CIOERT with UNCW *Mohawk* ROV, August 12- 29, 2019. Dives on Pulley Ridge are not included in this report.

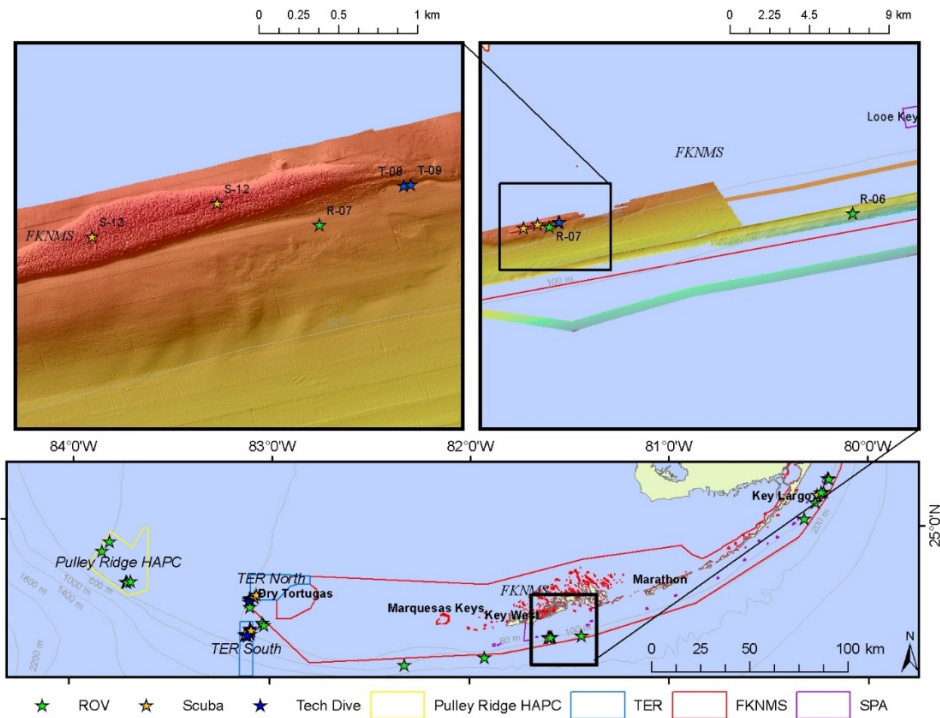


Figure 2. Mesophotic and rariphotic dive sites (30-120 m) off the middle keys in the Florida Keys National Marine Sanctuary (red polygon) made by HBOI-FAU CIOERT with UNCW *Mohawk* ROV, August 12- 29, 2019. Dives on Pulley Ridge are not included in this report.

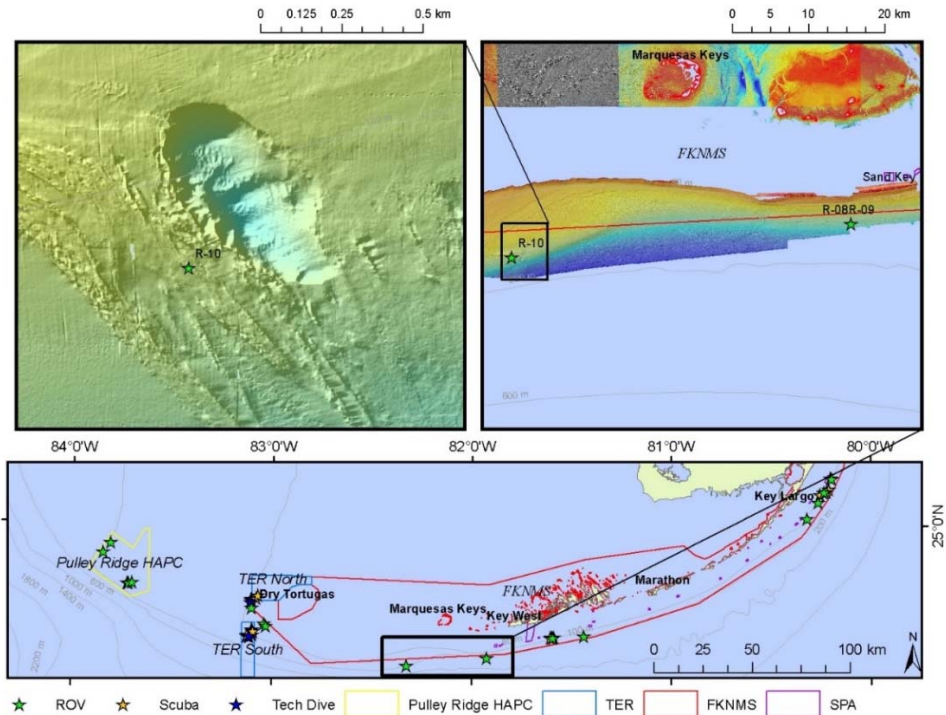


Figure 3. Mesophotic and rariphotic dives sites (30-120 m) off the lower keys in the Florida Keys National Marine Sanctuary (red polygon) made by HBOI-FAU CIOERT with UNCW *Mohawk* ROV, August 12- 29, 2019. Dives on Pulley Ridge are not included in this report.

Multibeam (MB) Maps of Deep-water Regions of the FKNMS and Adjacent Areas

This report is from data collected from ROV dives during the 2019 HBOI-FAU CIOERT research cruise within the mesophotic and rariphotic zones of the FKNMS and adjacent areas. ROV dives sites were selected from two datasets: multibeam maps and historical dive data. NOAA multibeam maps (MB) for the region were downloaded into Arc GIS 10.3. There is limited mapping of the FKNMS beyond the Florida reef tract, and especially for the mesophotic and rariphotic zones beyond 30 m depths. Most of the MB maps are for the upper and middle keys (Fig. 1-3), but still have considerable gaps at the time of this research cruise. The second data set was from previous dives in the mesophotic zone which is quite limited.

The following MB maps were available at the time of the cruise:

Taylor_FKNMS_Key_Largo_NS_2m (Chris Taylor, NOAA/NOS/NCCOS Center for Coastal Fisheries and Habitat Research)- This dataset proved to be the most helpful in selecting probable mesophotic sites in the region of the upper Keys off Key Largo (Fig. 4). The purpose of these MB surveys was to support the FKNMS benthic habitat map products and research planning efforts. This survey provided improved seafloor mapping data products for the areas of the FKNMS that are deeper than 20 meters. The geotiff represents a 5 meter resolution backscatter mosaic that was collected aboard the NOAA Ship *Nancy Foster*. Backscatter is the measurement of relative intensity of the sound reflected back off of the seafloor and is used to delineate benthic habitat types (i.e., hardbottom vs softbottom).

Naar_KeyWest_XS_C_10m (Fig. 4)- This is a single MB swath from Pulley Ridge region of Gulf of Mexico, south of TER to Key West. This provided information on a few deep-water rariphotic sites off lower Keys at depths around 100 m.

Haines_2004_FKNMS_H11340_4m (Fig. 4)- This mapped the region of TER south and the rariphotic zone of Miller’s Ledge.

NF_15_FKNMS_W00406b_4M; NF_09_09_FKNMS_W00232a_1m (Fig. 4) – Research vessel *Nancy Foster* 2009 and 2015 maps primarily provide single swaths of MB along the Keys.

Predictive Model of Mesophotic Ecosystem Habitat in the FKNMS and Adjacent Areas

A model of probable mesophotic habitat was developed based on the available multibeam (MB) sonar maps at the time of the 2019 HBOI-FAU CIOERT research cruise and ground-truthed with ROV dives (Fig. 4).

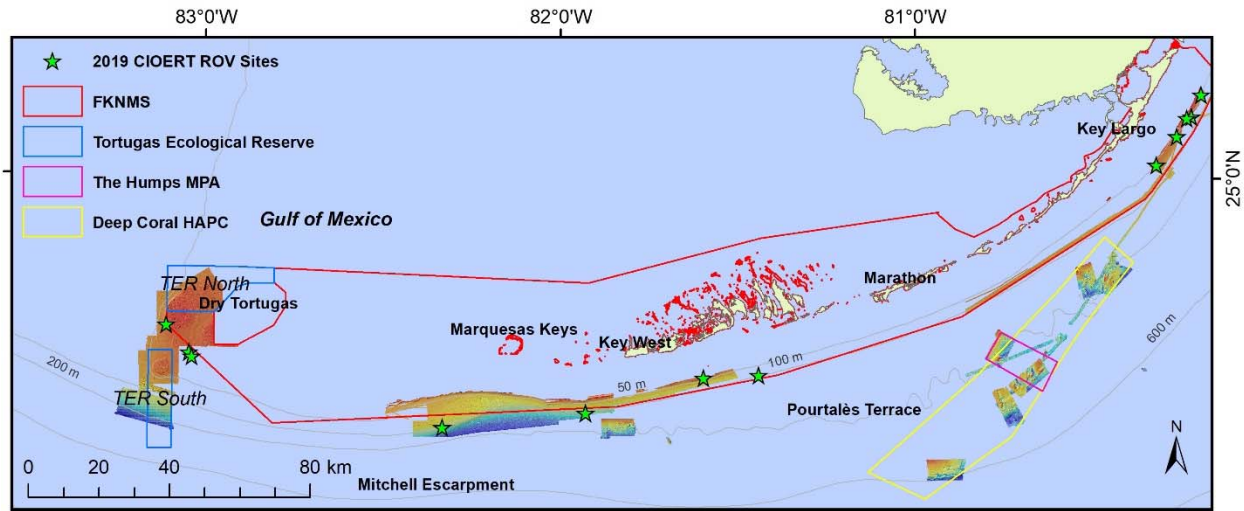


Figure 4. Multibeam maps of deep-water regions of Florida Keys National Marine Sanctuary, Tortugas Ecological Reserves, and adjacent areas. Sources of multibeam maps- Taylor (NOAA NCCOS), Naar, Haines, R/V *Nancy Foster* (2009, 2015).

Polygons were drawn in ArcGIS on the MB maps around areas where rugged topography was apparent. ROV dives verified that the irregular and rugged topography at depths of 30- 65 m were in fact mesophotic coral reef habitat. In the regions of available MB, the mesophotic reefs were documented off Key Largo, east of Carysfort Reef, Elbow Reef, Grecian Rocks, and French Reef (ROV Dives 1-5), and Pelican Shoal (Dive 7). Total area of probable mesophotic habitat in this region of available MB sonar maps is 19.66 km² (7.59 mi²). Obviously, additional multibeam are needed to verify the total extent of mesophotic reef habitat within the FKNMS.

Table 2. Predictive model of mesophotic reef habitat in FKNMS and adjacent areas.

Location	Nearest ROV Site	Area (Km²)	Depth Range (m)
Carysfort Mesophotic Reefs - Central Ridge	ROV 19-01	1.150	37-58
Carysfort Mesophotic Reefs - Deep Ridge	ROV 19-01	0.366	60-63

Carysfort Mesophotic Reefs - Mini Mounds	ROV 19-01	0.717	30-36
Elbow Mesophotic Reefs - Ridge	ROV 19-02	0.161	43-50
Elbow Mesophotic Reefs - Mini Mounds	ROV 19-03	6.737	30-34
Grecian Rocks Mesophotic Reefs - Deep Ridge	ROV 19-04	2.464	60-65
Grecian- French Mesophotic Reefs - West Ridge	ROV 19-04 & 05	7.895	40-55
Pelican Shoal - South Base	ROV 19-07	0.174	30-38
Total Area		19.664	30-65

The predictive model of mesophotic habitat in the region east of Carysfort Reef and ROV 19-01 (Fig. 5, Table 2) shows three mesophotic reef zones with a total area of 2.23 km² (0.86 mi²): NE-SW oriented Deep Ridge (60 m top, east base- 63 m; ~2.7 km long, 60 m wide), Central Ridge (37 m top, east base- 58 m, west base- 39 m; ~4.9 km long, 70-180 m wide; surveyed on ROV 19-01), and Mini-Mounds (tops- 30-34 m, east base- 36 m, west base- 30 m; ~4.6 km by 480 m wide). The Mini-Mounds are dense clusters of small individual mounds of 1-2 m height. These were not dived on here. The ROV video shows the east face of the Central Ridge to be rock ledges with 0.5- 1 m relief and 10° slope, with 80% cover of hard bottom; some with dense cover of sponges, algae, octocorals, and scleractinians are common.

In the region of ROV 19-02 and east of Elbow Reef (Fig. 6, Table 2), the Mesophotic Ridge is a continuation of the NE-SW oriented ridge to the north (top- 43 m, east base- 50 m; ~1.7 km long, 100 m wide). The ROV video shows relatively low relief rock ledges (0.5 m relief), rock mounds of 0.5-1 m tall, hardbottom and rubble, and 10-15° slope on the east face, with a dense cover of macroalgae and large sponges, and octocorals are common. ROV 19-03 (Fig. 6) is in a region of dense Mini-Mounds (~6.3 km long and 600 m wide; 6.74 km² area). Hundreds of 1-2 m tall mounds occur here. The tops of the mounds range from depths of 30- 32 m, and the bases are 32- 34 m. Without coring, we are unable to tell whether these are old coral heads such as *Orbicella*. The ROV video shows the rounded 1-2 m tall mounds, 3->5 m diameter, that are separated by sand, 3- 5 m apart. The sides of the mounds have 30-45° slope with exposed rugged rock and dense cover of sponges, octocorals, algae, and scleractinian coral.

In the region of dives 19-04 and 19-05, and east of Grecian Rocks and French Reef (Fig. 7, Table 2), are two NE-SW oriented ridges with a total area of 10.36 km² (4.0 mi²): Deep Ridge (top- 60 m, east base- 65 m; 9.0 km long, 450 m wide), and West Ridge (top- 40 m, east base- 52- 55 m; 13.7 km long, 770 m wide; ROV 19-04 and -05). ROV 19-04 shows low relief ledges and hard bottom with 15° slope on east face, and dominated by algae, large sponges, and gorgonians. ROV 19-05 is at the southern end of this same ridge and found low relief rock ledges and hard bottom dominated by octocorals, sponges, and algae, with dense cover on top of the ridge. No dives were made on the Deep Ridge here.

Multibeam data at dive site ROV 19-06 (Fig. 2) shows an isolated rounded mound, elongated NE-SW, 300 m diameter, 88 m at base, and 86 m at top. ROV video shows primarily soft bottom, with some low-relief (1 m) rock ledges, and ~10% cover of rubble and cobble (5-10 cm), with some black corals, sponges, and hydroids. This is not mesophotic habitat and there are no colonial corals. One rock ledge, however, had lionfish, many small schooling fish (*Hemanthias Anthiidae*), school of small red snapper (~dozen), big eye, and black fin snapper.

ROV 19-07 (Figs. 2, 8, Table 2) is on Pelican Shoal southeast of Key West. MB shows an elongated mound, oriented E-W, 2.7 km long, 38 m at the base, and a rubble zone extending deeper. Although the top of this reef is a depth of 17 m, the seaward base drops to 38 m in mesophotic depths. The lower slope is 30° slope with 1 m rock ledges, boulders, with dense cover of sponges, octocorals, and scleractinian corals, but heavily sedimented.

Multibeam data for dive sites ROV 19-08 and 19-09 are southeast of the Marquesas (Fig. 3) and shows an E-W oriented linear ridge, 2.2 km long and 230 m wide, at rariphotic depths of 112- 122 m. ROV 19-08 video shows mostly soft sediment, ~10% cover of rubble and cobble (10 cm rock), flat pavement hard bottom, and sparse cover of octocorals, black corals and sponges. ROV 19-09 was a continuation of Dive 8. This area is not mesophotic habitat and there are no colonial corals.

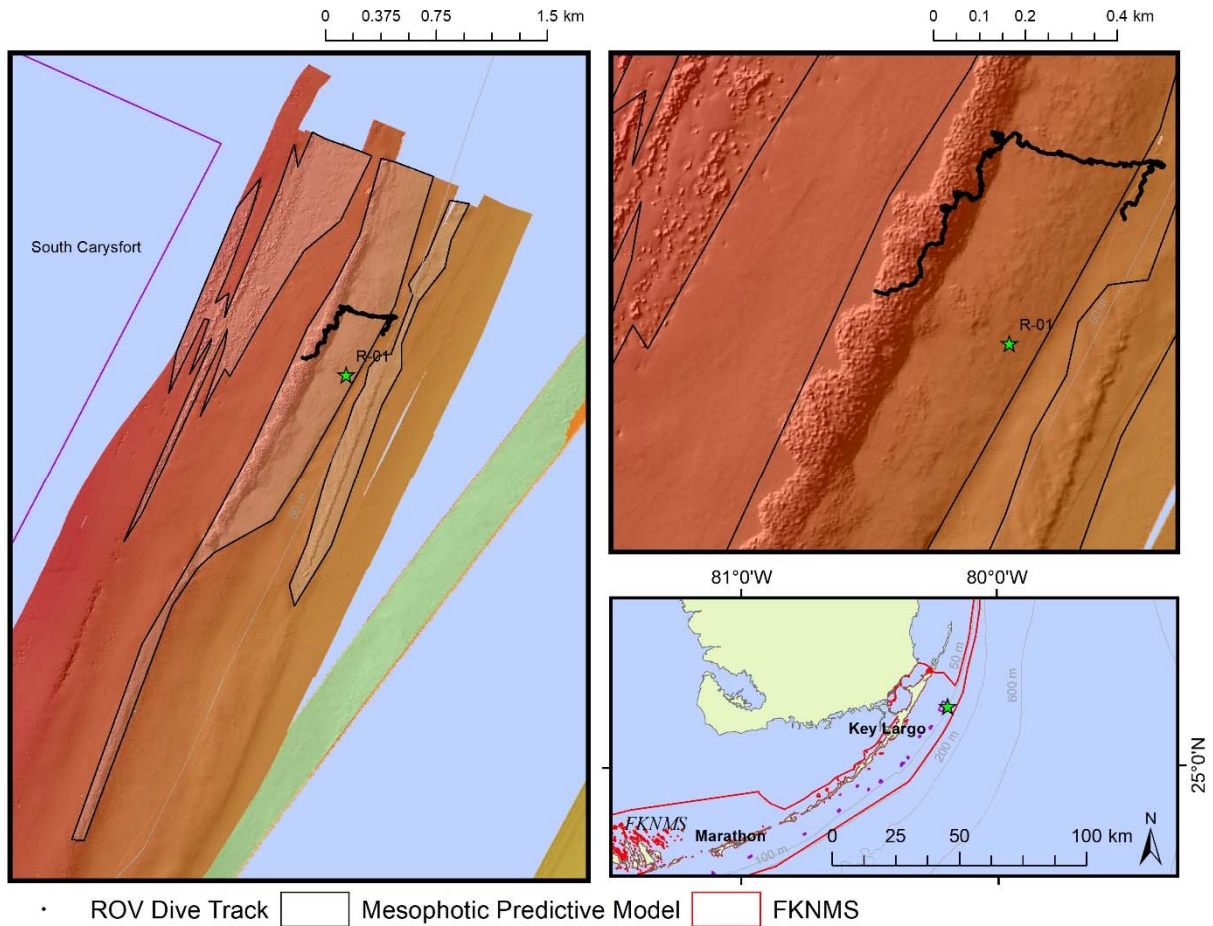


Figure 5. Predictive model of mesophotic coral reef habitat east of Carysfort Reef, Key Largo near ROV 19-01. Polygons around areas of Deep Ridge, Central Ridge (ROV 19-01), and Mini-Mounds (depth range 30-63 m).

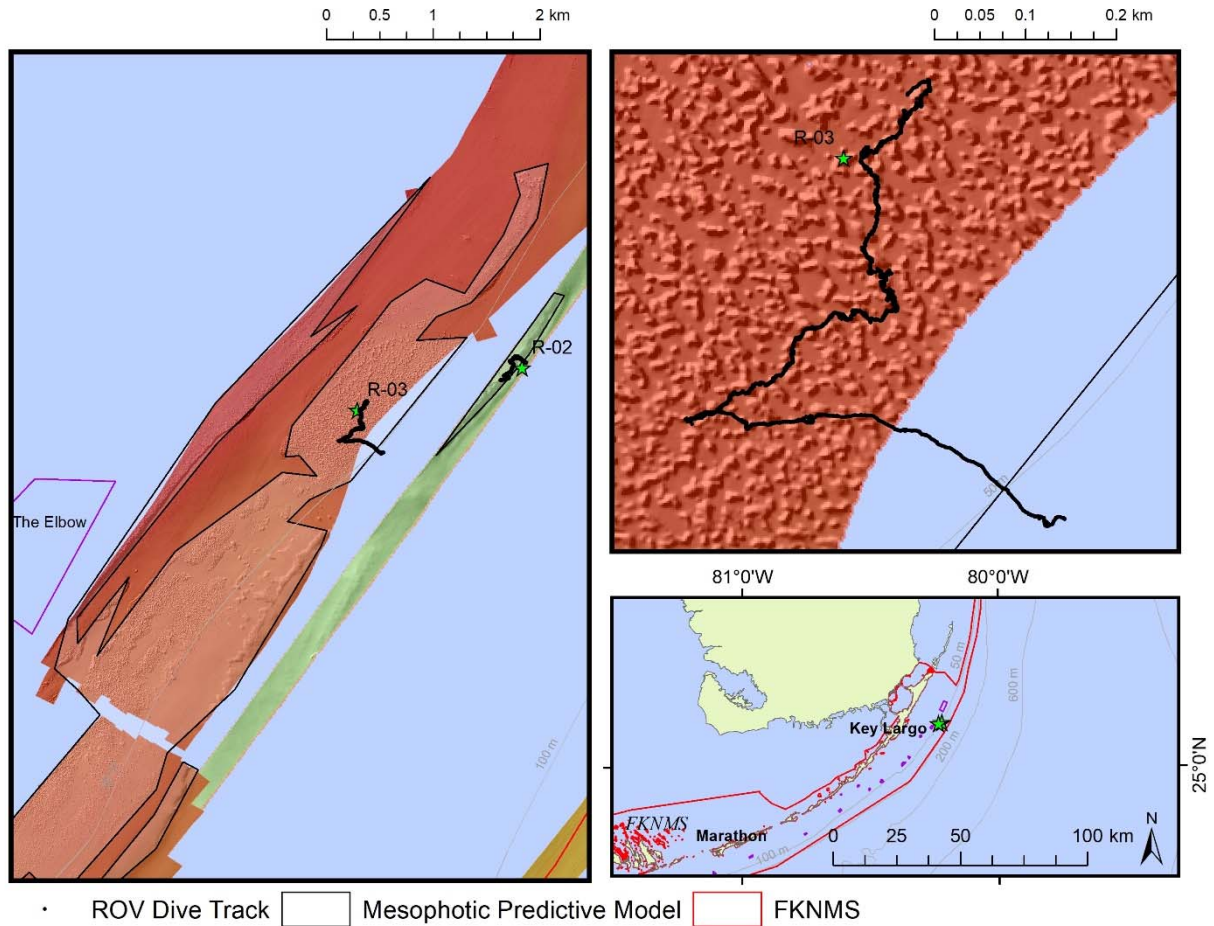


Figure 6. Predictive model of mesophotic coral reef habitat east of Elbow Reef, Key Largo near ROV 19-02 and 19-03. Polygons around areas of Ridge (ROV 19-02) and Mini-Mounds (ROV 19-03) (depth range 30- 50 m).

ROV 19-10 (Figs. 3, 9) is southwest of Marquesas at depths of 96-116 m. This large oval-shaped hole named Warsaw Sinkhole is 650 m maximum diameter, 90 m at the top edge, and 126 m at the base. The upper rim consists of flat rock pavement, rubble/cobble, and low relief ledges (0.25-0.5 m relief). Unusual ‘lollipop’ sponges (*Rhizaxinella clava*) and other sponges were common along with octocorals. Inside the upper rim is rugged rock, 3 m relief ledges, and step-like rock ledges on a 25° slope that extends to the bottom. The base of the hole at 116 m is silty sand with 20 cm rubble. This is rariphotic habitat and the only colonial scleractinian corals are the azooxanthelate *Madracis myriaster*. No Warsaw grouper were observed but schools of greater Amberjack, dense schools of anthiids (rough tongue bass and red barbier), snapper and scamp were present. This is the shallowest sinkhole in the region. At deeper depths on Pourtalès Terrace, Reed et al. (2005) described several sinkholes at depths of 175 to 461 m.

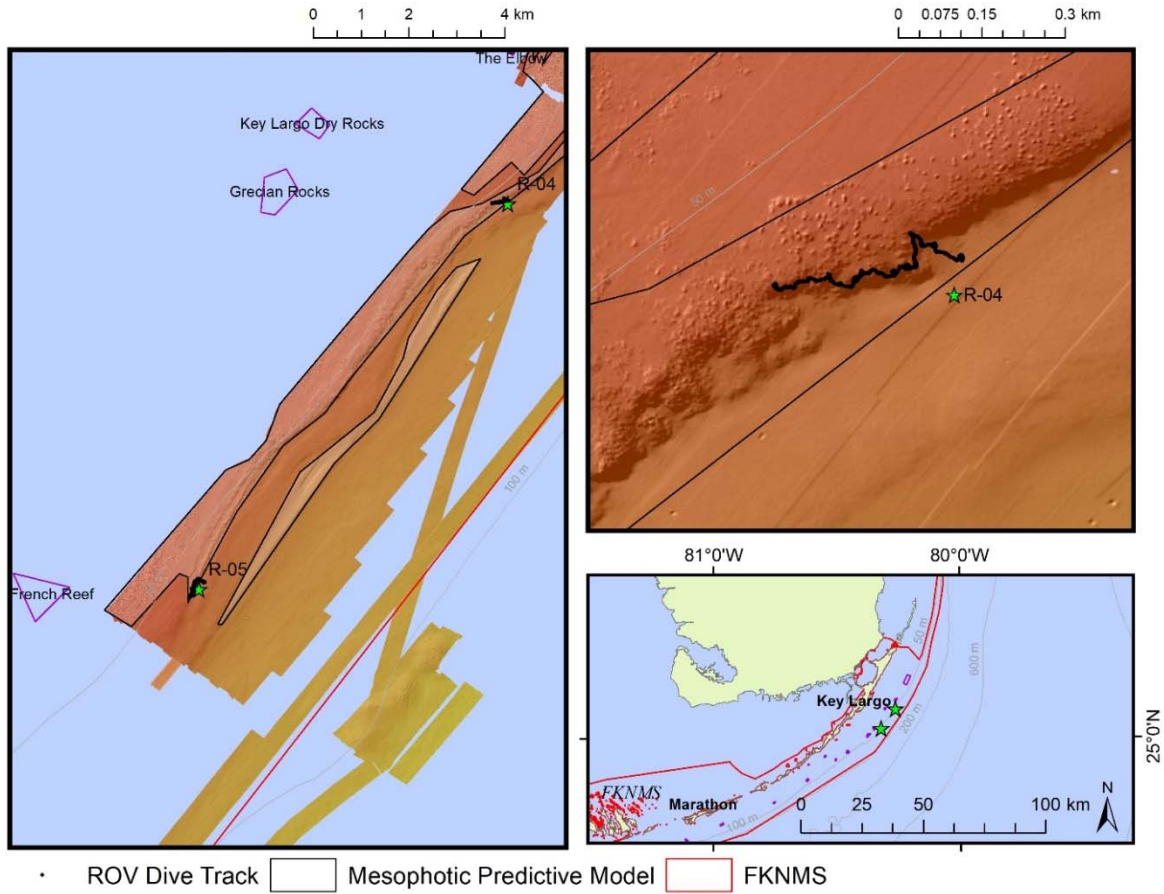


Figure 7. Predictive model of mesophotic coral reef habitat off Grecian Rocks and French Reefs, Key Largo near ROV 19-04 and 19-05. Polygons around areas of Deep Ridge and West Ridge (ROV 19-04, -05) (depth range 40- 65 m).

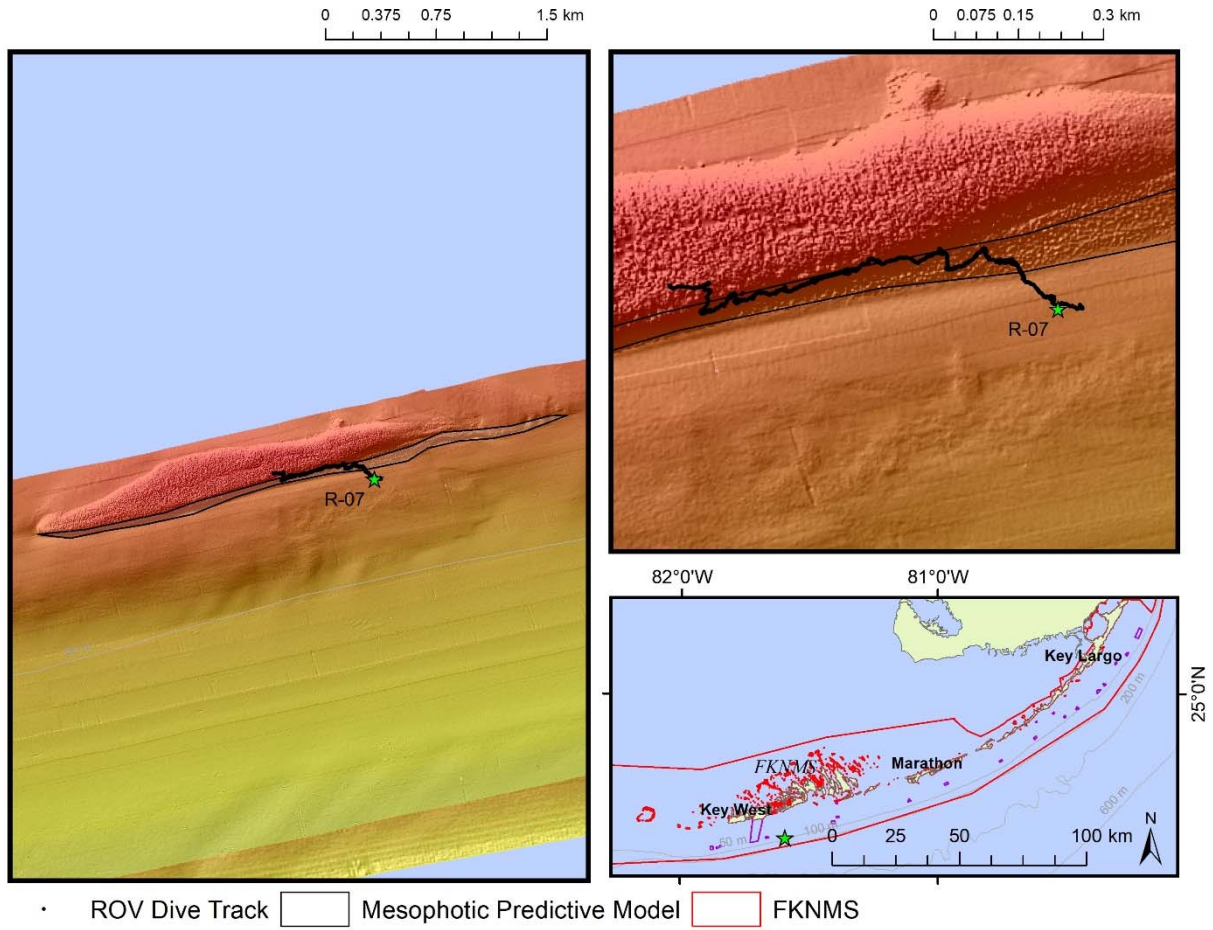


Figure 8. Predictive model of mesophotic coral reef habitat at Pelican Shoal near ROV 19-07. Polygon around mesophotic area of southern base of Pelican Shoal (depth range 30-38 m).

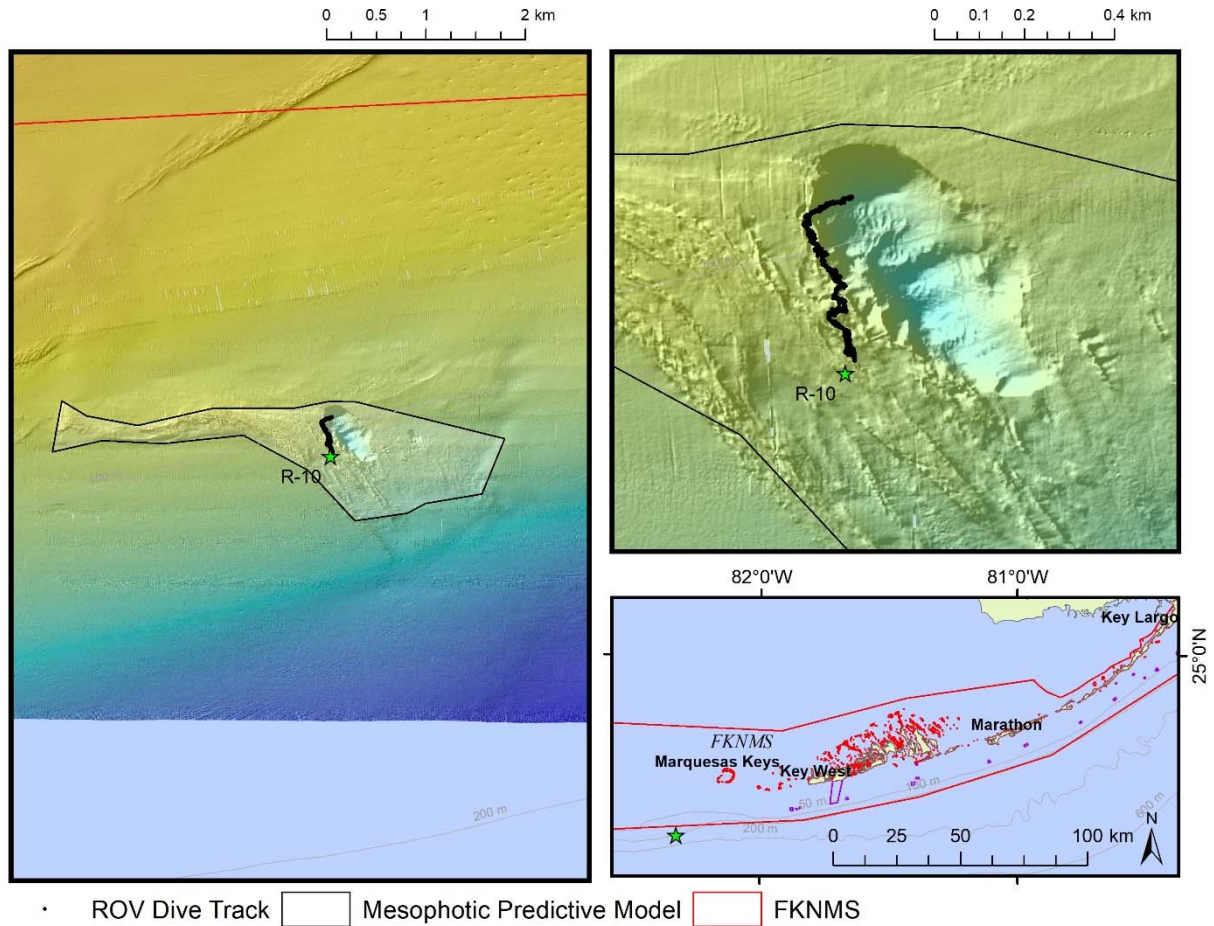


Figure 9. Predictive model of rariphotic ecosystem habitat at Warsaw Sinkhole near ROV 19-10. Polygon around sinkhole and adjacent hard-bottom areas (depth range 96- 116 m).

Characterization of the Mesophotic and Rariphotic Habitat and Macrobiota of the FKNMS

A SEADESC Level II Report (Southeastern United States Deep-Sea Corals) is presented in Appendix 1. Each ROV dive within the region of the FKNMS (ROV Dives 1-10) and TER (ROV 16-18) is described in detail: 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), CTD plots, dive notes describing the habitat and biota, and images of the biota and habitat that characterize the dive site. In addition, this SEADESC Report provides quantitative analyses for just the mesophotic and rariphotic sites (ROV Dives 1-10) including: 1) CPCe 4.1[©] analysis of percent cover of benthic macrobiota and substrate types, 2) density counts of scleractinian corals, and 3) frequency or presence/absence of fish. Dives in the Tortugas Ecological Reserve (ROV Dives 16-18) were mostly shallower than 30 m and had been described previously in Reed et al., 2016, 2017; therefore, were not quantitatively analyzed herein.

Appendix 2 lists the percent cover from CPCe analysis of the mesophotic and rariphotic sites (ROV Dives 1-10). Appendix 3 lists the coordinates and depth for each and every colonial scleractinian coral observed at depths >30 m with the ROV video or CPCe transect photos within the FKNMS

and TER. Appendix 4 lists the taxonomy of all 130 specimens of macrobiota that were collected. Appendix 5 lists the occurrence of fish for each dive site from the video analyses.

Dives 6 and 8-10 were at rariphotic depths (90-120 m) and did not have any zooxanthellate colonial corals and thus were distinctly different from the mesophotic reef sites (Appen. 2, Figure 12A). The biota of these deeper sites consisted mostly of hydroids, antipatharians (*Stichopathes luetkeni*, *Antipathes furcata*), some octocorals (*Nicella* sp., *Thesea rubra*, *T. grandiflora*), a few sponges, and the azooxanthellate coral (*Madracis myriaster*).

Benthic Communities of the Mesophotic Coral Reef Ecosystems of the FKNMS

The following details the mesophotic reef dives (ROV 1-5, and 7) within the Florida Keys National Marine Sanctuary (Table 3, Figs. 10, 11, Appendix 2).

Table 3. Percent cover of benthic macrobiota and substrate from CPCe Point Count analysis of ROV photographic transects on mesophotic coral reef dives during the 2019 HBOI-FAU CIOERT cruise. Algae= macroalgae, Anti= Antipatharia (black coral), Scler= Scleractinia (hard corals), Octo= Octocorallia (gorgonacea), Por= Porifera (sponges), Other= all other benthic macrobiota, Hum= human debris (fishing lines, trawl nets, anchors), HB= bare hard bottom, SB= bare soft bottom.

Dive	Algae	Anti	Scler	Octo	Por	Other	Hum	HB	SB	Total
19-01	23.82%	0.06%	2.80%	12.69%	12.56%	5.84%		36.08%	6.15%	100%
19-02	37.40%		0.60%	3.86%	14.71%	2.20%	0.23%	32.41%	8.59%	100%
19-03	14.91%	0.03%	4.46%	28.87%	16.44%	3.98%	0.10%	28.14%	3.06%	100%
19-04	18.48%	0.09%	0.52%	13.91%	8.76%	4.07%	0.06%	46.78%	7.33%	100%
19-05	53.42%		0.56%	1.25%	11.96%	2.40%	0.23%	23.75%	6.44%	100%
19-07	6.91%		7.35%	10.81%	7.62%	14.48%		51.40%	1.43%	100%
	26.85%	0.03%	2.36%	12.13%	12.26%	4.85%	0.11%	35.59%	5.81%	100%

All six dive sites which ranged from depths of 30-53 m were primarily hard bottom (less than 10% soft bottom) and were dominated by macroalgae 6.9- 53.4% cover; 22 taxa), Porifera (7.6- 16.4%, 73 taxa), octocoral gorgonians (1.2- 28.8%; 16 taxa), and Scleractinia (0.6- 7.3%; 13 taxa). Sponges were especially species rich. Although 130 specimens of macrobiota were collected (Appen. 4; 40 specimens of macroalgae [26 taxa], 63 Porifera [33 taxa], 16 Cnidaria [9 taxa]), much more sampling is needed to document the true biodiversity of the region, especially for macroalgae, octocorals, and sponges which require microscopic analyses to determine the taxonomy for many of the taxa. The deepest of the mesophotic dive sites were ROV 2 (Elbow-Mesophotic Deep Ridge, 44-51 m), and ROV 4 and 5 (Grecian/French- Mesophotic West Ridge, 43- 53 m). Although these three sites had similar coral cover (0.5- 0.6%), they varied widely in cover of macroalgae, octocorals and sponges. In particular, ROV 4 and 5 were on the same ridge feature but ROV 4 was on the north end of it and ROV 5 was on the south end. ROV 5 had the densest macroalgal cover (53.4%) of all sites but the least amount of octocorals (1.2%). ROV 5 was dominated by brown algae, *Dictyota* sp. (11.5%), and *Spatoglossum* sp. (13.2%). The shallower dive sites ranged from depths of 30-38 m and included ROV 1 (Carysfort Central Ridge), ROV 3 (Elbow Mini-Mounds), and ROV 7 (Pelican Shoal). These had the greatest coral cover (2.8- 7.3%). The Mini-Mounds mesophotic reefs are very interesting and geologically different than the other sites. Whereas most of the other sites are deep-water ridge features, the

Mini-Mounds consisted of hundreds to thousands of 2-3 m rock mounds, covering an area of 7.4 km². It had a high cover of coral (4.4%), and the highest cover of octocorals (28.8%) and sponges (16.4%). The mesophotic portion of Pelican Shoal is just the lower portion on the fore reef slope of the shoal. Although this site had the highest cover of Scleractinia (7.3%) of all the sites, it was heavily impacted with sedimentation and cyanobacteria (see images in Appen 1, ROV 19-07).

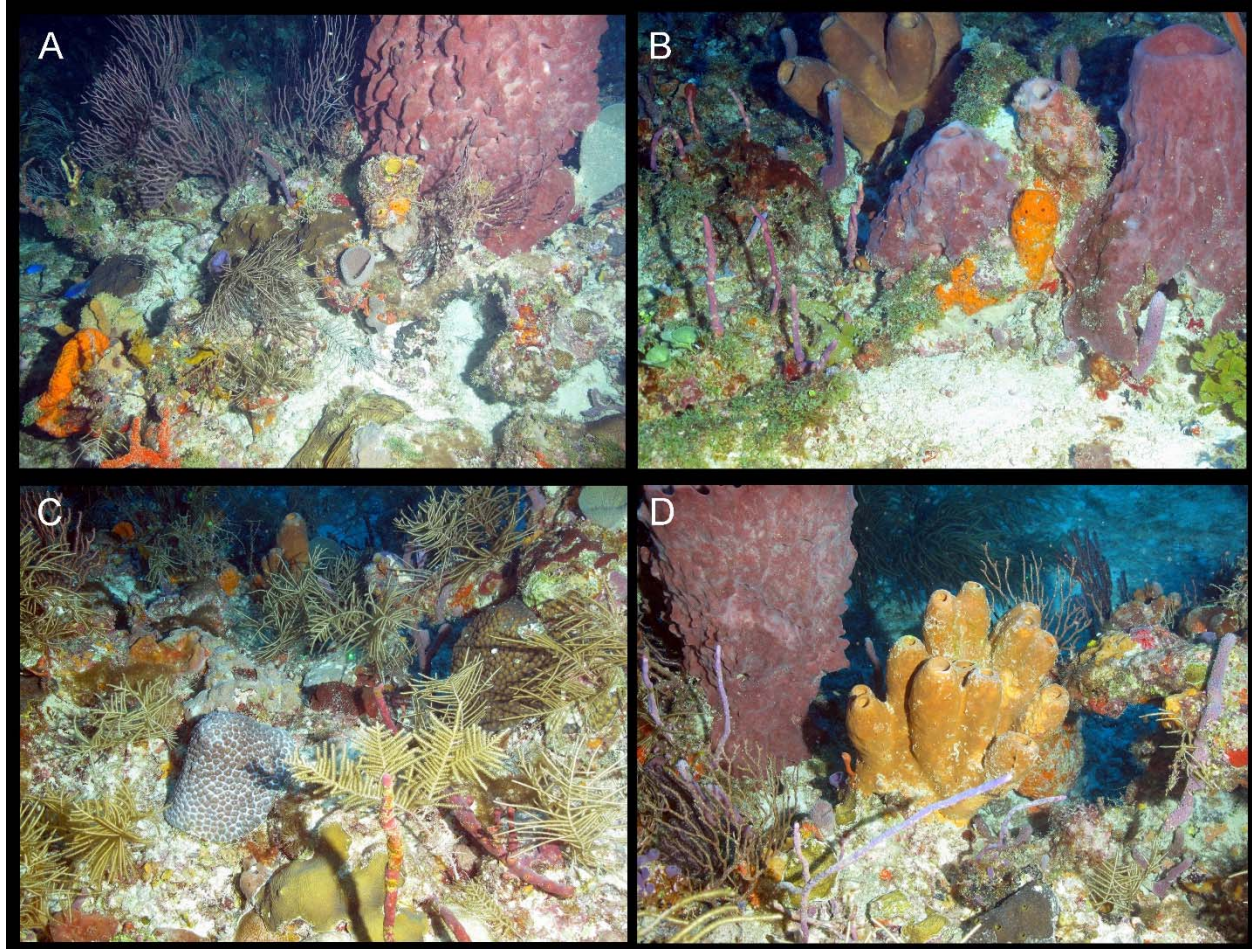


Figure 10. Biodiversity of the Mesophotic Reefs of FKNMS (*Mohawk* ROV dives, 2019 HBOI-FAU CIOERT cruise). (A) ROV Dive 19-01- Sponges (left to right)- *Agelas clathrodes*, *Ptilocaulis walpersii*, *Callyspongia plicifera* (tan color), *Amphimedon* sp. (tan-yellow), *Callyspongia plicifera* (blue), *Aplysina cauliformis*, *Oceanapia bartschi*, *Niphates digitalis* (cup), *Niphates amorphia*, *Verongula* new species (yellow tube), *Xestospongia muta*; Scleractinia- *Madracis seneria* (left), *Agaricia agaricites* (middle), *Agaricia lamarcki*, *Stephanocoenia intersepta* (right), *Siderastrea siderea* (lower right) ; Hydrozoa- Hydroida, *Millepora alcicornis*; Octocorallia- *Antillologorgia* sp., *Iciligorgia schrammi*, *Pseudoplexaura* sp., *Erythropodium caribaeorum*; macroalgae- *Dictyota* spp., crustose coralline algae. (B) ROV Dive 19-02- Sponges (left to right)- *Aplysina cauliformis* (many), *Niphates erecta*, *Agelas tubulata*, *Agelas cathrodes* (massive), and *Xestospongia muta* (3); macroalgae- *Udotea cyathiformis*, *Spatoglossum schroederi*, cyanobacteria, crustose coralline algae. (C) ROV Dive 19-03- Sponges- *Agelas tubulata*, *Aplysina cauliformis*, *Svenzea zea*, *Petrosia pellarca*, *Niphates digitalis*, *Niphates*

erecta; Scleractinia- *Montastraea cavernosa*, *Siderastrea siderea*, *Stephanocoenia intersepta*, *Agaricia agaricites*; Hydrozoa- *Millepora alcicornis*; Octocorallia- *Icilogorgia schrammi*, *Antillogorgia* sp., *Erythropodium caribaeorum*; macroalgae- *Halimeda* sp., crustose coralline algae. (D) ROV Dive 19-03- Sponges- *Xestospongia muta*, *Agelas tubulata*, *Aplysina cauliformis*, *Niphates erecta*, *Spirastrella coccinea*, *Smenospongia echina*, *Callyspongia fallax*, *Cliona delitrix*; Scleractinia- *Agaricia agaricites*; Octocorallia- *Icilogorgia schrammi*, *Antillogorgia* sp., *Pseudoplexaura* sp., *Erythropodium caribaeorum*; macroalgae- crustose coralline algae.

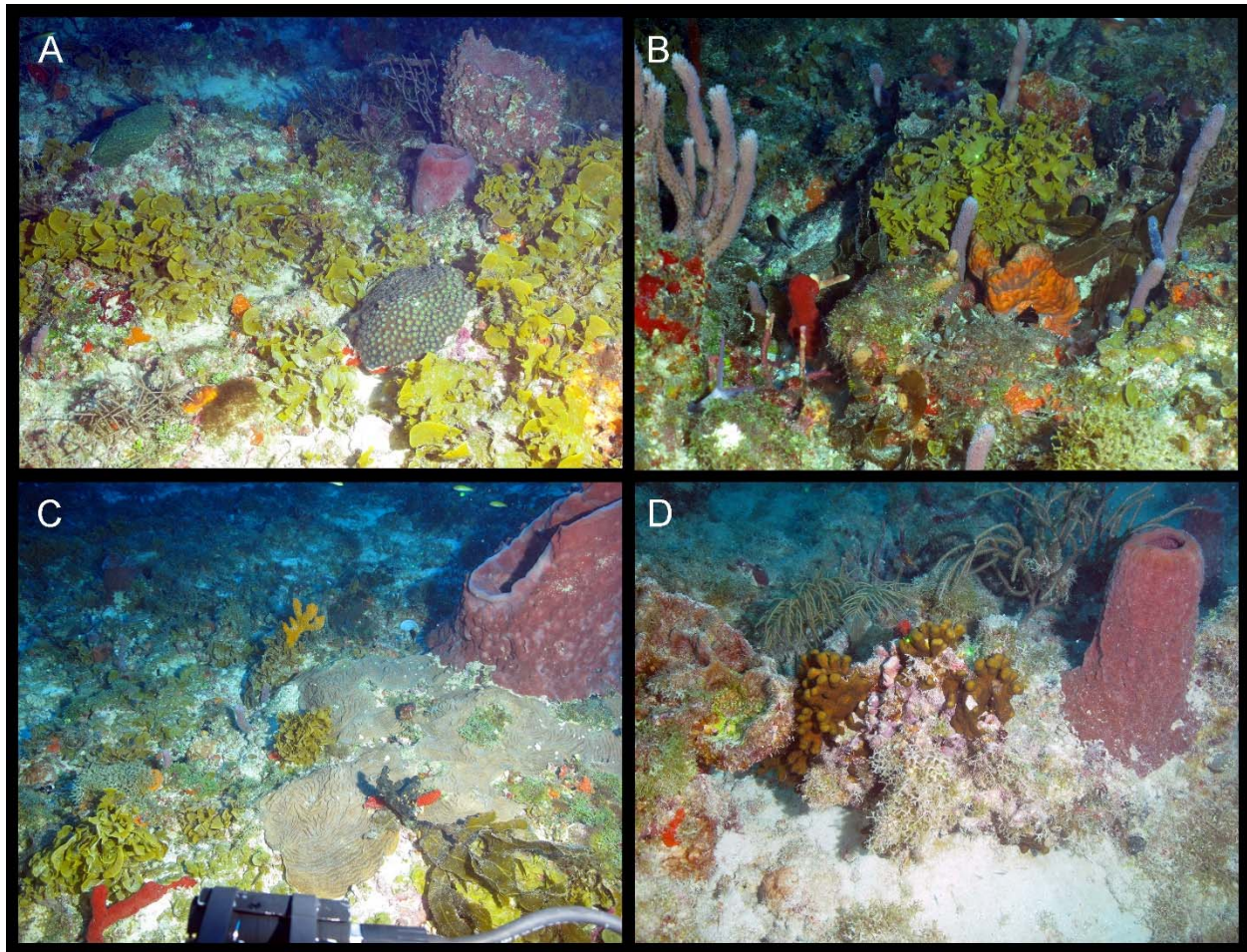


Figure 11. Biodiversity of the Mesophotic Reefs of FKNMS (*Mohawk* ROV dives, 2019 HBOI-FAU CIOERT cruise). (A) ROV Dive 19-04- Sponges- *Xestospongia muta*, *Niphates erecta*, Axinellida (few orange massive), *Spirastrella coccinea* (red encrusting); Scleractinia- *Montastraea cavernosa*; Octocorallia- *Antillogorgia* sp., *Icilogorgia schrammi*, *Erythropodium caribaeorum*; macroalgae- *Halimeda* sp., *Dictyota* sp., *Spatoglossum schroederi*, crustose coralline algae. (B) ROV Dive 19-05- Sponges- *Niphates erecta* (3-4 specimens), *Aplysina sciophila* (two specimens to the right of *N. erecta* on the left), *Amphimedon compressa*, *Agelas clathrodes* (orange folded fan); macroalgae- *Dictyota* sp., *Dictyopteris justii*, *Spatoglossum schroederi*, *Sargassum* sp., crustose coralline algae. (C) ROV Dive 19-05- Sponges- *Amphimedon compressa*, *Agelas sventres*, *Niphates digitalis*, *Xestospongia muta*, *Ptilocaulis walpersi* (orange finger), *Iotrochota birotulata*; Sceractinia- *Agaricia lamarcki*; macroalgae- *Dictyota* sp., *Spatoglossum schroederi*, *Lobophora* sp., *Dictyopteris justii*, crustose coralline algae. (D) ROV

Dive 19-07- Sponges- *Geodia* cf. *neptuni* (left), *Xestospongia* cf. *muta*, Spirastrellidae (*Spirastrella* or *Diplastrella*); Scleractinia- *Madracis decactis*; Octocorallia- *Antillogorgia* sp., *Pseudoplexaura* sp., *Erythropodium caribaeorum*; macroalgae- *Dictyota* sp., crustose coralline algae, cyanobacteria.

Benthic Biota and Habitat Relationships

Multivariate analyses were used to determine differences in benthic biota among the mesophotic (ROV 1-5, 7) and rariphotic (ROV 6, 8-10) reef dives sites. Using PRIMER 6, a multi-dimensional scaling (MDS) plot was made to compare each site based on Bray-Curtis similarity matrix calculated from square-root transformation of benthic macrobiota percent cover averaged by dive (Fig. 12). In general, there were 4 statistical groupings; Pelican Shoal Mesophotic Reef (PS) (ROV 7 = SIMPROF Group A), Key Largo Mesophotic Zone (KLM) (splits into 2 SIMPROF Groups [ROV 1, 3, 4 = Group C and ROV 2 and 5 = Group B]); and Rariphotic (Rar) sites (ROV 6 and 9=Group D). ROV 8 was the same site at 9 and grouped together. ROV 10, Deep-water Warsaw Sinkhole (DWS) was removed from Figure 12 because it was a strong outlier. There is a clear distinction between the Rar sites (40% similar to each other) and the KLM / PS (also 40% similar to each other). ANOSIM on Photic Zone comparison (including DWS); $R = 0.927$, $Sig = 0.1\%$, with pairwise tests showing PS and KLM with an $R = 0.8$ (dissimilar) and KLM vs Rar = 1 (totally different). The Rar sites vs DWS site also have an $R=1$.

There were very few species (6) identified in rariphotic sites (group D) that make up >90% of the contribution to the Average Similarity: 42.02 [Hydroidolina - Average Abundance (AA) = 0.17), *Antipathes furcata* (0.06), unidentified demosponges (0.03), unidentified antipatharians (0.03) and *Stichopathes* sp. (0.04)] compared to the KLM which had 38 taxa identified to make up >90% of the contribution to the Average Similarity: 59.50. The top 9 taxa (cumulative contribution 45.63) are *Dictyota* sp. (KLM AA = 0.28), unidentified macroalgae (0.21), unidentified Demospongiae (0.19), *Xestospongia muta* (0.16), unidentified brown algae (0.18), crustose coralline algae (0.14), *Antillogorgia* sp. (0.18), *Lobophora* sp. (0.12), and *Erythropodium caribaeorum* (0.14). The stark difference between the Rar and KLM are likely due to both depth and suitable substrate since both Dive 6 and 9 are >50% sediment (52%, 86% respectively) whereas the KLM dives had <10% bare sediment.

A pairwise test between the Key Largo mesophotic groups and the rariphotic group show the 1st five species contributing to the top 21% of differences do not appear in the Rar (AA = 0). These taxa are: *Dictyota* sp. (KLM AA=0.28), Algae- unidentified macroalgae (0.21), Phaeophyceae (0.18), *Antillogorgia* sp. (0.18), *Xestospongia muta* (0.16). The first taxa that appear in both groups is unidentified Demosponges (KLM AA = 0.19; Rar AA = 0.03). The next 2 species [*Spatoglossum schroederi* (KLM AA=0.15) and *Erythropodium caribaeorum* (0.14)] also do not appear in the Rar. The above 8 species explain the top contribution 30.61% of to the differences between the groups.

A pairwise test between the Key Largo Mesophotic groups and the Pelican Shoal group show the top ~30% of the differences between the groups are: *Pseudoplexaura* sp. (KLM=0.12, PS=0.29), *Antillogorgia* sp. (KLM=0.18, PS=0.03), *Madracis senaria* (KLM=0.01, PS=0.16), *Spatoglossum schroederi* (KLM=0.15, PS=0), *Dictyota* sp. (KLM=0.28, PS=0.12), *Lobophora* sp. (KLM=0.12, PS=0), *Halimeda* sp. (KLM=0.11, PS=0), Algae- unidentified macroalgae (KLM=0.21 PS=0.11),

Phaeophyceae (KLM=0.18 PS=0.09), *Agaricia lamarcki* (KLM=0.04, PS=0.13), *Siderastrea siderea* (KLM=0.02, PS=0.1). Interestingly, the top species are the abundance of mostly brown algae in the KLM area vs more coral abundance in the PS region. Pelican Shoal Mesophotic Reef is a shallower depth range (30-38 m) then the KLM dives 38-53 m which may explain the higher abundance of coral in the PS dive.

ROV 10 (Deepwater Warsaw Sinkhole [DWS]), while rariphotic is significantly different from the other Rar sites. The top 7 taxa that are contributing to the difference between Rar and DWS are as follows: Poecilosclerida (Rar AA: 0; DWS AA: 0.1), *Thesea grandiflora* (Rar: 0; DWS: 0.1), Demospongiae (Rar: 0.03; DWS: 0.12), *Antipathes furcata* (Rar: 0.06; DWS: 0), *Ophioderma devaneyi* (Rar: 0; DWS :0.06), Corallimorpharia (Rar: 0; DWS :0.05), and *Stichopathes luetkeni* (Rar: 0.05; DWS :0). ROV 10 has more hardbottom habitat (63%) then the other Rar sites. More suitable substrate may explain the reason for the outlier and its subsequent removal from Fig 12.

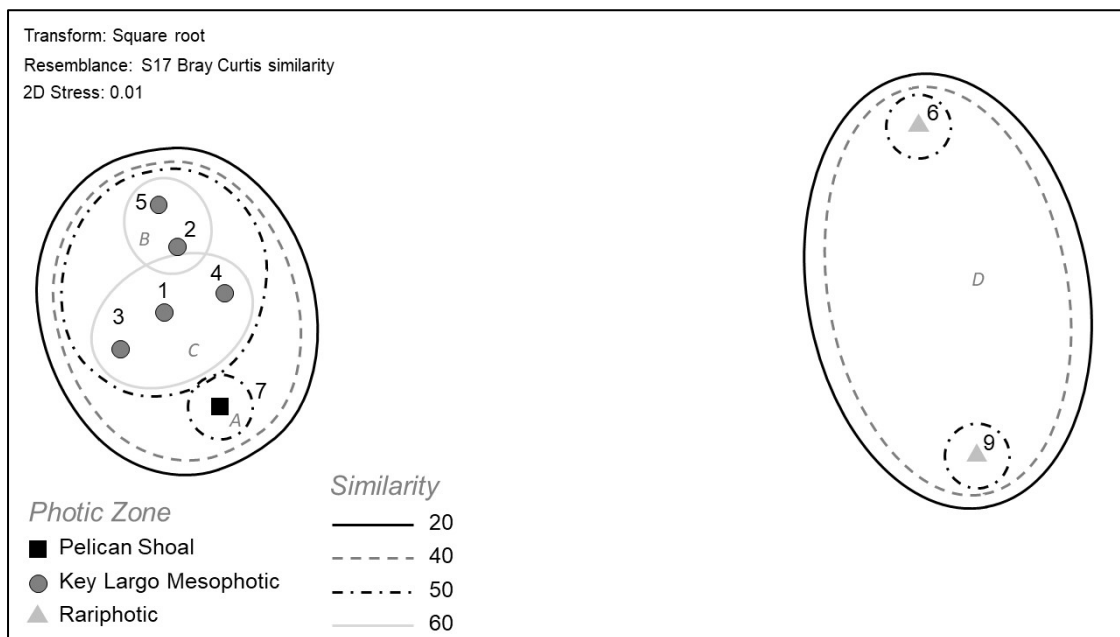


Figure 12. Multi-dimensional scaling (MDS) plot of ROV dives with species communities averaged for ROV dives based on Bray-Curtis similarity matrix calculated from square-root transformation of benthic macrobiota percent cover for the 2019 HBOI-FAU CIOERT cruise. Comparison of mesophotic ROV Dives 1-5 and 7; and rariphotic ROV 6 and 9 (ROV 10 not pictured).

Scleractinia of the Mesophotic Coral Reef Ecosystems of the FKNMS

All colonial Scleractinia were identified from the CPCE ARA density analysis of the ROV photo transects at the mesophotic reef dive sites (Dives 1-5, and 7; Table 4, Plate 13). Every individual coral colony in the transect photos was counted, measured (maximum diameter), and noted for disease or bleaching. Average coral density for all mesophotic sites was 0.862 colonies m⁻² and were most abundant at Dive 7 (4.968 m⁻²) and Dive 3 (4.422 m⁻²). Agariciids were the most abundant corals (0.275 m⁻²). *Stephanocoenia intersepta* was the single most abundant species (0.21 m⁻²), followed by *Agaricia agaricites* (0.15 m⁻²), *Montastraea cavernosa* (0.14 m⁻²), *A. lamarcki*

(0.106 m⁻²), *Siderastrea siderea* (0.087 m⁻²), *Madracis senaria* (0.41 m⁻²), *M. decactis* (0.034 m⁻²), and *Orbicella faveolata* (0.031 m⁻²).

Table 4. Density (# colonies m⁻²) of colonial zooxanthellate Scleractinia at mesophotic reef dive sites (ROV Dives 1-5, and 7; depths >30 m) within FKNMS during the 2019 HBOI-FAU CIOERT cruise.

	19-01	19-02	19-03	19-04	19-05	19-07	Total
Scleractinia	1.106	0.291	4.422	0.670	0.219	4.968	0.862
Scleractinia- unid colonial	0.049		0.065				0.017
Agariciidae	0.485		1.658	0.021	0.060	0.932	0.275
<i>Agaricia agaricites</i> (Linnaeus, 1758)	0.107		1.593	0.021		0.104	0.150
<i>Agaricia lamarcki</i> Milne Edwards & Haime, 1851	0.310		0.033		0.060	0.828	0.106
<i>Agaricia</i> sp.	0.058		0.033				0.017
<i>Helioseris cucullata</i> (Ellis & Solander, 1786)	0.010						0.002
Astrocoeniidae	0.184	0.091	0.780	0.356	0.040	2.070	0.210
<i>Stephanocoenia intersepta</i> (Lamarck, 1836)	0.184	0.091	0.780	0.356	0.040	2.070	0.210
Meandrinidae			0.033	0.063		0.104	0.012
<i>Eusmilia fastigiata</i> (Pallas, 1766)			0.033				0.002
<i>Meandrina meandrites</i> (Linnaeus, 1758)				0.063		0.104	0.010
Merulinidae	0.039	0.018	0.293				0.034
<i>Orbicella annularis</i> (Ellis & Solander, 1786)	0.010						0.002
<i>Orbicella faveolata</i> (Ellis & Solander, 1786)	0.029	0.018	0.293				0.031
Montastraeidae	0.116	0.164	0.813	0.146	0.080	0.104	0.140
<i>Montastraea cavernosa</i> (Linnaeus, 1767)	0.116	0.164	0.813	0.146	0.080	0.104	0.140
Mussidae	0.010			0.063			0.010
<i>Mycetophyllia aliciae</i> Wells, 1973	0.010			0.021			0.005
<i>Scolymia cubensis</i> (Milne Edwards & Haime, 1848)				0.042			0.005
Pocilloporidae	0.155		0.130	0.021	0.040	0.828	0.075
<i>Madracis decactis</i> (Lyman, 1859)	0.029		0.098	0.021		0.725	0.034
<i>Madracis senaria</i> Wells, 1973	0.126		0.033		0.040	0.104	0.041
Poritidae			0.033				0.002
<i>Porites astreoides</i> Lamarck, 1816			0.033				0.002
Siderastreidae	0.068	0.018	0.618			0.932	0.087
<i>Siderastrea siderea</i> (Ellis & Solander, 1786)	0.068	0.018	0.618			0.932	0.087
Grand Total	1.106	0.291	4.422	0.670	0.219	4.968	0.862

In addition to the corals documented in the transect photos, all scleractinian corals that were identified on the mesophotic reef sites from the visual video observations during the dives, as well as the CPCe ARA data, are listed in Appendix 3 which provides coordinates and depth of each. A total of 649 coral colonies were documented. The video analyses identified additional taxa that were missed in the still photo CPCe transects. Table 5 summarizes Appendix 3 and lists all the colonial, zooxanthellate coral taxa (23 total species) that we documented at the mesophotic reef dive sites (>30 m depths).

Table 5. Colonial zooxanthellate Scleractinia documented at the mesophotic reef dive sites (ROV Dives 1-5, and 7) at depths >30 m within FKNMS during 2019 HBOI-FAU CIOERT cruise. Counts of each species are from the CPCE ARA (density analysis), notes during the live ROV video, and samples.

	No. (Density)	Live Observation	Sample
Scleractinia- unid colonial	3		
Agariciidae	64	X	
<i>Agaricia agaricites</i> (Linnaeus, 1758)	35	X	
<i>Agaricia fragilis</i> Dana, 1848		X	
<i>Agaricia lamarcki</i> Milne Edwards & Haime, 1851	21	X	
<i>Agaricia</i> sp.	7	X	
<i>Agaricia undata</i> (Ellis & Solander, 1786)		X	
<i>Helioseris cucullata</i> (Ellis & Solander, 1786)	1	X	
Astrocoeniidae	63	X	
<i>Stephanocoenia intersepta</i> (Lamarck, 1836)	63	X	
Meandrinidae	5	X	
<i>Eusmilia fastigiata</i> (Pallas, 1766)	1		
<i>Meandrina danae</i> (Milne Edwards & Haime, 1848)		X	
<i>Meandrina meandrites</i> (Linnaeus, 1758)	4	X	
Merulinidae	10	X	1
<i>Orbicella annularis</i> (Ellis & Solander, 1786)	1		
<i>Orbicella faveolata</i> (Ellis & Solander, 1786)	9	X	1
Montastraeidae	46	X	
<i>Montastraea cavernosa</i> (Linnaeus, 1767)	46	X	
Mussidae	3	X	
<i>Colpophyllia natans</i> (Houttuyn, 1772)		X	
<i>Mycetophyllia aliciae</i> Wells, 1973	2	X	
<i>Scolymia cubensis</i> (Milne Edwards & Haime, 1848)	1		
Oculinidae	1		
<i>Oculina</i> sp.	1		
Pocilloporidae	16	X	
<i>Madracis auretenra</i> Locke, Weil & Coates, 2007		X	
<i>Madracis decactis</i> (Lyman, 1859)	8		
<i>Madracis formosa</i> Wells, 1973		X	
<i>Madracis senaria</i> Wells, 1973	8		
<i>Madracis</i> sp.		X	
Poritidae	1	X	
<i>Porites astreoides</i> Lamarck, 1816	1	X	
<i>Porites porites</i> (Pallas, 1766)		X	
Siderastreidae	25	X	
<i>Siderastrea siderea</i> (Ellis & Solander, 1786)	25	X	
Grand Total	237	X	1

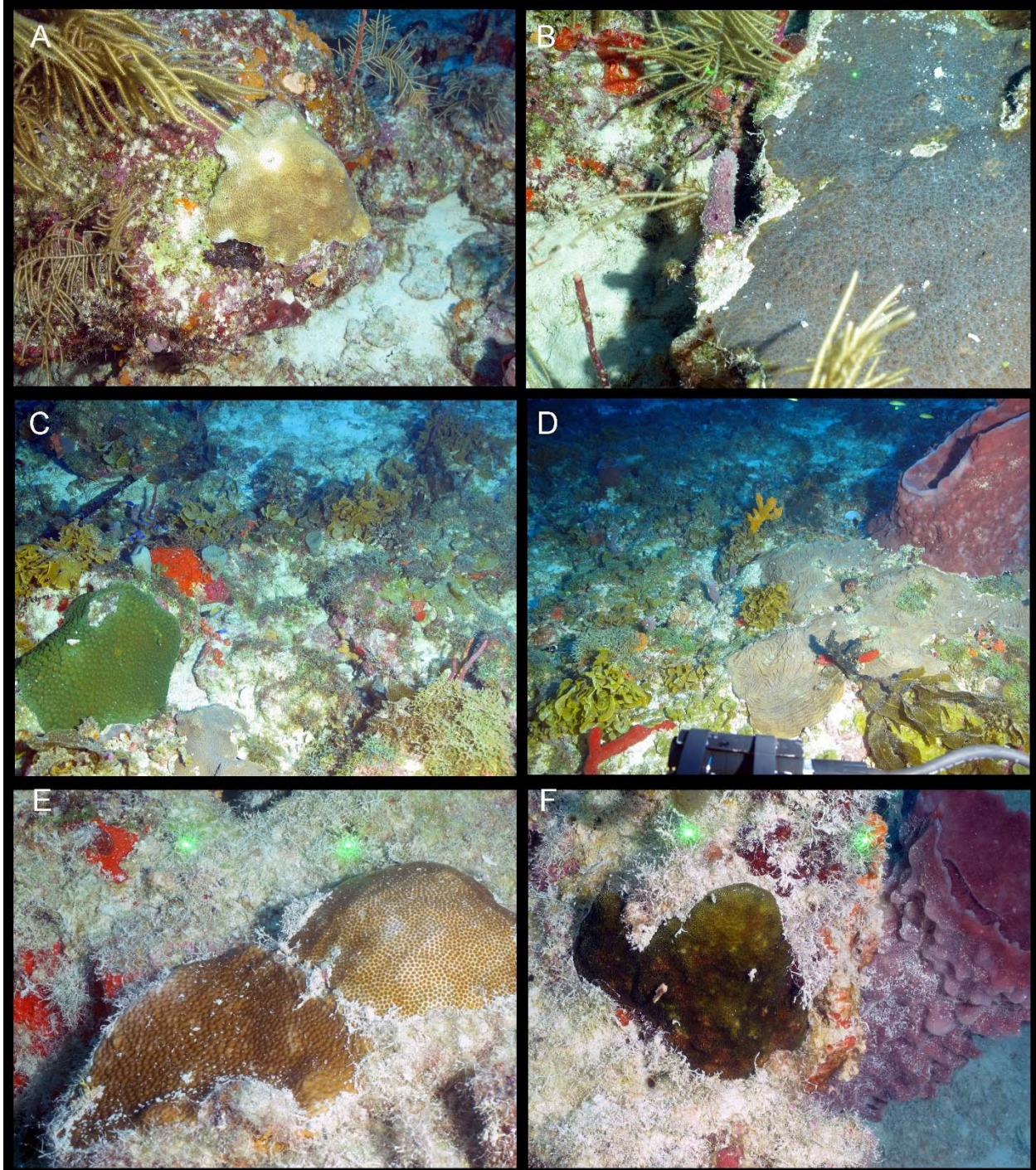


Figure 13. Mesophotic corals of the FKNMS (*Mohawk* ROV dives, 2019 HBOI-FAU CIOERT cruise). (A) ROV Dive 19-03- *Agaricia agaricites* (33 m). (B) ROV Dive 19-03- *Orbicella faveolata* (33 m). (C) ROV Dive 19-05- *Montastraea cavernosa*, *Agaricia agaricites* (43 m). (D) ROV Dive 19-05- *Agaricia lamarcki* (97 cm diameter; 43 m), (E) ROV Dive 19-07- *Stephanocoenia intersepta* (right), *Siderastrea siderea* (left) (35 m). (F) ROV Dive 19-07- *Madracis senaria* (35 m).

Predicted Coral Cover of the Mesophotic Coral Reef Ecosystems of the FKNMS

Of the eight predicted mesophotic coral reef sites (Table 2), five of the reefs were ground-truthed with ROV dives during which the densities of scleractinian corals were determined (Table 4). The total number of coral colonies for each mesophotic reef was estimated by multiplying the coral density (# colonies m⁻²) from the ROV transects by the total area of the reef (Table 6). Of course, this is a crude estimate, but does show the potential importance of these reefs to the Florida Keys ecosystem. The mesophotic reefs that we documented could conceivably have a population of 37.2 million corals, including 6.7 million *M. cavernosa*, 12 million Agariciidae, and 2 million *O. faveolata*. The Elbow Mini-Mounds may have 29.7 million, the Grecian/French Mesophotic West Ridge 5.2 million, and the Carysfort Central Ridge 1.2 million.

Table 6. Predicted total number of corals per mesophotic coral reef extrapolated from density of corals (from CPCe ARA) multiplied by the total mesophotic reef area. Den Scler= density of all Scleractinia, Mc= *Montastraea cavernosa*, Ag- all Agariciidae, Ofav= *Orbicella faveolata*; #= estimated total number of coral colonies (in millions) within the entire reef site.

Dive Site	Area (m ²)	Density (Colonies/m ²)				Estimated Coral Colonies (in Millions)			
		Scler	Mc	Ag	Ofav	Scler	Mc	Ag	Ofav
19-01 Carysfort Mesophotic Central Ridge	1,150,000	1.11	0.12	0.49	0.03	1.270	0.133	0.558	0.033
19-02 Elbow Mesophotic Ridge	161,000	0.29	0.16	0	0.02	0.047	0.026	0	0.003
19-03 Elbow Mesophotic Mini-Mounds	6,737,000	4.42	0.81	1.66	0.29	29.791	5.447	11.170	1.974
19-04 Grecian/French Mesophotic West Ridge	7,895,000	0.67	0.15	0.02	0	5.290	1.153	0.166	0
19-07 Pelican Shoal South Base	174,000	4.7	0.1	0.93	0	0.817	0.018	0.162	0
Total (in millions)						37.21	6.78	12.06	2.01

Coral Disease and Human Impacts

In general, the presence of disease was relatively low at the mesophotic reef dive sites (0.98 % of density counts; 0.45% of CPCe point counts). Of the 406 corals that were identified from the ROV transect photos for the density analysis, only 4 showed possible evidence of disease. The CPCe % cover is less comprehensive than the density since only random points were identified vs counting each individual coral colony. The affected species were *Agaricia agaricites*, *A. lamarcki*, *Siderastrea siderea*, and *Stephanocoenia intersepta* (Fig. 14 A, B, C, D). Two colonies had white patches which could be a white syndrome, however distinct tissue necrosis was not observed. Several corals showed evidence of paling but only 2.05% of the CPCe points showed apparent

bleaching. Two colonies were 100% old dead coral which was apparent by the mounded shape and could have been either *Siderastrea siderea* or *Montastraea cavernosa* (Fig. 14 E). Some corals such as *Orbicella faveolata* were partially dead with the boring sponge *Cliona delitrix* (Fig. 14 F).

Table 7. Coral disease and bleaching, from CPCe ARA density and CPCE notes. Total No.= number of colonies from ARA density data; CPCe %= percent of the corals affected from CPCe percent cover data.

	Total No. (Density)	CPCe (%)	CPCe (Points)
Bleached	2	2.05%	9
<i>A. agaricites</i>		0.23%	1
<i>A. lamarcki</i>		0.23%	1
<i>S. siderea</i>	2	0.46%	2
<i>S. intersepta</i>		1.14%	5
Disease	4	0.46%	2
Unknown	1	0.46%	2
<i>A. agaricites</i>	1		
<i>A. lamarcki</i>		0.46%	2
White disease	1		
<i>S. intersepta</i>	1		
White patches	2		
<i>A. agaricites</i>	1		
<i>S. siderea</i>	1		
Healthy	400	97.49%	428
Grand Total	406	100%	439

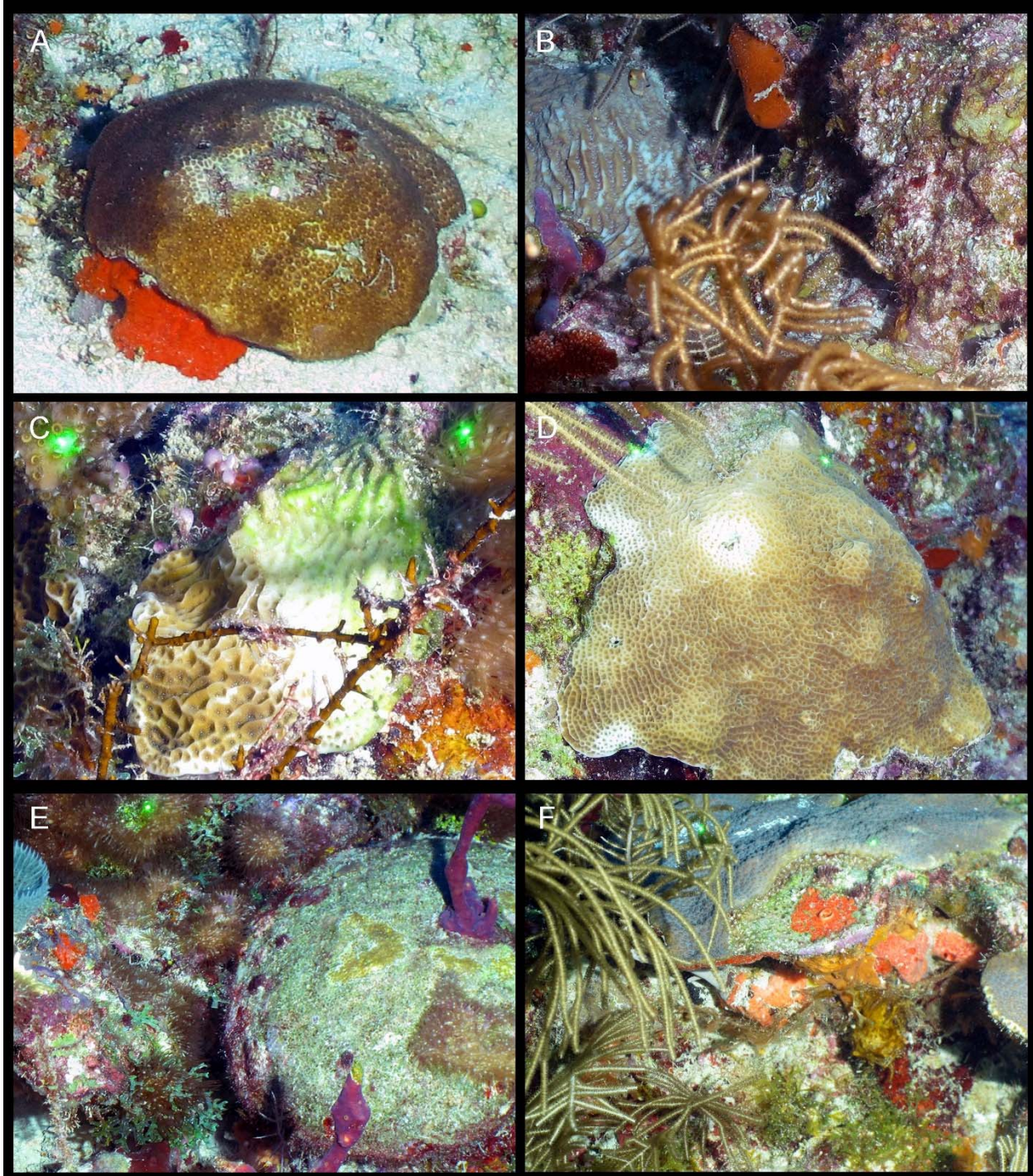


Figure 14. Mesophotic corals of the FKNMS (Mohawk ROV dives, 2019 HBOI-FAU CIOERT cruise). Coral diseases and bleaching. (A) ROV Dive 19-02- *Stephanocoenia intersepta* with damage to top. (B) ROV Dive 19-03- *Agaricia lamarcki* with white patches, paling. (C) ROV Dive 19-03- *Agaricia agaricites*, ½ recently dead, progressive lesions. (D) ROV Dive 19-03- *Agaricia agaricites* with white patches, paling. (E) ROV Dive 19-03- *Siderastrea siderea*(?), 100% old dead. (F) ROV Dive 19-03- *Orbicella faveolata* with *Cliona delitrix* boring sponge.

Human impact on the reefs was evident at most sites with monofilament fishing line, wire lines, abandoned crab and lobster pots, line from pots, and even an abandoned bottom trawl net (Table 8, Fig. 15). The most severe damage was seen at nearly all sites from pot lines which had cut large *Xestospongia muta* sponges in half. Often the top half was seen on the bottom near the severed top half. This was especially evident at Dive sites 19-02 (Elbow Mesophotic Reef, 44-51 m) and 19-05 (French Mesophotic Reef, 43-45 m). This is especially critical since some *X. muta* sponges have been aged to >1000 years old and are considered “Red Wood” trees of the reefs (McMurray et al. 2008). One ghost lobster pot line got wrapped around the ROV tether preventing the ROV to ascend until the line was cut. Fishing line was commonly wrapped around sponges and rock. A ghost bottom shrimp trawl was found at the Warsaw Sinkhole (ROV 19-10) which is outside the FKNMS boundaries.

Of all the mesophotic reefs sites, the Pelican Shoal site (ROV 19-07) is closest to shore and is severely impacted by sedimentation and overgrowth of what appeared to be bacterial mats. Many of the corals were partially dead from sedimentation. Although we only included our transects in the lower part of the fore reef mesophotic zone (30- 38 m), the shoal extends up to 17 m depth and is also impacted. Many colonies showed recent dead white edges; with white dead coming in from edge. Some *M. cavernosa* and *O. faveolata* had older dead patches in middle of coral with the boring sponge *Cliona delitrix*.

Table 8. Human impacts on the deep-water mesophotic reefs and rariphotic reefs observed from *Mohawk* ROV dives during 2019 HBOI CIOERT cruise.

Dive	Human Debris
19-01	Several abandoned lobster pots, and pot lines
19-02	Lines wrapped around sponges; <i>Xestospongia muta</i> sponges cut by lines
19-03	Abandoned pot lines common; fishing line wrapped around sponges and rock common
19-04	Abandoned lobster pot lines common
19-05	Numerous abandoned lobster lines and pots. Many 2-ft <i>X. muta</i> sponges with top cut off, very likely from lobster pot lines
19-07	Abandoned lobster pot lines
19-10	Large trawl net, long lines, anchor lines, piles fishing line, oil drum

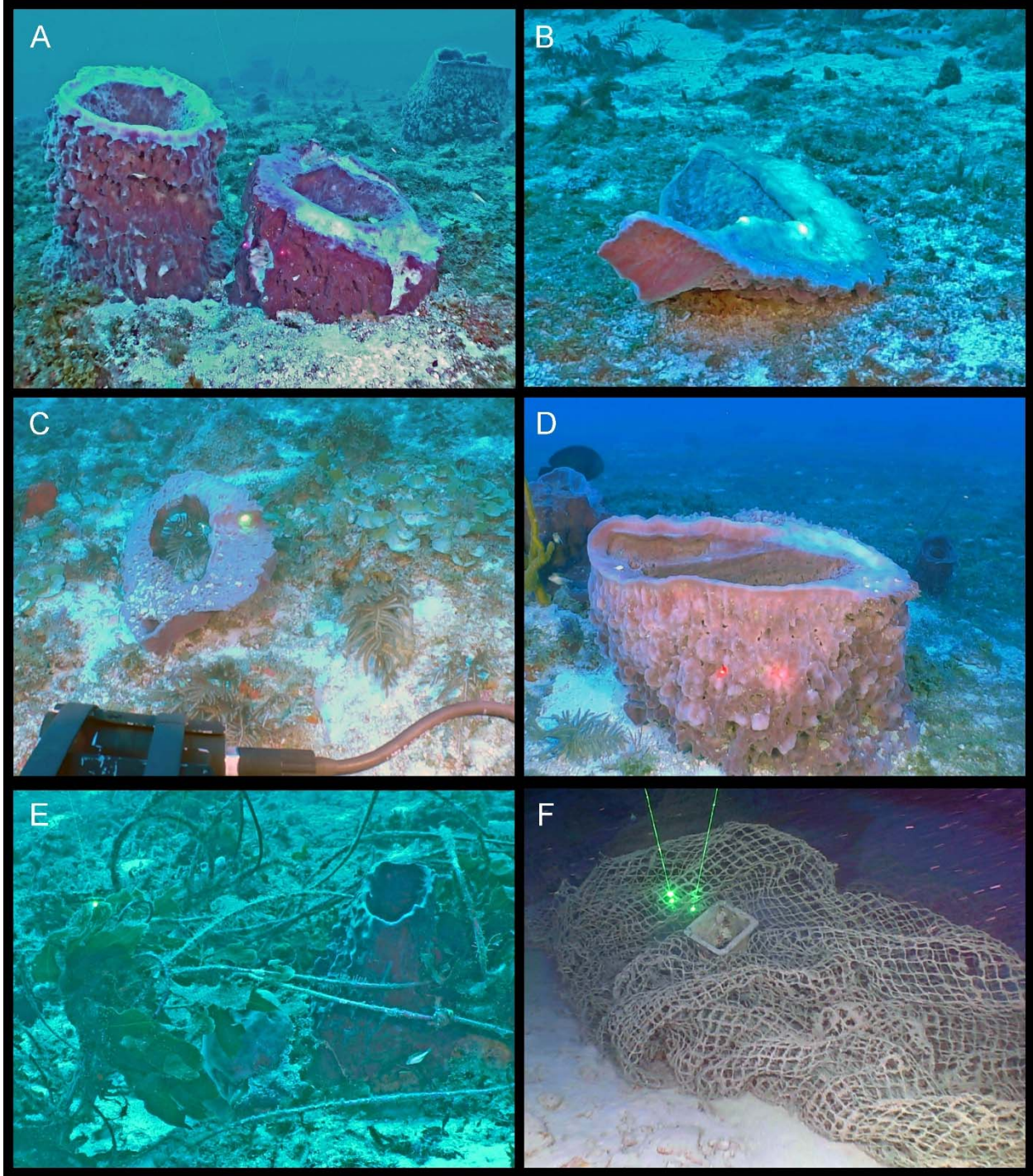


Figure 15. Mesophotic corals of the FKNMS (*Mohawk* ROV dives, 2019 HBOI-FAU CIOERT cruise). Human impacts. (A) ROV Dive 19-02- *Xestospongia muta* with tops cut off. (B) ROV Dive 19-02- *X. muta* top half sheared off. (C) ROV Dive 19-02- *X. muta* sheared in half. (D) ROV Dive 19-02- *X. muta* top half sheared off. (E) ROV Dive 19-05- pile of crab or lobster pot line wrapped around reef. (F) ROV Dive 19-10- Ghost bottom trawl net on rare reef.

Fish Communities of the Mesophotic Coral Reef Ecosystems of the FKNMS

All fish observed from the video of the ROV dives at the FKNMS (ROV 1-10) and TER (ROV 16-18) were recorded as present/absent (Appendix 5). Commercially and recreationally important species were counted along with lionfish (Table 9, Appendix 1 and 5). The larger snapper/grouper species were relatively rare. Some sites had aggregations at a particular rock formation. For example, a school of silk snapper were observed at the Warsaw Sinkhole. Surprisingly, a school of red snapper were found on ROV 6 which is a fairly barren deep-water mound except for an isolated rock outcrop of 0.25 m relief. Lionfish were present at most of the mesophotic sites but in relatively low numbers.

Table 9. Commercially/recreationally important fish (counted) from *Mohawk* ROV dive sites at FKNMS and TER during 2019 HBOI-FAU CIOERT cruise.

	Florida Keys National Marine Sanctuary										Tortugas Eco. Res.			Total
	19-01	19-02	19-03	19-04	19-05	19-06	19-07	19-08	19-09	19-10	19-16	19-17	19-18	
Commercial and Lionfish	17	13	9	4	8	21	3			67	7	10	2	161
Perciformes	10	6	7	4	1	20	2			67	6	8	2	133
Lutjanidae						19				63	1	2	1	86
Mutton Snapper												1		1
Blackfin Snapper						7				8				15
Red Snapper						11				3	1	1		16
Silk Snapper										52				52
Yellowtail Snapper													1	1
Vermilion Snapper						1								1
Serranidae	10	6	7	4	1	1	2			4	5	6	1	47
Two Spot Sea Bass										1				1
Graysby	10	3	7	1	1		1				2	1		26
Red Hind				3										3
Atlantic Goliath Grouper							1							1
Red Grouper		2											1	3
Snowy Grouper						1								1
Scamp										3	3	5		11
Grouper		1												1
Scorpaeniformes	7	7	2		7	1	1				1	2		28
Scorpaenidae	7	7	2		7	1	1				1	2		28
Lionfish	7	7	2		7	1	1				1	2		28

Red Grouper Pits

South of Marquesas and within the FKNMS, the multibeam shows an area of 73.5 km², at depths of 75-90 m, that is covered with very regular pits (Fig. 15). These range from 15- 20 m in diameter,

and are very regularly spaced apart by 50 to 100 m. Although we had no ROV dives to ground-truth these, they look very similar to red grouper pits and similar depths that we documented previously on Pulley Ridge mesophotic reef in the Gulf of Mexico. We estimated the number of pits by counting the number in 3 sets of 1 km² areas. Active pits were designated as having sharply defined edges, whereas inactive pits were defined as smoothed pits. Of course, ground-truthing is the only way to know if a pit is active or not with the presence of the red grouper. We estimate that there are 2,378 active pits in this 73.5 km² area. ROV dives are needed to verify these features.

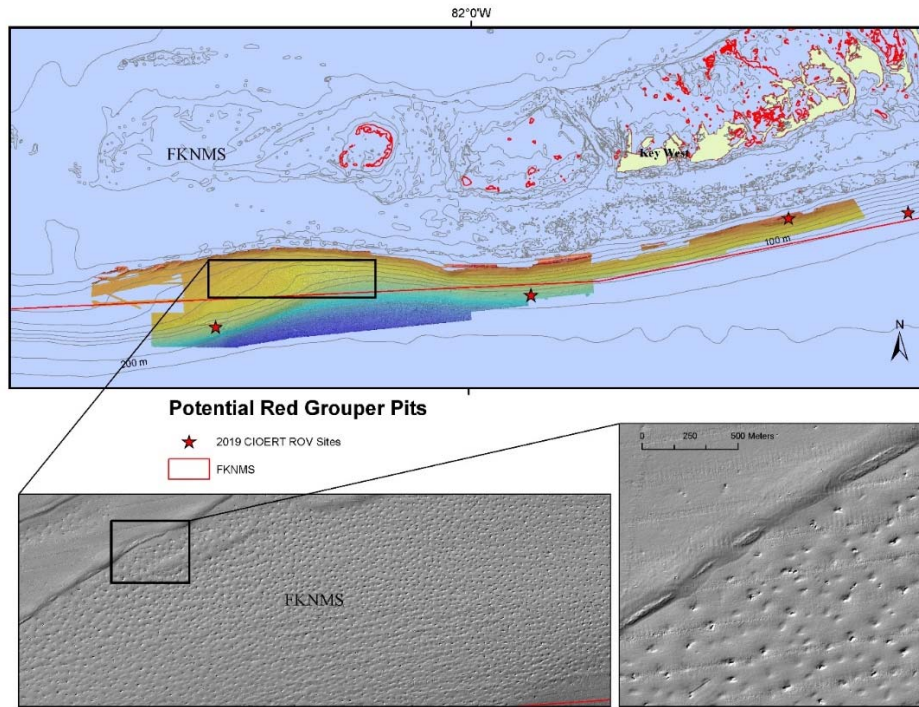


Figure 16. Region of potential red grouper pits seen in multibeam south of Marquesas. Box around the area of pits is 73.5 km². These have not been ground-truthed to verify whether they are red grouper pits.

On southern Pulley Ridge, Gulf of Mexico at depths of 60-80 m, red grouper have excavated over 155,000 burrow pits ranging from 5 m to over 15 m in diameter and 1-2 m deep (Fig. 17). Most active burrows have one adult red grouper with a total length of 50 cm or greater. The burrows provide habitat and act as oases for many small reef fish, but unfortunately most of the burrows seen in 2013 and 2014 had from several to 60 invasive lionfish per burrow (Reed 2016, Reed et al. 2019).

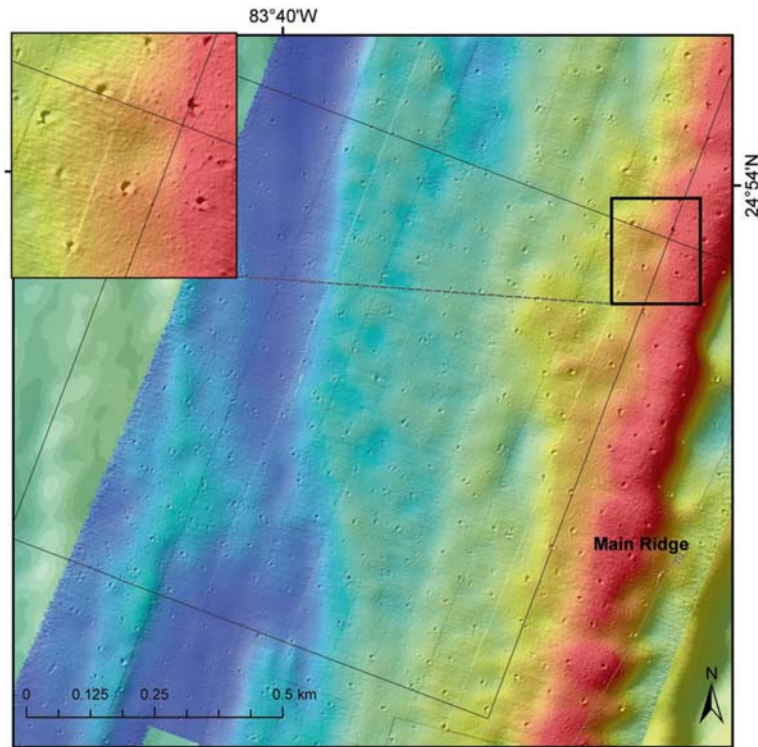


Figure 17. Multibeam of Pulley Ridge mesophotic reef, Gulf of Mexico, showing dense red grouper pits (8–15 m in diameter) in a 1 km² block (light black square) along the Main Ridge. Dark square = inset showing detail of pits. (reprinted from Reed et al., 2019).

FUTURE WORK AND CONCLUSIONS

The data from this 2019 cruise establish current 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 are made available to the FKNMS, SAFMC, NOAA Fisheries, NOAA Deepsea Coral Research and Technology Program (DSCRTP), NOAA Coral Reef Conservation Program (CRCP), NOAA Mesophotic Reef Ecosystem Program, and NOAA Marine Sanctuaries to assist management on these habitats and key species. In general, the mesophotic coral ecosystems of the FKNMS appear to be in better condition than shallow reefs in the region. Importantly, no stony coral tissue loss disease was observed in any mesophotic reef surveyed. Overall, the benthic diversity of the FKNMS mesophotic reefs was high compared to shallow reefs, and the mesophotic and rariphotic reef ecosystems presented very different signature species. Ongoing efforts to characterize connectivity among mesophotic and shallow coral ecosystems in the FKNMS continue, as do efforts to understand the drivers of population persistence for corals and sponges in this region.

REFERENCES

Antonius A. 1972. Preliminary report of surveys in and around John Pennekamp Coral Reef State Park. Harbor Branch Foundation Scientific Reports.

- Bohnsack JA, Cantillo AY, Bello MJ. 2002. Resource survey of looe key national marine sanctuary 1983. Noaa technical memorandum nos nccos ccma 160. US Dept. of Commerce, NOAA, MD.
- Clarke KR, Gorley RN. 2006. Primer v6: User manual/tutorial. Plymouth UK: PRIMER-E, Ltd.
- Clarke KR, Warwick RM. 2001. Changes in marine communities: An approach to statistical analysis and interpretation. Plymouth, UK: PRIMER-E.
- David, A., D. Cobián-Rojas, Drummond F, Rodríguez AG. 2018. Cuba's mesophotic reefs- fish photo identification guide. Reed JK, Farrington S, editors. Cooperative Institute for Ocean Exploration, Research, and Technology (CIOERT) at Harbor Branch Oceanographic Institute- Florida Atlantic University (HBOI-FAU). Ironside Press, Vero Beach, Florida.
- Díaz M, Pomponi S, Farrington S, Reed J. 2021. Sponges inhabiting the shelf-edge marine protected areas and deep-water reefs of the southeastern USA. Fort Pierce, FL: Cooperative Institute for Ocean Exploration, Research and Technology (CIOERT) at Harbor Branch Oceanographic Institute-Florida Atlantic University (HBOI-FAU).
- Díaz MC, Busutil L, García-Hernández MR, Pomponi SA. 2019. Cuba's mesophotic coral reefs- sponge photo identification guide, edition 1; cooperative institute for ocean exploration, research, and technology (cioert) at harbor branch oceanographic institute, florida atlantic university (hboi-fau). Reed JK, Farrington S, editors. Cooperative Institute for Ocean Exploration, Research, and Technology (CIOERT) at Harbor Branch Oceanographic Institute, Florida Atlantic University (HBOI-FAU). Ironside Press, Vero Beach, Florida.
- Dustan PA. 1988. Changes in the reef-coral community of carysfort reef, key largo, florida, 1975-1982-3. Noaa technical memorandum, nos memd 18. U.S. Dept of Commerce, Washington, DC.
- Jameson SC. 1981. Key largo coral reef national marine sanctuary deep water resource survey. US Department of Commerce, National Oceanic and Atmospheric Administration, Office of Coastal Zone Management.
- Kohler KE, Gill SM. 2006. Coral point count with excel extensions (cpce): A visual basic program for the determination of coral and substrate coverage using random point count methodology. Computers & Geosciences. 32(9):1259-1269.
- Martínez-Daranas B, González-Sánchez PM, Ramos A, Gómez EE, Alfonso Y, Suárez AM, Hanisak MD. 2018. Cuba's mesophotic coral reefs- macro algae photo identification guide. Reed JK, Farrington S, editors. Cooperative Institute for Ocean Exploration, Research, and Technology (CIOERT) at Harbor Branch Oceanographic Institute- Florida Atlantic University (HBOI-FAU). Ironside Press, Vero Beach, Florida.
- McMurray SE, Blum JE, Pawlik JR. 2008. Redwood of the reef: Growth and age of the giant barrel sponge *xestospongia muta* in the florida keys. Marine Biology. 155(2):159-171.
- Reed JK, Farrington S, David A, Harter S, Moe H, Horn L, Taylor G, White J, Voss J, Pomponi S et al. 2017. Characterization of mesophotic coral/sponge habitats and fish assemblages in the regions of pulley ridge and tortugas from rovs during r/v walton smith cruises of 2012 to 2015. NOAA and SAFMC websites: Harbor Branch Oceanographic Institute Technical Report # 178.
- Reed JK, Farrington S, David A, Harter S, Pomponi S, Diaz C, Voss J, Spring KD, Hine AC, Kourafalou V et al. 2019. Pulley ridge, gulf of mexico, u.S.A. In: Loya Y, Puglise KA, editors. Mesophotic coral ecosystems, coral reefs of the world. Switzerland AG: Springer Nature p. 57-69.

- Reed JK, Farrington S, Díaz MC, Pomponi SA, Hanisak D. 2021. Photo identification guide of the benthic taxa inhabiting the mesophotic reefs of the Florida Keys National Marine Sanctuary. Harbor Branch Oceanographic Technical Report Number 197.
- Reed JK, Farrington S, Hanisak D. 2016. Characterization of the mesophotic coral/sponge habitats in the region of the Tortugas Ecological Reserves from ROV dives during 2013 and 2014 Walton Smith cruises. Report to NOAA Office of Ocean Exploration and Research, NOAA Deep Sea Coral Research and Technology Program, and Florida Keys National Marine Sanctuary. No. Harbor Branch Oceanographic Technical Report Number 176.
- Reed JK, Farrington S, Harter S, David A, Pomponi S. 2012. CIOERT Seadesc II report: Survey of the deep-sea coral and sponge ecosystems of Pourtales Terrace. Florida shelf-edge exploration II (FLOSEE) cruise, NOAA ship *Nancy Foster*, leg 2-September 23-30, 2011. Report to NOAA Office of Ocean Exploration and Research, and NOAA Deep Sea Coral Research and Technology Program: Harbor Branch Oceanographic Institute Miscellaneous Contribution # 851.
- Reed JK, Harter S, Farrington S, David A. 2014. Characterization and interrelationships of deepwater coral/sponge habitats and fish communities off Florida, USA. In: Bortone S, editor. Coral habitat and fish interrelationships. New York, USA: CRC Press. p. 49-80.
- Reed JK, Pomponi SA, Weaver D, Paull CK, Wright AE. 2005. Deep-water sinkholes and bioherms of South Florida and the Pourtales Terrace - habitat and fauna. *Bulletin of Marine Science*. 77(2):267-296.
- Reed JK, Weaver DC, Pomponi SA. 2006. Habitat and fauna of deep-water *Lophelia pertusa* coral reefs off the southeastern US: Blake Plateau, Straits of Florida, and Gulf of Mexico. *Bulletin of Marine Science*. 78(2):343-375.
- Sturm AB, Eckert RJ, Carreiro AM, Voss JD. 2021. Population genetic structure of the broadcast spawning coral, *Montastraea cavernosa*, demonstrates refugia potential of upper mesophotic populations in the Florida Keys. *Coral Reefs*. doi: 10.1007/s00338-021-02112-y
- World Porifera Database. 2021. [accessed 2021 July 19]. <http://www.marinespecies.org/porifera>.
- Voss GL, Voss NA, Cantillo AY, Bello MJ. 2002. An environmental assessment of the John Pennekamp Coral Reef State Park and the Key Largo Coral Reef Marine Sanctuary (unpublished 1983 report).
- Walker BK, Messing C, Ash J, Brooke S, Reed JK, Farrington S. 2021. Regionalization of benthic hard-bottom communities across the Pourtales Terrace, Florida. *Deep Sea Research Part I: Oceanographic Research Papers*. 172:103514.
- Weaver DC, Naar DF, Donahue BT. 2006. Deepwater reef fishes and multibeam bathymetry of the Tortugas South Ecological Reserve, Florida Keys National Marine Sanctuary, Florida. *Emerging technologies for reef fisheries research and management*. Seattle, WA: NOAA. p. 48-68.

APPENDIX 1

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 HBOI CIOERT cruise to the Florida Keys National Marine Sanctuary and Tortugas Ecological Reserves:

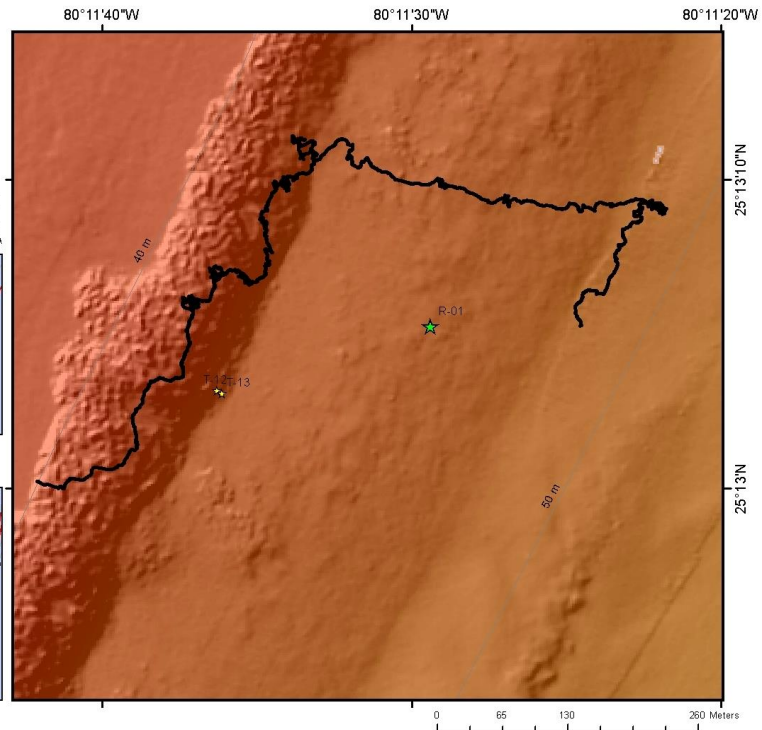
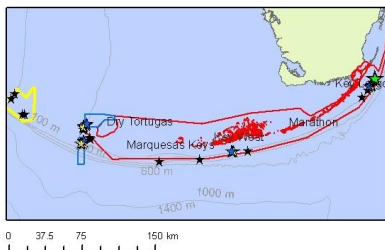
- cruise and ROV dive metadata and objectives
- figures showing each ROV dive track and habitat zones overlaid on multibeam sonar maps
- ROV dive track data (start and end coordinates, time, and depth)
- CTD plots of temperature profiles for each ROV dive
- images characterizing the habitat and biota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

Dive Site: Florida, Key Largo, E of South Carysfort Reef, Mesophotic Reef, FKNMS, Station FK-01, ROV 19-01, UNCW 773; 13-VIII-19-1

General Location and Dive Track:

Florida, Key Largo, E of South Carysfort Reef, Mesophotic Reef, FKNMS, Station FK-01, ROV 19-01, UNCW 773

- DiveTracks
- ★ R-01
- ★ Scuba
- ★ Tech Dive
- ★ ROV Dives
- Pulley Ridge
- TER
- FKNMS
- SPA



Site Overview:

Project: 2019 CIOERT Cruise
Vessel: R/V Walton Smith
Principal Investigator: John Reed
PI Contact Info: 5600 U.S. 1, North, Fort Pierce, FL 34946

Scientific Observers: John Reed, Stephanie Farrington, Shirley Pomponi, M. Dennis Hanisak, Jason White, Don Liberatore, Megan Conkling, Eric Glidden, Alexis Sturm, Ian Combs, Katherine Beckett

Ship Position System: DGPS
Data Management: Access Database
Report Analyst: John Reed or Stephanie Farrington
Date Compiled: 10/6/2021

Dive Overview:

Date of Dive: 8/13/2019
ROV: Mohawk ROV
ROV Navigation: TrackLink
ROV Sensors: Temperature (°C), Salinity (PSU), pH, Conductivity, Depth (m)

Purpose: ROV image transects and collections

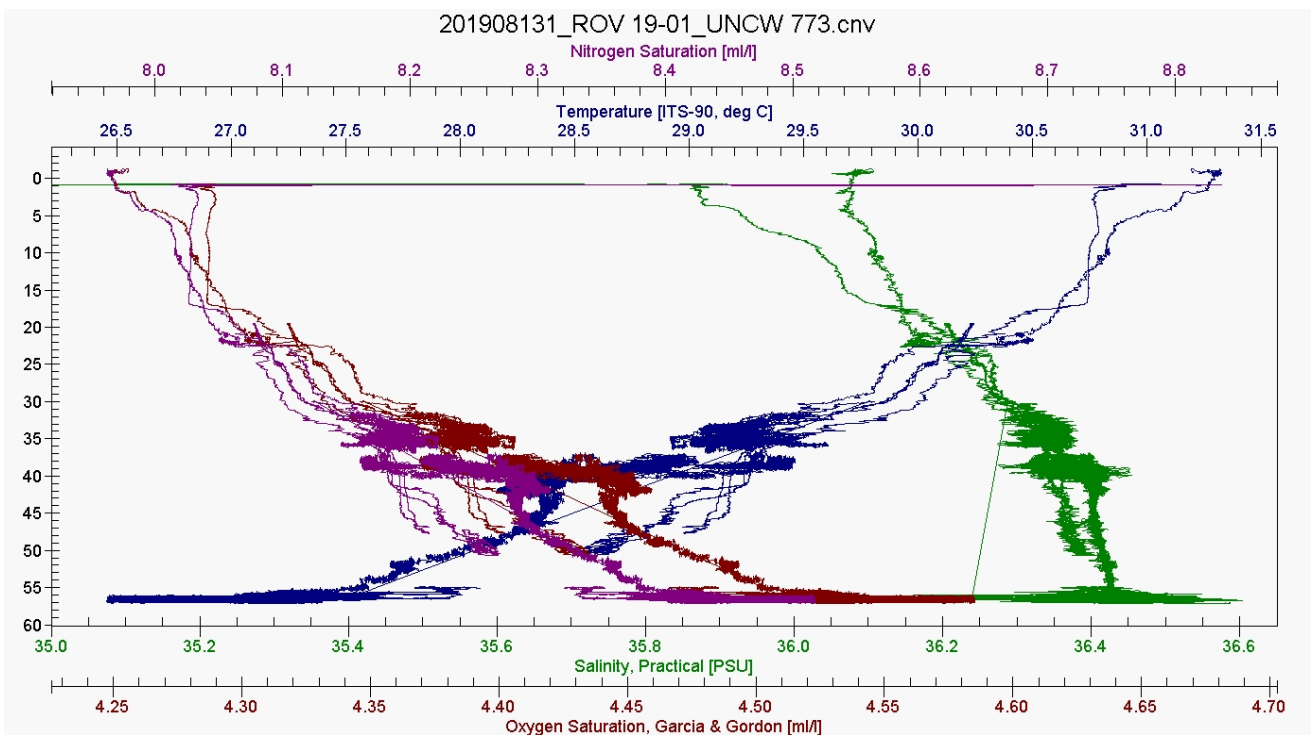
Digital Photos: 556
Distance (km): 1.3
Sonar Data: Taylor_FKNMS_Key_Largo_NS_2m_Grid
DVD: 0
Hard Drive: 2

Dive Site: Florida, Key Largo, E of South Carysfort Reef, Mesophotic Reef, FKNMS, Station FK-01, ROV 19-01, UNCW 773; 13-VIII-19-1

Dive Data:

Minimum Bottom Depth (m): 27.9	Total Transect Length (km): 1.313
Maximum Bottom Depth (m): 38.3	Surface Current (kn): 1
On Bottom (Time- GMT): 12:56	On Bottom (Lat/Long): 25.2181°N; -80.1915°W
Off Bottom (Time- GMT): 17:51	Off Bottom (Lat/Long): 25.2167°N; -80.195°W
Physical (bottom); Temp (°C): 28.9	Salinity: 36.37 Visibility (ft): 10 Current (kn): 0.5

Physical Environment:



Temperature, Salinity and Depth were collected with a Sea-Bird CTD 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: 57.2 m, Temperature: 26.5-31.3 °C, Salinity: 35.9-36.6 PSU, and Oxygen Saturation: 4.3-4.6 ml/l.

Dive Site: Florida, Key Largo, E of South Carysfort Reef, Mesophotic Reef, FKNMS, Station FK-01, ROV 19-01, UNCW 773; 13-VIII-19-1

Dive Imagery:



Figure 1: 25°13.136'N;80°11.3857'W: -58.2 m
Halymenia sp. red blade algae on a sediment/rubble bottom (lasers 10 cm)



Figure 2: 25°13.0318'N;80°11.6488'W: -38 m
Hard bottom dominated octocorals, sponges, and algae

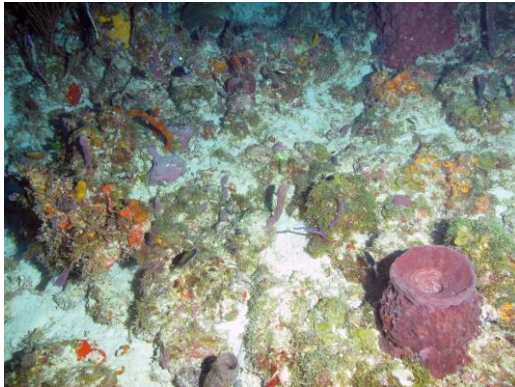


Figure 3: 25°13.0382'N;80°11.65'W: -38 m
Xestospongia muta vase sponge



Figure 4: 25°13.041'N;80°11.6485'W: -38.4 m
Diverse sponges on mesophotic reef



Figure 5: 25°13.0573'N;80°11.6392'W: -34.9 m
Xestospongia muta (upper right), *Iciligorgia schrammi* octocoral (upper left)



Figure 6: 25°12.9997'N;80°11.6873'W: -35.9 m
Agaricia sp. plate corals, Plexauridae octocorals, and lionfish

Dive Site: Florida, Key Largo, E of South Carysfort Reef, Mesophotic Reef, FKNMS, Station FK-01, ROV 19-01, UNCW 773; 13-VIII-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 13-VIII-19-1; Florida, Key Largo, E of South Carysfort Reef, Mesophotic Reef, FKNMS, Station FK-01, ROV 19-01, UNCW 773; 28- 38 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; collect samples of macrobiota for taxonomy, genetics, cell culture and biomedical research.

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. Coral, sponge and algal data were recorded in separate Access databases which were compiled with the benthic database. A Fastcat 49 CTD on the ROV continuously recorded, temperature, depth, conductivity, and salinity. ROV collection skid was used with 5-function manipulator to collect samples.

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, 1/250th second, strobe on, auto focus, white balance- fish mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing down, ~1.3 m off bottom. 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'. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

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

Depth range: east base 46 m, peak 36.5 m, west base 38.2 m

Key Largo, mesophotic patch reef southeast of south Carysfort Reef, inside FKNMS. NOAA MB shows a elongate reef, oriented NNE-SSW, 3000 m long, 150 m wide, 48.7 m at east base, 36 m top, 38 m west base. Two photo transects, 100 m each: parallel along outer slope, and one parallel along reef crest. Continue dive heading west to west base of reef.

Weather- Sunny, seas calm, wind 3.3 kn from 181 dg, air- 30.63 C, surface water 31.39 C, salinity 35.58 PSU, surface current- 1 kn to 30 dg; bottom current (ADCP)- 0.5 kn from S.

12:50:41 PM- Launch

12:56:24 PM- on bottom 52 m, visibility 10 m; 290 m E of target; flat sand, rubble, dense red algae.

12:57:57 PM- two lobster pots on bottom with lines, no associated floats- 51 m depth

1:03 PM- barracuda swam by

1:07 PM- video stopped, trouble with Hypack navigation

1:10 PM- CTD turned off

1:13 PM- back on bottom 58.5 m, flat sand, sparse rubble, red algae present; video back on.

1:21 PM- Sample 001, 55 m, red algae flat branching into bin 2

1:26 PM- Sample 002, 58.5 m, *Halymenia?* sp., bucket 2

1:30 PM- Sample 3, 58.5 m, 8 cm thin encrusting red sponge, *Spirastrellidae?*, near the *Halymenia* just

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collected, bin 4

1:43 PM- Sample 004, 58.5 m, 10 cm thin flat branching rhodophyte, bucket 3

1:46 PM- Sample 005, 58.5 m, *Halymenia?* Sp., flat bladed rhodophyte, 10 cm, bucket 3

1:47 PM- Sample 006, 58.5 m, *Kallymenia westii*, flat blade with holes, bucket 3

Sample 007, 58.5 m, rock that *Kallymenia* was attached, bin 4

Sample 008, 58.5 m, Spirastrellidae on Sample 7 rock, bin 4

1:52 PM- Sample 009, 58.5 m, *Amphimedon complanta*, 8 cm lobate with 1 cm oscules, reddish, relatively firm,

2:03 PM- Sample 010, 58.5 m, 20 cm flat blade *Halymenia* sp; part of red algae stuck in suction tube went in S4 with collection of 010, bin 4

2:09 PM- Sample 011, 58.5 m, encrusting rhodophyte on 10 cm rock, bin 3

2:13 PM- 300 m from the reef, flat sandy bottom and small rubble; heading due west toward the reef, taking haphazard photos

2:15 PM- bottom is sandy with scattered rubble and algae attached; some sponges

2:18 PM- reef butterfly and sharpnose fish swimming around *Xestospongia*; bottom flat sand with 10-20% rubble, hard bottom is increasing

2:21 PM- stopped to investigate sponges: *Aplysina cauliformis*, *Callyspongia*, soft orange sponge (*Axinella*)

2:25 PM- continuing on the path to the reef; saw some Didemnids, *Calyspongia*; possible crab pot lines on the bottom. Sergeant majors swimming by.

2:27 PM- red algae is starting to disappear, bottom becoming harder; doctorfish and puffer

2:30 PM- Sample 012, 51.5 m, *Xestospongia* to use for cell cultures and population genetics, 30-40 cm diameter, bin 3

2:41 PM- continuing the track west toward reef, 10 cm cobble with flat sandy bottom, *Xestospongia* interspersed; Lionfish, 2 blue angels and a sand tile fish. Currently 150 m east of reef

2:46 PM- getting a closer look at *Niphates erecta*; moving on to low relief rocks, *Xestospongia* common in this zone; puffers and damselfish using the sponges as habitat

2:47 PM- Sample 013, 49 m, *Xestospongia* for population and cell culture, bin 2

2:55 PM- 20 cm relief mound with cover of Didemnidae, and *Xestospongia*

2:56 PM- 3 hogfish swimming by; rock outcrop with *Xestospongia* and tube sponges

2:58 PM- hardbottom more common, came upon a gorgonian- *Pseudoplexaura*; several pufferfish

2:59 PM- pile of rubble, possibly sand tile fish mound; 50 m from base of the reef

3:01 PM- flat sediment with rubble, mostly algae and some sponges; patches of large sponges interspersed in the flat expanses

3:04 PM- getting dragged by the ship while trying to look at a branching sponge

3:06 PM- sand tile burrow among flat sand; depth 46 m

3:08 PM- rock outcrop habitat increasing; large sponges abundant; squirrelfish and many bicolor damsels, reef butterflys and other small reef fish

3:10 PM- thin branching gorgonian, *Nicella elongata*

3:11 PM- 0.5 m relief outcrops dominated by *Xestospongia* and *Callyspongia*; scattered hard bottom; longline or trap line on the bottom

3:13 PM- dense *Xestospongia* cover, hardbottom with sand interspersed

3:20 PM- rocky outcropping covered with invertebrates

3:21 PM- photo transect starting, parallel along east slope; take 30 images (3 every 2 minutes, for 20 minutes)

3:22 PM- rock ledge continuing, good sponge and gorgonian cover; half meter relief, low slope less than 5%; *Pseudoplexaura gorgonians*

3:27 PM- French angel; taking purposeful images of thick encrusting sponge

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- 3:30 PM- 0.5 m relief ledge continues with more coral cover
3:32 PM- purposeful photos of *Swiftia* for collection and *Montastrea* to see if diseased
3:35 PM- Sample 014, 42.5 m, *Swiftia exserta*, 25 cm tall, redish orange, branching erect, uncommon, bin 2
3:44 PM- purposeful photos of 1 m black hydroid
3:47 PM- resuming transect
3:48 PM- stopping to collect *Swiftia*; there are three large in the same area
3:48 PM- Sample 015, 42 m, *Swiftia*, 25 cm high, branching erect, red/orange, bin 1
3:52 PM- Sargassum filefish in algae near *Swiftia* that was collected
3:54 PM- resuming transect, hardbottom with dense cover continues; photos taken
3:55 PM- backtracked to take a purposeful photo of *Agaricia lamarki*, 40-50 cm diameter
3:57 PM- forward movement resumed; 5-10% slope, 80% cover hard bottom, dense cover of sponges and gorgonians, some hard corals mainly *M. cav* and *Agaricia*
3:59 PM- purposeful photo of *M. cav* to look at health
4:00 PM- photos for transect taken; hard coral cover is increasing
4:02 PM- Purposeful photo of purple encrusting sponge; gorgeous French angel swimming by
4:04 PM- Sample 016, 42 m, collecting thin encrusting lavender ascidian, 30 cm diameter, 1 cm oscules? all over the surface; bin 2
4:10 PM- continuing photo transect, dense cover of sponges, algae, and gorgonians on ~80% hardbottom cover continues; multiple grey angelfish
4:12 PM- 1 m relief ledges
4:16 PM- purposeful photo of 1m black hydroid
4:17 PM- several lionfish and squirrelfish
4:21 PM- end of transect at 41.6 m
- 4:24 PM- stopped to look at *M. cav* and *Meandrina*, now taking purposeful photos and a sample of brown algae
4:26 PM- Sample 017, 41.4 m, brown fan algae, bucket 5
4:29 PM- Sample 018, 41.4 m, *Dictyota*- brown branching, bucket 5
4:33 PM- Sample 019, 41 m, *Xestospongia* for population genetics, bin 1
4:38 PM- 30 cm *M. cav*, overall the colonies look healthy. Good site for hard corals
4:39 PM- traveling upslope to the shallowest part, habitat still 70% hardbottom cover, 0.5 m relief; haphazard photos taken. Cover of hardbottom a mixture of sponges, hard corals, gorgonians, algae, and some tunicates. Small reef fish are abundant
4:44 PM- Sample 020, 37.5 m, *Lobophora* sp., brown lettuce-like algae, bin 1
4:55 PM- Sample 021, *Dictyota* on rock, bucket 1
- 5:01 PM- Transect 2 beginning, starting depth 38 m
5:04 PM- purposeful photos of a *Stephanocoenia*
5:05 PM- transect resuming, habitat similar to transect 1
5:07 PM- lionfish (2) and multiple small reef fish
5:08 PM- inspecting a bleached coral, the hard coral cover and diversity has significantly increased; possible diseased coral
5:14 PM- attempting to collect a piece of almost dead, suspected diseased *O. faveolata* coral
5:23 PM- Sample 022, 36.5 m, *Orbicella faveolata*, bin 1
5:26 PM- Continuing transect, cover is now predominantly coral, hard and gorgonian, with large sponges interspersed
5:28 PM- Grouper; relief is starting to decrease, ~0.5 m at most; bicolor damsels and longfin butterfly fish common

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5:31 PM- Relief ~1m, heavy cover of sponges and gorgonians, still decent amount of hard corals

5:35 PM- back to scattered hardbottom, drifted off the transect a bit; sand grooves cutting through the reef

5:42 PM- Scrawled Filefish

5:43 PM- End transect

5:43 PM- running due west to the edge of the reef, taking haphazard photos

5:45 PM- sand chutes through the reef, relief continues to be 0.5-1 m; dominated by sponges and gorgonians; a lot of fish activity as it gets towards dusk

5:48 PM- possible diseased *M. cav*, taking purposeful photos

5:50 PM- reached the abrupt end of west edge of reef. Depth of sand 38.2 m

5:51 PM- end of dive

Human Debris:

Several lobster pots, long lines or pot lines

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CPCe Percent Cover Analysis:

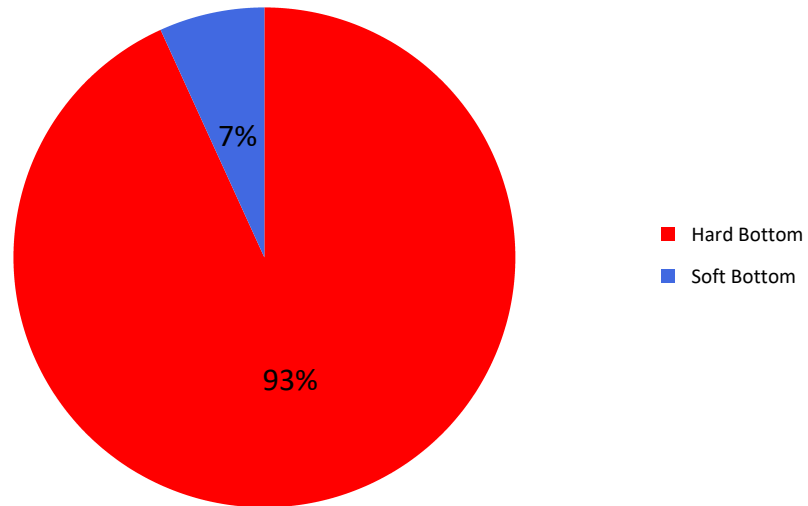
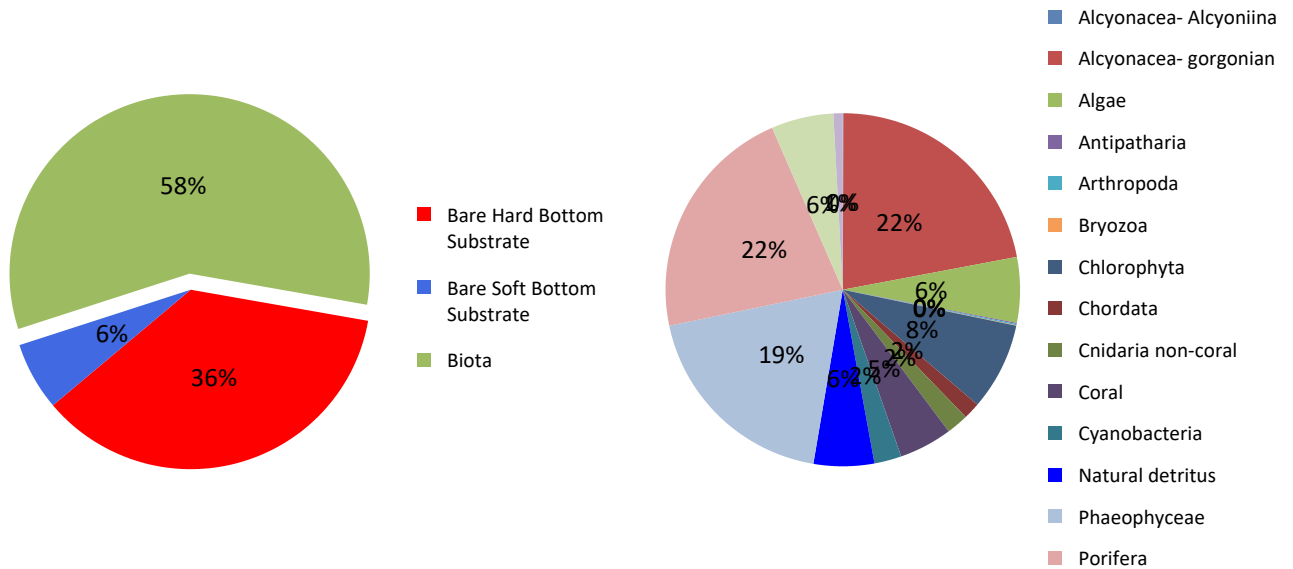


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-01. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



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.

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Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. %= Percent Cover from CPCe analysis, Den= Density of Scleractinia from CPCe ARA analysis, P/A = Presence/Absence from visual sightings during the dive, Sam = Samples (number collected) of benthic macro-biota and substrate from ROV 19-01.

Taxa	ROV 19-01			
	%	Den	P/A	Sam.
Biota	57.77%	142	X	23
Algae	23.82%		X	13
Algae- unid. macroalgae	3.47%			
Cyanobacteria	1.43%		X	
Chlorophyta	4.62%		X	
<i>Caulerpa racemosa</i> (Forsskål) J.Agardh, 1873	0.03%			
Chlorophyta	0.09%		X	
Chlorophyta- Turf Algae	0.03%			
<i>Halimeda copiosa</i> Goreau & E.A.Graham, 1967			X	
<i>Halimeda discoidea</i> Decaisne, 1842			X	
<i>Halimeda goreau</i> W.R.Taylor, 1962			X	
<i>Halimeda</i> sp.	4.44%			
<i>Udotea</i> sp.	0.03%			
<i>Ulva</i> sp.			X	
<i>Verdigellas</i> sp.			X	
Ochrophyta	11.01%		X	4
<i>Dictyota</i> sp.	6.85%		X	2
<i>Lobophora</i> sp.	1.19%		X	2
Phaeophyceae	2.65%		X	
<i>Sargassum</i> sp.	0.03%		X	
<i>Spatoglossum schroederi</i> (C.Agardh) Kützing, 1859	0.30%			
<i>Styopodium zonale</i> (J.V.Lamouroux) Papenfuss, 1940			X	
Rhodophyta	3.29%		X	9
<i>Austrokallymenia westii</i> (Ganesan) C.W.Schneider & G.W.Saunders, 2019				1
Corallinales (Crustose Coralline)				2
Corallinophycidae	2.49%		X	
<i>Gracilaria mammillaris</i> (Montagne) M.A.Howe, 1918				1
<i>Halymenia pseudofloresia</i> Collins & M.Howe, 1916				1
<i>Halymenia</i> sp.				3
<i>Peyssonnelia</i> sp.				1
Rhodophyta	0.79%		X	
Porifera	12.56%		X	6
Porifera	12.56%		X	6

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Calcarea		X	
Calcarea FK-01		X	
Demospongiae	12.56%	X	6
<i>Acanthella cubensis</i> (Alcolado, 1984)	0.09%		
<i>Agelas cerebrum</i> Assmann, van Soest & Köck, 2001		X	
<i>Agelas citrina</i> Gotera & Alcolado, 1987		X	
<i>Agelas clathrodes</i> (Schmidt, 1870)	0.03%	X	
<i>Agelas conifera</i> (Schmidt, 1870)	0.09%	X	
<i>Agelas dilatata</i> Duchassaing & Michelotti, 1864		X	
<i>Agelas sceptrum</i> (Lamarck, 1815)		X	
<i>Agelas</i> sp.	0.06%		
<i>Agelas tubulata</i> Lehnert & van Soest, 1996		X	
<i>Agelas wiedenmayeri</i> Alcolado, 1984		X	
<i>Aiolochoxia crassa</i> (Hyatt, 1875)	0.15%	X	
<i>Aiolochoxia</i> sp.	0.03%		
<i>Amphimedon</i> cf. <i>caribica</i> (Pulitzer-Finali, 1986)		X	
<i>Amphimedon</i> cf. <i>complanata</i> (Duchassaing, 1850)		X	
<i>Amphimedon compressa</i> Duchassaing & Michelotti, 1864	0.58%	X	1
<i>Amphimedon</i> sp.	0.06%		
<i>Amphimedon</i> sp. FK-03		X	
<i>Aplysina</i> aff. <i>lacunosa</i> (Lamarck, 1814)		X	
<i>Aplysina archeri</i> (Higgin, 1875)		X	
<i>Aplysina cauliformis</i> (Carter, 1882)	0.64%	X	
<i>Aplysina</i> cf. <i>fulva</i> (Pallas, 1766)		X	
<i>Auletta</i> cf. <i>tuberosa</i> Alvarez, van Soest & Rützler, 1998		X	
<i>Axinella corrugata</i> (George & Wilson, 1919)		X	
Axinellidae		X	
<i>Batzella rubra</i> (Alcolado, 1984)	0.15%		
<i>Callyspongia</i> (<i>Callyspongia</i>) cf. <i>fallax</i> Duchassaing & Michelotti, 1864		X	
<i>Callyspongia</i> (<i>Callyspongia</i>) <i>fallax</i> Duchassaing & Michelotti, 1864	0.21%	X	
<i>Callyspongia</i> (<i>Cladochalina</i>) <i>aculeata</i> (Linnaeus, 1759)	0.06%	X	
<i>Callyspongia</i> (<i>Cladochalina</i>) <i>armigera</i> (Duchassaing & Michelotti, 1864)		X	
<i>Callyspongia</i> (<i>Cladochalina</i>) <i>plicifera</i> (Lamarck, 1814)	0.03%		
<i>Callyspongia</i> sp.		X	
<i>Chondrilla nucula</i> Schmidt, 1862		X	
<i>Clathria</i> sp. FK-04		X	
<i>Cliona delitrix</i> Pang, 1973	0.03%	X	
<i>Cliona varians</i> (Duchassaing & Michelotti, 1864)	0.24%	X	
Demospongiae	3.19%	X	

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Demospongiae Cu-25		X	
<i>Desmapsamma anchorata</i> (Carter, 1882)	0.03%	X	
<i>Dragmacidon</i> sp.	0.03%		
<i>Dysidea etheria</i> Laubenfels, 1936	0.06%		
<i>Dysidea lehnerti</i> Van Soest & Hooper, 2020	0.06%		
Dysideidae		X	
<i>Geodia neptuni</i> (Sollas, 1886)	0.06%		
Haplosclerida FK-01		X	
<i>Iotrochota birotulata</i> (Higgin, 1877)		X	
<i>Ircinia</i> sp.	0.03%		
<i>Ircinia strobilina</i> (Lamarck, 1816)	0.03%	X	
Microcionidae	0.03%		
<i>Monanchora arbuscula</i> (Duchassaing & Michelotti, 1864)	0.03%	X	
<i>Monanchora</i> sp.		X	
<i>Mycale (Mycale) laevis</i> (Carter, 1882)	0.15%		
<i>Mycale</i> sp. FK-02		X	
<i>Myrmekioderma rea</i> (Laubenfels, 1934)	0.12%		
<i>Neofibularia nolitangere</i> (Duchassaing & Michelotti, 1864)		X	
<i>Neopetrosia ovata</i> Van Soest, Meesters & Becking, 2014	0.03%		
<i>Niphates alba</i> van Soest, 1980	0.30%		
<i>Niphates amorpha</i> Van Soest, 1980		X	
<i>Niphates digitalis</i> (Lamarck, 1814)	0.55%	X	
<i>Niphates erecta</i> Duchassaing & Michelotti, 1864	0.88%	X	
<i>Niphates</i> sp.	0.24%		
<i>Oceanapia bartschi</i> (Laubenfels, 1934)	0.52%	X	
<i>Petrosia (Petrosia) weinbergi</i> van Soest, 1980		X	
<i>Petrosia</i> sp.		X	
Petrosiidae	0.06%		
<i>Phorbas amaranthus</i> Duchassaing & Michelotti, 1864	0.06%		
<i>Ptilocaulis walpersii</i> (Duchassaing & Michelotti, 1864)	0.03%	X	
<i>Siphonodictyon coralliphagum</i> Rützler, 1971		X	
<i>Sphaciospongia vesparium</i> (Lamarck, 1815)		X	
<i>Spirastrella coccinea</i> (Duchassaing & Michelotti, 1864)	0.76%	X	1
<i>Spirastrella hartmani</i> Boury-Esnault, Klautau, Bézac, Wulff & Solé-Cava, 1999	0.09%		
<i>Spirastrella</i> sp.	0.12%		
Spirastrellidae		X	1
Verongiida		X	
<i>Verongula gigantea</i> (Hyatt, 1875)		X	
<i>Verongula rigida</i> (Esper, 1794)		X	
<i>Verongula</i> sp.		X	
<i>Verongula</i> sp. FK-01 ^N	0.06%	X	

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<i>Xestospongia muta</i> (Schmidt, 1870)	2.53%		X	3
<i>Xestospongia</i> sp.	0.03%			
<i>Xestospongia</i> sp. Cu-01			X	
Homoscleromorpha			X	
<i>Corticium</i> sp.			X	
<i>Plakortis</i> sp.			X	
Alcyonacea - gorgonian	12.69%		X	2
Cnidaria- Anthozoa	12.69%		X	2
Alcyonacea - gorgonian	12.69%		X	2
<i>Acanthogorgia</i> sp.			X	
<i>Antillogorgia bipinnata</i> (Verrill, 1864)	0.06%			
<i>Antillogorgia</i> sp.	5.48%		X	
<i>Ellisella elongata</i> (Pallas, 1766)	0.18%		X	
<i>Ellisella</i> sp.			X	
<i>Erythropodium caribaeorum</i> (Duchassaing & Michelotti, 1860)	1.31%			
<i>Eunicea</i> sp.	0.03%			
Gorgoniidae			X	
<i>Iciligorgia schrammi</i> Duchassaing, 1870	3.47%		X	
<i>Nicella</i> sp.	0.03%		X	
Plexauridae	0.27%		X	
<i>Pseudoplexaura</i> sp.	1.61%		X	
<i>Swiftia exserta</i> (Ellis & Solander, 1786)	0.24%		X	
<i>Swiftia</i> sp.				2
Antipatharia	0.06%	1	X	
Cnidaria- Anthozoa	0.06%	1	X	
Antipatharia	0.06%	1	X	
Antipatharia	0.06%	1		
<i>Antipathes atlantica</i> Gray, 1857			X	
<i>Antipathes</i> sp.			X	
<i>Stichopathes</i> sp.			X	
Coral- Scleractinia	2.80%	114	X	1
Cnidaria- Anthozoa	2.80%	114	X	1
Coral- Scleractinia	2.80%	114	X	1
<i>Agaricia agaricites</i> (Linnaeus, 1758)	0.15%	11	X	
<i>Agaricia fragilis</i> Dana, 1848			X	
<i>Agaricia lamarcki</i> Milne Edwards & Haime, 1851	1.67%	32	X	
<i>Agaricia</i> sp.	0.03%	6	X	
<i>Helioseris cucullata</i> (Ellis & Solander, 1786)	0.03%	1		
<i>Madracis decactis</i> (Lyman, 1859)	0.12%	3		
<i>Madracis senaria</i> Wells, 1973		13		
<i>Meandrina danae</i> (Milne Edwards & Haime, 1848)			X	
<i>Montastraea cavernosa</i> (Linnaeus, 1767)	0.27%	12	X	

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<i>Mycetophyllia aliciae</i> Wells, 1973	0.12%	1	X	
<i>Orbicella annularis</i> (Ellis & Solander, 1786)		1		
<i>Orbicella faveolata</i> (Ellis & Solander, 1786)	0.12%	3	X	1
Scleractinia- unid colonial		5		
<i>Siderastrea siderea</i> (Ellis & Solander, 1786)	0.03%	7		
<i>Stephanocoenia intersepta</i> (Lamarck, 1836)	0.24%	19	X	
Other	5.84%	27	X	1
Annelida			X	
Polychaeta			X	
<i>Spirobranchus giganteus</i> (Pallas, 1766)			X	
Bryozoa	0.03%			
Bryozoa	0.03%			
<i>Canda</i> sp.	0.03%			
Arthropoda	0.06%			
Crustacea	0.06%			
<i>Stenorhynchus seticornis</i> (Herbst, 1788)	0.06%			
Cnidaria- Anthozoa	0.03%			
Alcyonacea - Alcyoniina	0.03%			
Alcyoniina	0.03%			
Cnidaria- Hydrozoa	1.16%	1	X	
Hydrozoa	1.16%	1	X	
<i>Gymnangium</i> sp.	0.21%			
Hydroidolina	0.79%		X	
<i>Millepora alcicornis</i> Linnaeus, 1758	0.15%	1		
Chordata	0.88%		X	1
Chordata - Invertebrate	0.61%		X	1
Ascidiacea- unidentified	0.06%			
<i>Botryllus</i> sp.	0.09%			
Didemnidae	0.09%		X	
<i>Trididemnum solidum</i> (Van Name, 1902)	0.37%			1
Chordata - Vertebrate	0.27%			
Actinopterygii	0.27%			
Detritus	3.19%			
UNKNOWN	0.49%	26		
Human debris		1	X	
Human debris		1	X	
Human debris		1	X	
Human debris- Fishing Gear		1	X	
Line from lobster/crab pot		1		
Long line			X	
Human debris- other			X	
Bare Hard Bottom Substrate	36.08%			1

Dive Site: Florida, Key Largo, E of South Carysfort Reef, Mesophotic Reef, FKNMS, Station FK-01, ROV 19-01, UNCW 773; 13-VIII-19-1

Bare Hard Bottom Substrate	36.08%		1
Hard bottom	36.08%		1
Bare rock	34.90%		
Bare rubble/cobble	1.19%		
rock			1
Bare Soft Bottom Substrate	6.15%	X	
Bare Soft Bottom Substrate	6.15%	X	
Bare Soft Bottom Substrate	6.15%	X	
Burrow		X	
Sand Tilefish burrow		X	
Soft Bottom	6.15%		
Grand Total	100.00%	143	X 24

Dive Site: Florida, Key Largo, E of South Carysfort Reef, Mesophotic Reef, FKNMS, Station FK-01, ROV 19-01, UNCW 773; 13-VIII-19-1

Density of Fish:

Table 2. Counts of commercial/recreational fish and visual sightings (Presence/Absence) of non-commercial fish from video transects at dive site ROV 19-01.

Taxa	ROV 19-01 P/A
Target	17
Actinopterygii	17
Perciformes	10
Serranidae	10
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	10
Scorpaeniformes	7
Scorpaenidae	7
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	7
Chordata - Vertebrate	X
Actinopterygii	X
Batrachoidiformes	X
Batrachoididae	X
<i>Opsanus</i> sp. - Toadfish	X
Beryciformes	X
Holocentridae	X
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	X
Perciformes	X
Acanthuridae	X
<i>Acanthurus coeruleus</i> Bloch & Schneider, 1801 - Blue Tang	X
<i>Acanthurus tractus</i> Poey, 1860 - Ocean Surgeonfish	X
Apogonidae	X
<i>Apogon maculatus</i> (Poey, 1860) - Flamefish	X
Carangidae	X
<i>Carangoides bartholomaei</i> (Cuvier, 1833) - Yellow Jack	X
<i>Decapterus</i> sp. - Scad	X
Chaetodontidae	X
<i>Chaetodon capistratus</i> Linnaeus, 1758 - Foureye Butterflyfish	X
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	X
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	X
<i>Chaetodon striatus</i> Linnaeus, 1758 - Banded Butterflyfish	X
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	X
Ephippidae	X
<i>Chaetodipterus faber</i> (Broussonet, 1782) - Atlantic Spadefish	X
Haemulidae	X
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	X

Dive Site: Florida, Key Largo, E of South Carysfort Reef, Mesophotic Reef, FKNMS, Station FK-01, ROV 19-01, UNCW 773; 13-VIII-19-1

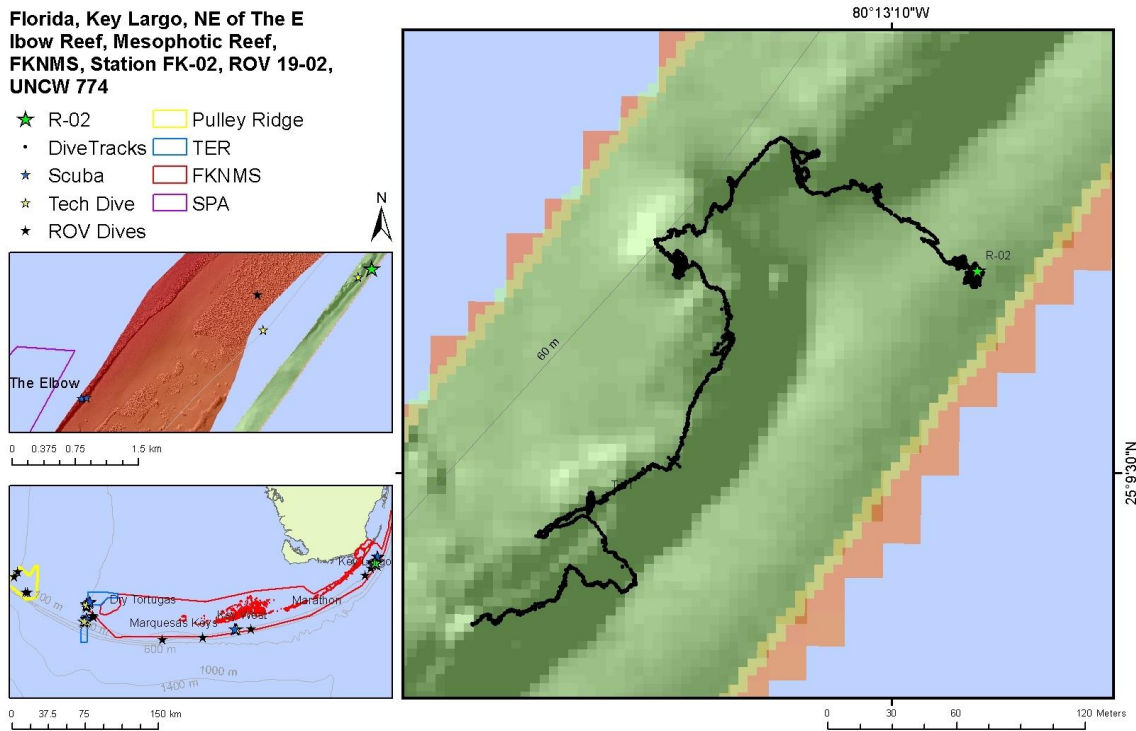
<i>Haemulon striatum</i> (Linnaeus, 1758) - Striped Grunt	X
Labridae	X
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	X
<i>Halichoeres bivittatus</i> (Bloch, 1791) - Slippery Dick	X
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Green Razorfish	X
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	X
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	X
<i>Thalassoma bifasciatum</i> (Bloch, 1791) - Bluehead	X
Microdesmidae	X
<i>Ptereleotris calliura</i> (Jordan & Gilbert, 1882) - Blue Goby	X
Mullidae	X
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	X
Pomacanthidae	X
<i>Centropyge argi</i> Woods & Kanazawa, 1951 - Cherubfish	X
<i>Centropyge aurantonotus</i> Burgess, 1974 - Flameback Angelfish	X
<i>Holacanthus bermudensis</i> Goode, 1876 - Blue Angelfish	X
<i>Holacanthus ciliaris</i> (Linnaeus, 1758) - Queen Angelfish	X
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	X
<i>Pomacanthus arcuatus</i> (Linnaeus, 1758) - Gray Angelfish	X
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	X
Pomacentridae	X
<i>Chromis cyanea</i> (Poey, 1860) - Blue Chromis	X
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reef fish	X
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	X
<i>Chromis scotti</i> Emery, 1968 - Purple Reef fish	X
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damselfish	X
<i>Stegastes variabilis</i> (Castelnau, 1855) - Cocoa Damselfish	X
Priacanthidae	X
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	X
Scaridae	X
<i>Nicholsina usta</i> (Valenciennes, 1840) - Emerald Parrotfish	X
<i>Scarus taeniopterus</i> Lesson, 1829 - Princess Parrotfish	X
<i>Sparisoma atomarium</i> (Poey, 1861) - Greenblotch Parrotfish	X
<i>Sparisoma aurofrenatum</i> (Valenciennes, 1840) - Redband Parrotfish	X
Serranidae	X
<i>Hypoplectrus randallorum</i> Lobel, 2011 - Tan Hamlet	X
<i>Hypoplectrus</i> sp. - Hamlet	X
<i>Hypoplectrus unicolor</i> (Walbaum, 1792) - Butter Hamlet	X
<i>Rypticus saponaceus</i> (Bloch & Schneider, 1801) - Greater Soapfish	X
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	X
<i>Serranus tigrinus</i> (Bloch, 1790) - Harlequin Bass	X
<i>Serranus tortugarum</i> Longley, 1935 - Chalk Bass	X

Dive Site: Florida, Key Largo, E of South Carysfort Reef, Mesophotic Reef, FKNMS, Station FK-01, ROV 19-01, UNCW 773; 13-VIII-19-1

Sparidae	X
<i>Calamus calamus</i> (Valenciennes, 1830) - Saucereye Porgy	X
<i>Diplodus argenteus</i> (Valenciennes, 1830) - Silver Porgy	X
Sphyraenidae	X
<i>Sphyraena barracuda</i> (Edwards, 1771) - Great Barracuda	X
Tetraodontiformes	X
Monacanthidae	X
<i>Cantherhines macrocerus</i> (Hollard, 1853) - Whitespotted Filefish	X
<i>Cantherhines pullus</i> (Ranzani, 1842) - Orangespotted Filefish	X
<i>Monacanthus tuckeri</i> Bean, 1906 - Slender Filefish	X
Ostraciidae	X
<i>Lactophrys triqueter</i> (Linnaeus, 1758) - Smooth Trunkfish	X
Tetraodontidae	X
<i>Canthigaster rostrata</i> (Bloch, 1786) - Sharpnose Puffer	X
Grand Total	X

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mesophotic Reef, FKNMS, Station FK-02, ROV 19-02, UNCW 774; 14-VIII-19-1

General Location and Dive Track:



Site Overview:

Project: 2019 CIOERT Cruise
Vessel: R/V Walton Smith
Principal Investigator: John Reed
PI Contact Info: 5600 U.S. 1, North, Fort Pierce, FL 34946

Scientific Observers: John Reed, Stephanie Farrington, Shirley Pomponi, M. Dennis Hanisak, Jason White, Don Liberatore, Megan Conkling, Eric Glidden, Alexis Sturm, Ian Combs, Katherine Beckett

Ship Position System: DGPS
Data Management: Access Database
Report Analyst: John Reed or Stephanie Farrington
Date Compiled: 10/6/2021

Dive Overview:

Date of Dive: 8/14/2019
ROV: Mohawk ROV
ROV Navigation: TrackLink
ROV Sensors: Temperature (°C), Salinity (PSU), pH, Conductivity, Depth (m)

Purpose: ROV image transects and collections

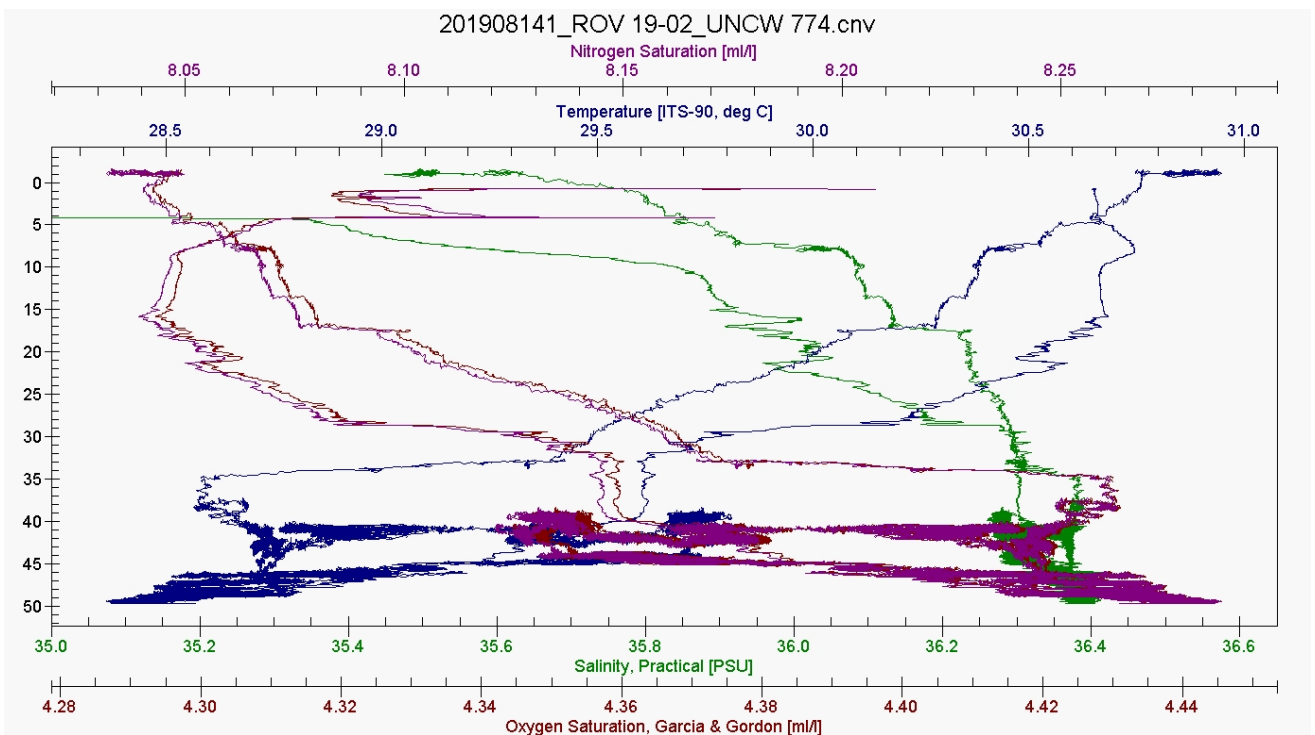
Digital Photos: 262
Distance (km): 0.7
Sonar Data: None Available
DVD: 0
Hard Drive: 1

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mesophotic Reef, FKNMS, Station FK-02, ROV 19-02, UNCW 774; 14-VIII-19-1

Dive Data:

Minimum Bottom Depth (m): 43.8	Total Transect Length (km): 0.655
Maximum Bottom Depth (m): 50.7	Surface Current (kn): 0.7
On Bottom (Time- GMT): 8:32	On Bottom (Lat/Long): 25.1592°N; -80.2191°W
Off Bottom (Time- GMT): 11:33	Off Bottom (Lat/Long): 25.1577°N; -80.2212°W
Physical (bottom); Temp (°C): 29.2	Salinity: 36.35 Visibility (ft): 49.21 Current (kn): 0.2

Physical Environment:



Temperature, Salinity and Depth were collected with a Sea-Bird CTD 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: 49.7 m, Temperature: 28.4-30.7 °C, Salinity: 34.4-36.4 PSU, and Oxygen Saturation: 4.3-4.4 ml/l.

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mesophotic Reef, FKNMS, Station FK-02, ROV 19-02, UNCW 774; 14-VIII-19-1

Dive Imagery:

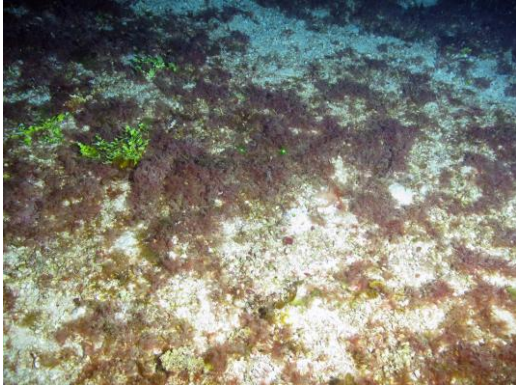


Figure 1: 25°9.5482'N;80°13.1455'W: -50.7 m
Martinsia pavona red algae and *Halmeda* sp. on sand



Figure 2: 25°9.584'N;80°13.195'W: -43 m
Sand/rubble bottom, with cyanobacteria mats



Figure 3: 25°9.5739'N;80°13.2068'W: -44.3 m
Xestospongia muta vase sponge and Plexauridae octocorals



Figure 4: 25°9.5673'N;80°13.2085'W: -43.5 m
Antillogorgia spp. octocorals, and various *Aplysina* spp. sponges

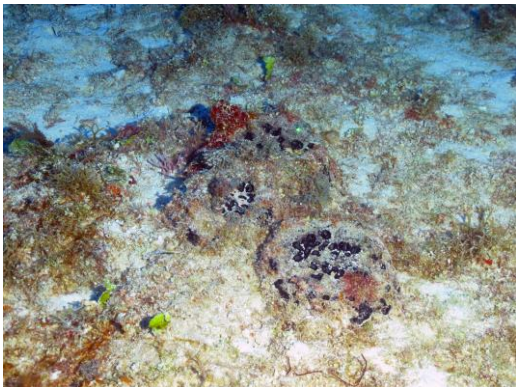


Figure 5: 25°9.5669'N;80°13.21'W: -43 m
Spheciospongia vesparium cake sponges



Figure 6: 25°9.5675'N;80°13.2109'W: -42.9 m
Nicella sp. (red), and *Antillogorgia* sp. octocorals

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mesophotic Reef, FKNMS, Station FK-02, ROV 19-02, UNCW 774; 14-VIII-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 14-VIII-19-1; Florida, Key Largo, NE of The Elbow Reef, Mesophotic Reef, FKNMS, Station FK-02, ROV 19-02, UNCW 774; 44- 51 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; collect samples of macrobiota for taxonomy, genetics, cell culture and biomedical research.

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. Coral, sponge and algal data were recorded in separate Access databases which were compiled with the benthic database. A Fastcat 49 CTD on the ROV continuously recorded, temperature, depth, conductivity, and salinity. ROV collection skid was used with 5-function manipulator to collect samples.

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, 1/250th second, strobe on, auto focus, white balance- fish mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing down, ~1.3 m off bottom. 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'. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

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

Depth range: east base 49.7 m, peak 41 m

NOAA MB shows a deep NNE-SSW linear ridge, 1.7 km long, 100 m wide, 46.6 m at east base, 42.6 m on top. Run transect along ridge.

Weather- Mostly cloudy, seas choppy 1 ft from SE, wind 9.7 kn from 184 dg, air- 30.23 C, surface water- 31.06 C, salinity- 35.54 PSU, surface current- 0.7 kn from SW; bottom current

8:28 AM- Launch

8:32 AM- On bottom at 50.7 m, 60 m E of the ridge, flat sand with shell hash, *Halimeda* hash, 80% cover of algae. Current from the S 0.2 kn, visibility 15 m.

8:36 AM- Sample 001 photos, 50.6 m, thin flat bladed highly branched red alga, bucket 3

8:37 AM- Sample 002 photos, 50.6 m, *Halimeda*, bin 4

8:38 AM- Sample 003 photos, 50.6 m, *Lobophora* brown lobed alga, bucket 3

8:47 AM- Sample 004 photos, 50.6 m, green bladed alga, bucket 4

8:55 AM- purposeful photos of a green fleshy alga, *Caulerpa*, and thin branching pink flat bladed alga

8:59 AM- Sample 005, 50.6 m, *Caulerpa*

Sample 006, 50.6 m, thin pink branching, bucket 5

9:04 AM- Sample 007, 50.6 m, fuzzy green puffball, bucket 5

9:07 AM- Continuing transect towards reef, haphazard photos; habitat continues to be shell hash covered by some sort of red alga, greens interspersed

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mesophotic Reef, FKNMS, Station FK-02, ROV 19-02, UNCW 774; 14-VIII-19-1

9:10 AM- Sample 008, 50 m, green erect branching *Codium* 10 cm high, other incidental collections to be split out later, bucket 1

9:15 AM- Hog snapper and sharpnose puffer by the collection site; the puffer seems to be particularly interested in the ROV

9:21 AM- Haphazard photos have resumed on our trek to the ledge; ~90% cover algae; 2 hog snapper swimming around. ROV came upon a lobster pot line, almost got caught in it. Habitat still flat sand, high cover of algae with few inverts

9:27 AM- Coming up to the base of the ledge, still don't see it on the screen but should be approaching soon.

9:28 AM- Sample 009, 48 m, base of reef, large *Xestospongia*, bin 4

9:37 AM- continuing haphazard photos to get to the ledge; on multibeam we are on the east slope, but we are not seeing anything on the visual. Large *Xestospongia* with a reef butterfly fish swimming around.

9:40 AM- a bit of a ridge has appeared, less than 0.5 relief, covered in large *Xestospongia*, other sponges, algae has become less abundant

9:42 AM- Sample 010, purple thin creeping branching sponge, 46.0 m, bin 3

9:55 AM- habitat is now distinctly hardbottom reef, more hard coral cover, large sponges with dense low algal and hydroid cover.

9:57 AM- Reached the upper slope, 43 m hardbottom relief, dense algal cover with cyanophyte balls, sponges. Top of the ridge is generally flat. Haphazard photos across the top of the ridge, see more hard bottom in the distance, could be the mound on the multibeam.

10:01 AM- Several large sponges sheared in half, most likely by lobster pot lines. Gorgonian cover increasing on this hardbottom mound.

10:02 AM- Photo transect 1 start, 44 m; hardbottom mound habitat characterized with dense algal cover, abundant gorgonians, and scattered sponges. Trunkfish, spotfin butterfly, among other reef dwelling fish. Large fish out in the distance, porkfish possibly?

10:06 AM- Many beat up sponges in this area

10:07 AM- purposeful photo of sponge, large scar on side

10:12 AM- continuing photo transect but changing heading

10:12 AM- lionfish

10:13 AM- stopping and backtracking for purposeful inspection of sponge, and collection of a thick walled vase with heavy algal and sponge cover, *Geodia*. Gave up on trying, *Geodia* was too hard

10:18 AM- Sample 012, *Dictyota* alga, 41.2 m, bucket 2 (out of order)

10:29 AM- Sample 011, *Xestospongia* 42 m, bin 2; beautiful French anglefish swimming around the ROV

10:36 AM- continuing photo transect, hardbottom now scattered ledges, 0.5 m relief. Depth 43 m. Coral cover has lessened, back to sponge and algal dominant cover. Heading S along the top edge of the reef. Low relief, rock and shell hash. Fishing line is common.

10:40 AM- stopping for inspection of a sponge, not what they were looking for. Continuing on...

10:42 AM- purposeful photo of a sponge, cut by a fishing line of some sort

10:46 AM- habitat changing to low relief, came off the ledge. Back to 90% algal cover with the occasional sponge.

10:49 AM- purposeful photo chase of lionfish; habitat mostly brown algae, scattered hardbottom reef outcrops with 0.5 m relief. These outcrops have denser sponges, but algal cover is still high

10:51 AM- Purposeful inspection and photos of mounding lobate *Agelas*.

10:52 AM- Continuing on transect

10:53 AM- Sponge and gorgonian cover has greatly increased, fish density has also increased with the increase in benthic reef habitat

10:57 AM- 43.6m depth, 0.5 m relief, scattered hardbottom ledge, 80-90% cover sponges, algae, and gorgonians. Hard corals are here, but not very abundant.

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mesophotic Reef, FKNMS, Station FK-02, ROV 19-02, UNCW 774; 14-VIII-19-1

10:58 AM- Photo transect end (~30 images)

11:02 AM- Sample 013, 20 cm pink/purple erect branching *Desmapsamma*, 43 m depth, bin 1

11:05 AM- Sample 014, small *Xestospongia*, 43 m, bin 3

11:12 AM- Haphazard transiting, S along top edge; 0.5 m rock outcrops. Organism cover similar to before.

11:13 AM- Opens up to sediment with 90% low algal cover and scattered sponges and gorgonians.

11:15 AM- Heading SE downslope, habitat changing to low relief mound, ~0.5m., rubble with sponge and algae dominant; 45.5 m depth; 10-15 degree slope

11:19 AM- approaching base of the ridge, still 15 dg slope. E base depth 49.7m

11:22 AM- Photo transect 2 start.

11:23 AM- hardbottom outcrop, 0.5-1m relief, sponges dominant, hard coral increased in abundance, algae still abundant.

11:28 AM- habitat a series of low rock mounds, 0.5-1 m high, covered in algae and sponges predominantly, with gorgonians and the occasional hard coral.

11:31 AM- Hard corals have increased in abundance, purposeful photos of suspected *Porites* and an *Agaricia*

11:33 AM- end of photo transect 2, depth 43.8m; end of dive

Human Debris:

Several lines wrapped around sponges, lobster pot lines, evidence of sponges chopped by lines, Styrofoam cups

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mesophotic Reef, FKNMS, Station FK-02, ROV 19-02, UNCW 774; 14-VIII-19-1

CPCe Percent Cover Analysis:

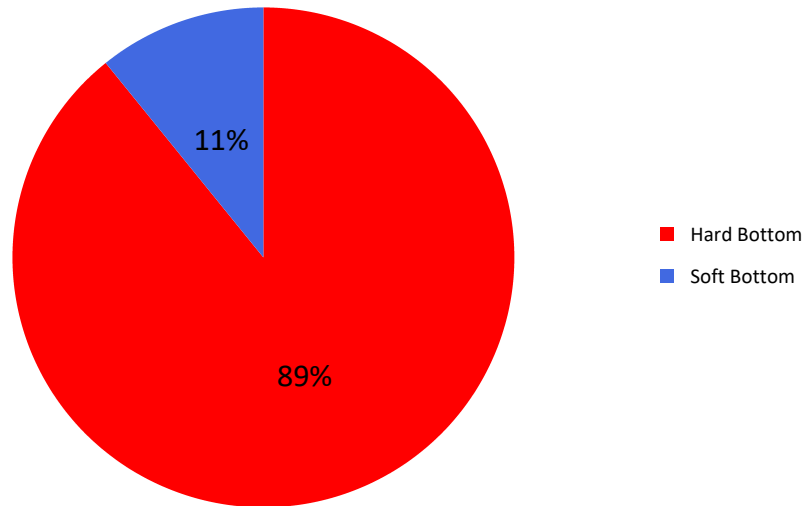
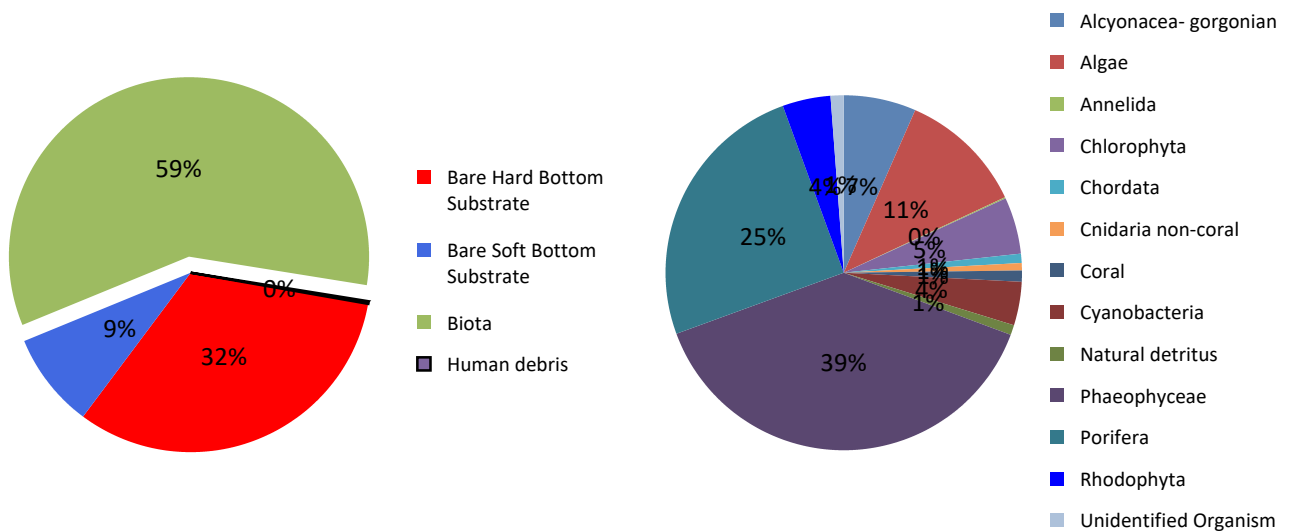


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-02. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



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.

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mesophotic Reef, FKNMS, Station FK-02, ROV 19-02, UNCW 774; 14-VIII-19-1

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. %= Percent Cover from CPCe analysis, Den= Density of Scleractinia from CPCe ARA analysis, P/A = Presence/Absence from visual sightings during the dive, Sam = Samples (number collected) of benthic macro-biota and substrate from ROV 19-02.

Taxa	ROV 19-02			
	%	Den.	P/A	Sam.
Biota	58.77%	58	X	19
Algae	37.40%		X	11
Algae- unid. macroalgae	6.72%		X	11
Cyanobacteria	2.33%		X	
Chlorophyta	3.03%		X	5
<i>Caulerpa chemnitzia</i> (Esper) J.V.Lamouroux, 1809	0.03%			
<i>Caulerpa racemosa</i> (Forsskål) J.Agardh, 1873	0.17%			1
<i>Caulerpa</i> sp.	0.00%		X	
<i>Chaetomorpha</i> sp.	0.00%		X	
Chlorophyta	1.06%		X	
Chlorophyta- Filamentous Green	0.00%		X	
<i>Codium isthmocladum</i> Vickers, 1905	0.00%			2
<i>Codium</i> sp.	0.00%		X	
<i>Halimeda copiosa</i> Goreau & E.A.Graham, 1967	0.00%		X	
<i>Halimeda gracilis</i> Harvey ex J.Agardh, 1887	0.00%			1
<i>Halimeda</i> sp.	0.57%		X	
<i>Microdictyon umbilicatum</i> (Velley) Zanardini, 1862	0.00%			1
<i>Rhizocephalus phoenix</i> (J.Ellis & Solander) Kützing, 1843	0.20%			
<i>Udotea cyathiformis</i> Decaisne, 1842	1.00%			
Ochrophyta	22.76%		X	3
<i>Dictyopteris justii</i> J.V.Lamouroux, 1809	0.00%			1
<i>Dictyota bartayresiana</i> J.V.Lamouroux, 1809	0.00%			1
<i>Dictyota menstrualis</i> (Hoyt) Schnetter, Hörning & Weber-Peukert, 1987	0.00%			1
<i>Dictyota</i> sp.	13.94%		X	
<i>Lobophora</i> sp.	1.73%		X	
Phaeophyceae	2.46%		X	
<i>Sargassum</i> sp.	0.07%			
<i>Spatoglossum schroederi</i> (C.Agardh) Kützing, 1859	4.56%			
Rhodophyta	2.56%		X	3
<i>Amphiroa rigida</i> J.V.Lamouroux, 1816	0.37%			
Corallinophycidae	1.46%			
<i>Haloplegma duperreyi</i> Montagne, 1842	0.00%			1

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mesophotic Reef, FKNMS, Station FK-02, ROV 19-02, UNCW 774; 14-VIII-19-1

Rhodophyta	0.73%	X	1
<i>Titanophora incrustans</i> (J.Agardh) Børgesen, 1949	0.00%		1
Porifera	14.71%	X	8
Porifera	14.71%	X	8
Demospongiae	14.71%	X	8
<i>Acanthella cubensis</i> (Alcolado, 1984)	0.03%		
<i>Agelas citrina</i> Gotera & Alcolado, 1987	1.46%	X	
<i>Agelas clathrodes</i> (Schmidt, 1870)	0.03%	X	
<i>Agelas conifera</i> (Schmidt, 1870)	0.03%	X	
<i>Agelas dispar</i> Duchassaing & Michelotti, 1864	0.03%		
<i>Agelas sceptrum</i> (Lamarck, 1815)	0.00%	X	
<i>Agelas schmidtii</i> Wilson, 1902	0.00%		1
<i>Agelas</i> sp.	0.10%		
<i>Agelas sventres</i> Lehnert & van Soest, 1996	0.03%		
<i>Agelas tubulata</i> Lehnert & van Soest, 1996	0.10%	X	
<i>Agelas wiedenmayeri</i> Alcolado, 1984	0.63%	X	
<i>Aiolochoxia crassa</i> (Hyatt, 1875)	0.00%	X	
<i>Amphimedon</i> cf. <i>caribica</i> (Pulitzer-Finali, 1986)	0.00%	X	
<i>Amphimedon compressa</i> Duchassaing & Michelotti, 1864	0.27%	X	
<i>Amphimedon</i> sp. FK-01	0.00%	X	1
<i>Aplysina cauliformis</i> (Carter, 1882)	0.73%	X	
<i>Callyspongia</i> (<i>Cladochalina</i>) <i>aculeata</i> (Linnaeus, 1759)	0.00%	X	
<i>Callyspongia</i> (<i>Cladochalina</i>) <i>plicifera</i> (Lamarck, 1814)	0.00%	X	
<i>Cliona varians</i> (Duchassaing & Michelotti, 1864)	0.10%	X	
Demospongiae	3.96%		
<i>Desmapsamma anchorata</i> (Carter, 1882)	0.00%	X	1
<i>Geodia neptuni</i> (Sollas, 1886)	0.07%	X	
<i>Hymedesmia</i> (<i>Hymedesmia</i>) <i>agariciicola</i> van Soest, 1984	0.00%	X	
<i>Hymedesmia</i> (<i>Hymedesmia</i>) cf. <i>jamaicensis</i> van Soest, 1984	0.00%		1
<i>Iotrochota birotulata</i> (Higgin, 1877)	0.00%	X	
<i>Mycale</i> (<i>Arenochalina</i>) <i>laxissima</i> (Duchassaing & Michelotti, 1864)	0.03%		
<i>Niphates alba</i> van Soest, 1980	0.17%	X	
<i>Niphates digitalis</i> (Lamarck, 1814)	0.07%	X	
<i>Niphates erecta</i> Duchassaing & Michelotti, 1864	0.30%	X	
<i>Niphates</i> sp.	0.20%		
<i>Oceanapia bartschi</i> (Laubenfels, 1934)	0.07%		
Petrosiidae	0.10%		
<i>Ptilocaulis walpersii</i> (Duchassaing & Michelotti,	0.17%	X	

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mesophotic Reef, FKNMS, Station FK-02, ROV 19-02, UNCW 774; 14-VIII-19-1

1864)			
<i>Scopalina</i> sp.	0.00%		1
<i>Sphaciospongia vesparium</i> (Lamarck, 1815)	0.30%		X
<i>Spirastrella coccinea</i> (Duchassaing & Michelotti, 1864)	0.50%		
Spirastrellidae	0.00%		X
<i>Xestospongia muta</i> (Schmidt, 1870)	5.22%		X 3
Alcyonacea - gorgonian	3.86%		X
Cnidaria- Anthozoa	3.86%		X
Alcyonacea - gorgonian	3.86%		X
<i>Antillogorgia</i> sp.	0.77%		X
<i>Ellisella elongata</i> (Pallas, 1766)	0.37%		X
<i>Ellisella</i> sp.	0.00%		X
<i>Erythropodium caribaeorum</i> (Duchassaing & Michelotti, 1860)	0.23%		
<i>Eunicea</i> sp.	0.03%		
<i>Iciligorgia schrammi</i> Duchassaing, 1870	0.00%		X
<i>Nicella</i> sp.	0.77%		X
<i>Plexaurella</i> sp.	0.00%		X
Plexauridae	0.33%		X
<i>Pseudoplexaura</i> sp.	1.16%		X
<i>Pterogorgia</i> sp.	0.20%		
Antipatharia	0.00%		X
Cnidaria- Anthozoa	0.00%		X
Antipatharia	0.00%		X
<i>Stichopathes luetkeni</i> Brook, 1889	0.00%		X
<i>Stichopathes</i> sp.	0.00%		X
Coral- Scleractinia	0.60%	16	X
Cnidaria- Anthozoa	0.60%	16	X
Coral- Scleractinia	0.60%	16	X
<i>Agaricia agaricites</i> (Linnaeus, 1758)	0.07%		
<i>Agaricia lamarcki</i> Milne Edwards & Haime, 1851	0.00%		X
<i>Agaricia</i> sp.	0.00%		X
<i>Montastraea cavernosa</i> (Linnaeus, 1767)	0.40%	9	X
<i>Orbicella faveolata</i> (Ellis & Solander, 1786)	0.00%	1	
<i>Porites astreoides</i> Lamarck, 1816	0.00%		X
<i>Siderastrea siderea</i> (Ellis & Solander, 1786)	0.00%	1	X
<i>Stephanocoenia intersepta</i> (Lamarck, 1836)	0.13%	5	
Other	2.20%	42	X
Annelida	0.07%		
Polychaeta	0.07%		
Sabellidae	0.07%		

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mesophotic Reef, FKNMS, Station FK-02, ROV 19-02, UNCW 774; 14-VIII-19-1

Cnidaria- Hydrozoa	0.40%			
Hydrozoa	0.40%			
<i>Gymnangium</i> sp.	0.17%			
Hydroidolina	0.20%			
<i>Millepora alvicornis</i> Linnaeus, 1758	0.03%			
Mollusca	0.00%		X	
Gastropoda	0.00%		X	
<i>Lobatus gigas</i> (Linnaeus, 1758)	0.00%		X	
Chordata	0.50%			
Chordata - Invertebrate	0.17%			
Ascidiacea- unidentified	0.10%			
<i>Botryllus</i> sp.	0.07%			
Chordata - Vertebrate	0.33%			
Actinopterygii	0.33%			
Detritus	0.53%			
UNKNOWN	0.70%	42	X	
Human debris	0.23%	6	X	
Human debris	0.23%	6	X	
Human debris	0.23%	6	X	
Human debris- Fishing Gear	0.13%	6	X	
Fish line/gear	0.13%			
Fishing line	0.00%	6	X	
Line from lobster/crab pot	0.00%		X	
Human debris- other	0.10%			
Bare Hard Bottom Substrate	32.41%			
Bare Hard Bottom Substrate	32.41%			
Hard bottom	32.41%			
Bare rock	25.76%			
Bare rubble/cobble	6.66%			
Bare Soft Bottom Substrate	8.59%			
Grand Total	100.00%	64	X	19

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mesophotic Reef, FKNMS, Station FK-02, ROV 19-02, UNCW 774; 14-VIII-19-1

Density of Fish:

Table 2. Counts of commercial/recreational fish and visual sightings (Presence/Absence) of non-commercial fish from video transects at dive site ROV 19-02.

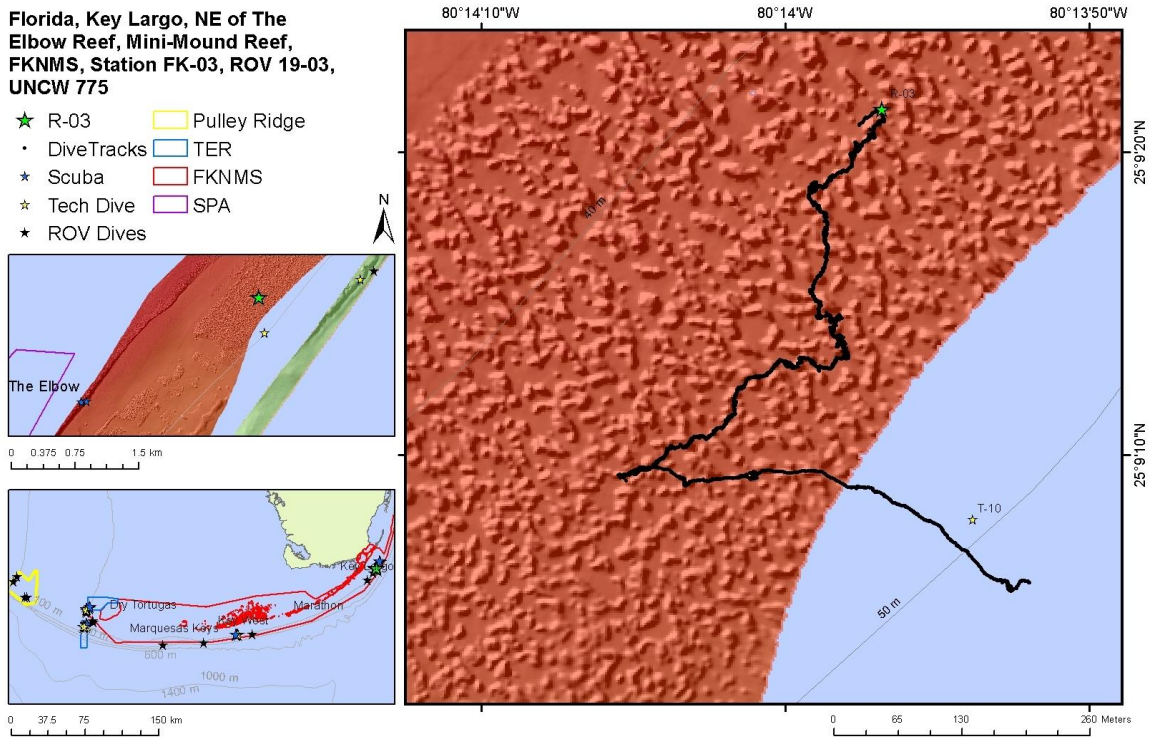
Status/Class/Order/Family/Tax Name (authority)	ROV 19-02 No. or P/A
Target	13
Actinopterygii	13
Perciformes	6
Serranidae	6
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	3
<i>Epinephelus morio</i> (Valenciennes, 1828) - Red Grouper	2
<i>Mycteroperca</i> sp. - Grouper	1
Scorpaeniformes	7
Scorpaenidae	7
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	7
Chordata - Vertebrate	X
Actinopterygii	X
Beryciformes	X
Holocentridae	X
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	X
Perciformes	X
Acanthuridae	X
<i>Acanthurus chirurgus</i> (Bloch, 1787) - Doctorfish	X
<i>Acanthurus coeruleus</i> Bloch & Schneider, 1801 - Blue Tang	X
<i>Acanthurus tractus</i> Poey, 1860 - Ocean Surgeonfish	X
Carangidae	X
<i>Carangoides bartholomaei</i> (Cuvier, 1833) - Yellow Jack	X
<i>Caranx ruber</i> (Bloch, 1793) - Bar Jack	X
Chaetodontidae	X
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	X
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	X
<i>Chaetodon striatus</i> Linnaeus, 1758 - Banded Butterflyfish	X
Ephippidae	X
<i>Chaetodipterus faber</i> (Broussonet, 1782) - Atlantic Spadefish	X
Haemulidae	X
<i>Anisotremus surinamensis</i> (Bloch, 1791) - Black Margate	X
<i>Haemulon</i> sp. - Grunt	X
Labridae	X
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	X
<i>Bodianus rufus</i> (Linnaeus, 1758) - Spanish Hogfish	X

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mesophotic Reef, FKNMS, Station FK-02, ROV 19-02, UNCW 774; 14-VIII-19-1

<i>Halichoeres cyanocephalus</i> (Bloch, 1791) - Yellowcheek Wrasse	X
<i>Halichoeres</i> sp. - Wrasse	X
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	X
<i>Thalassoma bifasciatum</i> (Bloch, 1791) - Bluehead	X
Malacanthidae	X
<i>Malacanthus plumieri</i> (Bloch, 1786) - Sand Tilefish	X
Mullidae	X
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	X
Pomacanthidae	X
<i>Holacanthus bermudensis</i> Goode, 1876 - Blue Angelfish	X
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	X
<i>Pomacanthus arcuatus</i> (Linnaeus, 1758) - Gray Angelfish	X
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	X
Pomacentridae	X
<i>Chromis cyanea</i> (Poey, 1860) - Blue Chromis	X
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	X
<i>Stegastes adustus</i> (Troschel, 1865) - Dusky Damselfish	X
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damselfish	X
Scaridae	X
<i>Scarus vetula</i> Bloch & Schneider, 1801 - Queen Parrotfish	X
<i>Sparisoma atomarium</i> (Poey, 1861) - Greenblotch Parrotfish	X
Serranidae	X
<i>Hypoplectrus</i> sp. - Hamlet	X
<i>Serranus tortugarum</i> Longley, 1935 - Chalk Bass	X
Tetraodontiformes	X
Monacanthidae	X
<i>Stephanolepis hispidus</i> (Linnaeus, 1766) - Planehead Filefish	X
Ostraciidae	X
<i>Acanthostracion polygonius</i> Poey, 1876 - Honeycomb Cowfish	X
<i>Lactophrys triqueter</i> (Linnaeus, 1758) - Smooth Trunkfish	X
Tetraodontidae	X
<i>Canthigaster rostrata</i> (Bloch, 1786) - Sharpnose Puffer	X
Grand Total	X

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mini-Mound Reef, FKNMS, Station FK-03, ROV 19-03, UNCW 775; 14-VIII-19-2

General Location and Dive Track:



Site Overview:

Project: 2019 CIOERT Cruise
Vessel: R/V Walton Smith
Principal Investigator: John Reed
PI Contact Info: 5600 U.S. 1, North, Fort Pierce, FL 34946

Scientific Observers: John Reed, Stephanie Farrington, Shirley Pomponi, M. Dennis Hanisak, Jason White, Don Liberatore, Megan Conkling, Eric Glidden, Alexis Sturm, Ian Combs, Katherine Beckett

Ship Position System: DGPS
Data Management: Access Database
Report Analyst: John Reed or Stephanie Farrington
Date Compiled: 10/6/2021

Dive Overview:

Date of Dive: 8/14/2019
ROV: Mohawk ROV
ROV Navigation: TrackLink
ROV Sensors: Temperature (°C), Salinity (PSU), pH, Conductivity, Depth (m)

Purpose: ROV image transects and collections

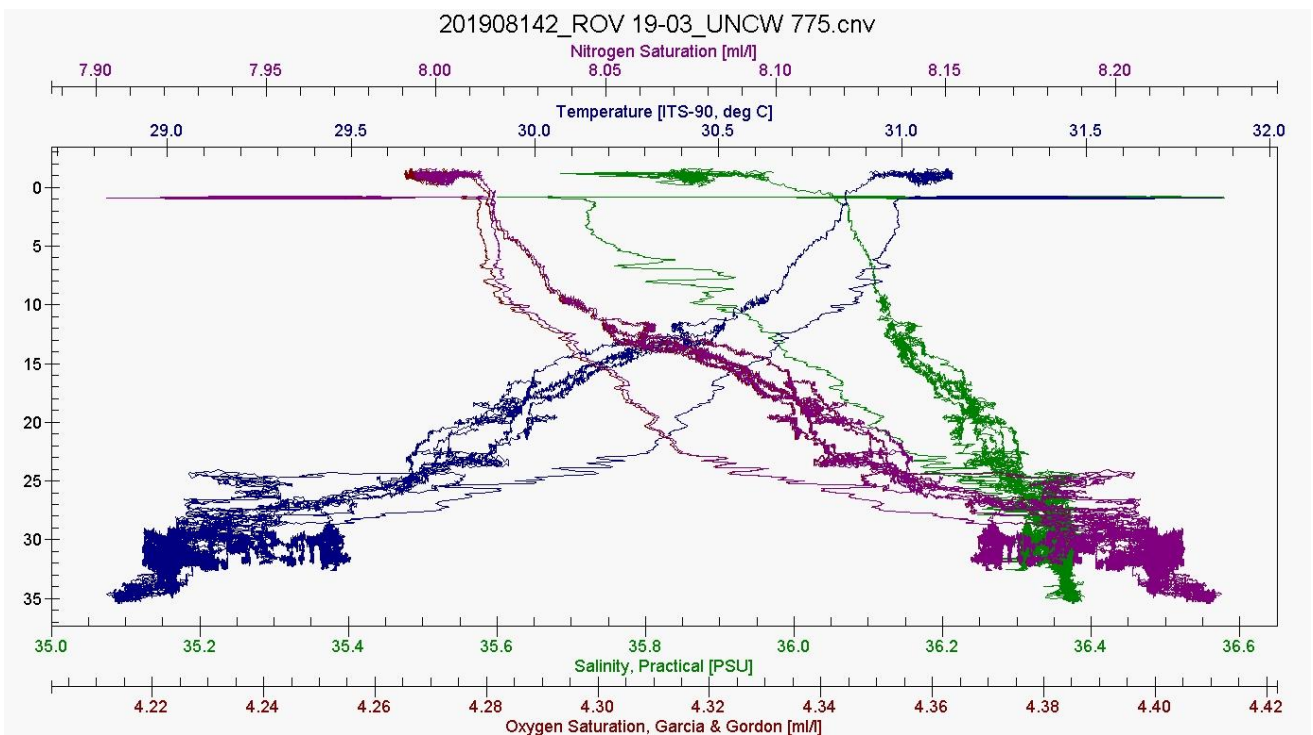
Digital Photos: 332
Distance (km): 1.1
Sonar Data: Taylor_FKNMS_Key_Largo_NS_2m_Grid
DVD: 0
Hard Drive: 1

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mini-Mound Reef, FKNMS, Station FK-03, ROV 19-03, UNCW 775; 14-VIII-19-2

Dive Data:

Minimum Bottom Depth (m): 32.5	Total Transect Length (km): 1.090
Maximum Bottom Depth (m): 37.3	Surface Current (kn): 1.1
On Bottom (Time- GMT): 13:44	On Bottom (Lat/Long): 25.156°N; -80.2324°W
Off Bottom (Time- GMT): 17:29	Off Bottom (Lat/Long): 25.1516°N; -80.2311°W
Physical (bottom); Temp (°C): 29.4	Salinity: 36.33 Visibility (ft): 32.81 Current (kn): 0.3

Physical Environment:



Temperature, Salinity and Depth were collected with a Sea-Bird CTD 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: 35.4 m, Temperature: 28.8-31 °C, Salinity: 35.7-36.4 PSU, and Oxygen Saturation: 4.3-4.4 ml/l.

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mini-Mound Reef, FKNMS, Station FK-03, ROV 19-03, UNCW 775; 14-VIII-19-2

Dive Imagery:



Figure 1: 25°9.3383'N;80°13.9615'W: -30.9 m
Montastraea cavernosa (bottom), and *Agaricia* sp. with with pox or fish bites.

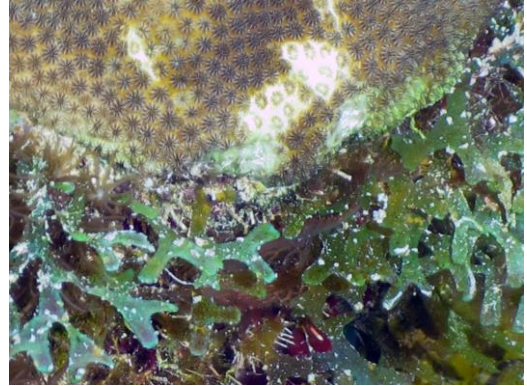


Figure 2: 25°9.3362'N;80°13.9594'W: -30.9 m
Agaricia faveolata coral and *Dictyota* sp. algae



Figure 3: 25°9.3355'N;80°13.9601'W: -30.8 m
Geodia neptuni (pink sponge) overgrown with *Desmapsamma anchorata*



Figure 4: 25°9.3365'N;80°13.9594'W: -31 m
Diverse sponges and octocorals on mesophotic reef



Figure 5: 25°9.336'N;80°13.9594'W: -30.7 m
Millepora alcicornis fire coral



Figure 6: 25°9.3321'N;80°13.9634'W: -32.5 m
Xestospongia muta vase sponge

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mini-Mound Reef, FKNMS, Station FK-03, ROV 19-03, UNCW 775; 14-VIII-19-2

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 14-VIII-19-2; Florida, Key Largo, NE of The Elbow Reef, Mini-Mound Reef, FKNMS, Station FK-03, ROV 19-03, UNCW 775; 32- 37 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; collect samples of macrobiota for taxonomy, genetics, cell culture and biomedical research.

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. Coral, sponge and algal data were recorded in separate Access databases which were compiled with the benthic database. A Fastcat 49 CTD on the ROV continuously recorded, temperature, depth, conductivity, and salinity. ROV collection skid was used with 5-function manipulator to collect samples.

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, 1/250th second, strobe on, auto focus, white balance- fish mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing down, ~1.3 m off bottom. 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'. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

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

Depth range: 33 m- 37.3 m

NOAA MB shows, dense field of 1-2 tall mounds; 1.5 km long, 500 m wide; 31-33 m. Run transect across mounds.

Weather- Mostly cloudy, seas:1 ft from SE, wind 2 kn from 130 dg, air- 30.64 C, surface water- 31.439 C, salinity-35.87 PSU, surface current 1.1 kn from Se; bottom current .3 kt from south

1:41:06 PM- Launch

1:44 PM- rounded 1-2 m tall mounds, covered in coral, series of mounds, rounded 1-2 m relief. Individual mounds 3->5 m diameter, separated by flat sand, 3-5 m apart. Slope of mounds 30-45 degree, with exposed eroded rugged rock. Dense cover of sponges, octocorals, algae, and scleractinian coral. General photos of habitat and biota. *Montastraea cavernosa* common, octocorals- Plexauridae, *Antillogorgia*, *Icilogorgia*, HD S over the mounds on the MB. 33.4 m in the sand. *Agelas*, *Xestospongia muta* common.

2:00 PM- pause to image corals including a possible diseased *Orbicella faveolata*

2:04 PM- examining a large mounding lobate sponge with another encrusting sponge over it, not sure exactly what it is. Going to try to collect.

2:05 PM- failed sample

2:10 PM- continuing on transect, dense hardbottom reef with rich fish diversity, high cover of hard coral (40%), gorgonians, and sponges. Habitat continues to be large mounds 1-2 m tall.

2:15 PM- Rock ledges covered in encrusting sponges and ascidians. Mounds separated by 3-5 m flat sand

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mini-Mound Reef, FKNMS, Station FK-03, ROV 19-03, UNCW 775; 14-VIII-19-2

covered by cyano film, each mound 3-5 m diameter with a ~30 dg slope

2:20 PM- crab pot line running through reef

2:27 PM- seeing more diversity: more encrusting ascidians and sponges, more hard corals, hydroids, less algae but greater diversity.

2:29 PM- tried to sample possible hydroid, 1 m tall bushy, but current wasn't in our favor.

2:44 PM- Start of Photo transect; going over mounds

2:51 PM- purposeful photos of a lobate coral head, and a *Siderastrea* that is possibly diseased

2:54 PM- Purposeful photo of *Montastrea*

2:56 PM- 2 squirrel fish by a plate coral with a 10 cm dead spot in the middle

2:58 PM- reached a larger sandy patch between mounds, ~10 m

2:59 PM- queen angel and French angel swimming under large old dead *O. faveolata*

3:00 PM- end of photo transect (~30 images)

3:01 PM- continuing to meander around, looking for possible collections or things to photograph

3:02 PM- large bundle of fishing line around the base of the mound, purposeful photo

3:04 PM- large dead *Montastrea* mounds; reef continues with dense invert and algal cover broken by swatches of sands

3:08 PM- predominant fish: bluehead wrasse, bicolor damsel, blue chromis, princess parrotfish juveniles, foureye butterfly, squirrel fish

3:27 PM- Sample 001, *Xestospongia muta*, 30 cm diameter, 34.2 m deep, bin 4

3:35 PM- Wandering around looking for *Xestospongia* and algae to sample

3:36 PM- east side of multibeam, sand depth 34.4m

3:39 PM- stopping for sample of Xesto, tall vase with two small off-shoots at the base

3:40 PM- Sample 002, *Xestospongia*, 20 cm diameter, 33.9 m deep, in bin 3

3:50 PM- Sample 003, *Dictyota*, depth 34 m, at the base of the coral mound, in bucket 2

4:01 PM- Sample 004, *Xestospongia* 15 cm diameter, 34 m deep, at the base of a mound, in bin 2

4:08 PM- Sample 005, *Xestospongia* 20 cm diameter, 33.5 m deep, in bin 1

4:13 PM- start Photo transect 2, only photographing on mounds, not the sediment between; 34 m heading SW

4:27 PM- habitat unchanged from before, large mounds interspersed with sand; high coral cover with large sponges and gorgonians, and diverse algal cover; heavy fish activity; no lionfish seen so far

4:41 PM- End transect (~25 images); 33.5 m deep; heading E to explore extent of habitat past multibeam

4:44 PM- beautiful trumpetfish

4:45 PM- Sample 006, cyano bacteria covering the sand, bucket 3 & 4

4:56 PM- Sample 007, 20 cm wide lobate amorphous sponge with apicle oscules, encrusted by other inverts- spicule prep identified as *Discodermia*, 34.8 m deep, bucket 5 and bin 4

5:17 PM- we are 30 yds to the end of the multibeam data, habitat is still the same. Fish activity heavy

5:19 PM- officially off the multibeam data, habitat is similar; patchy hard coral reef, with many large sponges, heavy fish activity.

5:23 PM- patchy reefs have become more spread apart, ~15 m; relief 1 m. trap lines littering a mound.

5:28 PM- end dive; flat sediment covered by cyanobacteria, depth 37.3m

5:30 PM- realized the ROV tether tangled in ghost lobster pot line. Took ½ hour to get free- luckily had razor cutter on manipulator and was able to cut the line loose.

Human Debris:

Ghost lobster pot lines common, fishing lines wrapped around sponges and rock common.

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mini-Mound Reef, FKNMS, Station FK-03, ROV 19-03, UNCW 775; 14-VIII-19-2

CPCe Percent Cover Analysis:

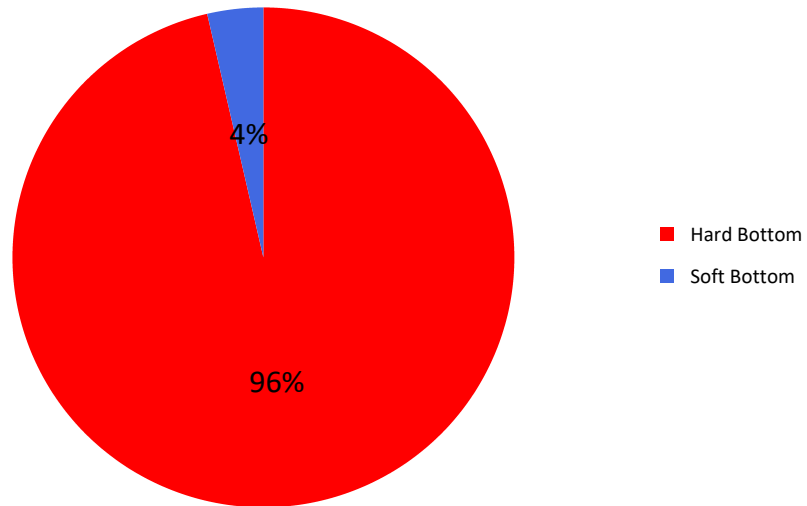
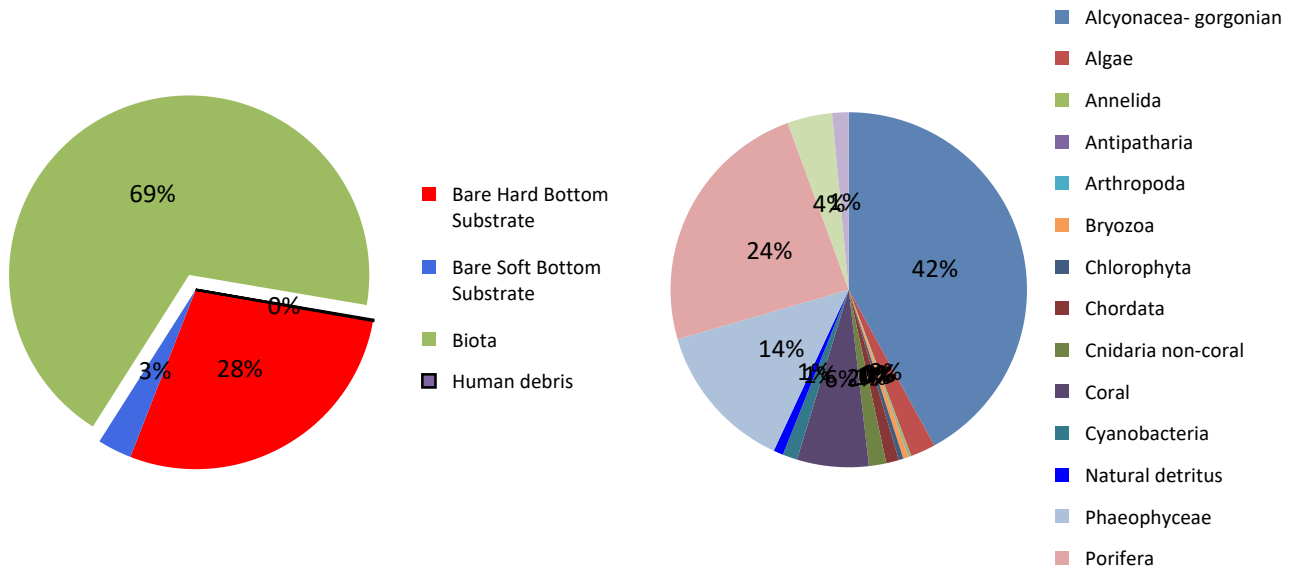


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-03. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



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.

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mini-Mound Reef, FKNMS, Station FK-03, ROV 19-03, UNCW 775; 14-VIII-19-2

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. %= Percent Cover from CPCe analysis, Den= Density of Scleractinia from CPCe ARA analysis, P/A = Presence/Absence from visual sightings during the dive, Sam = Samples (number collected) of benthic macro-biota and substrate from ROV 19-03.

Taxa	%	ROV 19-03		
		Den.	P/A	Sam.
Biota	68.71%	189	X	7
Algae	14.91%		X	2
Algae	14.91%		X	2
Algae- unid. macroalgae	1.56%			
Cyanobacteria	0.92%		X	1
Chlorophyta	0.29%		X	
Chlorophyta	0.06%		X	
Chlorophyta- Filamentous Green			X	
<i>Halimeda</i> sp.	0.22%		X	
Ochrophyta	9.34%		X	1
<i>Dictyota bartayresiana</i> J.V.Lamouroux, 1809				1
<i>Dictyota</i> sp.	4.43%		X	
<i>Lobophora</i> sp.	3.54%		X	
Phaeophyceae	1.37%			
Rhodophyta	2.80%		X	
Corallinophycidae	2.01%		X	
Rhodophyta	0.80%			
Porifera	16.44%		X	5
Porifera	16.44%		X	5
Calcarea			X	
Calcarea FK-01			X	
Demospongiae	16.25%		X	5
<i>Acanthella vaceleti</i> van Soest & Stentoft, 1988			X	
<i>Agelas clathrodes</i> (Schmidt, 1870)	0.03%		X	
<i>Agelas conifera</i> (Schmidt, 1870)	0.99%		X	
<i>Agelas dilatata</i> Duchassaing & Michelotti, 1864			X	
<i>Agelas dispar</i> Duchassaing & Michelotti, 1864			X	
<i>Agelas sceptrum</i> (Lamarck, 1815)			X	
<i>Agelas</i> sp.	0.25%			
<i>Agelas sventres</i> Lehnert & van Soest, 1996	0.03%		X	
<i>Agelas tubulata</i> Lehnert & van Soest, 1996	0.25%		X	
<i>Agelas wiedenmayeri</i> Alcolado, 1984	0.10%		X	
<i>Aiolochoira crassa</i> (Hyatt, 1875)	0.22%		X	
<i>Amphimedon cf. caribica</i> (Pulitzer-Finali, 1986)			X	

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mini-Mound Reef, FKNMS, Station FK-03, ROV 19-03, UNCW 775; 14-VIII-19-2

<i>Amphimedon compressa</i> Duchassaing & Michelotti, 1864	0.22%	X
<i>Amphimedon</i> sp.	0.06%	
<i>Aplysina</i> aff. <i>lacunosa</i> (Lamarck, 1814)		X
<i>Aplysina cauliformis</i> (Carter, 1882)	1.63%	X
<i>Aplysina</i> cf. <i>fulva</i> (Pallas, 1766)		X
<i>Aplysina fistularis</i> (Pallas, 1766)		X
<i>Aplysina lacunosa</i> (Lamarck, 1814)		X
Astrophorina		X
<i>Auletta</i> cf. <i>tuberosa</i> Alvarez, van Soest & Rützler, 1998		X
<i>Batzella rubra</i> (Alcolado, 1984)	0.10%	
<i>Callyspongia</i> (<i>Callyspongia</i>) <i>fallax</i> Duchassaing & Michelotti, 1864		X
<i>Callyspongia</i> (<i>Cladochalina</i>) <i>aculeata</i> (Linnaeus, 1759)	0.29%	X
<i>Callyspongia</i> (<i>Cladochalina</i>) <i>alcoladoi</i> Busutil, García-Hernández, Díaz & Pomponi, 2018	0.03%	
<i>Callyspongia</i> (<i>Cladochalina</i>) <i>plicifera</i> (Lamarck, 1814)	0.03%	X
<i>Cinachyrella kuekenthali</i> (Uliczka, 1929)	0.38%	X
<i>Cinachyrella</i> sp.		X
<i>Clathria</i> sp. FK-04		X
<i>Cliona aprica</i> Pang, 1973		X
<i>Cliona delitrix</i> Pang, 1973	0.10%	X
<i>Cliona varians</i> (Duchassaing & Michelotti, 1864)		X
Demospongiae	4.33%	
<i>Dercitus</i> (<i>Halinastra</i>) <i>luteus</i> (Pulitzer-Finali, 1986)		X
<i>Desmapsamma anchorata</i> (Carter, 1882)		X
Dictyoceratida	0.03%	
<i>Discodermia dissoluta</i> Schmidt, 1880		1
<i>Geodia neptuni</i> (Sollas, 1886)		X
<i>Ircinia campana</i> (Lamarck, 1814)	0.03%	
<i>Monanchora arbuscula</i> (Duchassaing & Michelotti, 1864)	0.06%	X
<i>Mycale</i> (<i>Mycale</i>) <i>laevis</i> (Carter, 1882)	0.10%	X
<i>Myrmekioderma gyroderma</i> (Alcolado, 1984)		X
<i>Myrmekioderma rea</i> (Laubenfels, 1934)	0.19%	
<i>Niphates alba</i> van Soest, 1980	0.25%	
<i>Niphates arenata</i> Rützler, Piantoni, van Soest & Díaz, 2014	0.06%	
<i>Niphates digitalis</i> (Lamarck, 1814)	0.67%	X
<i>Niphates erecta</i> Duchassaing & Michelotti, 1864	0.54%	X
<i>Niphates</i> sp.	0.13%	
Petrosiidae	0.16%	
<i>Ptilocaulis</i> sp.	0.03%	
<i>Ptilocaulis walpersii</i> (Duchassaing & Michelotti, 1864)		X
<i>Scopalina ruetzleri</i> (Wiedenmayer, 1977)	0.06%	X
<i>Smenospongia aurea</i> (Hyatt, 1875)		X

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mini-Mound Reef, FKNMS, Station FK-03, ROV 19-03, UNCW 775; 14-VIII-19-2

<i>Smenospongia echina</i> (Laubenfels, 1934)	0.03%		
<i>Spheciospongia vesparium</i> (Lamarck, 1815)	0.06%		X
<i>Spirastrella coccinea</i> (Duchassaing & Michelotti, 1864)	1.59%		X
<i>Spirastrella hartmani</i> Boury-Esnault, Klautau, Bézac, Wulff & Solé-Cava, 1999			X
<i>Spirastrella</i> sp.	0.03%		
Spirastrellidae			X
<i>Stromatospongia</i> sp.	0.16%		
<i>Svenzea zeai</i> (Alvarez, van Soest & Rützler, 1998)	0.89%		X
<i>Topsentia ophiraphidites</i> (Laubenfels, 1934)	0.19%		
<i>Verongula rigida</i> (Esper, 1794)			X
<i>Verongula</i> sp.	0.03%		
<i>Verongula</i> sp. FK-01 ^N	0.22%		
<i>Xestospongia muta</i> (Schmidt, 1870)	1.66%		X 4
Homoscleromorpha	0.19%		
<i>Plakinastrella onkodes</i> Uliczka, 1929	0.03%		
<i>Plakortis angulospiculatus</i> (Carter, 1879)	0.16%		
Alcyonacea - gorgonian	28.87%		X
Cnidaria- Anthozoa	28.87%		X
Alcyonacea - gorgonian	28.87%		X
<i>Antillogorgia</i> sp.	16.16%		X
<i>Carijoa riisei</i> (Duchassaing & Michelotti, 1860)	0.25%		
<i>Ellisella elongata</i> (Pallas, 1766)			X
<i>Ellisella</i> sp.			X
<i>Erythropodium caribaeorum</i> (Duchassaing & Michelotti, 1860)	9.27%		
<i>Erythropodium</i> sp.			X
<i>Eunicea</i> sp.	0.51%		X
<i>Iciligorgia schrammi</i> Duchassaing, 1870	0.92%		X
<i>Plexaurella</i> sp.			X
Plexauridae	0.76%		X
<i>Pseudoplexaura</i> sp.	0.99%		X
Antipatharia	0.03%		
Coral- Scleractinia	4.46%	136	X
Cnidaria- Anthozoa	4.46%	136	X
Coral- Scleractinia	4.46%	136	X
<i>Agaricia agaricites</i> (Linnaeus, 1758)	0.99%	49	X
<i>Agaricia lamarcki</i> Milne Edwards & Haime, 1851	0.13%	1	
<i>Agaricia</i> sp.		1	X
<i>Eusmilia fastigiata</i> (Pallas, 1766)		1	
<i>Madracis decactis</i> (Lyman, 1859)	0.10%	3	
<i>Madracis formosa</i> Wells, 1973			X
<i>Madracis senaria</i> Wells, 1973	0.06%	1	

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mini-Mound Reef, FKNMS, Station FK-03, ROV 19-03, UNCW 775; 14-VIII-19-2

<i>Montastraea cavernosa</i> (Linnaeus, 1767)	1.02%	25	X
<i>Orbicella faveolata</i> (Ellis & Solander, 1786)	1.53%	9	X
<i>Porites astreoides</i> Lamarck, 1816		1	X
<i>Porites porites</i> (Pallas, 1766)			X
Scleractinia- unid colonial		2	
<i>Siderastrea siderea</i> (Ellis & Solander, 1786)	0.41%	19	X
<i>Stephanocoenia intersepta</i> (Lamarck, 1836)	0.22%	24	X
Other	3.98%	53	X
Annelida	0.13%		
Polychaeta	0.13%		
Sabellidae	0.13%		
Bryozoa	0.32%		
Bryozoa	0.32%		
Bryozoa	0.03%		
<i>Canda sp.</i>	0.29%		
Arthropoda	0.03%		
Crustacea	0.03%		
<i>Stenorhynchus seticornis</i> (Herbst, 1788)	0.03%		
Cnidaria- Hydrozoa	1.08%	44	X
Hydrozoa	1.08%	44	X
Hydroidolina	0.29%		X
<i>Millepora alvicornis</i> Linnaeus, 1758	0.80%	44	X
<i>Millepora sp.</i>			X
Mollusca			X
Bivalvia			X
<i>Spondylus sp.</i>			X
Chordata	0.80%		X
Chordata - Invertebrate	0.41%		X
Ascidiacea- unidentified	0.41%		
Didemnidae			X
Chordata - Vertebrate	0.38%		
Actinopterygii	0.38%		
Detritus	0.61%		
UNKNOWN	1.02%	9	X
Human debris	0.10%	1	X
Human debris	0.10%	1	X
Human debris	0.10%	1	X
Human debris- Fishing Gear	0.10%	1	X
Fish line/gear	0.10%		
Fishing line		1	X
Line from lobster/crab pot			X
Bare Hard Bottom Substrate	28.14%		

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mini-Mound Reef, FKNMS, Station FK-03, ROV 19-03, UNCW 775; 14-VIII-19-2

Bare Hard Bottom Substrate	28.14%			
Bare Hard Bottom Substrate	28.14%			
Dead Coral	0.03%			
Bare dead coral plate	0.03%			
Hard bottom	28.11%			
Bare rock	28.11%			
Bare Soft Bottom Substrate	3.06%			
Grand Total	100.00%	190	X	7

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mini-Mound Reef, FKNMS, Station FK-03, ROV 19-03, UNCW 775; 14-VIII-19-2

Density of Fish:

Table 2. Counts of commercial/recreational fish and visual sightings (Presence/Absence) of non-commercial fish from video transects at dive site ROV 19-03.

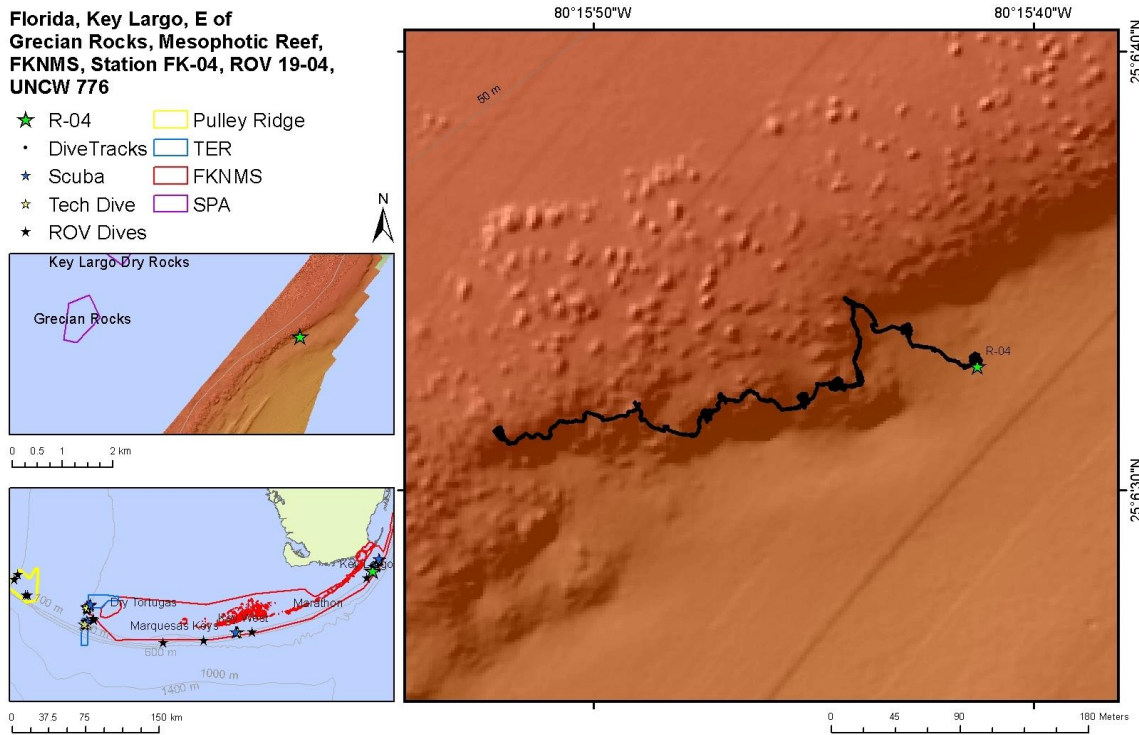
Status/Class/Order/Family/Tax Name (authority)	ROV 19-03 No. or P/A
Target	9
Actinopterygii	9
Perciformes	7
Serranidae	7
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	7
Scorpaeniformes	2
Scorpaenidae	2
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	2
Chordata - Vertebrate	X
Actinopterygii	X
Beryciformes	X
Holocentridae	X
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	X
<i>Myripristis jacobus</i> Cuvier, 1829 - Blackbar Soldierfish	X
Perciformes	X
Acanthuridae	X
<i>Acanthurus chirurgus</i> (Bloch, 1787) - Doctorfish	X
<i>Acanthurus coeruleus</i> Bloch & Schneider, 1801 - Blue Tang	X
<i>Acanthurus tractus</i> Poey, 1860 - Ocean Surgeonfish	X
Carangidae	X
<i>Caranx ruber</i> (Bloch, 1793) - Bar Jack	X
Chaetodontidae	X
<i>Chaetodon capistratus</i> Linnaeus, 1758 - Foureye Butterflyfish	X
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	X
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	X
Haemulidae	X
<i>Haemulon flavolineatum</i> (Desmarest, 1823) - French Grunt	X
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	X
Labridae	X
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	X
<i>Bodianus rufus</i> (Linnaeus, 1758) - Spanish Hogfish	X
<i>Clepticus parrae</i> (Bloch & Schneider, 1801) - Creole Wrasse	X
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	X
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	X
<i>Thalassoma bifasciatum</i> (Bloch, 1791) - Bluehead	X

Dive Site: Florida, Key Largo, NE of The Elbow Reef, Mini-Mound Reef, FKNMS, Station FK-03, ROV 19-03, UNCW 775; 14-VIII-19-2

Pomacanthidae	X
<i>Holacanthus bermudensis</i> Goode, 1876 - Blue Angelfish	X
<i>Holacanthus ciliaris</i> (Linnaeus, 1758) - Queen Angelfish	X
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	X
<i>Pomacanthus arcuatus</i> (Linnaeus, 1758) - Gray Angelfish	X
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	X
Pomacentridae	X
<i>Chromis cyanea</i> (Poey, 1860) - Blue Chromis	X
<i>Chromis scotti</i> Emery, 1968 - Purple Reefish	X
<i>Stegastes adustus</i> (Troschel, 1865) - Dusky Damsel	X
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damsel	X
Scaridae	X
<i>Scarus iseri</i> (Bloch, 1789) - Striped Parrotfish	X
<i>Scarus taeniopterus</i> Lesson, 1829 - Princess Parrotfish	X
<i>Sparisoma atomarium</i> (Poey, 1861) - Greenblotch Parrotfish	X
<i>Sparisoma aurofrenatum</i> (Valenciennes, 1840) - Redband Parrotfish	X
<i>Sparisoma viride</i> (Bonnaterre, 1788) - Stoplight Parrotfish	X
Serranidae	X
<i>Diplectrum formosum</i> (Linnaeus, 1766) - Sand Perch	X
<i>Hypoplectrus unicolor</i> (Walbaum, 1792) - Butter Hamlet	X
<i>Serranus tabacarius</i> (Cuvier, 1829) - Tobaccosfish	X
<i>Serranus tigrinus</i> (Bloch, 1790) - Harlequin Bass	X
Syngnathiformes	X
Aulostomidae	X
<i>Aulostomus maculatus</i> Valenciennes, 1841 - Atlantic Trumpetfish	X
Tetraodontiformes	X
Balistidae	X
<i>Balistes capriscus</i> Gmelin, 1789 - Grey Triggerfish	X
Monacanthidae	X
<i>Cantherhines macrocerus</i> (Hollard, 1853) - Whitespotted Filefish	X
<i>Stephanolepis hispidus</i> (Linnaeus, 1766) - Planehead Filefish	X
Ostraciidae	X
<i>Lactophrys triqueter</i> (Linnaeus, 1758) - Smooth Trunkfish	X
Tetraodontidae	X
<i>Canthigaster rostrata</i> (Bloch, 1786) - Sharpnose Puffer	X
Grand Total	X

Dive Site: Florida, Key Largo, E of Grecian Rocks, Mesophotic Reef, FKNMS, Station FK-04, ROV 19-04, UNCW 776; 15-VIII-19-1

General Location and Dive Track:



Site Overview:

Project: 2019 CIOERT Cruise
Vessel: R/V Walton Smith
Principal Investigator: John Reed
PI Contact Info: 5600 U.S. 1, North, Fort Pierce, FL 34946
Scientific Observers: John Reed, Stephanie Farrington, Shirley Pomponi, M. Dennis Hanisak, Jason White, Don Liberatore, Megan Conkling, Eric Glidden, Alexis Sturm, Ian Combs, Katherine Beckett
Ship Position System: DGPS
Data Management: Access Database
Report Analyst: John Reed or Stephanie Farrington
Date Compiled: 10/6/2021

Dive Overview:

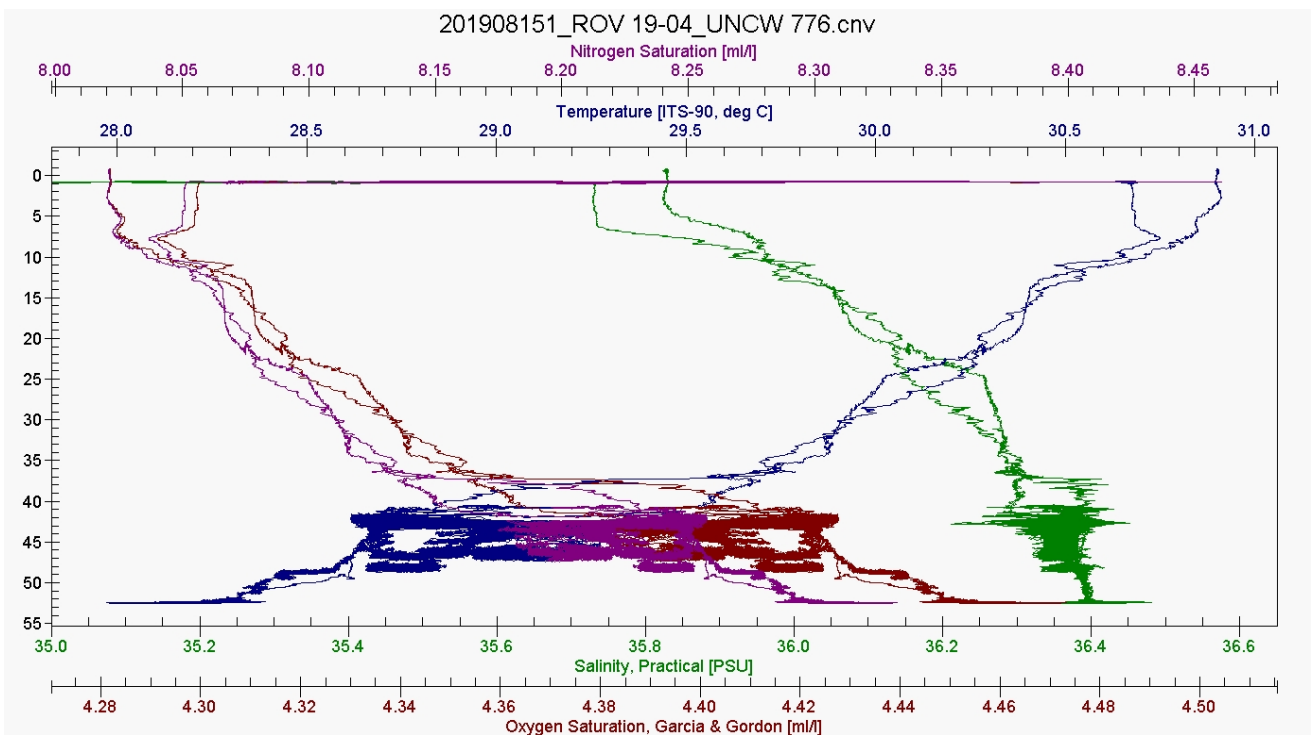
Date of Dive: 8/15/2019
ROV: Mohawk ROV
ROV Navigation: TrackLink
ROV Sensors: Temperature (°C), Salinity (PSU), pH, Conductivity, Depth (m)
Purpose: ROV image transects and collections
Digital Photos: 367
Distance (km): 0.5
Sonar Data: Taylor_FKNMS_Key_Largo_NS_2m_Grid
DVD: 0
Hard Drive: 1

Dive Site: Florida, Key Largo, E of Grecian Rocks, Mesophotic Reef, FKNMS, Station FK-04, ROV 19-04, UNCW 776; 15-VIII-19-1

Dive Data:

Minimum Bottom Depth (m): 44.4	Total Transect Length (km): 0.547
Maximum Bottom Depth (m): 53.4	Surface Current (kn): 0.6
On Bottom (Time- GMT): 8:09	On Bottom (Lat/Long): 25.1091°N; -80.2615°W
Off Bottom (Time- GMT): 11:17	Off Bottom (Lat/Long): 25.1087°N; -80.2645°W
Physical (bottom); Temp (°C): 28.6	Salinity: 36.39 Visibility (ft): 32.81 Current (kn): 0.1

Physical Environment:



Temperature, Salinity and Depth were collected with a Sea-Bird CTD 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: 52.6 m, Temperature: 28-30.9 °C, Salinity: 35.7-36.5 PSU, and Oxygen Saturation: 4.3-4.5 ml/l.

Dive Site: Florida, Key Largo, E of Grecian Rocks, Mesophotic Reef, FKNMS, Station FK-04, ROV 19-04, UNCW 776; 15-VIII-19-1

Dive Imagery:



Figure 1: 25°6.5498'N;80°15.6881'W: -53.4 m
Rubble pile of sand tilefish burrow



Figure 2: 25°6.5615'N;80°15.7148'W: -50.2 m
Octocoral and *Halimeda* sp. green algae



Figure 3: 25°6.5609'N;80°15.7159'W: -50.2 m
Halimeda copiosa algae



Figure 4: 25°6.5684'N;80°15.7297'W: -45.6 m
Squirrelfish, *Holocentrus adscensionis*



Figure 5: 25°6.57'N;80°15.7318'W: -45.2 m
Xestospongia muta vase sponge on hard bottom habitat



Figure 6: 25°6.5708'N;80°15.7345'W: -45 m
Aiolochroia crassa

Dive Site: Florida, Key Largo, E of Grecian Rocks, Mesophotic Reef, FKNMS, Station FK-04, ROV 19-04, UNCW 776; 15-VIII-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 15-VIII-19-1; Florida, Key Largo, E of Grecian Rocks, Mesophotic Reef, FKNMS, Station FK-04, ROV 19-04, UNCW 776; 44- 53 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; collect samples of macrobiota for taxonomy, genetics, cell culture and biomedical research.

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. Coral, sponge and algal data were recorded in separate Access databases which were compiled with the benthic database. A Fastcat 49 CTD on the ROV continuously recorded, temperature, depth, conductivity, and salinity. ROV collection skid was used with 5-function manipulator to collect samples.

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, 1/250th second, strobe on, auto focus, white balance- fish mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing down, ~1.3 m off bottom. 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'. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

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

Depth range: 44.2- 51 m

NOAA MB shows linear ridge oriented NNE-SSW, 12 km long, 250 m wide, 40- 52 m.

Weather- Partly cloudy, seas: 1-2 from SW, wind 5.2 kn from 195 dg, air- 30.3 C, surface water- 31.11 C, salinity-35.92 PSU, surface current 0.6 kn from SW; bottom current 0.1 kt from south

8:04 AM- Launch

8:09 AM- On bottom, 53.4 m; habitat is flat sediment, cobble, rubble with dense algal cover. Sand tilefish mounds. Examining a tilefish mound rich in benthic organism cover

8:14 AM- Collecting Sample 001, 53.4 m, rock 5 cm with CCA pink, other rocks being collected with it, on tilefish mound. In bin 4

8:27 AM- Collecting Sample 002, purple lumps ascidian (*Eudistoma?*), 53.4 m deep, 2 cm

8:33 AM- Still exploring the mound, collecting *Peysonellia* to include in Sample 001

8:38 AM- Taking photos and collecting Sample 003, encrusting blanket ascidian, possibly botryllid, 3 cm, at 53.4 depth,

8:44 AM- taking photos of algae

8:47 AM- continuing on the path to the reef, taking haphazard photos

8:51 AM- almost at the base of the reef, seeing 15 cm gorgonians on rock cobble and small boulders, sponges encrusting; <10 cm low relief pavement with sediment; came upon another tile fish with *Xestospongia* beside

Dive Site: Florida, Key Largo, E of Grecian Rocks, Mesophotic Reef, FKNMS, Station FK-04, ROV 19-04, UNCW 776; 15-VIII-19-1

8:53 AM- stopping to collect 40 cm diameter *Xestospongia*, Sample 004, 50.3 m deep, bin 2
8:59 AM- examining algal growth on the mound around the *Xesto.* that was just samples
9:01 AM- Sample 005, target is *Dictyota*, depth 50.2 m; Sample 006, target is *Halimeda*; both in S1
9:08 AM- Sample 007, target is yellow encrusting sponge, *Mycale*, 50.2 m depth, in S2
9:13 AM- Continuing towards the reef, flat soft rubble
9:14 AM- habitat changing to scattered hard bottom, 15% slope, <0.5 m relief; quite a bit of sediment
9:18 AM- increase in fish activity, on the rock ledge; change heading S
9:20 AM- start Photo transect 1, 44.4 m heading S; rock ledge, low relief with high fish activity and ~80% cover hard bottom
9:24 AM- scattered rock ledge, separated by 5 m swatches of sand; sand flats have gorgonian and sand cover
9:27 AM- Good coral cover; spotfin hogfish
9:28 AM- stopping for purposeful photos of *M cav.* And sponges nearby
9:31 AM- Sample 008, thin red rope sponge ~40 cm diameter bush, 48.5 m deep, in B3
9:36 AM- continuing transect, headed W along top rim; habitat is low relief scattered rock with sediment
9:40 AM- stopping to examine an encrusted *Xestospongia*, questions as to what it is and why it is completely encrusted
9:41 AM- Sample 009, encrusted tube sponge (*Xestospongia muta*) 20 cm diameter, in B1
9:44 AM- Midnight parrotfish browsing along the bottom while sampling
9:46 AM- Sample 010, *Swiftia* 20 cm tall bush, in Bin 2
9:53 AM – Resume photo transect; in a sand-covered hardbottom patch with many large sponges and gorgonians common
9:57 AM- stopping to take photos and sample of *Lobophora*; Sample 011, 15 cm clump, 50 m deep, in S3
10:05 AM- Examining a brown sponge that is 15 cm, subspherical with 1 cm oscula on the top, Sample 012, 50 m deep, in B4; got before and after photos
10:13 AM- Sample 013, *Swiftia* 20 cm tall, reddish, with reddish polyps exsert, in B4
10:17 AM- Continuing transect, habitat unchanged
10:23 AM- Low relief hard reef ledge, 15% slope dominated by octocorals and sponges; everything is very encrusted by hydroids and other fouling species
10:32 AM- stopped to investigate some sponges, collecting a burnt orange *Auletta*, and a second specimen of burnt orange lobate *Auletta* sponge
10:36 AM- Sample 015, 15 cm burnt orange sponge, *Aulelta*, bin 4
10:42 AM- Sample 014, 15 cm burnt orange *Auletta* sponge (thought it was *Forcepia*), bin 1
10:47 AM- continuing transct, fish activity is still high, squirrel, bicolor damsel, and other small reef dwelling species; sand swatches are ~5 m wide, less scattered hard bottom and more distinct rock ridges. Coral cover increasing
10:50 AM- Photo transect 1 end (~30 photos), 49 m depth. Cutting due west across sediment to another mound
10:52 AM- small juvenile fish all around, could be using as a nursery?; habitat still scattered rocky ridges interspersed with sand chutes. High rugosity, low relief.
10:53 AM- photo of a flat hard coral, *Siderastrea siderea*
10:55 AM- Cover dominated by sponges and gorgonians, with decent algal cover. Hard coral rare
10:58 AM- start Photo transect 2, 45.8 m depth; habitat similar to before; video is cutting out
11:02 AM- high fish activity, small reef dwellers; 30 dg slope, sediment transported from shallow reefs; approaching another ridge on the MB
11:06 AM- Cover dominated by algae and hydroids with large sponges and gorgonians in the over-story
11:10 AM- end Photo transect 2 (~30 photos)
11:11 AM- EEL!!! Either a goldentail or a spotted?
11:15 AM- Sample 016, *Xestospongia*, 15 cm diameter, 44.2 m deep, in bin 3

Dive Site: Florida, Key Largo, E of Grecian Rocks, Mesophotic Reef, FKNMS, Station FK-04, ROV 19-04, UNCW 776; 15-VIII-19-1

11:16 AM- End dive, 44.2 m depth

Human Debris:

Lobster pot lines-numerous ghost lines on bottom.

Dive Site: Florida, Key Largo, E of Grecian Rocks, Mesophotic Reef, FKNMS, Station FK-04, ROV 19-04, UNCW 776; 15-VIII-19-1

CPCe Percent Cover Analysis:

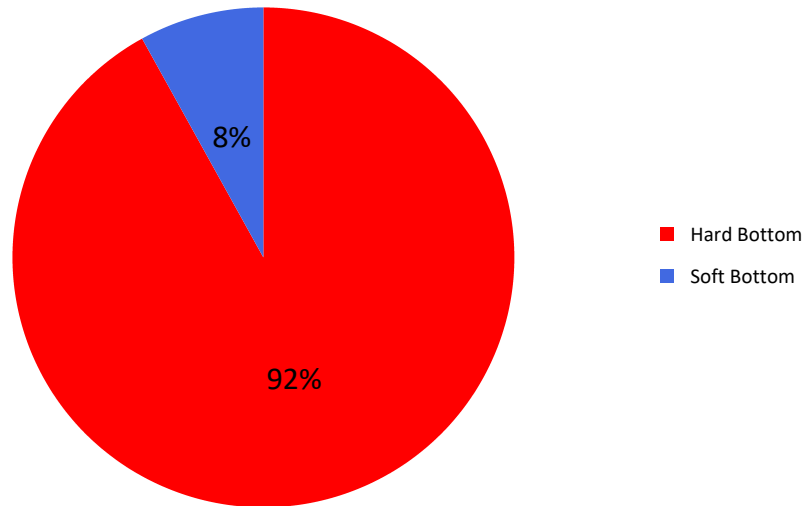
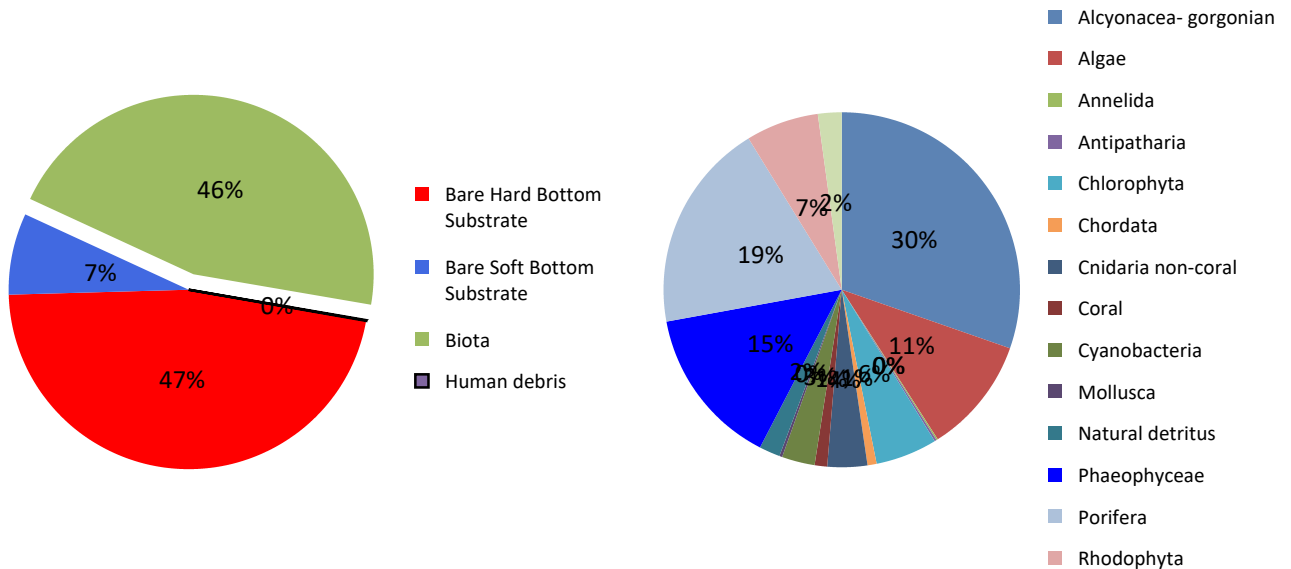


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-04. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



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: Florida, Key Largo, E of Grecian Rocks, Mesophotic Reef, FKNMS, Station FK-04, ROV 19-04, UNCW 776; 15-VIII-19-1

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. %= Percent Cover from CPCe analysis, Den= Density of Scleractinia from CPCe ARA analysis, P/A = Presence/Absence from visual sightings during the dive, Sam = Samples (number collected) of benthic macro-biota and substrate from ROV 19-04.

Taxa	ROV 19-04			
	%	Den.	P/A	Sam.
Biota	45.82%	80	X	18
Algae	18.48%		X	4
Algae	18.48%		X	4
Algae- unid. macroalgae	4.86%			
Cyanobacteria	1.37%		X	
Chlorophyta	2.56%		X	1
<i>Caulerpa racemosa</i> (Forsskål) J.Agardh, 1873			X	
<i>Caulerpa sertularioides</i> (S.G.Gmelin) M.A.Howe, 1905			X	
Chlorophyta	0.29%			
Chlorophyta- Filamentous Green			X	
<i>Halimeda gorieau</i> W.R.Taylor, 1962			X	1
<i>Halimeda</i> sp.	2.15%		X	
<i>Udotea cyathiformis</i> Decaisne, 1842	0.09%			
<i>Udotea dixonii</i> D.S.Littler & M.M.Littler, 1990	0.03%			
<i>Valonia</i> sp.			X	
Ochrophyta	6.66%		X	2
<i>Dictyota bartayresiana</i> J.V.Lamouroux, 1809				1
<i>Dictyota</i> sp.	3.87%		X	
<i>Lobophora</i> sp.	0.06%		X	1
Phaeophyceae	1.43%			
<i>Sargassum</i> sp.	0.17%			
<i>Spatoglossum schroederi</i> (C.Agardh) Kützing, 1859	1.13%			
<i>Styopodium zonale</i> (J.V.Lamouroux) Papenfuss, 1940			X	
Rhodophyta	3.03%		X	1
<i>Amphiroa rigida</i> J.V.Lamouroux, 1816	0.06%			
Corallinophycidae	2.44%		X	1
<i>Peyssonnelia</i> sp.			X	
Rhodophyta	0.52%			
<i>Titanophora incrustans</i> (J.Agardh) Børgesen, 1949	0.00%		X	
Porifera	8.76%		X	10
Porifera	8.76%		X	10
Demospongiae	8.41%		X	9
<i>Acanthella cubensis</i> (Alcolado, 1984)				1
<i>Acanthella vaceleti</i> van Soest & Stentoft, 1988	0.09%			

Dive Site: Florida, Key Largo, E of Grecian Rocks, Mesophotic Reef, FKNMS, Station FK-04, ROV 19-04, UNCW 776; 15-VIII-19-1

<i>Agelas clathrodes</i> (Schmidt, 1870)		X	
<i>Agelas conifera</i> (Schmidt, 1870)	0.17%		
<i>Agelas dispar</i> Duchassaing & Michelotti, 1864	0.03%		
<i>Agelas sceptrum</i> (Lamarck, 1815)		X	
<i>Agelas</i> sp.	0.03%		
<i>Agelas sventres</i> Lehnert & van Soest, 1996	0.12%	X	
<i>Agelas tubulata</i> Lehnert & van Soest, 1996	0.03%	X	
<i>Aiolochoxia crassa</i> (Hyatt, 1875)	0.03%	X	
<i>Amphimedon cf. caribica</i> (Pulitzer-Finali, 1986)		X	
<i>Amphimedon compressa</i> Duchassaing & Michelotti, 1864	0.32%	X	
<i>Amphimedon</i> sp.	0.29%		
<i>Amphimedon</i> sp. FK-02		X	1
<i>Amphimedon</i> sp. PR-01	0.03%		
<i>Aplysina bathyphila</i> Maldonado & Young, 1998		X	
<i>Aplysina cauliformis</i> (Carter, 1882)	0.23%	X	
<i>Aplysina cf. fulva</i> (Pallas, 1766)		X	
<i>Aplysina lacunosa</i> (Lamarck, 1814)		X	
<i>Aplysina</i> sp.	0.06%		
<i>Auletta tuberosa</i> Alvarez, van Soest & Rützler, 1998		X	1
Axinellidae		X	
Axinellidae FK-01		X	
<i>Batzella rubra</i> (Alcolado, 1984)	0.06%		
<i>Callyspongia (Callyspongia) fallax</i> Duchassaing & Michelotti, 1864		X	
<i>Callyspongia (Cladochalina) aculeata</i> (Linnaeus, 1759)	0.03%	X	
<i>Callyspongia (Cladochalina) plicifera</i> (Lamarck, 1814)		X	
<i>Clathria</i> sp.	0.06%		
<i>Cliona delitrix</i> Pang, 1973		X	
Demospongiae	3.52%		
Demospongiae FK-03		X	
<i>Desmapsamma anchorata</i> (Carter, 1882)		X	
<i>Discodermia dissoluta</i> Schmidt, 1880	0.03%		
<i>Dysidea etheria</i> Laubenfels, 1936	0.06%		
Dysideidae		X	
Dysideidae FK-01		X	
<i>Hymedesmia (Hymedesmia) agariciicola</i> van Soest, 1984		X	1
<i>Iotrochota birotulata</i> (Higgin, 1877)		X	
<i>Monanchora arbuscula</i> (Duchassaing & Michelotti, 1864)	0.12%	X	
<i>Mycale</i> sp. FK-01		X	1
<i>Niphates alba</i> van Soest, 1980	0.06%		

Dive Site: Florida, Key Largo, E of Grecian Rocks, Mesophotic Reef, FKNMS, Station FK-04, ROV 19-04, UNCW 776; 15-VIII-19-1

<i>Niphates digitalis</i> (Lamarck, 1814)	0.38%		X	
<i>Niphates erecta</i> Duchassaing & Michelotti, 1864	0.76%		X	
<i>Niphates</i> sp.	0.03%			
Petrosiidae	0.12%			
Poecilosclerida- FK-01			X	
Poecilosclerida- FK-02			X	
<i>Ptilocaulis walpersii</i> (Duchassaing & Michelotti, 1864)			X	
<i>Scopalina ruetzleri</i> (Wiedenmayer, 1977)			X	
<i>Spirastrella coccinea</i> (Duchassaing & Michelotti, 1864)	0.38%		X	
Spirastrellidae			X	
<i>Spongia (Spongia) tubulifera</i> Lamarck, 1814			X	
<i>Svenzea zeai</i> (Alvarez, van Soest & Rützler, 1998)			X	
<i>Terpios</i> sp. FK-01				1
<i>Xestospongia muta</i> (Schmidt, 1870)	1.40%		X	2
<i>Xestospongia</i> sp.				1
<i>Xestospongia</i> sp. Cu-01			X	
Homoscleromorpha	0.35%		X	1
<i>Plakortis angulospiculatus</i> (Carter, 1879)	0.35%			
<i>Plakortis</i> sp.				1
<i>Plakortis</i> sp. FK-01			X	
Alcyonacea - gorgonian	13.91%		X	2
Cnidaria- Anthozoa	13.91%		X	2
Alcyonacea - gorgonian	13.91%		X	2
Alcyonacea- gorgonian	0.06%			
<i>Antillogorgia</i> sp.	3.38%		X	
<i>Ellisella elongata</i> (Pallas, 1766)	0.06%		X	
<i>Erythropodium caribaeorum</i> (Duchassaing & Michelotti, 1860)	2.15%		X	
<i>Eunicea</i> sp.	0.12%		X	
<i>Iciligorgia schrammi</i> Duchassaing, 1870	0.52%		X	
<i>Nicella</i> sp.	0.12%		X	
<i>Plexaurella</i> sp.			X	
Plexauridae	2.71%		X	
<i>Pseudoplexaura</i> sp.	4.77%		X	
<i>Swiftia exserta</i> (Ellis & Solander, 1786)	0.03%		X	2
Antipatharia	0.09%		X	
Cnidaria- Anthozoa	0.09%		X	
Antipatharia	0.09%		X	
<i>Stichopathes</i> sp.	0.09%		X	
<i>Tanacetipathes</i> sp.			X	
<i>Tanacetipathes tanacetum</i> (Pourtalès, 1880)			X	
Coral- Scleractinia	0.52%	32	X	

Dive Site: Florida, Key Largo, E of Grecian Rocks, Mesophotic Reef, FKNMS, Station FK-04, ROV 19-04, UNCW 776; 15-VIII-19-1

Cnidaria- Anthozoa	0.52%	32	X	
Coral- Scleractinia	0.52%	32	X	
<i>Agaricia agaricites</i> (Linnaeus, 1758)	0.03%	1	X	
<i>Madracis decactis</i> (Lyman, 1859)		1		
<i>Madracis senaria</i> Wells, 1973	0.03%			
<i>Meandrina meandrites</i> (Linnaeus, 1758)		3		
<i>Montastraea cavernosa</i> (Linnaeus, 1767)	0.20%	7	X	
<i>Mycetophyllia aliciae</i> Wells, 1973	0.06%	1		
Scleractinia- unid solitary	0.03%			
<i>Scolymia cubensis</i> (Milne Edwards & Haime, 1848)		2		
<i>Siderastrea siderea</i> (Ellis & Solander, 1786)			X	
<i>Stephanocoenia intersepta</i> (Lamarck, 1836)	0.17%	17	X	
Other	4.07%	48	X	2
Annelida	0.06%			
Polychaeta	0.06%			
Sabellidae	0.06%			
Arthropoda			X	
Crustacea			X	
<i>Stenorhynchus seticornis</i> (Herbst, 1788)			X	
Cnidaria- Anthozoa			X	
Anthozoa - Non Coral			X	
Cnidaria			X	
Cnidaria- Hydrozoa	1.66%			
Hydrozoa	1.66%			
Hydroidolina	1.66%			
Mollusca	0.12%			
Bivalvia	0.03%			
<i>Spondylus</i> sp.	0.03%			
Gastropoda	0.09%			
Tenagodus sp.	0.09%			
Chordata	0.38%		X	2
Chordata - Invertebrate	0.23%		X	2
Ascidiacea- unidentified	0.17%		X	2
<i>Botryllus</i> sp.	0.06%			
Chordata - Vertebrate	0.15%			
Actinopterygii	0.15%			
Detritus	0.87%			
UNKNOWN	0.99%	48	X	
Human debris	0.06%	1	X	
Human debris	0.06%	1	X	
Human debris	0.06%	1	X	
Human debris- Fishing Gear	0.06%	1	X	

Dive Site: Florida, Key Largo, E of Grecian Rocks, Mesophotic Reef, FKNMS, Station FK-04, ROV 19-04, UNCW 776; 15-VIII-19-1

Fish line/gear	0.06%			
Fishing line		1	X	
Long line			X	
Bare Hard Bottom Substrate	46.78%			
Bare Hard Bottom Substrate	46.78%			
Bare Hard Bottom Substrate	46.78%			
Hard bottom	46.78%			
Bare rock	44.81%			
Bare rubble/cobble	1.98%			
Bare Soft Bottom Substrate	7.33%		X	
Bare Soft Bottom Substrate	7.33%		X	
Bare Soft Bottom Substrate	7.33%		X	
Burrow			X	
Sand Tilefish burrow			X	
Soft Bottom	7.33%			
Grand Total	100.00%	81	X	18

Dive Site: Florida, Key Largo, E of Grecian Rocks, Mesophotic Reef, FKNMS, Station FK-04, ROV 19-04, UNCW 776; 15-VIII-19-1

Density of Fish:

Table 2. Counts of commercial/recreational fish and visual sightings (Presence/Absence) of non-commercial fish from video transects at dive site ROV 19-04.

Status/Class/Order/Family/Tax Name (authority)	ROV 19-04 No. or P/A
Target	4
Actinopterygii	4
Perciformes	4
Serranidae	4
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	1
<i>Epinephelus guttatus</i> (Linnaeus, 1758) - Red Hind	3
Chordata - Vertebrate	X
Actinopterygii	X
Anguilliformes	X
Muraenidae	X
<i>Gymnothorax moringa</i> (Cuvier, 1829) - Spotted Moray	X
Beryciformes	X
Holocentridae	X
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	X
Perciformes	X
Acanthuridae	X
<i>Acanthurus chirurgus</i> (Bloch, 1787) - Doctorfish	X
<i>Acanthurus coeruleus</i> Bloch & Schneider, 1801 - Blue Tang	X
Carangidae	X
<i>Caranx ruber</i> (Bloch, 1793) - Bar Jack	X
Chaetodontidae	X
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	X
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	X
<i>Chaetodon striatus</i> Linnaeus, 1758 - Banded Butterflyfish	X
Gobiidae	X
<i>Gnatholepis cauerensis</i> (Bleeker, 1853) - Goldspot Goby	X
Haemulidae	X
<i>Anisotremus surinamensis</i> (Bloch, 1791) - Black Margate	X
Labridae	X
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	X
<i>Clepticus parrae</i> (Bloch & Schneider, 1801) - Creole Wrasse	X
<i>Halichoeres cyanocephalus</i> (Bloch, 1791) - Yellowcheek Wrasse	X
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	X
<i>Thalassoma bifasciatum</i> (Bloch, 1791) - Bluehead	X
Mullidae	X

Dive Site: Florida, Key Largo, E of Grecian Rocks, Mesophotic Reef, FKNMS, Station FK-04, ROV 19-04, UNCW 776; 15-VIII-19-1

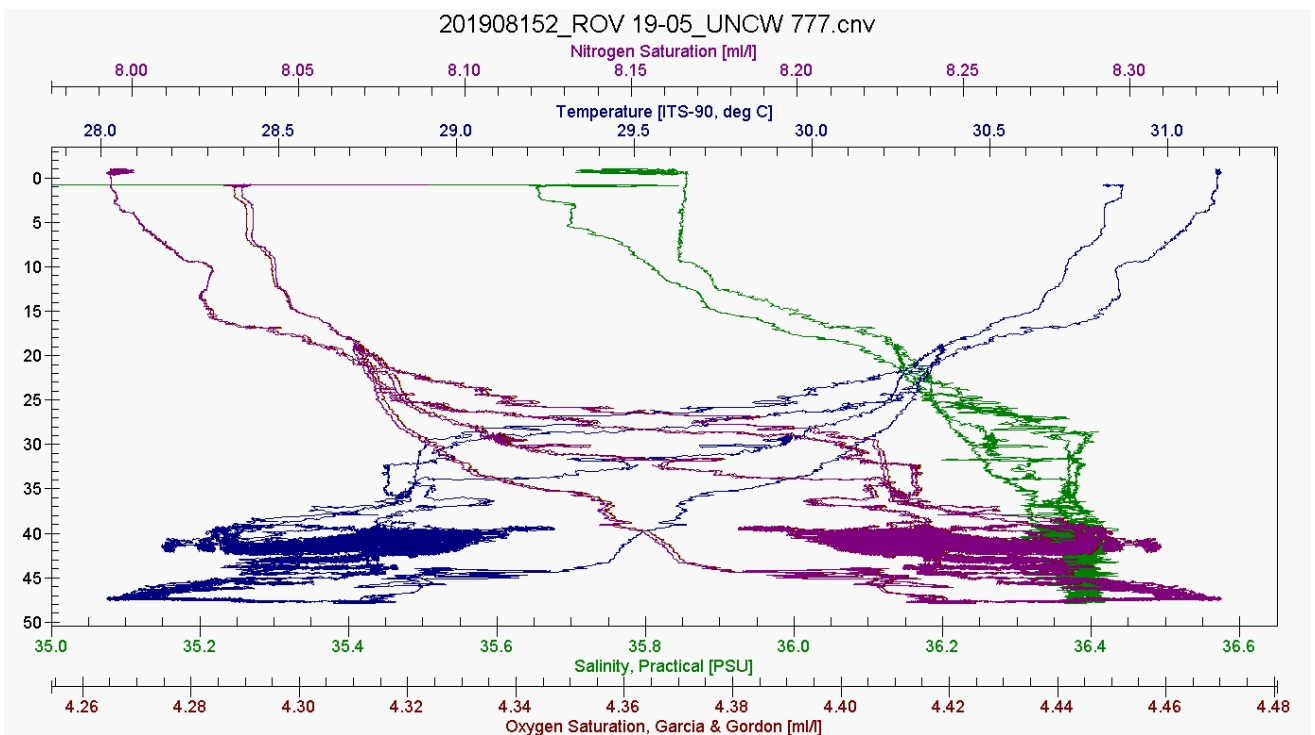
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	X
Pomacanthidae	X
<i>Centropyge argi</i> Woods & Kanazawa, 1951 - Cherubfish	X
<i>Holacanthus bermudensis</i> Goode, 1876 - Blue Angelfish	X
<i>Holacanthus ciliaris</i> (Linnaeus, 1758) - Queen Angelfish	X
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	X
<i>Pomacanthus arcuatus</i> (Linnaeus, 1758) - Gray Angelfish	X
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	X
Pomacentridae	X
<i>Chromis cyanea</i> (Poey, 1860) - Blue Chromis	X
<i>Chromis enchrysur</i> Jordan & Gilbert, 1882 - Yellowtail Reefish	X
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	X
<i>Stegastes adustus</i> (Troschel, 1865) - Dusky Damselfish	X
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damselfish	X
Scaridae	X
<i>Scarus coelestinus</i> Valenciennes, 1840 - Midnight Parrotfish	X
<i>Scarus iseri</i> (Bloch, 1789) - Striped Parrotfish	X
Serranidae	X
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	X
<i>Serranus tabacarius</i> (Cuvier, 1829) - Tobaccofish	X
<i>Serranus tortugarum</i> Longley, 1935 - Chalk Bass	X
Sphyraenidae	X
<i>Sphyraena barracuda</i> (Edwards, 1771) - Great Barracuda	X
Tetraodontiformes	X
Balistidae	X
<i>Balistes capricus</i> Gmelin, 1789 - Grey Triggerfish	X
Ostraciidae	X
<i>Lactophrys triqueter</i> (Linnaeus, 1758) - Smooth Trunkfish	X
Tetraodontidae	X
<i>Canthigaster rostrata</i> (Bloch, 1786) - Sharpnose Puffer	X
Grand Total	X

Dive Site: Florida, Key Largo, E of French Reef, Mesophotic Reef, FKNMS, Station FK-06, ROV 19-05, UNCW 777; 15-VIII-19-2

Dive Data:

Minimum Bottom Depth (m): 43.3	Total Transect Length (km): 1.065
Maximum Bottom Depth (m): 48.6	Surface Current (kn): 1
On Bottom (Time- GMT): 13:37	On Bottom (Lat/Long): 25.0376°N; -80.3185°W
Off Bottom (Time- GMT): 17:25	Off Bottom (Lat/Long): 25.0362°N; -80.3203°W
Physical (bottom); Temp (°C): 28.8	Salinity: 36.37 Visibility (ft): Current (kn): N/A

Physical Environment:



Temperature, Salinity and Depth were collected with a Sea-Bird CTD 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: 47.9 m, Temperature: 28-31.1 °C, Salinity: 35.7-36.4 PSU, and Oxygen Saturation: 4.3-4.5 ml/l.

Dive Site: Florida, Key Largo, E of French Reef, Mesophotic Reef, FKNMS, Station FK-06, ROV 19-05, UNCW 777; 15-VIII-19-2

Dive Imagery:

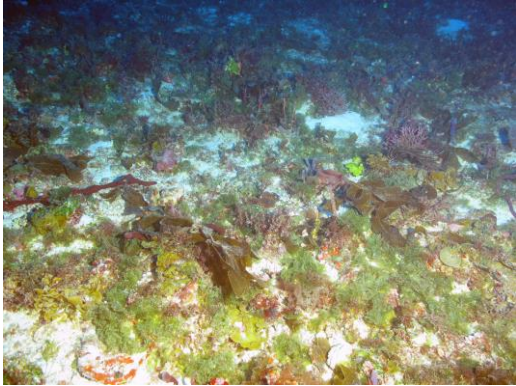


Figure 1: 25°2.2579'N;80°19.1101'W: -49 m
Dense cover of algae on hard bottom



Figure 2: 25°2.2577'N;80°19.1121'W: -48.7 m
Green turf algae and a sampled *Xestospongia* sponge



Figure 3: 25°2.2585'N;80°19.1126'W: -48.7 m
Agaricia lamarkii

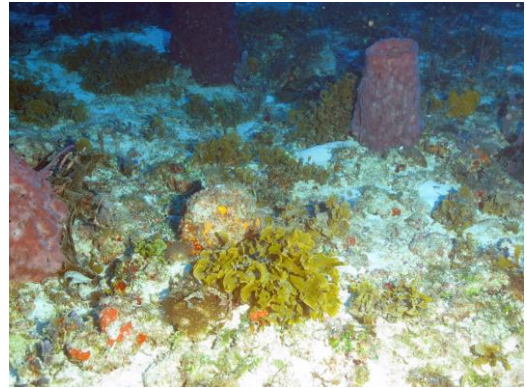


Figure 4: 25°2.2923'N;80°19.1739'W: -45.9 m
Padina sp. algae (middle), *Xestospongia muta* (upper right)

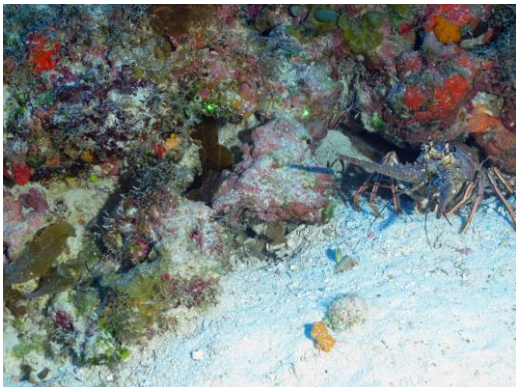


Figure 5: 25°2.2918'N;80°19.1877'W: -44.3 m
Panulirus argus lobster in reef



Figure 6: 25°2.2892'N;80°19.1886'W: -44.5 m
Fishing line wrapped around sponges

Dive Site: Florida, Key Largo, E of French Reef, Mesophotic Reef, FKNMS, Station FK-06, ROV 19-05, UNCW 777; 15-VIII-19-2

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 15-VIII-19-2; Florida, Key Largo, E of French Reef, Mesophotic Reef, FKNMS, Station FK-06, ROV 19-05, UNCW 777; 43- 49 m; same site at 1979 Johnson-Sea-Link submersible survey

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; collect samples of macrobiota for taxonomy, genetics, cell culture and biomedical research.

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. Coral, sponge and algal data were recorded in separate Access databases which were compiled with the benthic database. A Fastcat 49 CTD on the ROV continuously recorded, temperature, depth, conductivity, and salinity. ROV collection skid was used with 5-function manipulator to collect samples.

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, 1/250th second, strobe on, auto focus, white balance- fish mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing down, ~1.3 m off bottom. 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'. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

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

Depth range: 42- 49 m

NOAA multibeam survey shows a deepwater reef, linear ridge, oriented NNE-SSW, 12 km long (same ridge as Site 4), 60 m wide, east base 46 m, top 42 m, west base 42 m.

Weather- Sunny, seas: 0-1 from SE, wind 12.2 kn from 182 dg, air- 30.52 C, surface water- 31.33 C, salinity-35.87 PSU, surface current 1 kn from SW; bottom current kt from south

1:31 PM- Launch

1:37 PM- on bottom, 49 m depth; flat dsediment covering rock cobble, dense cover of algae, some sponges.

1:40 PM- Sample 001, possible small *Xestospongia* 10 cm diameter, 49 m deep, in bin 1

1:51 PM- Sample 002, algal conglomerate, many photos taken will separate later; in bucket 2&3

2:11 PM- Stingray scared from under ROV

2:13 PM- Sample 003, target is *Lobophora*, brown alga, in bucket 4

2:15 PM- heading due west, taking haphazard photos until reach ridge

2:20 PM- Substrate rubble covered in brown algae, ~40% cover. Not much sessile invert cover aside from the stray vase sponge

2:27 PM- Approaching the foot of the reef on MB, getting less algal cover, depth 46.5 m. flat sand rubble; Hogfish; many *Xestospongia* on this rocky outcrop

2:30 PM- lobster pot line through the very low relief rocky outcrop; fish activity increasing

2:34 PM- Sample 004, *Lobophora* depth 45.3 m, in bucket 5

Dive Site: Florida, Key Largo, E of French Reef, Mesophotic Reef, FKNMS, Station FK-06, ROV 19-05, UNCW 777; 15-VIII-19-2

- 2:36 PM- Continuing transit to W, rubble and rock HB <0.5 m tall, patchy, interspersed with sediment and rubble; sand tile mound
- 2:38 PM- first lobster; hiding under a small ledge, large spiny
- 2:41 PM- Photos of lobster pot line wrapped around the reef
- 2:42 PM- Photoa transect 1 start, depth 44.2; low relief, hard bottom patchy reef with sediment
- 2:45 PM- habitat has changed, we are off the reef in a sandy patch
- 2:50 PM- Low relief, 0.25 m ledge and scattered HB reef, another lobster; fish activity moderate; cover predominantly sponges and algae, with hard corals just increasing
- 2:51 PM- inspecting several things, an M cav. and a sponge
- 2:53 PM- school of jacks swimming by while taking photos of *Discodermia*
- 2:54 PM- Sample 005, *Discodermia* 20 cm lobate mound, purple/grey, 43.4 m deep, in Bin 4
- 3:03 PM- continuing transect, habitat still low scattered HB
- 3:07 PM- heading S ontop of the ridge; brown and green algae dominant with gorgonians and sponges also very present
- 3:11 PM- a lot of ghost lobster lines littered about the reef; reef still dominated brown and green algae, with sponges second. Gorgonians have declined in abundance, but hard coral cover has remained consistent
- 3:15 PM- reached a break in the habitat, sand with some scattered small patched of HB mounds
- 3:20 PM- back on the reef ridge, low relief
- 3:22 PM- stopping to collect *Sargassum*; Sample 006, target *Sargassum*, in bucket 1
- 3:26 PM- continuing photo transect
- 3:29 PM- have reached the crest of the reef, 43 m; dense cover of rugose hard bottom ridge; high fish activity, many small reef dwellers and juveniles
- 3:31 PM- purposeful photos of *Agaricia*; increase in coral cover
- 3:33 PM- *Condylactes* anemone, purposeful photo
- 3:35 PM- continuing transect,
- 3:36 PM- end of Photo transect 1 (~30 photos), 42 m depth
- 3:37 PM- collecting several sponges; Sample 007 *Xestospongia* ~15 cm diameter in bin 2
- 3:46 PM- continuing on path, travelling through an isthmus of low flat sand between two reef ridges
- 3:49 PM- on the reef, slope 10% at most, <0.5 m high; covered by algae and sponges predominantly
- 3:51 PM- start Photo transect 2; depth 42.2; south along lower peninsula ridge. This is region of JSL submersible dive site in 1979. 80% cover hard bottom dominated by brown and green algae, sponges, and the occasional coral head; high fish activity
- 3:53 PM- dragged a bit off the ledge, working our way back to it
- 3:59 PM- habitat has shifted to more of a scattered hardbottom, with less distinct ridges
- 4:01 PM- getting close to where the 1979 dive was; continuing with hardbottom ridge reef habitat, 0.25 m relief; high fish activity, lobster,
- 4:08 PM- sliced *Xestospongia*, looks fairly fresh- top is right next to it, getting purposeful photos
- 4:15 PM- back down on the bottom after checking out possible lobster lines around us; we had to back-track, so waiting to continue photos until reach where we were previously
- 4:19 PM- back to the lopped off *Xesto*, so finishing photo transect; habitat unchanged
- 4:21 PM- End of Photo transect 2 (~30 photos), 43 m, low relief HB patchy dispersed with sediment
- 4:34 PM- Sample 008, *Sargassum* clump ~10 cm, 42.6 m deep. Sample lost, number will be reassigned
- 4:49 PM- collecting Sample 008, 10-15 cm Titanophora white/pink flat branching bush algae, in bucket 4
- 4:56 PM- Sample 009, *Xestospongia* 15 cm diameter, 43 m deep, in bin 3
- 5:11 PM- Sample 010, 10 cm spherical lobate redish brown *Discodermia*, in bin 1

Dive Site: Florida, Key Largo, E of French Reef, Mesophotic Reef, FKNMS, Station FK-06, ROV 19-05, UNCW 777; 15-VIII-19-2

5:26 PM- off bottom, getting dragged by ship.

5:26 PM- end of dive, 47 m, off reef in flat sandy area

Human Debris:

Numerous ghost lobster lines and pot. Many 2-3' *Xestospongia muta* sponges with top cut off, very likely from lobster pot lines. Photos of lines wrapped around *Xestospongia*

Dive Site: Florida, Key Largo, E of French Reef, Mesophotic Reef, FKNMS, Station FK-06, ROV 19-05, UNCW 777; 15-VIII-19-2

CPCe Percent Cover Analysis:

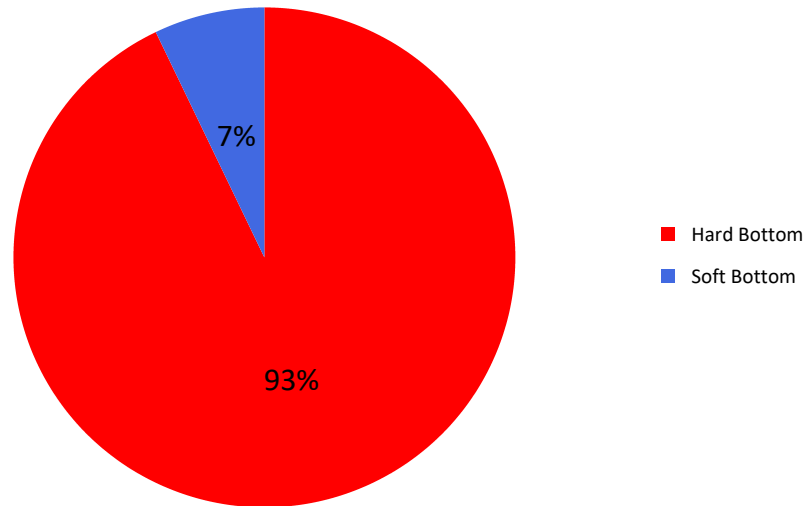
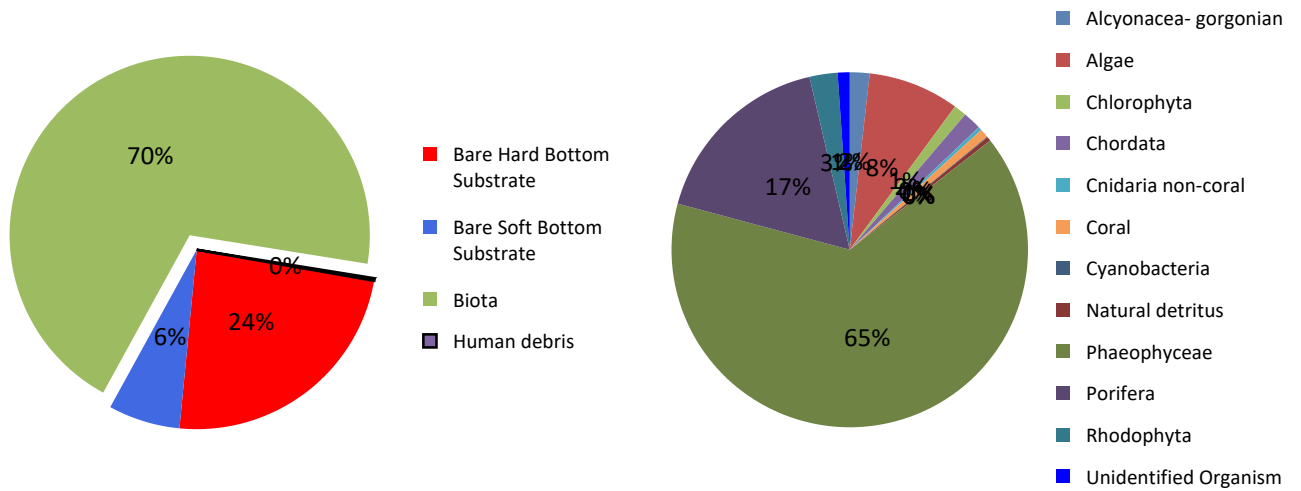


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-05. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



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: Florida, Key Largo, E of French Reef, Mesophotic Reef, FKNMS, Station FK-06, ROV 19-05, UNCW 777; 15-VIII-19-2

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. %= Percent Cover from CPCe analysis, Den= Density of Scleractinia from CPCe ARA analysis, P/A = Presence/Absence from visual sightings during the dive, Sam = Samples (number collected) of benthic macro-biota and substrate from ROV 19-05.

Taxa	ROV 19-05 %	Den.	P/A	Sam.
Biota	69.58%	65	X	11
Algae	53.42%		X	5
Algae	53.42%		X	5
Algae	5.75%			
Algae- unid. macroalgae	5.75%			
Cyanobacteria	0.03%			
Chlorophyta	0.82%		X	
<i>Caulerpa chemnitzia</i> (Esper) J.V.Lamouroux, 1809	0.03%			
<i>Caulerpa racemosa</i> (Forsskål) J.Agardh, 1873	0.26%		X	
<i>Caulerpa</i> sp.			X	
Chlorophyta	0.20%			
Chlorophyta- Filamentous Green			X	
<i>Codium</i> sp.	0.03%			
<i>Halimeda</i> sp.	0.30%		X	
Ochrophyta	45.04%		X	3
<i>Dictyopteris justii</i> J.V.Lamouroux, 1809	5.72%			
<i>Dictyopteris</i> sp.			X	
<i>Dictyota</i> sp.	11.50%		X	
<i>Lobophora</i> sp.	2.96%		X	1
Phaeophyceae	11.17%			
<i>Sargassum hystrix</i> var. <i>buxifolium</i> (Chauvin) M.J.Wynne, 2011	0.00%			1
<i>Sargassum</i> sp.	0.49%		X	
<i>Spatoglossum schroederi</i> (C.Agardh) Kützing, 1859	13.21%			
<i>Styopodium zonale</i> (J.V.Lamouroux) Papenfuss, 1940			X	1
Rhodophyta	1.77%		X	2
<i>Amphiroa rigida</i> J.V.Lamouroux, 1816	0.03%			1
<i>Amphiroa</i> sp.	0.03%		X	
<i>Botryocladia</i> sp.			X	
Corallinophycidae	1.45%		X	
<i>Kallymenia</i> sp.			X	
Rhodophyta	0.26%			
<i>Titanophora incrustans</i> (J.Agardh) Børgesen, 1949			X	1

Dive Site: Florida, Key Largo, E of French Reef, Mesophotic Reef, FKNMS, Station FK-06, ROV 19-05, UNCW 777; 15-VIII-19-2

Porifera	11.96%	X	6
Porifera	11.96%	X	6
Demospongiae	11.96%	X	6
<i>Agelas citrina</i> Gotera & Alcolado, 1987	0.69%	X	
<i>Agelas clathrodes</i> (Schmidt, 1870)	0.03%	X	
<i>Agelas conifera</i> (Schmidt, 1870)	0.30%		
<i>Agelas dilatata</i> Duchassaing & Michelotti, 1864		X	
<i>Agelas dispar</i> Duchassaing & Michelotti, 1864	0.03%		
<i>Agelas sceptrum</i> (Lamarck, 1815)		X	
<i>Agelas</i> sp.	0.03%	X	
<i>Agelas sventres</i> Lehnert & van Soest, 1996	0.03%		
<i>Agelas tubulata</i> Lehnert & van Soest, 1996	0.07%	X	
<i>Agelas wiedenmayeri</i> Alcolado, 1984	0.03%	X	
<i>Aiolochoxia crassa</i> (Hyatt, 1875)	0.07%	X	
<i>Amphimedon</i> cf. <i>caribica</i> (Pulitzer-Finali, 1986)		X	
<i>Amphimedon compressa</i> Duchassaing & Michelotti, 1864	0.46%	X	
<i>Amphimedon</i> sp.	0.03%		
<i>Amphimedon</i> sp. PR-01	0.03%		
<i>Aplysina cauliformis</i> (Carter, 1882)	1.28%	X	
<i>Aplysina</i> cf. <i>fulva</i> (Pallas, 1766)		X	
<i>Auletta</i> cf. <i>tuberosa</i> Alvarez, van Soest & Rützler, 1998		X	
<i>Batzella</i> cf. <i>fusca</i> van Soest, 2009			1
<i>Batzella rubra</i> (Alcolado, 1984)	0.07%		
<i>Callyspongia</i> (<i>Callyspongia</i>) <i>fallax</i> Duchassaing & Michelotti, 1864	0.07%	X	
<i>Callyspongia</i> (<i>Cladochalina</i>) <i>plicifera</i> (Lamarck, 1814)	0.03%	X	
<i>Clathria</i> (<i>Thalysias</i>) <i>venosa</i> (Alcolado, 1984)		X	
<i>Cliona delitrix</i> Pang, 1973		X	
<i>Cliona varians</i> (Duchassaing & Michelotti, 1864)	0.13%	X	
<i>Cribrochalina vasculum</i> (Lamarck, 1814)		X	
Demospongiae	2.43%		
Dictyoceratida	0.03%		
<i>Discodermia</i> cf. <i>dissoluta</i> Schmidt, 1880		X	
<i>Discodermia dissoluta</i> Schmidt, 1880			2
<i>Dysidea etheria</i> Laubenfels, 1936	0.03%	X	
<i>Erylus</i> cf. <i>formosus</i> Sollas, 1886		X	
<i>Geodia neptuni</i> (Sollas, 1886)	0.39%	X	
<i>Iotrochota birotulata</i> (Higgin, 1877)	0.20%	X	
<i>Ircinia</i> sp.	0.03%		
<i>Monanchora arbuscula</i> (Duchassaing & Michelotti, 1864)	0.07%		

Dive Site: Florida, Key Largo, E of French Reef, Mesophotic Reef, FKNMS, Station FK-06, ROV 19-05, UNCW 777; 15-VIII-19-2

<i>Mycale (Mycale) laevis</i> (Carter, 1882)	0.03%		
<i>Myrmekioderma gyroderma</i> (Alcolado, 1984)		X	
<i>Myrmekioderma rea</i> (Laubenfels, 1934)	0.13%		
<i>Neofibularia nolitangere</i> (Duchassaing & Michelotti, 1864)		X	
<i>Niphates alba</i> van Soest, 1980	0.30%		
<i>Niphates digitalis</i> (Lamarck, 1814)	0.36%	X	
<i>Niphates erecta</i> Duchassaing & Michelotti, 1864	0.76%	X	
<i>Oceanapia bartschi</i> (Laubenfels, 1934)	0.03%		
<i>Petrosia (Petrosia) weinbergi</i> van Soest, 1980		X	
Petrosiidae	0.13%		
<i>Phorbas amaranthus</i> Duchassaing & Michelotti, 1864		X	
<i>Ptilocaulis walpersii</i> (Duchassaing & Michelotti, 1864)	0.07%	X	
<i>Spheciospongia vesparium</i> (Lamarck, 1815)	0.03%		
<i>Spirastrella coccinea</i> (Duchassaing & Michelotti, 1864)	0.30%		
Spirastrellidae		X	
<i>Topsentia ophiraphidites</i> (Laubenfels, 1934)	0.07%		
<i>Verongula rigida</i> (Esper, 1794)		X	
<i>Verongula</i> sp.	0.03%		
<i>Xestospongia muta</i> (Schmidt, 1870)	3.12%	X	2
<i>Xestospongia</i> sp.	0.03%		1
<i>Xestospongia</i> sp. Cu-01		X	
Homoscleromorpha		X	
<i>Plakortis</i> sp.		X	
Alcyonacea - gorgonian	1.25%	X	
Cnidaria- Anthozoa	1.25%	X	
Alcyonacea - gorgonian	1.25%	X	
<i>Antillogorgia</i> sp.		X	
<i>Ellisella elongata</i> (Pallas, 1766)	0.07%	X	
<i>Ellisella</i> sp.		X	
<i>Erythropodium caribaeorum</i> (Duchassaing & Michelotti, 1860)	0.79%		
<i>Eunicea</i> sp.		X	
Gorgoniidae		X	
<i>Iciligorgia schrammi</i> Duchassaing, 1870		X	
<i>Nicella</i> sp.		X	
<i>Plexaurella</i> sp.		X	
Plexauridae	0.33%	X	
<i>Pseudoplexaura</i> sp.	0.07%	X	
Antipatharia		X	
Cnidaria- Anthozoa		X	
Antipatharia		X	
<i>Stichopathes</i> sp.		X	

Dive Site: Florida, Key Largo, E of French Reef, Mesophotic Reef, FKNMS, Station FK-06, ROV 19-05, UNCW 777; 15-VIII-19-2

<i>Tanacetipathes tanacetum</i> (Portalès, 1880)			X
Coral- Scleractinia	0.56%	11	X
Cnidaria- Anthozoa	0.56%	11	X
Coral- Scleractinia	0.56%	11	X
<i>Agaricia lamarcki</i> Milne Edwards & Haime, 1851	0.30%	3	X
<i>Agaricia</i> sp.			X
<i>Agaricia undata</i> (Ellis & Solander, 1786)			X
<i>Helioseris cucullata</i> (Ellis & Solander, 1786)			X
<i>Madracis senaria</i> Wells, 1973		2	
<i>Meandrina meandrites</i> (Linnaeus, 1758)			X
<i>Montastraea cavernosa</i> (Linnaeus, 1767)	0.26%	4	X
<i>Stephanocoenia intersepta</i> (Lamarck, 1836)		2	
Other	2.40%	54	X
Arthropoda			X
Crustacea			X
<i>Panulirus argus</i> (Latreille, 1804)			X
Penaeidae			X
Cnidaria- Anthozoa	0.07%		X
Anthozoa - Non Coral	0.07%		X
Cnidaria			X
<i>Condylactis gigantea</i> (Weinland, 1860)	0.03%		X
<i>Ricordea florida</i> Duchassaing & Michelotti, 1860	0.03%		
Cnidaria- Hydrozoa	0.16%	1	
Hydrozoa	0.16%	1	
Hydroidolina	0.16%		
<i>Millepora alcicornis</i> Linnaeus, 1758		1	
Chordata	1.15%		
Chordata - Invertebrate	0.49%		
Ascidiacea- unidentified	0.23%		
<i>Botryllus</i> sp.	0.20%		
Didemnidae	0.07%		
Chordata - Vertebrate	0.66%		
Actinopterygii	0.66%		
Detritus	0.26%		
UNKNOWN	0.76%	53	
Human debris	0.23%	6	X
Human debris	0.23%	6	X
Human debris	0.23%	6	X
Human debris- Fishing Gear	0.23%	6	X
Fishing line		2	
Line from lobster/crab pot	0.03%	3	X
Lobster/crab pot		1	

Dive Site: Florida, Key Largo, E of French Reef, Mesophotic Reef, FKNMS, Station FK-06, ROV 19-05, UNCW 777; 15-VIII-19-2

Trap	0.20%			
Bare Hard Bottom Substrate	23.75%			
Bare Hard Bottom Substrate	23.75%			
Hard bottom	23.75%			
Bare rock	19.94%			
Bare rubble/cobble	3.81%			
Bare Soft Bottom Substrate	6.44%		X	
Bare Soft Bottom Substrate	6.44%		X	
Burrow			X	
Sand Tilefish burrow			X	
Soft Bottom	6.44%			
Grand Total	100.00%	71	X	11

Dive Site: Florida, Key Largo, E of French Reef, Mesophotic Reef, FKNMS, Station FK-06, ROV 19-05, UNCW 777; 15-VIII-19-2

Density of Fish:

Table 2. Counts of commercial/recreational fish and visual sightings (Presence/Absence) of non-commercial fish from video transects at dive site ROV 19-05.

Status/Class/Order/Family/Tax Name (authority)	ROV 19-05 No. or P/A
Target	8
Actinopterygii	8
Perciformes	1
Serranidae	1
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	1
Scorpaeniformes	7
Scorpaenidae	7
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	7
Chordata - Vertebrate	X
Actinopterygii	X
Aulopiformes	X
Synodontidae	X
<i>Synodus intermedius</i> (Spix & Agassiz, 1829) - Sand Diver	X
Beryciformes	X
Holocentridae	X
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	X
Perciformes	X
Acanthuridae	X
<i>Acanthurus chirurgus</i> (Bloch, 1787) - Doctorfish	X
<i>Acanthurus coeruleus</i> Bloch & Schneider, 1801 - Blue Tang	X
<i>Acanthurus tractus</i> Poey, 1860 - Ocean Surgeonfish	X
Apogonidae	X
<i>Apogon</i> sp. - Cardinalfish	X
Carangidae	X
<i>Carangoides bartholomaei</i> (Cuvier, 1833) - Yellow Jack	X
<i>Caranx ruber</i> (Bloch, 1793) - Bar Jack	X
Chaetodontidae	X
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	X
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	X
Gobiidae	X
<i>Gnatholepis cauerensis</i> (Bleeker, 1853) - Goldspot Goby	X
Haemulidae	X
<i>Anisotremus surinamensis</i> (Bloch, 1791) - Black Margate	X
<i>Haemulon album</i> Cuvier, 1830 - White Margate	X
Labridae	X

Dive Site: Florida, Key Largo, E of French Reef, Mesophotic Reef, FKNMS, Station FK-06, ROV 19-05, UNCW 777; 15-VIII-19-2

<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	X
<i>Halichoeres bivittatus</i> (Bloch, 1791) - Slippery Dick	X
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	X
<i>Halichoeres</i> sp. - Wrasse	X
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	X
<i>Thalassoma bifasciatum</i> (Bloch, 1791) - Bluehead	X
Malacanthidae	X
<i>Malacanthus plumieri</i> (Bloch, 1786) - Sand Tilefish	X
Pomacanthidae	X
<i>Centropyge argi</i> Woods & Kanazawa, 1951 - Cherubfish	X
<i>Holacanthus bermudensis</i> Goode, 1876 - Blue Angelfish	X
<i>Holacanthus ciliaris</i> (Linnaeus, 1758) - Queen Angelfish	X
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	X
<i>Pomacanthus arcuatus</i> (Linnaeus, 1758) - Gray Angelfish	X
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	X
Pomacentridae	X
<i>Chromis cyanea</i> (Poey, 1860) - Blue Chromis	X
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	X
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damselfish	X
Scaridae	X
<i>Scarus coelestinus</i> Valenciennes, 1840 - Midnight Parrotfish	X
<i>Sparisoma atomarium</i> (Poey, 1861) - Greenblotch Parrotfish	X
<i>Sparisoma aurofrenatum</i> (Valenciennes, 1840) - Redband Parrotfish	X
Serranidae	X
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	X
<i>Serranus baldwini</i> (Evermann & Marsh, 1899) - Lantern Bass	X
<i>Serranus tigrinus</i> (Bloch, 1790) - Harlequin Bass	X
<i>Serranus tortugarum</i> Longley, 1935 - Chalk Bass	X
Sparidae	X
<i>Calamus</i> sp. - Porgy	X
Tetraodontiformes	X
Balistidae	X
<i>Balistes caprisicus</i> Gmelin, 1789 - Grey Triggerfish	X
Diodontidae	X
<i>Diodon holocanthus</i> Linnaeus, 1758 - Longspined Porcupinefish	X
Ostraciidae	X
<i>Acanthostracion polygonius</i> Poey, 1876 - Honeycomb Cowfish	X
<i>Lactophrys trigonus</i> (Linnaeus, 1758) - Buffalo Trunkfish	X
<i>Lactophrys triqueter</i> (Linnaeus, 1758) - Smooth Trunkfish	X
Tetraodontidae	X
<i>Canthigaster rostrata</i> (Bloch, 1786) - Sharpnose Puffer	X
Elasmobranchii	X

Dive Site: Florida, Key Largo, E of French Reef, Mesophotic Reef, FKNMS, Station FK-06, ROV 19-05, UNCW 777; 15-VIII-19-2

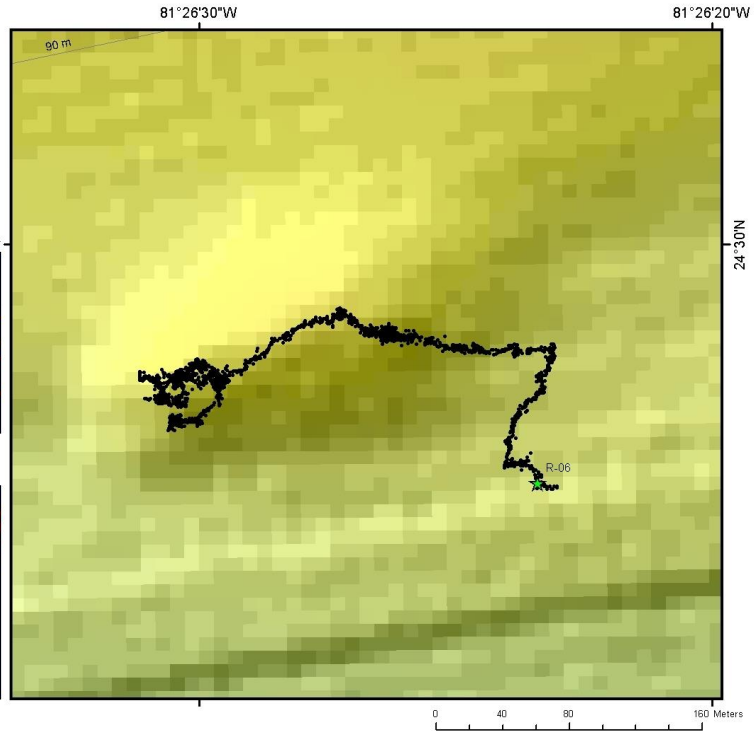
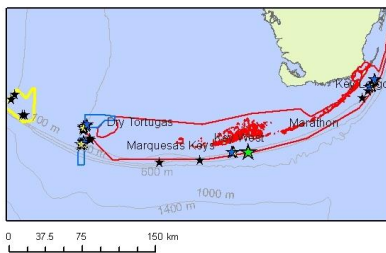
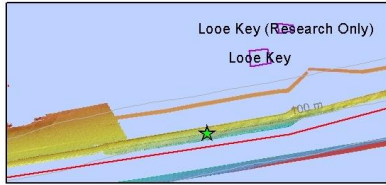
Myliobatiformes	X
Urotrygonidae	X
<i>Urobatis jamaicensis</i> (Cuvier, 1816) - Yellow Stingray	X
Grand Total	X

Dive Site: Florida, Cudjoe, SE of Looe Key, Deepwater Mound, FKNMS, Station FK-07, ROV 19-06, UNCW 778; 16-VIII-19-1

General Location and Dive Track:

Florida, Cudjoe, SE of Looe Key, Deepwater Mound, FKNMS, Station FK-07, ROV 19-06, UNCW 778

- ★ R-06
- DiveTracks
- ★ Scuba
- ★ Tech Dive
- ★ ROV Dives
- Pulley Ridge
- TER
- FKNMS
- SPA



Site Overview:

Project: 2019 CIOERT Cruise
Vessel: R/V Walton Smith
Principal Investigator: John Reed
PI Contact Info: 5600 U.S. 1, North, Fort Pierce, FL 34946

Scientific Observers: John Reed, Stephanie Farrington, Shirley Pomponi, M. Dennis Hanisak, Jason White, Don Liberatore, Megan Conkling, Eric Glidden, Alexis Sturm, Ian Combs, Katherine Beckett

Ship Position System: DGPS
Data Management: Access Database
Report Analyst: John Reed or Stephanie Farrington
Date Compiled: 10/6/2021

Dive Overview:

Date of Dive: 8/16/2019
ROV: Mohawk ROV
ROV Navigation: TrackLink
ROV Sensors: Temperature (°C), Salinity (PSU), pH, Conductivity, Depth (m)

Purpose: ROV image transects and collections

Digital Photos: 228
Distance (km): 0.5
Sonar Data: NF_09_09_FKNMS_W002 32ad_8m_Grid

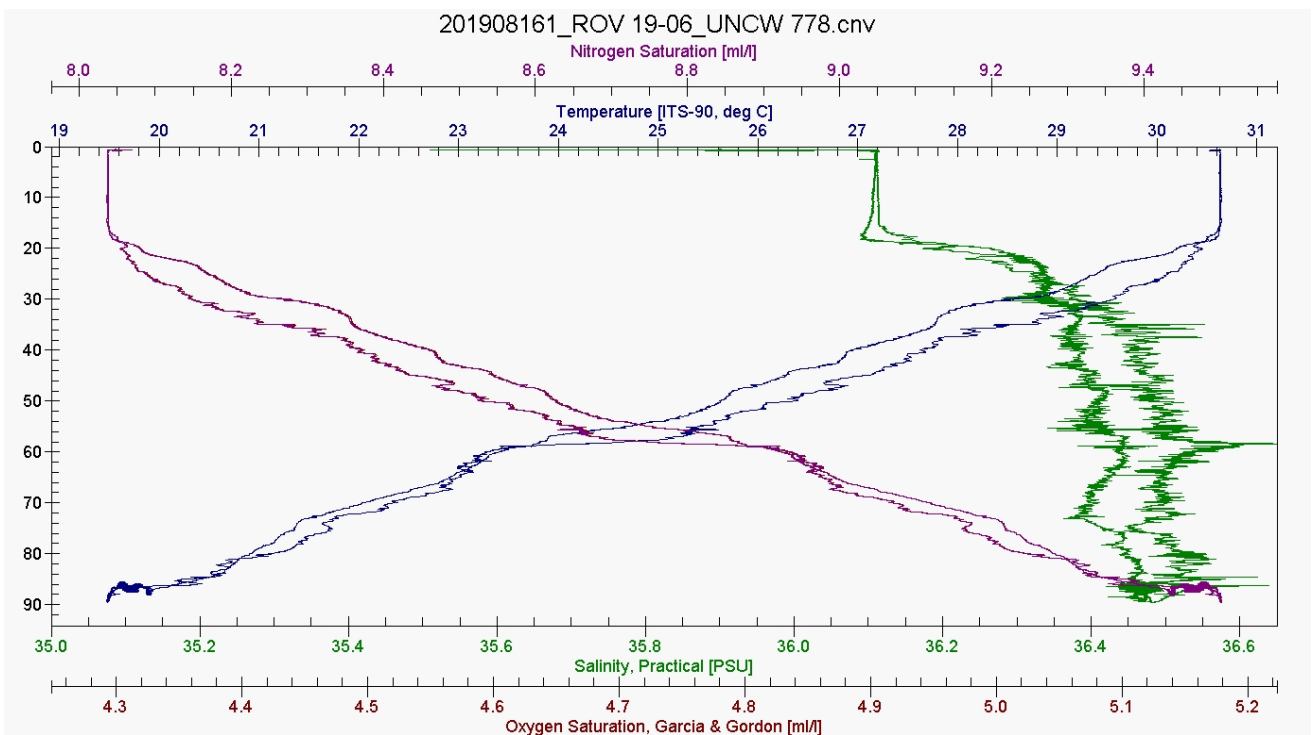
DVD:
Hard Drive:

Dive Site: Florida, Cudjoe, SE of Looe Key, Deepwater Mound, FKNMS, Station FK-07, ROV 19-06, UNCW 778; 16-VIII-19-1

Dive Data:

Minimum Bottom Depth (m):	89.6	Total Transect Length (km):	0.509
Maximum Bottom Depth (m):	91.4	Surface Current (kn):	0.7
On Bottom (Time- GMT):	8:19	On Bottom (Lat/Long):	24.4987°N; -81.4398°W
Off Bottom (Time- GMT):	10:36	Off Bottom (Lat/Long):	24.4991°N; -81.4417°W
Physical (bottom); Temp (°C):	19.5	Salinity: 36.52	Visibility (ft): 9.84 Current (kn): 0.1

Physical Environment:



Temperature, Salinity and Depth were collected with a Sea-Bird CTD 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: 89.7 m, Temperature: 19.5-30.6 °C, Salinity: 36.1-36.6 PSU, and Oxygen Saturation: 4.3-5.2 ml/l.

Dive Site: Florida, Cudjoe, SE of Looe Key, Deepwater Mound, FKNMS, Station FK-07, ROV 19-06, UNCW 778; 16-VIII-19-1

Dive Imagery:



Figure 1: 24°29.9285'N;81°26.3953'W: -91.4 m
Sandy bottom pot marked from infauna

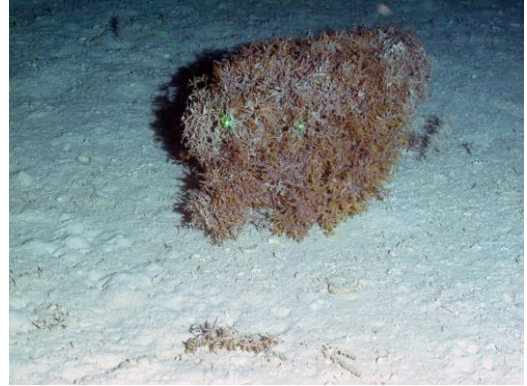


Figure 2: 24°29.9574'N;81°26.3889'W: -89.8 m
Sargassum tumble weed



Figure 3: 24°29.9662'N;81°26.399'W: -89.6 m
School of Amberjacks, *Seriola* sp. near deep reef



Figure 4: 24°29.9653'N;81°26.4085'W: -89.6 m
Spidercrab (*Stenorhynchus seticornis*?)

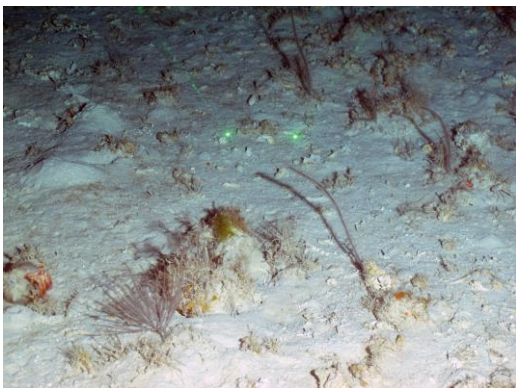


Figure 5: 24°29.9707'N;81°26.4361'W: -88.1 m
Antipatharia on hard bottom

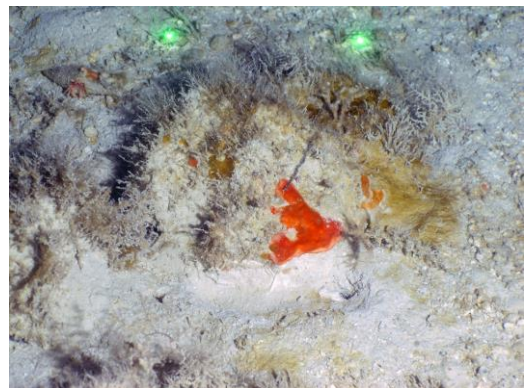


Figure 6: 24°29.9777'N;81°26.453'W: -87.4 m
Encrusting sponge and hydroids

Dive Site: Florida, Cudjoe, SE of Looe Key, Deepwater Mound, FKNMS, Station FK-07, ROV 19-06, UNCW 778; 16-VIII-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 16-VIII-19-1; Florida, Cudjoe, SE of Looe Key, Deepwater Mound, FKNMS, Station FK-07, ROV 19-06, UNCW 778; 89- 91 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; collect samples of macrobiota for taxonomy, genetics, cell culture and biomedical research.

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. Coral, sponge and algal data were recorded in separate Access databases which were compiled with the benthic database. A Fastcat 49 CTD on the ROV continuously recorded, temperature, depth, conductivity, and salinity. ROV collection skid was used with 5-function manipulator to collect samples.

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, 1/250th second, strobe on, auto focus, white balance- fish mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing down, ~1.3 m off bottom. 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'. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

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

Depth range: 91- 87 m

NOAA multibeam shows isolated rounded mound, elongated NE-SW, 300 m diameter, 88 m at base, 86 m at top.

Weather- Partly cloudy, seas: 2-3 ft from S, wind 11.7 kn from 148 dg, air- 30.22 C, surface water- 31.05 C, salinity-36.32 PSU, surface current 0.7 kn from NE; bottom current 0.1 kt from WSW

8:13 AM- Launch

8:19 AM- on bottom, depth 91.4 m, 71.5 m SE of feature, visibility 3 m, on fine white sand with bioturbation, 2-3 cm circular pits in the sand

8:23 AM- Fish and some sort of human trash; the sand is very loose and fine

8:26 AM- biota very sparse, some fish; sargassum drift algae that have settled from the surface

8:35 AM- approaching the east end of the feature, habitat has continued to be flat silty sand with the occasional critter, sargassum bunch, and greater amberjack school; rubble and shells increasing

8:39 AM- up to 10% cover of rubble and cobble (5-10 cm), 88.6 m

8:42 AM- rock encrusted with sponges, small odd-shaped bottom dwelling fish in the rock

8:44 AM- Inspecting *Antipathes*, *Stichopathes*, and a sponge- all >10 cm small; collecting

8:45 AM- Sample 001, *Antipathes furcata?* (or hydroida) 10 cm tall, in bin 4

8:56 AM- Sample 002, green filamentous alga, 5 cm clump, in bucket 4

9:04 AM- Sample 003, white worm (identified on deck as *Platyhelmenthes*), wiggly 5 cm, bucket 4

Dive Site: Florida, Cudjoe, SE of Looe Key, Deepwater Mound, FKNMS, Station FK-07, ROV 19-06, UNCW 778; 16-VIII-19-1

9:09 AM- continuing along, habitat the same

9:09 AM- Sample 004, *Antipathes furcata*? 10 cm high, elongate branching coral, in bin 3, 87.8 depth

9:19 AM- continuing transit up slope, not too far from the 'peak' of the ridge on MB; still flat sand with 20% rubble-cobble cover

9:22 AM- changed heading to SW

9:23 AM- stopped to photograph and try to collect a thin encrusting orange sponge

9:26 AM- starting Photo transect 1

9:33 AM- close to the top of the ridge on MB; tattler and greater amberjack common

9:34 AM- just got to the ridge; rock outcrop, 0.25 m relief, 1 lionfish and many small schooling fish, *Hemanthias anthiidae*; fish activity high; school of small red snapper (~dozen), big eye, black fin snapper, eel

9:45 AM- transect paused, we got distracted by large game fish. Back to haphazard photos and sand.

9:50 AM- Sample 005, *Antipathes furcata*? 10 cm tall elongate branching, in bin 2

9:59 AM- continuing transect 1

10:00 AM- back to the ledge we left, same things, looking for CCA; paused transect

10:01 AM- continue photo transect

10:04 AM- pausing to look at fuzzy green

10:06 AM- Sample 006, light green branching hydroid on rock with other encrusting things, on rock ~10 cm, in bin 4

10:12 AM- continuing on photo transect

10:13 AM- Sample 007, 10 cm tall *Antipathes furcata*? dropped it, will get a different one...

10:22 AM- Sample 008, *Pycnogonida* 2 cm, in suction bucket 2

10:30 AM- headed SW along the 'mound', continuing photo transect

10:31 AM- pausing to look for a good *Antipathes* to take up as 007

10:35 AM- Sample 007, *Antipathes furcata*? 10 cm tall, holding in the claw

10:36 AM- end dive, 89.5 m, on the south base of the 'mound'

Human Debris:

Fishing line-1

Dive Site: Florida, Cudjoe, SE of Looe Key, Deepwater Mound, FKNMS, Station FK-07, ROV 19-06, UNCW 778; 16-VIII-19-1

CPCe Percent Cover Analysis:

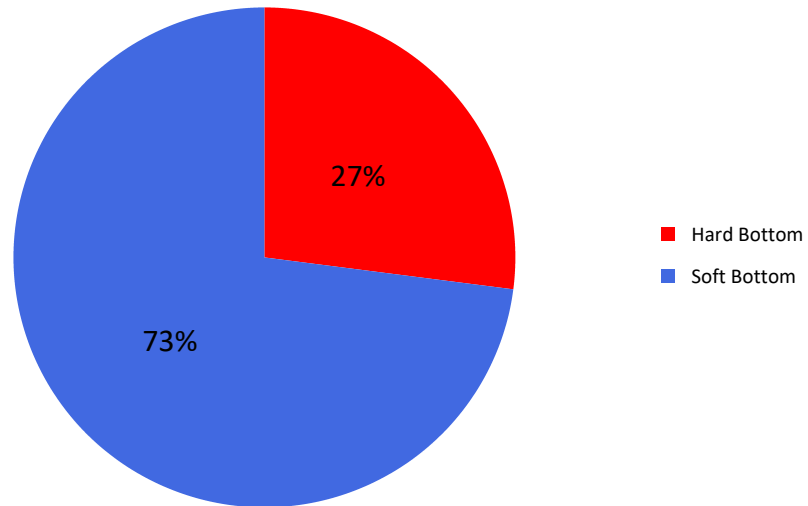
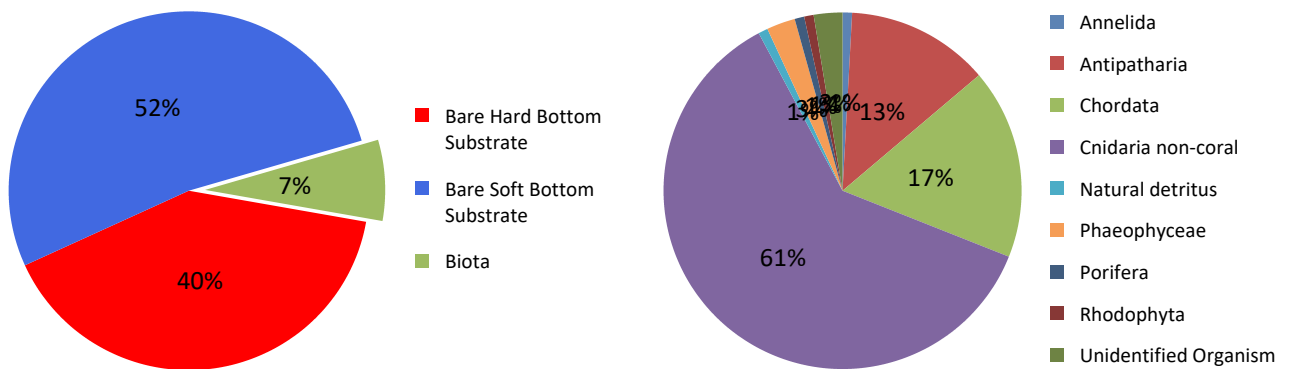


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-06. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



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: Florida, Cudjoe, SE of Looe Key, Deepwater Mound, FKNMS, Station FK-07, ROV 19-06, UNCW 778; 16-VIII-19-1

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. %= Percent Cover from CPCe analysis, Den= Density of Scleractinia from CPCe ARA analysis, P/A = Presence/Absence from visual sightings during the dive, Sam = Samples (number collected) of benthic macro-biota and substrate from ROV 19-06.

Taxa	ROV 19-06			
	%	Den.	P/A	Sam.
Biota	7.28%	34	X	11
Algae	0.25%		X	1
Algae	0.25%		X	1
Chlorophyta			X	1
Chlorophyta- Filamentous Green			X	
<i>Derbesia marina</i> (Lyngbye) Solier, 1846				1
Ochrophyta	0.19%			
<i>Sargassum</i> sp.	0.19%			
Rhodophyta	0.06%		X	
Corallinophycidae	0.06%		X	
Porifera	0.06%		X	2
Porifera	0.06%		X	2
Demospongiae	0.06%		X	2
<i>Clathria (Thalysias) cf. minuta</i> (van Soest, 1984)				1
Demospongiae	0.06%			
<i>Forcepia</i> sp. FK-01				1
Spirastrellidae			X	
Alcyonacea - gorgonian			X	
Cnidaria- Anthozoa			X	
Alcyonacea - gorgonian			X	
Gorgoniidae			X	
Antipatharia	0.94%		X	4
Cnidaria- Anthozoa	0.94%		X	4
Antipatharia	0.94%		X	4
Antipatharia	0.06%			
<i>Antipathes furcata</i> Gray, 1857	0.82%		X	4
Antipathidae			X	
<i>Stichopathes</i> sp.	0.06%		X	
<i>Tanacetipathes</i> sp.			X	
<i>Tanacetipathes tanacetum</i> (Pourtalès, 1880)			X	
Coral- Scleractinia		1		
Cnidaria- Anthozoa		1		
Coral- Scleractinia		1		
Oculina sp.		1		
Other	6.02%	33	X	4

Dive Site: Florida, Cudjoe, SE of Looe Key, Deepwater Mound, FKNMS, Station FK-07, ROV 19-06, UNCW 778; 16-VIII-19-1

Platyhelminthes				1
Annelida	0.06%			
Polychaeta	0.06%			
Sabellidae	0.06%			
Bryozoa				1
Arthropoda		X		1
Chelicerata				1
<i>Anoplodactylus lentus</i> Wilson, 1878				1
Crustacea		X		
Anomura		X		
Galatheidae		X		
<i>Mithrax</i> sp.		X		
<i>Stenorhynchus seticornis</i> (Herbst, 1788)		X		
Cnidaria- Anthozoa		X		
Anthozoa - Non Coral		X		
Cerianthidae		X		
Cnidaria		X		
Zoanthidae		X		
Alcyonacea - Alcyoniina		X		
Octocorallia- unidentified		X		
Cnidaria- Hydrozoa	4.45%	X		1
Hydrozoa	4.45%	X		1
Hydroidolina	4.45%	X		
Hydrozoa				1
Mollusca		X		
Bivalvia		X		
Gastropoda		X		
Gastropoda		X		
<i>Sinistrofulgur perversum</i> (Linnaeus, 1758)		X		
Chordata	1.25%			
Chordata - Vertebrate	1.25%			
Actinopterygii	1.25%			
Detritus	0.06%		X	
UNKNOWN	0.19%		33	
Human debris			X	
Human debris			X	
Human debris			X	
Human debris- Fishing Gear			X	
Lobster/crab pot			X	
Human debris- other			X	
Bare Hard Bottom Substrate	40.40%			
Bare rock	6.46%			

Dive Site: Florida, Cudjoe, SE of Looe Key, Deepwater Mound, FKNMS, Station FK-07, ROV 19-06, UNCW 778; 16-VIII-19-1

Bare rubble/cobble	33.94%			
Bare Soft Bottom Substrate	52.32%			
Grand Total	100.00%	34	X	11

Dive Site: Florida, Cudjoe, SE of Looe Key, Deepwater Mound, FKNMS, Station FK-07, ROV 19-06, UNCW 778; 16-VIII-19-1

Density of Fish:

Table 2. Counts of commercial/recreational fish and visual sightings (Presence/Absence) of non-commercial fish from video transects at dive site ROV 19-06.

Status/Class/Order/Family/Tax Name (authority)	ROV 19-06 No. or P/A
Target	21
Actinopterygii	21
Perciformes	20
Lutjanidae	19
<i>Lutjanus buccanella</i> (Cuvier, 1828) - Blackfin Snapper	7
<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper	11
<i>Rhomboplites aurorubens</i> (Cuvier, 1829) - Vermilion Snapper	1
Serranidae	1
<i>Hyporthodus niveatus</i> (Valenciennes, 1828) - Snowy Grouper	1
Scorpaeniformes	1
Scorpaenidae	1
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	1
Chordata - Vertebrate	X
Actinopterygii	X
Anguilliformes	X
Muraenidae	X
<i>Gymnothorax</i> sp. - Morays	X
Aulopiformes	X
Synodontidae	X
<i>Synodus intermedius</i> (Spix & Agassiz, 1829) - Sand Diver	X
Perciformes	X
Carangidae	X
<i>Carangoides bartholomaei</i> (Cuvier, 1833) - Yellow Jack	X
<i>Caranx crysos</i> (Mitchill, 1815) - Blue Runner	X
<i>Seriola rivoliana</i> Valenciennes, 1833 - Almaco Jack	X
Chaetodontidae	X
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	X
Gobiidae	X
<i>Coryphopterus punctipectophorus</i> Springer, 1960 - Spotted Goby	X
Labridae	X
<i>Halichoeres bivittatus</i> (Bloch, 1791) - Slippery Dick	X
Malacanthidae	X
<i>Malacanthus plumieri</i> (Bloch, 1786) - Sand Tilefish	X
Priacanthidae	X
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	X

Dive Site: Florida, Cudjoe, SE of Looe Key, Deepwater Mound, FKNMS, Station FK-07, ROV 19-06, UNCW 778; 16-VIII-19-1

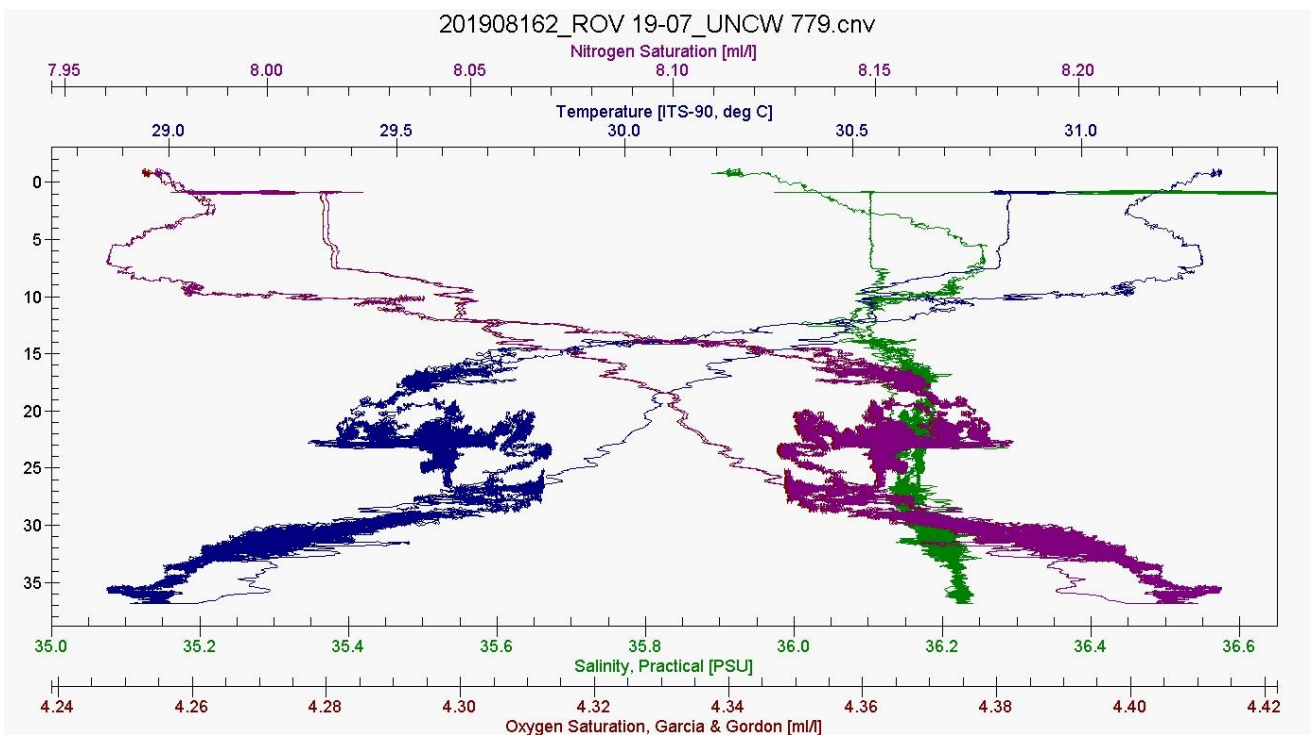
Serranidae	X
<i>Centropristis ocyurus</i> (Jordan & Evermann, 1887) - Bank Sea Bass	X
<i>Hemanthias vivanus</i> (Jordan & Swain, 1885) - Red Barbier	X
<i>Serranus phoebe</i> Poey, 1851 - Tattler	X
Scorpaeniformes	X
Scorpaenidae	X
<i>Scorpaena</i> sp. - Rock/scorpion/rosefish	X
Tetraodontiformes	X
Monacanthidae	X
<i>Aluterus monoceros</i> (Linnaeus, 1758) - Unicorn Leatherjacket Filefish	X
Tetraodontidae	X
<i>Sphoeroides</i> sp. - Pufferfish	X
Grand Total	X

Dive Site: Florida, S of Big Coppitt, Pelican Shoal Reef, FKNMS, Station FK-08, ROV 19-07, UNCW 779; 16-VIII-19-2

Dive Data:

Minimum Bottom Depth (m): 16.7	Total Transect Length (km): 0.949
Maximum Bottom Depth (m): 38	Surface Current (kn): 0.3
On Bottom (Time- GMT): 13:01	On Bottom (Lat/Long): 24.4918°N; -81.5928°W
Off Bottom (Time- GMT): 17:03	Off Bottom (Lat/Long): 24.4921°N; -81.5993°W
Physical (bottom); Temp (°C): 29.2	Salinity: 47.89 Visibility (ft): 32.81 Current (kn): 0.1

Physical Environment:



Temperature, Salinity and Depth were collected with a Sea-Bird CTD 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: 36.9 m, Temperature: 28.9-31.3 °C, Salinity: 36-36.4 PSU, and Oxygen Saturation: 4.2-4.4 ml/l.

Dive Site: Florida, S of Big Coppitt, Pelican Shoal Reef, FKNMS, Station FK-08, ROV 19-07, UNCW 779; 16-VIII-19-2

Dive Imagery:



Figure 1: 24°29.5368'N;81°35.6208'W: -36.1 m
Rock ledge on mesophotic reef with large Goliath grouper, *Hyporthodus itajara*



Figure 2: 24°29.5429'N;81°35.624'W: -35.2 m
Plexauridae octocoral



Figure 3: 24°29.5498'N;81°35.6366'W: -34.6 m
Agaricia agaricites



Figure 4: 24°29.5517'N;81°35.6521'W: -33.2 m
Siderastrea siderea coral



Figure 5: 24°29.55'N;81°35.6686'W: -32.1 m
Plexaura sp. octocoral



Figure 6: 24°29.5428'N;81°35.6833'W: -33 m
Squirrelfish, *Holocentrus adscensionis*

Dive Site: Florida, S of Big Coppitt, Pelican Shoal Reef, FKNMS, Station FK-08, ROV 19-07, UNCW 779; 16-VIII-19-2

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 16-VIII-19-2; Florida, S of Big Coppitt, Pelican Shoal Reef, FKNMS, Station FK-08, ROV 19-07, UNCW 779; 17- 38 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; collect samples of macrobiota for taxonomy, genetics, cell culture and biomedical research.

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. Coral, sponge and algal data were recorded in separate Access databases which were compiled with the benthic database. A Fastcat 49 CTD on the ROV continuously recorded, temperature, depth, conductivity, and salinity. ROV collection skid was used with 5-function manipulator to collect samples.

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, 1/250th second, strobe on, auto focus, white balance- fish mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing down, ~1.3 m off bottom. 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'. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

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

Depth range: 37.8-19 m

NOAA multibeam shows elongated mound, oriented E-W, 2.7 km long, 20 m top, 36 m base, and rubble zone extending deeper.

Weather- Partly cloudy, seas: 1-2 ft from SE, wind 3.6 kn from 199 dg, air- 30.51 C, surface water- 31.35 C, salinity- 36.41 PSU, surface current 0.3 kn from W; bottom current 0.1 kt from NW

12:57 PM- Launch

1:01 PM- On bottom, 37.8 m, flat fine white sediment with shells and rubble; 85 m south of reef; visibility 10 m; lobster pots in the way, going NNW to avoid them

1:09 PM- stopping to collect; Sample 001, target is 5 cm tall feathery green rhizomous alga, will get more in bucket, in S3

1:20 PM- Sample 002, thin branching red foliose alga, 10 cm high, in bin 1

1:23 PM- Sample 003, *Udotea*, 2 cm green fan alga, in bucket 5

1:28 PM- Sample 004, Conglomerate mixed phyla, just sucking up a whole rock and other things, in bucket 5

1:32 PM- continue heading N to reef. Habitat is unchanged

1:38 PM- at base of reef, 36 m; grouper swam by in the distance, fairly large. Goliath grouper, 3 ft long

1:39 PM- 0.5 m relief undercut ledge, fish activity increasing, small reef fish and the grouper. Bad vis, ~5 m. Sponge and gorgonian cover increasing. Highly silted rock, large boulders and outcrops, 1 m relief; visibility poor- 5 m. Maybe tidal; large cut between islands to the north

Dive Site: Florida, S of Big Coppitt, Pelican Shoal Reef, FKNMS, Station FK-08, ROV 19-07, UNCW 779; 16-VIII-19-2

1:42 PM- 1 m relief, 10 dg slope, benthic organism cover ~40 %

1:43 PM- found a hard coral, coral cover increasing

1:52 PM- starting Photo transect 1; on Multibeam shows mini mounds feature (like off Key Largo) at south east end of reef; transect head W parallel to base of reef; 34 m depth, habitat 1-2 m rock mounds, boulders, and ledges. Decent coral cover with sponges dominant

1:54 PM- stopping to look at a *Geodia*, the struggle to harvest continues.... DON DID IT!

2:00 PM- Sample 005, *Geodia* piece, vase was 30 cm diameter, in bin 1

2:04 PM- inspecting more coral, back on transect, but stopping to look at corals to ID

2:09 PM- looking at a sponge, blowing the sand off to look at and collect

2:14 PM- Sample 006, *Smenospongia* possibly, yellow green amorphous soft sponge ~10 cm, in bin 2

2:21 PM- back on transect, taking photos

2:24 PM- scattered 1-2 m boulders interspersed by sediments

2:25 PM- stopping to examine a coral

2:31 PM- sand chutes have become less frequent, more of a reef ridge habitat now, high fish activity

2:38 PM- end Photo transect (~30 photos); at end of mini mound region of multibeam

2:42 PM- move north into base of reef on multibeam (west of mini mound region); appears a bit less silty

2:43 PM- starting Photo transect 2 parallel along base of reef in multibeam; habitat very rocky, 1 m relief, 30 dg slope

2:44 PM- stopping to look at a coral growing around sponges

2:46 PM- attempting to collect a *Geodia*

2:54 PM- back on transect

3:01 PM- high fish activity, typical small reef fish. Ledge characterized by sponge and algal cover with gorgonians and hard coral interspersed

3:03 PM- end Photo transect 2 (~30 photos), lower slope of the reef, ~ 27 m

3:08 PM- haphazard purposeful shots; still heading west along lower slope of fore reef

3:10 PM- solid hardbottom, 1 m relief rock, low slope

3:13 PM- 30-45 dg slope, characterized by high cover of algae and sponges with decent hard coral cover

3:19 PM- Sample 007, *Xestospongia* 40 cm diameter, 24.7 m deep, in bin 3

3:29 PM- *Siderastraea sideria* with pink spots, pigmentation response disease

3:38 PM- Continuing W transiting on 30 dg slope, habitat similar

3:51 PM- still on rocky hardbottom 25 dg slope, high sponge, algal and coral cover, ~80%. Fishing line present. Moderate fish activity. 23 m deep, fairly shallow

3:55 PM- Close to the foot of the slope, starting to flatten out

3:59 PM- Sample 008, *Cribrachalina* fan vase sponge, 30 cm diameter, in bin 4

4:05 PM- continuing on transit to W

4:21 PM- Habitat is unchanged, taking photos of interesting things as we transit

4:23 PM- Sample 009, 10 cm *Geodia*, attempting to grab it, in bin 4

4:41 PM- continuing transect to the SW, photo of a partially dead coral head

4:45 PM- taking a photo of an old dead *Meandrina*

4:52 PM- Photo transect 3 at top edge of reef, 20 m; transect W parallel to edge of reef; hard bottom reef, 1 m relief, slope 20% to the S, high rugosity, running W; characterized by deep cuts in the rock, high cover of sponges and coral (gorgonian and hard,, algal cover has decreased. Visibility is low, ~5 m. Fish activity is high, all the common reef fish.

5:02 PM- Gorgonians are more common here

Dive Site: Florida, S of Big Coppitt, Pelican Shoal Reef, FKNMS, Station FK-08, ROV 19-07, UNCW 779; 16-VIII-19-2

5:03 PM- end Photo transect 3 (~30 photos)

5:03 PM- Off bottom, 19 m, on the top of the reef

Coral and Disease: Corals were common- *Siderastraea siderea*, *M. cavernosa*, *O. faveolata*, *Stephanocoenia*, *Meandrina*, *Pseudodiploria*, others. Various coral diseases were common, most prevalent on lower slope (25-27 m), rather than on top. Many showing recent dead white edges; with white dead coming in from edge; one with green circular dead area; many older dead patches in middle of coral with *Cliona delitrix*). Diseases and dead coral present on *S. siderea* (most commonly diseased), *O. faveolata*, some of the dead with *Cliona* were *M. cavernosa*.

Human Debris:

Lobster pot lines

Dive Site: Florida, S of Big Coppitt, Pelican Shoal Reef, FKNMS, Station FK-08, ROV 19-07, UNCW 779; 16-VIII-19-2

CPCe Percent Cover Analysis:

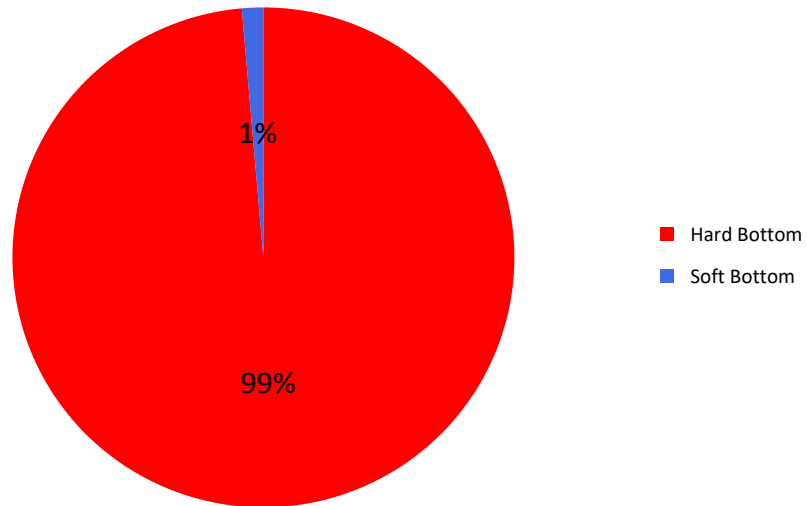
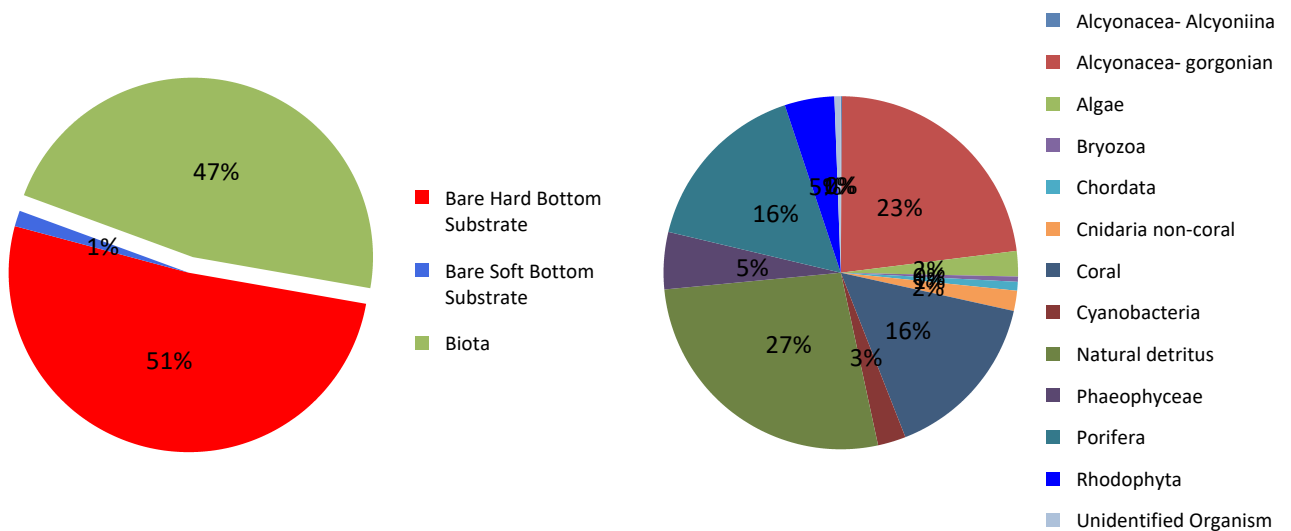


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-07. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



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.

Dive Site: Florida, S of Big Coppitt, Pelican Shoal Reef, FKNMS, Station FK-08, ROV 19-07, UNCW 779; 16-VIII-19-2

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. %= Percent Cover from CPCe analysis, Den= Density of Scleractinia from CPCe ARA analysis, P/A = Presence/Absence from visual sightings during the dive, Sam = Samples (number collected) of benthic macro-biota and substrate from ROV 19-07.

Taxa	ROV 19-07 %	Den.	P/A	Sam.
Biota	47.17%	62	X	10
Algae	6.91%		X	4
Algae	6.91%		X	4
Algae	1.10%			
Algae- unid. macroalgae	1.10%			
Cyanobacteria	1.21%			
Chlorophyta			X	2
Caulerpa sertularioides (S.G.Gmelin) M.A.Howe, 1905			X	1
<i>Caulerpa</i> sp.			X	
<i>Halimeda</i> sp.			X	
<i>Udotea</i> sp.			X	1
Ochrophyta	2.47%		X	
<i>Dictyota</i> sp.	1.59%		X	
Phaeophyceae	0.88%			
<i>Sargassum hystrix</i> J.Agardh, 1847			X	
<i>Sargassum</i> sp.			X	
Rhodophyta	2.14%		X	2
Corallinophycidae	1.10%		X	
<i>Gracilaria</i> sp.				2
Rhodophyta	1.04%		X	
Porifera	7.62%		X	6
Porifera	7.62%		X	6
Demospongiae	7.62%		X	6
<i>Agelas clathrodes</i> (Schmidt, 1870)			X	
<i>Agelas conifera</i> (Schmidt, 1870)			X	
<i>Agelas dispar</i> Duchassaing & Michelotti, 1864			X	
<i>Agelas sceptrum</i> (Lamarck, 1815)	0.05%		X	
<i>Agelas sventres</i> Lehnert & van Soest, 1996			X	
<i>Agelas tubulata</i> Lehnert & van Soest, 1996			X	
<i>Agelas wiedenmayeri</i> Alcolado, 1984			X	
<i>Aiolochoxia crassa</i> (Hyatt, 1875)	0.16%		X	
<i>Amphimedon compressa</i> Duchassaing & Michelotti, 1864	0.38%		X	
<i>Amphimedon</i> sp. FK-01			X	

Dive Site: Florida, S of Big Coppitt, Pelican Shoal Reef, FKNMS, Station FK-08, ROV 19-07, UNCW 779; 16-VIII-19-2

<i>Amphimedon</i> sp. FK-02		X	
<i>Aplysina cauliformis</i> (Carter, 1882)	0.33%	X	
<i>Aplysina cf. fulva</i> (Pallas, 1766)		X	
<i>Aplysina fistularis</i> (Pallas, 1766)		X	
<i>Aplysina lacunosa</i> (Lamarck, 1814)		X	
<i>Callyspongia (Callyspongia) fallax</i> Duchassaing & Michelotti, 1864		X	
<i>Callyspongia (Cladochalina) aculeata</i> (Linnaeus, 1759)		X	
<i>Callyspongia (Cladochalina) plicifera</i> (Lamarck, 1814)		X	
<i>Cliona delitrix</i> Pang, 1973		X	
<i>Cliona varians</i> (Duchassaing & Michelotti, 1864)	0.05%	X	
<i>Cribrochalina vasculum</i> (Lamarck, 1814)		X	1
Demospongiae	1.87%		1
<i>Dysidea etheria</i> Laubenfels, 1936		X	
<i>Geodia neptuni</i> (Sollas, 1886)	0.60%	X	
<i>Geodia</i> sp.			2
<i>Iotrochota birotulata</i> (Higgin, 1877)		X	
<i>Ircinia</i> sp.	0.05%		
<i>Monanchora arbuscula</i> (Duchassaing & Michelotti, 1864)	0.16%	X	
<i>Niphates amorpha</i> Van Soest, 1980		X	
<i>Niphates digitalis</i> (Lamarck, 1814)	0.33%	X	
<i>Niphates erecta</i> Duchassaing & Michelotti, 1864		X	
Petrosiidae	0.05%		
<i>Ptilocaulis walpersii</i> (Duchassaing & Michelotti, 1864)		X	
<i>Smenospongia aurea</i> (Hyatt, 1875)		X	
<i>Smenospongia conulosa</i> Pulitzer-Finali, 1986		X	1
<i>Smenospongia echina</i> (Laubenfels, 1934)	0.11%		
<i>Spheciospongia vesparium</i> (Lamarck, 1815)		X	
<i>Spirastrella coccinea</i> (Duchassaing & Michelotti, 1864)	0.82%	X	
Spirastrellidae		X	
<i>Svenzea zeai</i> (Alvarez, van Soest & Rützler, 1998)		X	
<i>Verongula rigida</i> (Esper, 1794)		X	
<i>Xestospongia muta</i> (Schmidt, 1870)	2.63%	X	
<i>Xestospongia</i> sp.			1
<i>Xestospongia</i> sp. Cu-01		X	
Alcyonacea - gorgonian	10.81%	X	
Cnidaria- Anthozoa	10.81%	X	
Alcyonacea - gorgonian	10.81%	X	
<i>Antillogorgia</i> sp.	0.11%	X	
<i>Ellisella elongata</i> (Pallas, 1766)		X	
<i>Ellisella</i> sp.		X	
<i>Erythropodium caribaeorum</i> (Duchassaing & Michelotti,	0.71%		

Dive Site: Florida, S of Big Coppitt, Pelican Shoal Reef, FKNMS, Station FK-08, ROV 19-07, UNCW 779; 16-VIII-19-2

1860)				
<i>Eunicea</i> sp.	0.82%			X
<i>Gorgonia ventalina</i> Linnaeus, 1758				X
<i>Iciligorgia schrammi</i> Duchassaing, 1870				X
<i>Muricea</i> sp.	0.11%			
<i>Plexaurella</i> sp.				X
Plexauridae	0.82%			X
<i>Pseudoplexaura</i> sp.	8.23%			X
Antipatharia				X
Cnidaria- Anthozoa				X
Antipatharia				X
<i>Antipathes</i> sp.				X
Antipathidae				X
<i>Stichopathes</i> sp.				X
Coral- Scleractinia	7.35%	48		X
Cnidaria- Anthozoa	7.35%	48		X
Coral- Scleractinia	7.35%	48		X
<i>Agaricia agaricites</i> (Linnaeus, 1758)	0.16%	1		X
<i>Agaricia lamarcki</i> Milne Edwards & Haime, 1851	1.54%	8		X
<i>Agaricia</i> sp.	0.22%			X
<i>Colpophyllia natans</i> (Houttuyn, 1772)				X
<i>Madracis decactis</i> (Lyman, 1859)	0.22%	7		
<i>Madracis senaria</i> Wells, 1973	2.80%	1		
<i>Madracis</i> sp.				X
<i>Meandrina meandrites</i> (Linnaeus, 1758)	0.05%	1		X
<i>Montastraea cavernosa</i> (Linnaeus, 1767)	0.05%	1		X
<i>Mycetophyllia aliciae</i> Wells, 1973				X
<i>Orbicella faveolata</i> (Ellis & Solander, 1786)				X
<i>Porites astreoides</i> Lamarck, 1816				X
<i>Pseudodiploria strigosa</i> (Dana, 1846)				X
Scleractinia- unid solitary	0.05%			
<i>Siderastrea siderea</i> (Ellis & Solander, 1786)	1.04%	9		X
<i>Stephanocoenia intersepta</i> (Lamarck, 1836)	1.21%	20		X
Other	14.48%	14		X
Bryozoa	0.22%			
Bryozoa	0.22%			
<i>Canda</i> sp.	0.22%			
Cnidaria- Anthozoa	0.05%			X
Anthozoa - Non Coral				X
Cnidaria				X
Alcyonacea - Alcyoniina	0.05%			
Alcyoniina	0.05%			

Dive Site: Florida, S of Big Coppitt, Pelican Shoal Reef, FKNMS, Station FK-08, ROV 19-07, UNCW 779; 16-VIII-19-2

Cnidaria- Hydrozoa	0.88%	3		
Hydrozoa	0.88%	3		
Hydroidolina	0.82%			
<i>Millepora alcicornis</i> Linnaeus, 1758	0.05%	3		
Chordata	0.38%			
Chordata - Invertebrate	0.11%			
Ascidiacea- unidentified	0.11%			
Chordata - Vertebrate	0.27%			
Actinopterygii	0.27%			
Detritus	12.67%		X	
UNKNOWN	0.27%	11		
Human debris		1	X	
Human debris		1	X	
Human debris		1	X	
Human debris- Fishing Gear		1	X	
Anchor line			X	
Line from lobster/crab pot		1	X	
Bare Hard Bottom Substrate	51.40%			
Bare Hard Bottom Substrate	51.40%			
Bare rock	51.34%			
Bare rubble/cobble	0.05%			
Bare Soft Bottom Substrate	1.43%			
Grand Total	100.00%	63	X	10

Dive Site: Florida, S of Big Coppitt, Pelican Shoal Reef, FKNMS, Station FK-08, ROV 19-07, UNCW 779; 16-VIII-19-2

Density of Fish:

Table 2. Counts of commercial/recreational fish and visual sightings (Presence/Absence) of non-commercial fish from video transects at dive site ROV 19-07.

Status/Class/Order/Family/Tax Name (authority)	ROV 19-07 No. or P/A
Target	3
Actinopterygii	3
Perciformes	2
Serranidae	2
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	1
<i>Epinephelus itajara</i> (Lichtenstein, 1822) - Atlantic Goliath Grouper	1
Scorpaeniformes	1
Scorpaenidae	1
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	1
Chordata - Vertebrate	X
Actinopterygii	X
Beryciformes	X
Holocentridae	X
<i>Holocentrus rufus</i> (Walbaum, 1792) - Longspine Squirrelfish	X
Perciformes	X
Acanthuridae	X
<i>Acanthurus coeruleus</i> Bloch & Schneider, 1801 - Blue Tang	X
<i>Acanthurus tractus</i> Poey, 1860 - Ocean Surgeonfish	X
Carangidae	X
<i>Caranx ruber</i> (Bloch, 1793) - Bar Jack	X
<i>Caranx</i> sp. - Jack	X
Chaetodontidae	X
<i>Chaetodon capistratus</i> Linnaeus, 1758 - Foureye Butterflyfish	X
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	X
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	X
<i>Chaetodon striatus</i> Linnaeus, 1758 - Banded Butterflyfish	X
Gobiidae	X
<i>Coryphopterus personatus</i> (Jordan & Thompson, 1905) - Masked Goby	X
<i>Elacatinus oceanops</i> Jordan, 1904 - Neon Goby	X
Haemulidae	X
<i>Anisotremus surinamensis</i> (Bloch, 1791) - Black Margate	X
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	X
Labridae	X
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	X
<i>Bodianus rufus</i> (Linnaeus, 1758) - Spanish Hogfish	X

Dive Site: Florida, S of Big Coppitt, Pelican Shoal Reef, FKNMS, Station FK-08, ROV 19-07, UNCW 779; 16-VIII-19-2

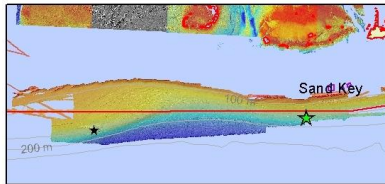
<i>Clepticus parrae</i> (Bloch & Schneider, 1801) - Creole Wrasse	X
<i>Halichoeres bivittatus</i> (Bloch, 1791) - Slippery Dick	X
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	X
<i>Thalassoma bifasciatum</i> (Bloch, 1791) - Bluehead	X
Lutjanidae	X
<i>Ocyurus chrysurus</i> (Bloch, 1791) - Yellowtail Snapper	X
Mullidae	X
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	X
Pomacanthidae	X
<i>Holacanthus bermudensis</i> Goode, 1876 - Blue Angelfish	X
<i>Holacanthus ciliaris</i> (Linnaeus, 1758) - Queen Angelfish	X
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	X
<i>Pomacanthus arcuatus</i> (Linnaeus, 1758) - Gray Angelfish	X
Pomacentridae	X
<i>Chromis cyanea</i> (Poey, 1860) - Blue Chromis	X
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	X
<i>Stegastes adustus</i> (Troschel, 1865) - Dusky Damselfish	X
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damselfish	X
<i>Stegastes variabilis</i> (Castelnau, 1855) - Cocoa Damselfish	X
Scaridae	X
<i>Scarus coeruleus</i> (Edwards, 1771) - Blue Parrotfish	X
<i>Scarus iseri</i> (Bloch, 1789) - Striped Parrotfish	X
<i>Scarus vetula</i> Bloch & Schneider, 1801 - Queen Parrotfish	X
<i>Sparisoma aurofrenatum</i> (Valenciennes, 1840) - Redband Parrotfish	X
Serranidae	X
<i>Hypoplectrus unicolor</i> (Walbaum, 1792) - Butter Hamlet	X
<i>Rypticus</i> sp. - Soapfish	X
Tetraodontiformes	X
Balistidae	X
<i>Balistes caprisicus</i> Gmelin, 1789 - Grey Triggerfish	X
Ostraciidae	X
<i>Lactophrys triqueter</i> (Linnaeus, 1758) - Smooth Trunkfish	X
Tetraodontidae	X
<i>Canthigaster rostrata</i> (Bloch, 1786) - Sharpnose Puffer	X
Grand Total	X

Dive Site: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-08, UNCW 780; 17-VIII-19-1

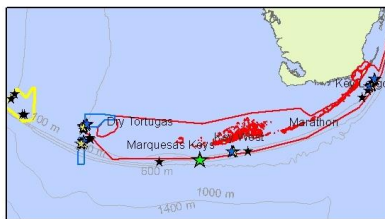
General Location and Dive Track:

Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-08, UNCW 780

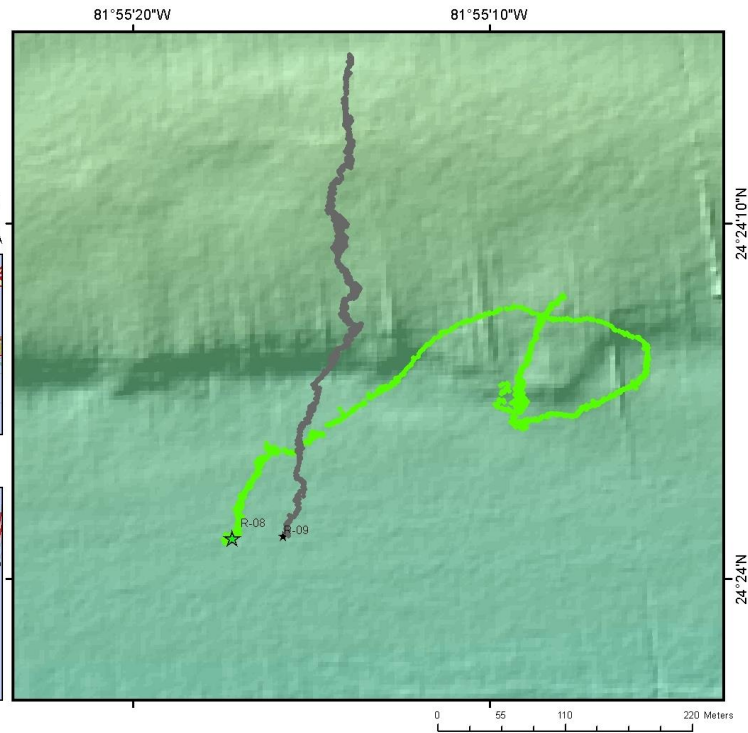
- ★ R-08
- Dive Track 19-08
- Dive Track 19-09
- ★ Scuba
- ★ Tech Dive
- ★ ROV Dives
- Pulley Ridge
- TER
- FKNMS
- SPA



0 5 10 20 km



0 37.5 75 150 km



Site Overview:

Project: 2019 CIOERT Cruise
Vessel: R/V Walton Smith
Principal Investigator: John Reed
PI Contact Info: 5600 U.S. 1, North, Fort Pierce, FL 34946

Scientific Observers: John Reed, Stephanie Farrington, Shirley Pomponi, M. Dennis Hanisak, Jason White, Don Liberatore, Megan Conkling, Eric Glidden, Alexis Sturm, Ian Combs, Katherine Beckett

Ship Position System: DGPS
Data Management: Access Database
Report Analyst: John Reed or Stephanie Farrington
Date Compiled: 10/6/2021

Dive Overview:

Date of Dive: 8/17/2019
ROV: Mohawk ROV
ROV Navigation: TrackLink
ROV Sensors: Temperature (°C), Salinity (PSU), pH, Conductivity, Depth (m)

Purpose: ROV image transects and collections

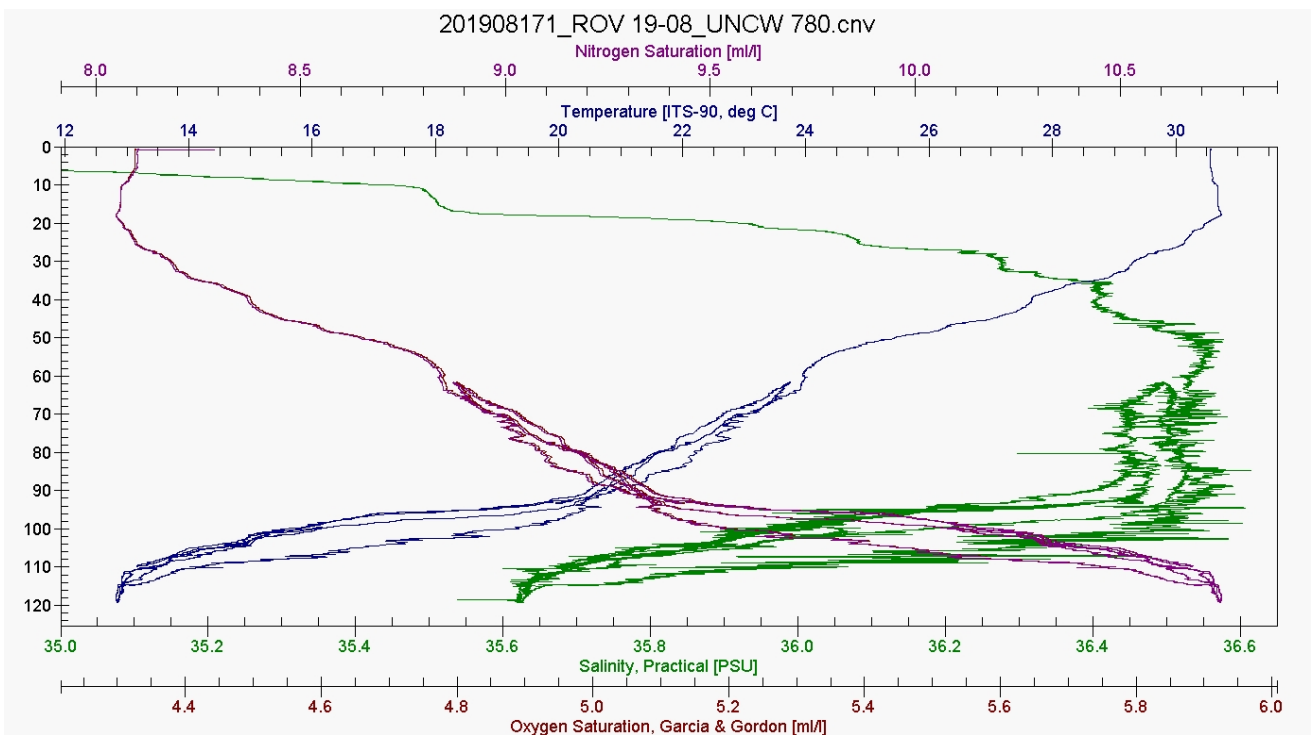
Digital Photos: 103
Distance (km): 0.6
Sonar Data: None Available
DVD: 0
Hard Drive: 2

Dive Site: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-08, UNCW 780; 17-VIII-19-1

Dive Data:

Minimum Bottom Depth (m): 114	Total Transect Length (km): 0.619
Maximum Bottom Depth (m): 121.9	Surface Current (kn): 0.6
On Bottom (Time- GMT): 8:17	On Bottom (Lat/Long): 24.4003°N; -81.9214°W
Off Bottom (Time- GMT): 9:01	Off Bottom (Lat/Long): 24.4022°N; -81.9188°W
Physical (bottom); Temp (°C): 12.8	Salinity: 35.64 Visibility (ft): 9.84 Current (kn): N/A

Physical Environment:



Temperature, Salinity and Depth were collected with a Sea-Bird CTD 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: 119.4 m, Temperature: 12.8-30.7 °C, Salinity: 35-36.6 PSU, and Oxygen Saturation: 4.3-5.9 ml/l.

Dive Site: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-08, UNCW 780; 17-VIII-19-1

Dive Imagery:



Figure 1: 24°24.0299'N;81°55.2837'W: -121.3 m
Stylocidaris urchin on sand (lasers 10 cm)

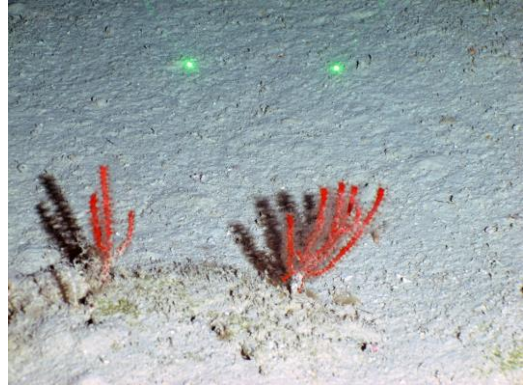


Figure 2: 24°24.0845'N;81°55.1528'W: -118.2 m
Nicella sp. octocorals



Figure 3: 24°24.0324'N;81°55.2838'W: -121 m
Paguridae hermit crab



Figure 4: 24°24.1228'N;81°55.1411'W: -114.4 m
Stichopathes luetkeni wire coral

Dive Site: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-08, UNCW 780; 17-VIII-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 17-VIII-19-1; Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-08, UNCW 780; 114- 122 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; collect samples of macrobiota for taxonomy, genetics, cell culture and biomedical research.

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. Coral, sponge and algal data were recorded in separate Access databases which were compiled with the benthic database. A Fastcat 49 CTD on the ROV continuously recorded, temperature, depth, conductivity, and salinity. ROV collection skid was used with 5-function manipulator to collect samples.

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, 1/250th second, strobe on, auto focus, white balance- fluorescent lightbulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing down, ~1.3 m off bottom. 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'. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

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

Depth range: 121-114 m

NOAA multibeam shows E-W linear ridge, 2.2 km long, 230 m wide; 110- 117 m. Near CIOERT dive site 201505191.

Weather- Partly cloudy, seas: 0-1 ft from WSW, wind 14.9 kn from 170 dg, air- 29.96 C, surface water- 30.78 C, salinity- 35.21 PSU, surface current 0.6 kn from WSW

8:09 AM- Launch

8:16 AM- in a turbid zone, ~5 m off bottom

8:17 AM- on bottom, 121 m depth, flat, fine white sediment, very silty; ~5 m vis.; few urchins (*Eucidaris tribuloides*?) and a hermit crab

8:20 AM- photo of *Eucidaris* urchin, trying out white balances (fluorescent vs fish mode)

8:21 AM- bioturbation, pits 10 cm wide

8:23 AM- 100 m S of the reef; ~12 urchins in each frame. That's all we're seeing

8:28 AM- storm coming in, coming up 1 clip to wait it out; stopping video

8:30 AM- started video again, 23 m off bottom to look at the cool midwater organisms

8:34 AM- video off

8:41 AM- resuming the dive, approaching bottom and video is back recording

8:43 AM- on bottom, 119 m depth, flat fine white sediment with small pits; marine snow in the column; haphazard photos

Dive Site: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-08, UNCW 780; 17-VIII-19-1

8:45 AM- south bas of reef on multibeam; exposed flat rock hard bottom; sparse cover of small gorgonians

8:46 AM- collecting Sample 001, depth 118, 5 cm high gorgonian in the claw

8:51 AM- having issues with the ROV bin function... attempting to fix

8:54 AM- we're going to drive up-slope to the top of the ridge, then call the dive to fix the bin drawer; haphazard photos

8:57 AM- some cobble, no real slope in our field of view; still have urchins, and a bit of algae; batfish and greeneye

8:59 AM- MB and true depth are matching

9:00 AM- gorgonian cover is increasing, ~10-20%

9:02 AM- calling the dive, unable to pull collection bin in; off bottom 114 m depth, flat silty sediment with 10% cobble

Dive Site: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-08, UNCW 780; 17-VIII-19-1

CPCe Percent Cover Analysis:

Partial Dive, not enough images for Point Count analysis.

Dive Site: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-08, UNCW 780; 17-VIII-19-1

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. P/A = Presence/Absence from visual sightings during the dive, Sam = Samples (number collected) of benthic macro-biota and substrate from ROV 19-08.

Taxa	ROV 19-08	
	P/A	Sam.
Biota	X	1
Algae	X	
Algae	X	
Ochrophyta	X	
<i>Sargassum</i> sp.	X	
Alcyonacea - gorgonian	X	1
Cnidaria- Anthozoa	X	1
Alcyonacea - gorgonian	X	1
Gorgoniidae	X	
<i>Nicella</i> sp.	X	
Plexauridae	X	
<i>Thesea rubra</i> Deichmann, 1936		1
Antipatharia	X	
Cnidaria- Anthozoa	X	
Antipatharia	X	
<i>Antipathes furcata</i> Gray, 1857	X	
Antipathidae	X	
<i>Stichopathes</i> sp.	X	
Other	X	
Arthropoda	X	
Crustacea	X	
Anomura	X	
Echinodermata	X	
Echinoidea	X	
<i>Eucidaris tribuloides</i> (Lamarck, 1816)	X	
Grand Total	X	1

Dive Site: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-08, UNCW 780; 17-VIII-19-1

Density of Fish:

Table 2. Counts of commercial/recreational fish and visual sightings (Presence/Absence) of non-commercial fish from video transects at dive site ROV 19-08.

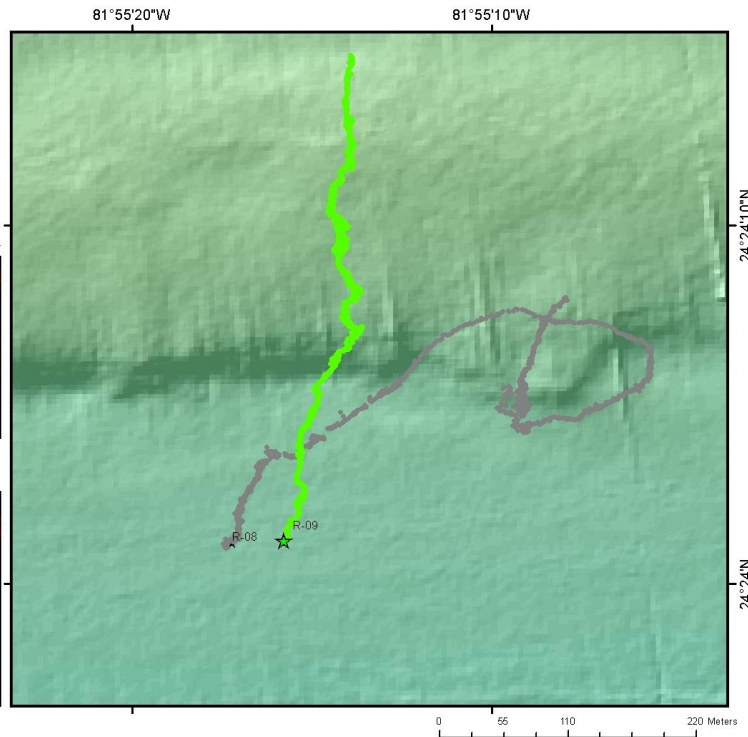
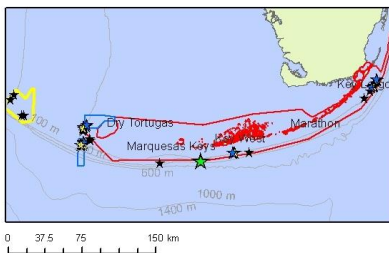
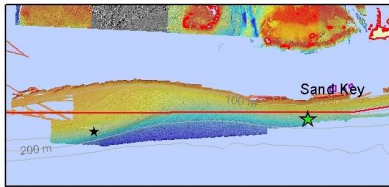
Status/Class/Order/Family/Tax Name (authority)	ROV 19-08 No. or P/A
Chordata - Vertebrate	X
Actinopterygii	X
Aulopiformes	X
Synodontidae	X
<i>Synodus intermedius</i> (Spix & Agassiz, 1829) - Sand Diver	X
Lophiiformes	X
Ogcocephalidae	X
<i>Ogcocephalus nasutus</i> (Cuvier, 1829) - Shortnose Batfish	X
Perciformes	X
Serranidae	X
<i>Centropristis ocyurus</i> (Jordan & Evermann, 1887) - Bank Sea Bass	X
<i>Serranus notospilus</i> Longley, 1935 - Saddle Bass	X
<i>Serranus phoebe</i> Poey, 1851 - Tattler	X
Grand Total	X

Dive Site: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-09, UNCW 781; same as previous dive; 17-VIII-19-2

General Location and Dive Track:

Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-09, UNCW 781

- ★ R-09
- Dive Track 19-08
- Dive Track 19-09
- ★ Scuba
- ★ Tech Dive
- ★ ROV Dives
- Pulley Ridge
- TER
- FKNMS
- SPA



Site Overview:

Project: 2019 CIOERT Cruise
Vessel: R/V Walton Smith
Principal Investigator: John Reed
PI Contact Info: 5600 U.S. 1, North, Fort Pierce, FL 34946

Scientific Observers: John Reed, Stephanie Farrington, Shirley Pomponi, M. Dennis Hanisak, Jason White, Don Liberatore, Megan Conkling, Eric Glidden, Alexis Sturm, Ian Combs, Katherine Beckett

Ship Position System: DGPS
Data Management: Access Database
Report Analyst: John Reed or Stephanie Farrington
Date Compiled: 10/6/2021

Dive Overview:

Date of Dive: 8/17/2019
ROV: Mohawk ROV
ROV Navigation: TrackLink
ROV Sensors: Temperature (°C), Salinity (PSU), pH, Conductivity, Depth (m)

Purpose: ROV image transects and collections

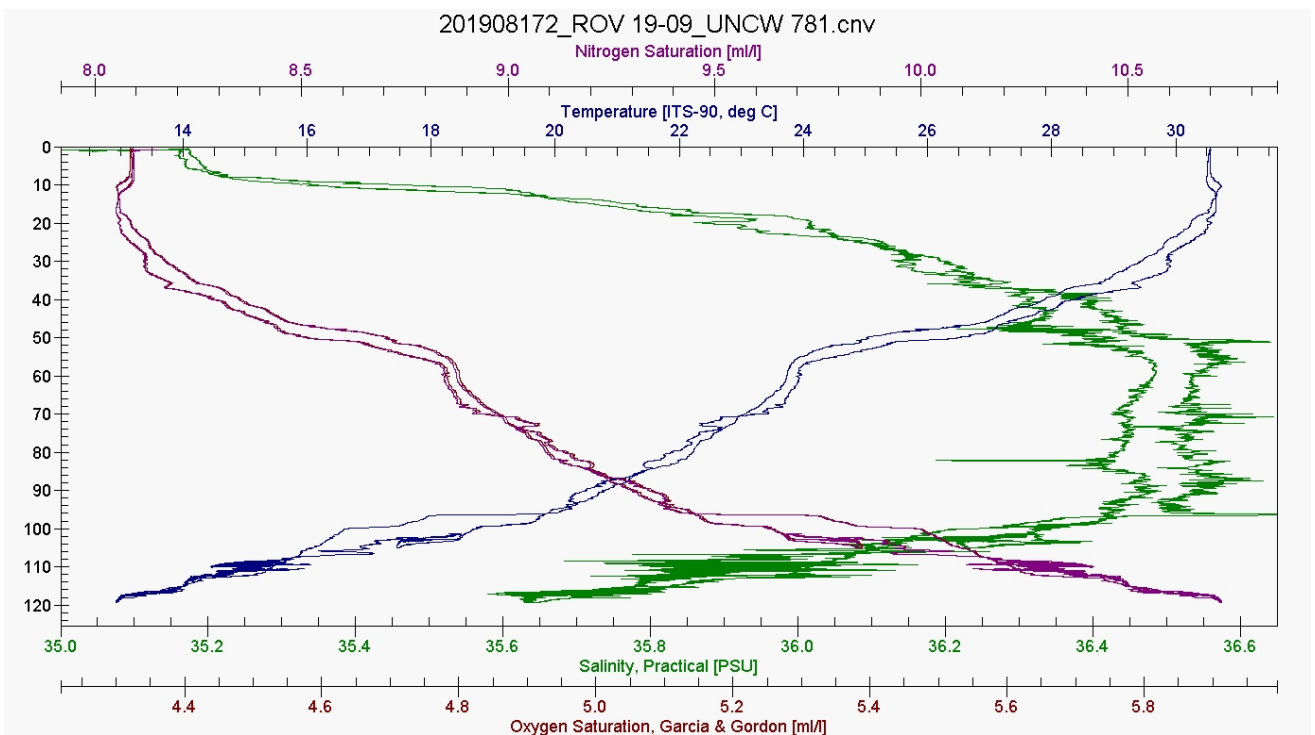
Digital Photos: 185
Distance (km): 0.4
Sonar Data: None Available
DVD: 0
Hard Drive: 1

Dive Site: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-09, UNCW 781; same as previous dive; 17-VIII-19-2

Dive Data:

Minimum Bottom Depth (m):	111.6	Total Transect Length (km):	0.449
Maximum Bottom Depth (m):	121	Surface Current (kn):	0.7
On Bottom (Time- GMT):	10:47	On Bottom (Lat/Long):	24.4003°N; -81.921°W
Off Bottom (Time- GMT):	12:10	Off Bottom (Lat/Long):	24.4041°N; -81.9206°W
Physical (bottom); Temp (°C):	12.9	Salinity: 35.64	Visibility (ft): 9.84 Current (kn): N/A

Physical Environment:



Temperature, Salinity and Depth were collected with a Sea-Bird CTD 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: 119.4 m, Temperature: 12.9-30.7 °C, Salinity: 35-36.8 PSU, and Oxygen Saturation: 4.3-5.9 ml/l.

Dive Site: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-09, UNCW 781; same as previous dive; 17-VIII-19-2

Dive Imagery:



Figure 1: 24°24.1565'N;81°55.2358'W: -112.6 m
Octopus

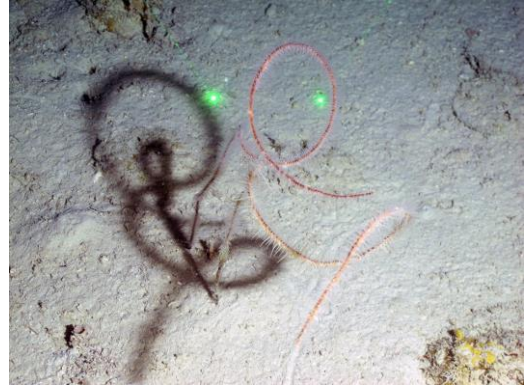


Figure 2: 24°24.13'N;81°55.2341'W: -114.1 m
Stichophathes luetkeni wire coral

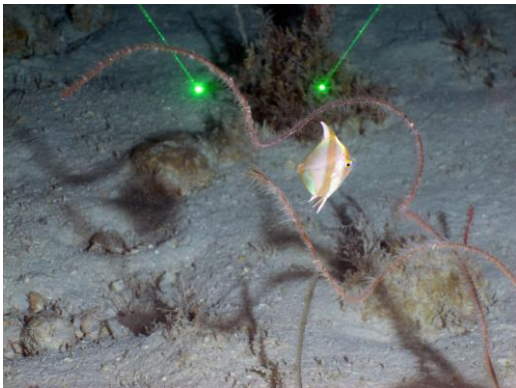


Figure 3: 24°24.215'N;81°55.2321'W: -110.8 m
Deepbody Boarfish, *Antigonía capros*

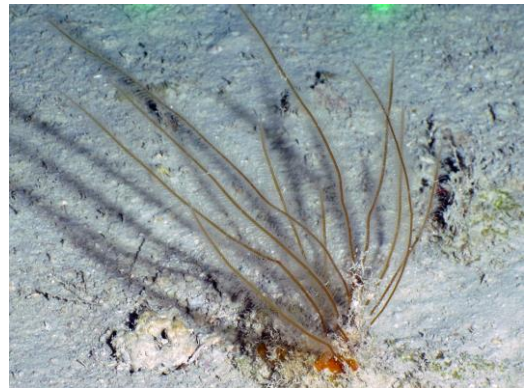


Figure 4: 24°24.1667'N;81°55.2361'W: -112.3 m
Hydrozoa

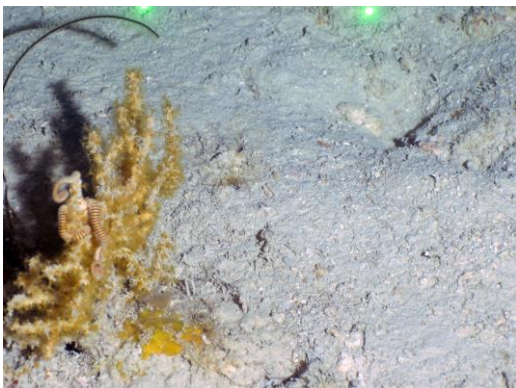


Figure 5: 24°24.1667'N;81°55.235'W: -112.2 m
Bebryce sp. octocoral



Figure 6: 24°24.1333'N;81°55.2304'W: -113.9 m
Hydrozoa and *Tanacetipathes* sp. black coral (right)

Dive Site: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-09, UNCW 781; same as previous dive; 17-VIII-19-2

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 17-VIII-19-2; Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-09, UNCW 781; 111- 121 m; same site as previous dive

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; collect samples of macrobiota for taxonomy, genetics, cell culture and biomedical research.

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. Coral, sponge and algal data were recorded in separate Access databases which were compiled with the benthic database. A Fastcat 49 CTD on the ROV continuously recorded, temperature, depth, conductivity, and salinity. ROV collection skid was used with 5-function manipulator to collect samples.

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, 1/250th second, strobe on, auto focus, white balance- fluorescent lightbulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing down, ~1.3 m off bottom. 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'. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

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

Depth range: 122- 111 m

NOAA multibeam shows E-W linear ridge, 2.2 km long, 230 m wide; 110- 117 m. Near CIOERT dive site 201505191. Transect S to N across the ridge.

Weather- Partly cloudy, seas: 1-2 ft from S, wind 8.3 kn from 187 dg, air- 30.04 C, surface water- 30.86 C, salinity- 35.31 PSU, surface current 0.7 kn from NW

10:38 AM- launch

10:40 AM- video on, depth is 20 m

10:43 AM- getting some plankton @70 m, worms (chaetognaths)

10:45 AM- nephroid layer, 10 m off bottom; bottom still not visible 5 m away

10:46 AM- on bottom, 122 m depth; 145 m S of reef, transiting N to the reef; vis <5 m; flat sand, sediment with pits and the occasional urchin. This looks oddly familiar....

10:49 AM- hole, burrow of some sort

10:51 AM- still sparse; dah nah nah nah, BATFISH!

10:54 AM- made it to the base of the reef, starting transect soon

10:56 AM- Scattered cobble, red gorgs

10:56 AM -Starting Photo transect 1, 117 m; head N up slope; habitat flat sand with 10% cover of rubble, some gorgonians on that rubble

Dive Site: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-09, UNCW 781; same as previous dive; 17-VIII-19-2

10:59 AM- getting yanked
11:01 AM- 10 % cover of 10 cm cobble covered in algae and hydroids with a few sponges and coral
11:02 AM- stopped to inspect a solitary coral
11:04 AM- stopped to photograph brittle star (*Asteropora annulata*- brown striped) on a octocoral
11:07 AM- continuing on transect, a lot of the same
11:08 AM- investigating a coral- debate as to what it is; settled on 1 cm cup coral
11:12 AM- Sample 001, *Antipathes furcata*? Or hydrioda; 8 cm tall sparsely branched coral, in bin 1
11:20 AM- continuing on transect, sparse rubble and organism cover continues
11:26 AM- stopped to look at the octopuses! Two octopi, one approaches other quickly make contact and separate- probable quicky mating
11:31 AM- Sample 002, yellow encrusting sponge on a rock, 5 cm, in bin 1
11:38 AM- continuing transect, flat sediment with some cobble and dominated by black coral
11:39 AM- stopping to look at a fish- scorpion
11:40 AM- Sample 003, yellow fan gorgonian, 5 cm tall, in bin 4
11:46 AM- getting a photo of a hydroid
11:49 AM- moray eel- honeycomb; very yellow
11:50 AM- back on transect; continue heading north across ridge feature of multibeam.
11:52 AM- stopping to take purposeful photo of *Parthenopes* crab
12:03 PM- stopped to take a look at a boarfish and a coke bottle
12:05 PM- back on transect
12:08 PM- exposed rock cobble, 5-10 cm
12:10 PM- End of Photo transect, at north base of ridge; off bottom, 111 m depth, sandy flat habitat; no hard bottom at end

Dive Site: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-09, UNCW 781; same as previous dive; 17-VIII-19-2

CPCe Percent Cover Analysis:

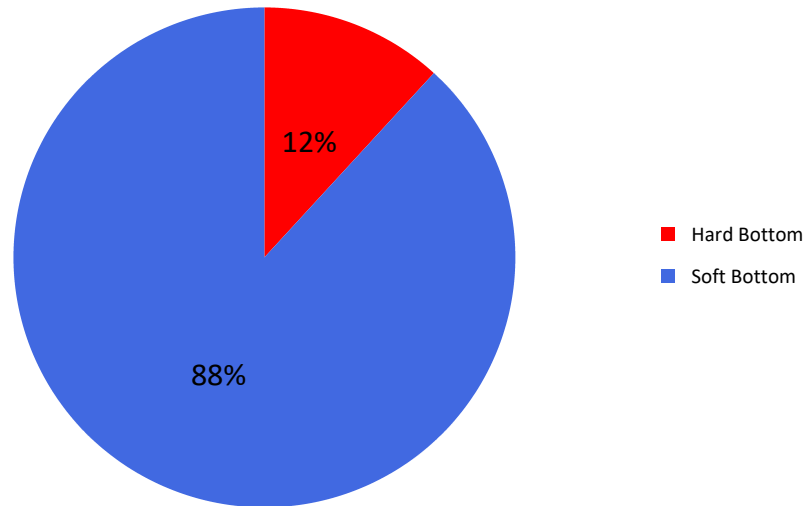
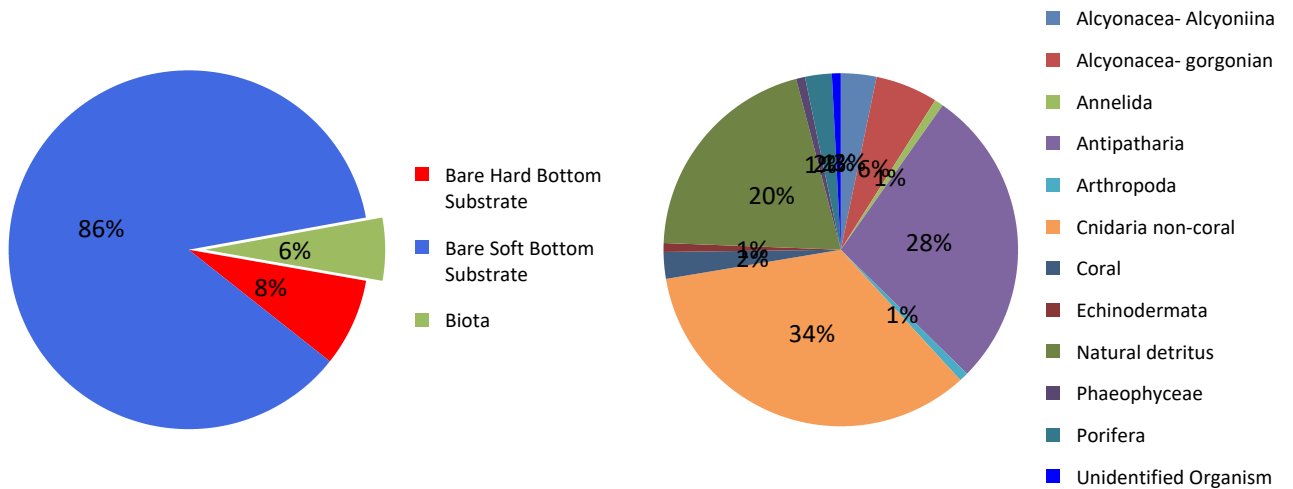


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-09. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



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: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-09, UNCW 781; same as previous dive; 17-VIII-19-2

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. %= Percent Cover from CPCe analysis, Den= Density of Scleractinia from CPCe ARA analysis, P/A = Presence/Absence from visual sightings during the dive, Sam = Samples (number collected) of benthic macro-biota and substrate from ROV 19-09.

Taxa	ROV 19-09 %	Den.	P/A	Sam.
Biota	5.65%	43	X	5
Algae	0.05%			
Algae	0.05%			
Ochrophyta	0.05%			
<i>Sargassum</i> sp.	0.05%			
Porifera	0.14%		X	2
Demospongiae	0.14%		X	2
<i>Cribrochalina vasculum</i> (Lamarck, 1814)			X	
Demospongiae	0.14%			
<i>Poecillastra</i> sp. FK-03			X	1
Poecilosclerida				1
Spirastrellidae			X	
Alcyonacea - gorgonian	0.32%		X	1
Cnidaria- Anthozoa	0.32%		X	1
Alcyonacea - gorgonian	0.32%		X	1
Alcyonacea- gorgonian	0.09%			
<i>Bebryce</i> sp.				1
<i>Eunicea</i> sp.			X	
Gorgoniidae			X	
Plexauridae			X	
<i>Thesea rubra</i> Deichmann, 1936	0.23%			
Antipatharia	1.56%		X	1
Cnidaria- Anthozoa	1.56%		X	1
Antipatharia	1.56%		X	1
Antipatharia	0.09%			
<i>Antipathes furcata</i> Gray, 1857	0.14%		X	1
<i>Stichopathes luetkeni</i> Brook, 1889	0.97%			
<i>Stichopathes</i> sp.	0.37%		X	
Coral- Scleractinia	0.14%	5	X	
Cnidaria- Anthozoa	0.14%	5	X	
Coral- Scleractinia	0.14%	5	X	
Scleractinia- unid solitary	0.14%	5	X	
<i>Stephanocoenia intersepta</i> (Lamarck, 1836)			X	

Dive Site: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-09, UNCW 781; same as previous dive; 17-VIII-19-2

Other	3.45%	38	X	1
Annelida	0.05%		X	
Annelida	0.05%			
Polychaeta			X	
Serpulidae			X	
Arthropoda	0.05%		X	
Chelicerata	0.05%		X	
<i>Anoplodactylus lentus</i> Wilson, 1878	0.05%			
Pycnogonida			X	
Crustacea			X	
Anomura			X	
Parthenope sp.			X	
Cnidaria- Anthozoa	0.28%		X	
Anthozoa - Non Coral	0.09%		X	
Actiniaria	0.09%			
Cnidaria			X	
Alcyonacea - Alcyoniina	0.18%		X	
Alcyoniina	0.14%			
Nidalia sp.	0.05%		X	
Cnidaria- Hydrozoa	1.84%		X	
Hydrozoa	1.84%		X	
Hydroidolina	1.84%		X	
Echinodermata	0.05%		X	1
Echinoidea			X	
<i>Eucidaris tribuloides</i> (Lamarck, 1816)			X	
Ophiuroidea	0.05%		X	1
<i>Asteroporpa (Asteroporpa) annulata</i> Örsted & Lütken in: Lütken, 1856	0.05%		X	1
Detritus	1.15%			
UNKNOWN	0.05%	38		
Bare Hard Bottom Substrate	7.90%			
Bare Hard Bottom Substrate	7.90%			
Bare Hard Bottom Substrate	7.90%			
Hard bottom	7.90%			
Bare rock	7.54%			
Bare rubble/cobble	0.37%			
Bare Soft Bottom Substrate	86.44%			
Bare Soft Bottom Substrate	86.44%			
Bare Soft Bottom Substrate	86.44%			
Soft Bottom	86.44%			
Grand Total	100.00%	43	X	5

Dive Site: Florida, Key West, SW of Sand Key, Deepwater Ridge, Outside FKNMS, Station FK-09, ROV 19-09, UNCW 781; same as previous dive; 17-VIII-19-2

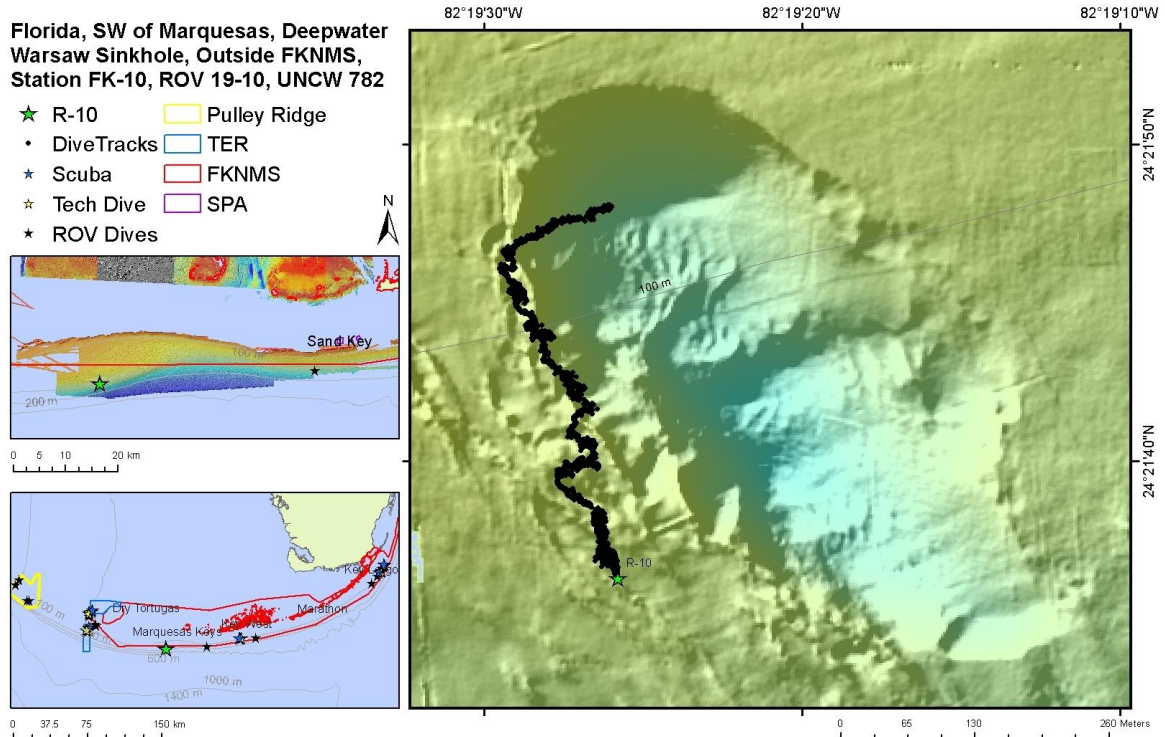
Density of Fish:

Table 2. Counts of commercial/recreational fish and visual sightings (Presence/Absence) of non-commercial fish from video transects at dive site ROV 19-09.

Status/Class/Order/Family/Tax Name (authority)	ROV 19-09 No. or P/A
Chordata - Vertebrate	X
Actinopterygii	X
Anguilliformes	X
Muraenidae	X
<i>Gymnothorax saxicola</i> Jordan & Davis, 1891 - Honeycomb Moray	X
Lophiiformes	X
Ogcocephalidae	X
<i>Ogcocephalus cubifrons</i> (Richardson, 1836) - Polka-Dot Batfish	X
Perciformes	X
Caproidae	X
<i>Antigonia capros</i> Lowe, 1843 - Deepbody Boarfish	X
Serranidae	X
<i>Centropristis ocyurus</i> (Jordan & Evermann, 1887) - Bank Sea Bass	X
<i>Serranus phoebe</i> Poey, 1851 - Tattler	X
Scorpaeniformes	X
Scorpaenidae	X
<i>Scorpaena</i> sp. - Rock/scorpion/rosefish	X
Triglidae	X
<i>Prionotus</i> sp. - Searobin	X
Grand Total	X

Dive Site: Florida, SW of Marquesas, Deepwater Warsaw Sinkhole, Outside FKNMS, Station FK-10, ROV 19-10, UNCW 782; 17-VIII-19-3

General Location and Dive Track:



Site Overview:

Project: 2019 CIOERT Cruise
Vessel: R/V Walton Smith
Principal Investigator: John Reed
PI Contact Info: 5600 U.S. 1, North, Fort Pierce, FL 34946

Scientific Observers: John Reed, Stephanie Farrington, Shirley Pomponi, M. Dennis Hanisak, Jason White, Don Liberatore, Megan Conkling, Eric Glidden, Alexis Sturm, Ian Combs, Katherine Beckett

Ship Position System: DGPS
Data Management: Access Database
Report Analyst: John Reed or Stephanie Farrington
Date Compiled: 10/6/2021

Dive Overview:

Date of Dive: 8/17/2019
ROV: Mohawk ROV
ROV Navigation: TrackLink
ROV Sensors: Temperature (°C), Salinity (PSU), pH, Conductivity, Depth (m)

Purpose: ROV image transects and collections

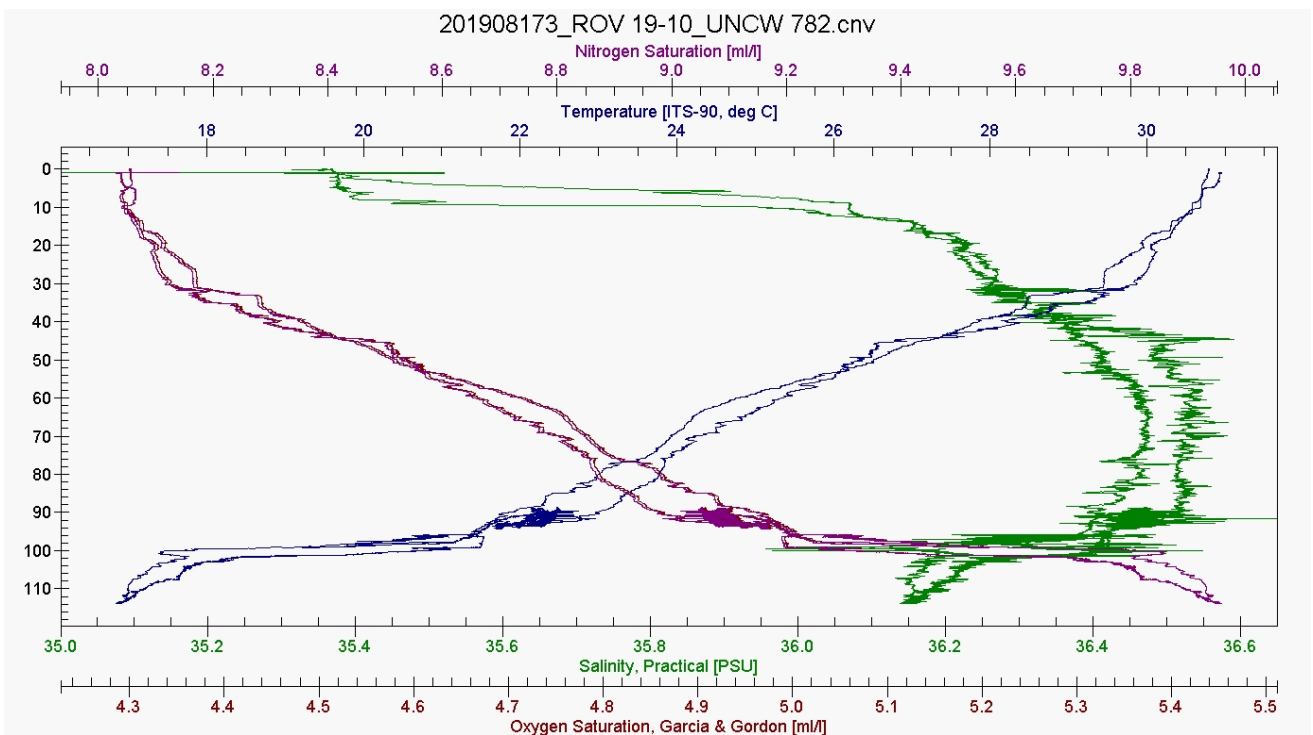
Digital Photos: 378
Distance (km): 0.7
Sonar Data: None Available
DVD: 0
Hard Drive: 1

Dive Site: Florida, SW of Marquesas, Deepwater Warsaw Sinkhole, Outside FKNMS, Station FK-10, ROV 19-10, UNCW 782; 17-VIII-19-3

Dive Data:

Minimum Bottom Depth (m): 96.2	Total Transect Length (km): 0.718
Maximum Bottom Depth (m): 116.1	Surface Current (kn): 0.2
On Bottom (Time- GMT): 16:08	On Bottom (Lat/Long): 24.3601°N; -82.3238°W
Off Bottom (Time- GMT): 18:21	Off Bottom (Lat/Long): 24.3633°N; -82.3237°W
Physical (bottom); Temp (°C): 21.7	Salinity: 36.45 Visibility (ft): Current (kn): 0.25

Physical Environment:



Temperature, Salinity and Depth were collected with a Sea-Bird CTD attached to the ROV (recording descent, bottom and ascent). The ranges of the bottom data recorded during ROV 19-10 are as follows: Depth Maximum: 113.9 m, Temperature: 16.8-30.9 °C, Salinity: 35.4-36.6 PSU, and Oxygen Saturation: 4.3-5.5 ml/l.

Dive Site: Florida, SW of Marquesas, Deepwater Warsaw Sinkhole, Outside FKNMS, Station FK-10, ROV 19-10, UNCW 782; 17-VIII-19-3

Dive Imagery:

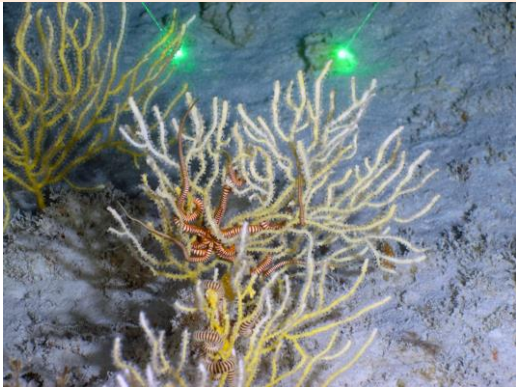


Figure 1: 24°21.6182'N;82°19.4375'W: -95.6 m
Species of Plexauridae with brittlestar



Figure 2: 24°21.6142'N;82°19.4323'W: -94.4 m
Schizoporella sp. bryozoan



Figure 3: 24°21.7025'N;82°19.451'W: -95 m
Madracis



Figure 4: 24°21.7108'N;82°19.4555'W: -94.1 m
Rock with lithified fish borrow?

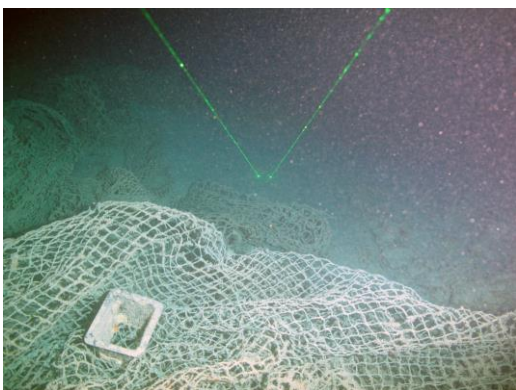


Figure 5: 24°21.7447'N;82°19.4779'W: -91.8 m
Ghost trawl net



Figure 6: 24°21.7423'N;82°19.4742'W: -92.4 m
Lobster pot debris

Dive Site: Florida, SW of Marquesas, Deepwater Warsaw Sinkhole, Outside FKNMS, Station FK-10, ROV 19-10, UNCW 782; 17-VIII-19-3

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 17-VIII-19-3; Florida, SW of Marquesas, Deepwater Warsaw Sinkhole, Outside FKNMS, Station FK-10, ROV 19-10, UNCW 782, 96- 116 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; collect samples of macrobiota for taxonomy, genetics, cell culture and biomedical research.

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. Coral, sponge and algal data were recorded in separate Access databases which were compiled with the benthic database. A Fastcat 49 CTD on the ROV continuously recorded, temperature, depth, conductivity, and salinity. ROV collection skid was used with 5-function manipulator to collect samples.

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, 1/250th second, strobe on, auto focus, white balance- fluorescent lightbulb mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Quantitative photo transects used the digital still camera pointing down, ~1.3 m off bottom. 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'. Direction of transects were generally along the geological feature, but depended on the ship's maneuverability with the wind and current.

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

Depth range: 96- 116 m

NOAA multibeam shows oval sinkhole feature, 650 m diameter, 126 m base, 90 m top edge. Geological surveys by Locker, Hine et al. Geology 1996. Start on western rim, transect along top edge of west rim heading northerly; then finish transect down into base of sinkhole.

Weather- Partly cloudy, seas: 1-2 ft from S, wind 9.6 kn from 148 dg, air- 30.44 C, surface water- 31.24 C, salinity- 35.57 PSU, surface current 0.2 kn from E; bottom current 0.25 kt from W

4:01 PM- Launch

4:06 PM- Sandbar Shark swam by mid column

4:07 PM- On bottom, 96 m; flat hardbottom pavement with exposed cobble 10 cm; small rock outcrop, 25 cm relief; some fish activity; gorgonian and algal cover

4:09 PM- Inspecting lollipop sponge (*Stylocordyla?*) and gorgonians

4:12 PM- *Asteropora annulata* brown stripped brittle star on a gorg

4:12 PM- Sample 001, yellow planar branching gorgonian, abundant, in bin 4

4:18 PM- taking photos of the lollipop sponge

4:21 PM- Sample 002, 2-4 cm tall lollipop sponges, in bucket 1, yellow gorg incidental

4:46 PM- start Photo transect 1; approx. 130 m south of west rim of sinkhole; flat pavement with sediment veneer, rubble, 10 cm cobble

Dive Site: Florida, SW of Marquesas, Deepwater Warsaw Sinkhole, Outside FKNMS, Station FK-10, ROV 19-10, UNCW 782; 17-VIII-19-3

- 4:47 PM- found a sock
4:47 PM- bottom flat with 30% scattered rubble, covered with lollipop sponges and yellow fan gorgonians, and hydroids; fairly uniform
4:48 PM- heading N to the s edge of the sinkhole
4:49 PM- photos of the giant red brittle star (*Ophroderma devanyii*)
4:49 PM- medium fish activity, reef butterfly!, bigeye
4:50 PM- 0.25 m ledge rock, getting rockyer, more ridges
4:51 PM- stopping to inspect some fish, believe they are red snapper... large line on the bottom
4:53 PM- pausing transect to turn the lights out and see what happens.... Dozens of snappers, several scamp grouper, greater amberjack, several other species
4:56 PM- restarting transect
4:57 PM- rocky ridge and ledge, 0.5 m relief with scattered rubble hardbottom as you get further from the edge; heavy fish activity; lots of long line and anchor line
4:59 PM- the ridge has broken down to flat sand with 50% cover of 10 cm rubble; 30 m from the sink hole
5:04 PM- small boulders, 20 cm and rock outcrops 25 cm relief; mostly hydroid cover
5:06 PM- rock outcrops have evolved a bit, 0.5 m relief with scattered boulders all around
5:10 PM- heading N along the hole to get to the wall
5:13 PM- end Photo transect 1 at end of hole
- 5:16 PM- start Photo transect 2, parallel to top edge of sinkhole, heading N along ridge; rocky outcrops, 1 m relief, many crevasses; high fish activity
5:18 PM- habitat has changed to small shell and rock rubble
5:19 PM- back on the ledge; 3 m high rugged, eroded rock on inside top edge of hole; high fish activity- snapper, scamp; small fish- dense anthiids (Hemanthias rough tongue bass, red barbiar), bigeye, eel; rock outcrop covered with hydroids and some algae (not sure about that note), sponges, ~80% cover
5:23 PM- very high rugosity, many hide holes for fish, and many fish taking advantage of them; seeing different species than we have seen the rest of the trip
5:24 PM- stopped to take a look at a coral- *Madracis myriaster* (purple) coral
5:28 PM- now stopping to look at something else... a small round sponge?
5:33 PM- back on the transect
5:36 PM- Sample 003, red orange thin encrusting sponge on rock
5:43 PM- petrified burrows? And found an old oil barrel
5:45 PM- we have lost the ledge; lobster pot entrances; large trawl net
5:50 PM- stopping to photograph and collect *Antipathes furcata*? Or hydroid
5:54 PM- Sample 004, *Antipathes furcata*? 5 cm tall, in bin 3
5:54 PM- failed sample collection, moving on
6:04 PM- still on the top of the ledge, mound and rubble, decent fish activity
6:05 PM- rubble turning to rock slaps, boulders larger, 1 m high, sand between
6:09 PM- saw a cucumber, but lost it in the silt
6:09 PM- back on the ledge
6:11 PM- end Photo transect 2
- 6:12 PM- Head West down slope into sinkhole; start Photo transect 3
6:13 PM- stair step rock ledges going down, 250 slope, then flattened terraces, on slope
6:15 PM- siltier, fewer fish and biota on the rock
6:20 PM- low rock cover, 20 cm boulders 20% cover, no biota
6:21 PM- end Photo transect, about ½ way across bottom of sinkhole; 116 m, silty sand with 20 cm rubble scattered, no biota; end dive

Dive Site: Florida, SW of Marquesas, Deepwater Warsaw Sinkhole, Outside FKNMS, Station FK-10, ROV 19-10, UNCW 782; 17-VIII-19-3

Human Debris:

Large long lines and anchor lines, piles fishing line, large trawl net, oil drum

Dive Site: Florida, SW of Marquesas, Deepwater Warsaw Sinkhole, Outside FKNMS, Station FK-10, ROV 19-10, UNCW 782; 17-VIII-19-3

CPCe Percent Cover Analysis:

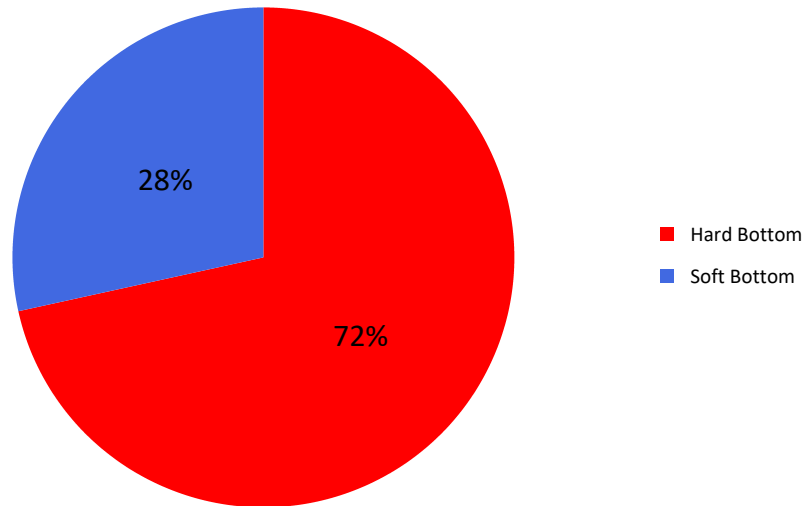
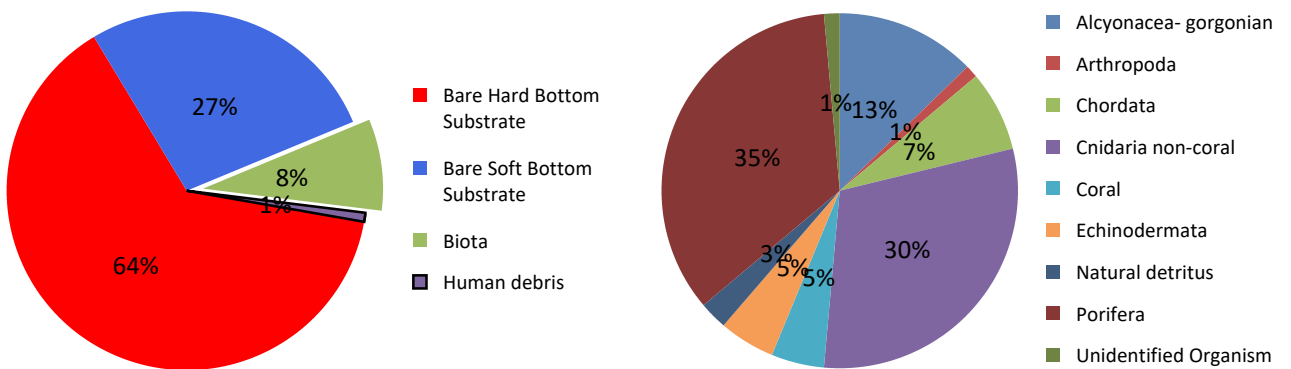


Figure 1. Percent cover of hard and soft bottom substrate at dive site ROV 19-10. CPCe© points on organisms were scored as the underlying substrate (hard or soft).



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.

Dive Site: Florida, SW of Marquesas, Deepwater Warsaw Sinkhole, Outside FKNMS, Station FK-10, ROV 19-10, UNCW 782; 17-VIII-19-3

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. %= Percent Cover from CPCe analysis, Den= Density of Scleractinia from CPCe ARA analysis, P/A = Presence/Absence from visual sightings during the dive, Sam = Samples (number collected) of benthic macro-biota and substrate from ROV 19-10.

Taxa	ROV 19-10 %	Den.	P/A	Sam.
Biota	8.24%	84	X	6
Porifera	2.86%		X	4
Porifera	2.86%		X	4
Demospongiae	2.86%		X	4
<i>Clathria (Thalysias) cf. minuta</i> (van Soest, 1984)				1
<i>Corallistes</i> sp. FK-02			X	
Demospongiae	1.51%		X	
<i>Hymedesmia</i> sp.	0.07%			
<i>Hymedesmia</i> sp. FK-01				1
<i>Hymedesmia</i> sp. FK-02				1
<i>Phorbas amaranthus</i> Duchassaing & Michelotti, 1864	0.14%			
Poecilosclerida	1.05%		X	
<i>Rhizaxinella clava</i> (Schmidt, 1870)	0.09%			1
Spirastrellidae			X	
<i>Stylocordyla</i> sp.			X	
Hexactinellida			X	
<i>cf. Hyalonema</i> sp.			X	
Alcyonacea - gorgonian	1.05%		X	1
Cnidaria- Anthozoa	1.05%		X	1
Alcyonacea - gorgonian	1.05%		X	1
Alcyonacea- gorgonian	0.05%			
Gorgoniidae			X	
<i>Nicella</i> sp.			X	
<i>Thesea grandiflora</i> Deichmann, 1936	0.98%			1
<i>Thesea rubra</i> Deichmann, 1936	0.02%			
Antipatharia			X	1
Cnidaria- Anthozoa			X	1
Antipatharia			X	1
<i>Antipathes furcata</i> Gray, 1857			X	1
<i>Plumapathes pennacea</i> (Pallas, 1766)			X	
<i>Stichopathes</i> sp.			X	
Coral- Scleractinia	0.40%	16	X	
Cnidaria- Anthozoa	0.40%	16	X	

Dive Site: Florida, SW of Marquesas, Deepwater Warsaw Sinkhole, Outside FKNMS, Station FK-10, ROV 19-10, UNCW 782; 17-VIII-19-3

Coral- Scleractinia	0.40%	16	X
<i>Madracis auretenra</i> Locke, Weil & Coates, 2007			X
Scleractinia- unid solitary	0.40%	15	X
<i>Stephanocoenia intersepta</i> (Lamarck, 1836)		1	
Other	3.93%	68	X
Bryozoa			X
Arthropoda	0.09%		X
Chelicerata	0.02%		
<i>Anoplodactylus lentus</i> Wilson, 1878	0.02%		
Crustacea	0.07%		X
Anomura	0.05%		X
<i>Stenorhynchus seticornis</i> (Herbst, 1788)	0.02%		
Cnidaria- Anthozoa	0.23%		X
Anthozoa - Non Coral	0.23%		X
Cnidaria			X
Corallimorpharia	0.23%		X
Cnidaria- Hydrozoa	2.26%		
Hydrozoa	2.26%		
Hydroidolina	2.26%		
Echinodermata	0.42%		X
Asteroidea			X
Asteroidea			X
<i>Narcissia trigonaria</i> Sladen, 1889			X
Holothuroidea	0.02%		X
<i>Holothuria (Vaneyothuria) lentiginosa</i> enodis Miller & Pawson, 1979			X
Holothuroidea	0.02%		
<i>Isostichopus badionotus</i> (Selenka, 1867)			X
Ophiuroidea	0.40%		X
<i>Ophioderma devaneyi</i> Hendler & Miller, 1984	0.40%		X
Mollusca			X
Gastropoda			X
Olividae			X
Chordata	0.60%		
Chordata - Vertebrate	0.60%		
Actinopterygii	0.60%		
Detritus	0.21%		
UNKNOWN	0.12%	68	
Human debris	0.81%	8	X
Human debris	0.81%	8	X
Human debris	0.81%	8	X
Human debris- Fishing Gear	0.72%	8	X

Dive Site: Florida, SW of Marquesas, Deepwater Warsaw Sinkhole, Outside FKNMS, Station FK-10, ROV 19-10, UNCW 782; 17-VIII-19-3

Anchor line	0.07%			
Fish line/gear	0.42%			
Fishing line		6	X	
Fishing net			X	
Line from lobster/crab pot	0.02%	1	X	
Lobster/crab pot			X	
Long line			X	
Trawl net	0.21%	1		
Human debris- other	0.09%		X	
Bare Hard Bottom Substrate	63.61%			1
Bare Hard Bottom Substrate	63.61%			1
Bare Hard Bottom Substrate	63.61%			1
Hard bottom	63.61%			1
Bare rock	61.28%			
Bare rubble/cobble	2.33%			
rock				1
Bare Soft Bottom Substrate	27.34%			
Grand Total	100.00%	92	X	7

Dive Site: Florida, SW of Marquesas, Deepwater Warsaw Sinkhole, Outside FKNMS, Station FK-10, ROV 19-10, UNCW 782; 17-VIII-19-3

Density of Fish:

Table 2. Counts of commercial/recreational fish and visual sightings (Presence/Absence) of non-commercial fish from video transects at dive site ROV 19-10.

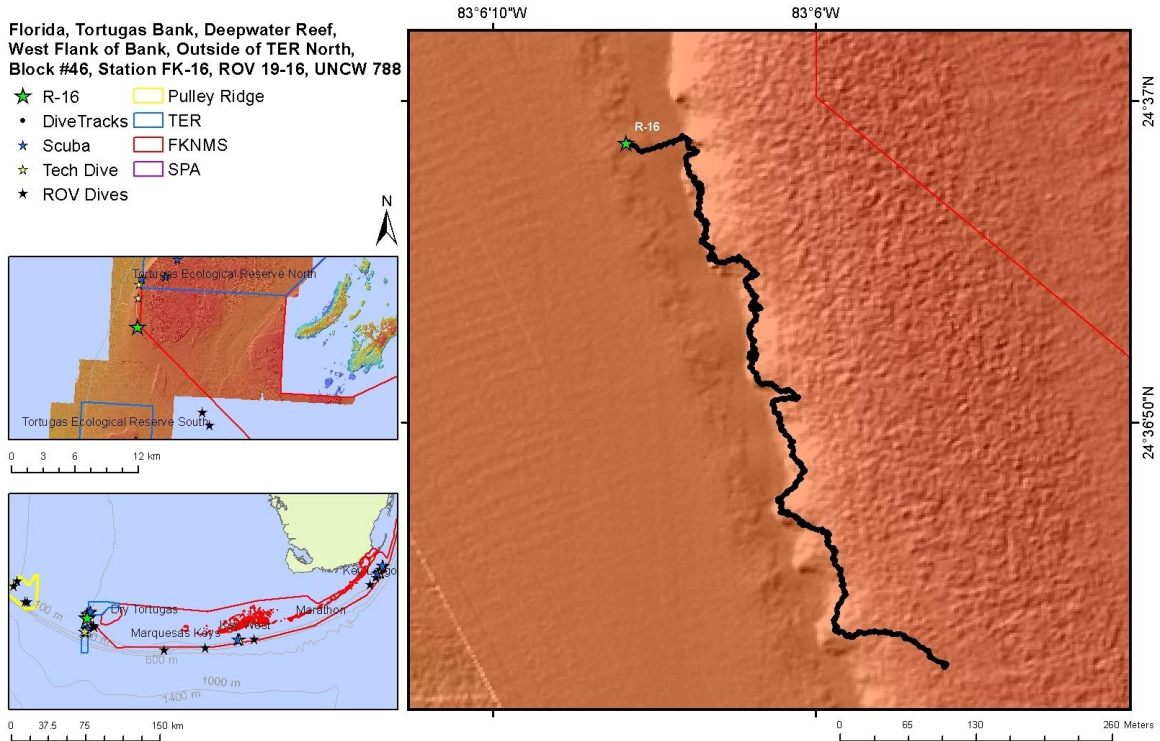
Status/Class/Order/Family/Tax Name (authority)	ROV 19-10 No. or P/A
Target	67
Actinopterygii	67
Perciformes	67
Lutjanidae	63
<i>Lutjanus buccanella</i> (Cuvier, 1828) - Blackfin Snapper	8
<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper	3
<i>Lutjanus vivanus</i> (Cuvier, 1828) - Silk Snapper	52
Serranidae	4
<i>Centropristis fuscus</i> Poey, 1861 - Two Spot Sea Bass	1
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	3
Chordata - Vertebrate	X
Actinopterygii	X
Aulopiformes	X
Synodontidae	X
<i>Synodus intermedius</i> (Spix & Agassiz, 1829) - Sand Diver	X
Beryciformes	X
Holocentridae	X
<i>Plectryops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish	X
Perciformes	X
Carangidae	X
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack	X
<i>Seriola rivoliana</i> Valenciennes, 1833 - Almaco Jack	X
Chaetodontidae	X
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	X
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	X
Labridae	X
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	X
<i>Decodon puellaris</i> (Poey, 1860) - Red Hogfish	X
<i>Halichoeres</i> sp. - Wrasse	X
Malacanthidae	X
<i>Malacanthus plumieri</i> (Bloch, 1786) - Sand Tilefish	X
Priacanthidae	X
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	X
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	X
Serranidae	X

Dive Site: Florida, SW of Marquesas, Deepwater Warsaw Sinkhole, Outside FKNMS, Station FK-10, ROV 19-10, UNCW 782; 17-VIII-19-3

Anthiadae - Sea Bass: Groupers And Fairy Basslets (Fam.)	X
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass	X
<i>Pronotogrammus martinicensis</i> (Guichenot, 1868) - Roughtongue Bass	X
<i>Serranus atrobranchus</i> (Cuvier, 1829) - Blackear bass	X
<i>Serranus phoebe</i> Poey, 1851 - Tattler	X
Scorpaeniformes	X
Scorpaenidae	X
<i>Scorpaena</i> sp. - Rock/scorpean/rosefish	X
Tetraodontiformes	X
Tetraodontidae	X
<i>Canthigaster rostrata</i> (Bloch, 1786) - Sharpnose Puffer	X
Grand Total	X

Dive Site: Florida, Tortugas Bank, Deepwater Reef, West Flank of Bank, Outside of TER North, Block #46, Station FK-16, ROV 19-16, UNCW 788; 20-VIII-19-1

General Location and Dive Track:



Site Overview:

Project: 2019 CIOERT Cruise
Vessel: R/V Walton Smith
Principal Investigator: John Reed
PI Contact Info: 5600 U.S. 1, North, Fort Pierce, FL 34946

Scientific Observers: John Reed, Stephanie Farrington, Shirley Pomponi, M. Dennis Hanisak, Jason White, Don Liberatore, Megan Conkling, Eric Glidden, Alexis Sturm, Ian Combs, Katherine Beckett

Ship Position System: DGPS
Data Management: Access Database
Report Analyst: John Reed or Stephanie Farrington
Date Compiled: 10/6/2021

Dive Overview:

Date of Dive: 8/20/2019
ROV: Mohawk ROV
ROV Navigation: TrackLink
ROV Sensors: Temperature (°C), Salinity (PSU), pH, Conductivity, Depth (m)

Purpose: ROV image transects and collections

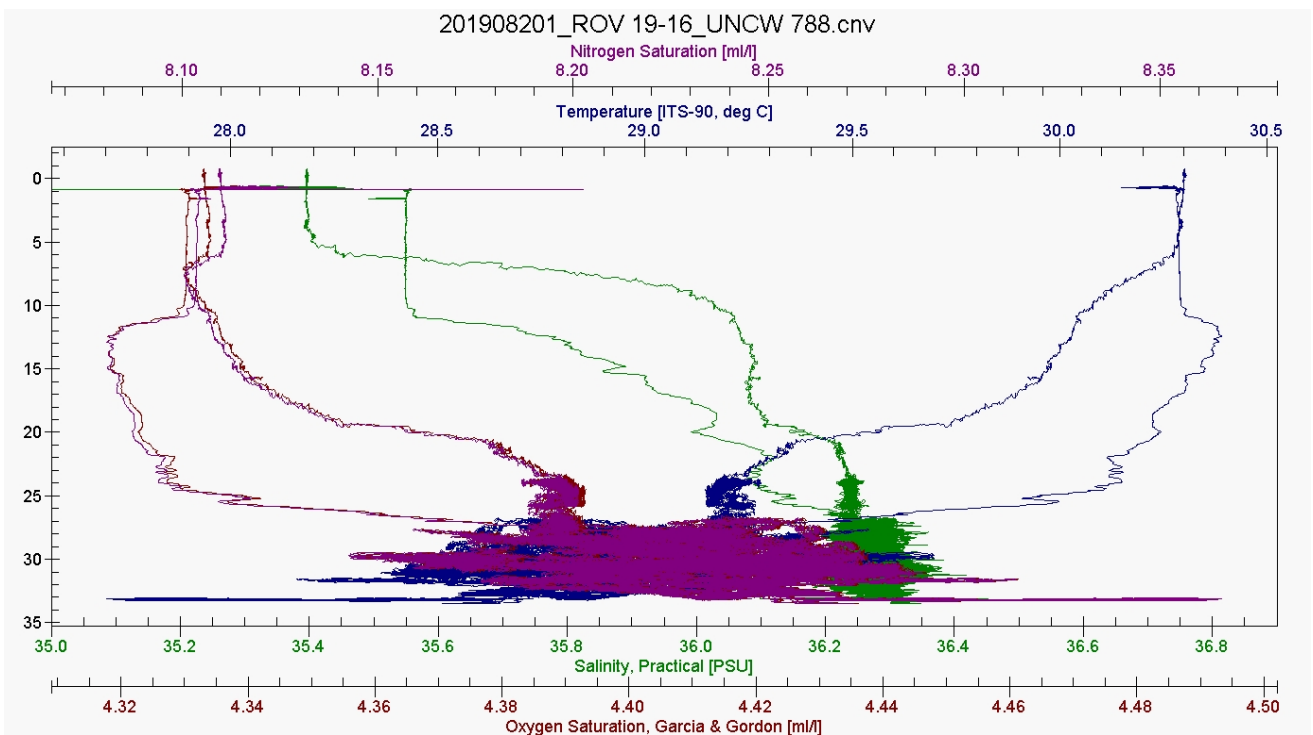
Digital Photos: 421
Distance (km): 0.8
Sonar Data: None Available
DVD: 0
Hard Drive: 1

Dive Site: Florida, Tortugas Bank, Deepwater Reef, West Flank of Bank, Outside of TER North, Block #46, Station FK-16, ROV 19-16, UNCW 788; 20-VIII-19-1

Dive Data:

Minimum Bottom Depth (m): 26.5	Total Transect Length (km): 0.800
Maximum Bottom Depth (m): 34.5	Surface Current (kn): 0.4
On Bottom (Time- GMT): 8:08	On Bottom (Lat/Long): 24.6163°N; -83.1016°W
Off Bottom (Time- GMT): 11:02	Off Bottom (Lat/Long): 24.6118°N; -83.0988°W
Physical (bottom); Temp (°C): 28.8	Salinity: 36.32 Visibility (ft): 49.21 Current (kn): 0.1

Physical Environment:



Temperature, Salinity and Depth were collected with a Sea-Bird CTD attached to the ROV (recording descent, bottom and ascent). The ranges of the bottom data recorded during ROV 19-16 are as follows: Depth Maximum: 33.5 m, Temperature: 27.7-30.4 °C, Salinity: 35.4-36.4 PSU, and Oxygen Saturation: 4.3-4.5 ml/l.

Dive Site: Florida, Tortugas Bank, Deepwater Reef, West Flank of Bank, Outside of TER North, Block #46, Station FK-16, ROV 19-16, UNCW 788; 20-VIII-19-1

Dive Imagery:



Figure 1: 24°36.9566'N;83°6.0608'W: -32.5 m
Ellisella elongata octocoral



Figure 2: 24°36.9558'N;83°6.0606'W: -32.5 m
Agelas conifera sponge

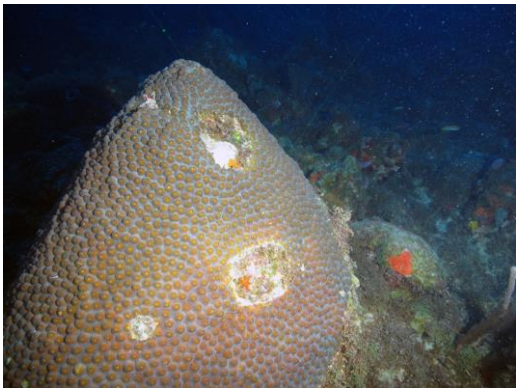


Figure 3: 24°36.91'N;83°6.0304'W: -30.3 m
Conical *Monstraera cavernosa*

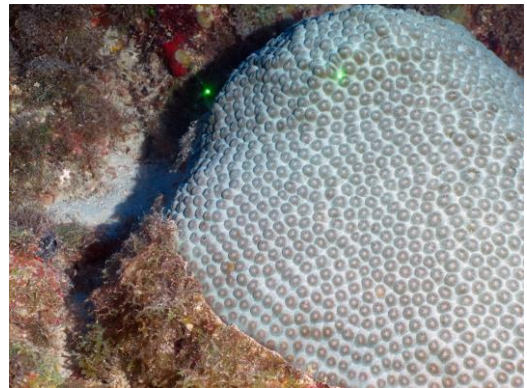


Figure 4: 24°36.8884'N;83°6.0309'W: -32.9 m
Monstraera cavernosa



Figure 5: 24°36.7753'N;83°5.9935'W: -30.7 m
Monstraera cavernosa diseased or recently dead



Figure 6: 24°36.7146'N;83°5.9415'W: -27.5 m
Monstraera cavernosa with part overgrown with *Cliona* boring sponge

Dive Site: Florida, Tortugas Bank, Deepwater Reef, West Flank of Bank, Outside of TER North, Block #46, Station FK-16, ROV 19-16, UNCW 788; 20-VIII-19-1

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 20-VIII-19-1; Florida, Tortugas Bank, Deepwater Reef, West Flank of Bank, Outside of TER North, Block #46, Station FK-16, ROV 19-16, UNCW 788; 26- 35 m

Objectives- Previous dives by Reed et al., 2010 CIOERT Oil Cruise. Objectives of this dive are to collect and document with video and digital still photos of samples of macrobiota for taxonomy, genetics, cell culture and biomedical research; documentation of coral disease or bleaching.

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. Coral, sponge and algal data were recorded in separate Access databases which were compiled with the benthic database. A Fastcat 49 CTD on the ROV continuously recorded, temperature, depth, conductivity, and salinity. ROV collection skid was used with 5-function manipulator to collect samples.

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, strobe on, 1/250th sec, auto focus, white balance- fish mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Non-quantitative photos for habitat and species identifications were logged. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged.

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

Depth range: 34.4 – 27 m

Florida, Gulf of Mexico, west of Tortugas North Ecological Reserve, west slope of Tortugas reef; just outside TER, 30 m; previous dive with Johnson-Sea-Link submersible during 2010 CIOERT Oil Cruise. Transect south along west slope of reef.

Weather- Partly cloudy, seas: 1-3 ft from SE, wind 10.6 kn from 74, air- 29.77 C, surface water- 30.59 C, salinity- 35.74 PSU, surface current 0.4 kn from SE, bottom current 0.1 from E

8:06 AM- Launch

8:08 AM- on bottom; 34.4 m, flat sand with 20% rubble, dominated by algal cover 20% and cyanobacteria 40%; 44 m W of the reef, HD E; vis 15 m

8:13 AM- found a 1-2 m relief rock, high rugosity covered in algae and sponges, with gorgonians scattered through; scattered hardbottom around the rock; Dominant species: *Dictyota*, *Antillogorgia*, *Niphates erecta*, CCA

8:18 AM- *Meandrina*

8:19 AM- Live *Siderastrea sideria*, 20 cm with paling edges; 10 cm *Montastraea cavernosa* "Mcav" healthy

8:20 AM- *Stephanocoenia intersepta*, 10 cm live and healthy

8:21 AM- heading up on the reef; slope is 10%, low relief, high rugosity. Covered 90% with biota

8:22 AM- 20 cm MCav bright green, live and well

8:26 AM- collecting *Agelas tubulata*; 15 cm cluster of thick walled hollow tubes, yellow orange; 33 m deep;... Unable to collect

8:28 AM- Sample 001; *Niphates digitalis*, 10 cm tall hollow tube, whole thing; 33 m deep; in bin

8:34 AM- MCav 12 cm, healthy

Dive Site: Florida, Tortugas Bank, Deepwater Reef, West Flank of Bank, Outside of TER North, Block #46, Station FK-16, ROV 19-16, UNCW 788; 20-VIII-19-1

8:36 AM- MCav 20 cm, green and healthy
8:37 AM- MCav 5 cm healthy
8:37 AM- relief has increase to 1 m
8:37 AM- MCav 5 cm
8:38 AM- 25 cm MCav, 25% old dead, but the live tissue looks healthy; ledge is now up to 2 m relief; high fish activity, hogfish and some grouper, many little reef fish
8:39 AM- 10 cm MCav live
8:40:37 AM- 12 cm MCav healthy
8:41:18 AM- 10 cm MCav, healthy
8:42:47 AM- 20 cm MCav, healthy
8:43:47 AM- 30 cm MCav mound, 50% old dead but live tissue looks healthy
8:46:19 AM- MCav 10 cm, healthy
8:46:50 AM- MCav, 50 cm, healthy; on a 2 m relief ledge out crop
8:47:17 AM- MCav , 15 cm
8:47:33 AM- 30 cm MCav healthy
8:47:50 AM- *Agaricia agaricites* 10 cm, healthy
8:49:26 AM- MCAV 15 cm, healthy
8:50:03 AM- Sample 002, *Lobophora*, green brown flakes, in bucket 5
8:56:50 AM- large MCAV, live tissue is 1+m, healthy
9:01:19 AM- MCAV, 15 cm live and healthy
9:02:13 AM- 30 cm MCAV, healthy
9:03:02 AM- 30 cm *Orbicella faveolata* (OFAV), healthy
9:03:52 AM- 20 cm, purplish and healthy
9:05:07 AM- 15 cm MCAV, healthy
9:06:11 AM- 30 cm diameter, 50 cm tall MCAV has some polyps that look suspicious, may be bleaching out, but could be disease
9:08:07 AM- 20 cm MCAV
9:08:33 AM- 20 cm OFAV, has some old dead patches
9:10:38 AM- MCAV 15 cm healthy; 30 cm MCAV healthy
9:11:32 AM- MCAV 10 cm healthy
9:12:22 AM- *Colpophyllia natans* (CNAT) 30 cm, healthy
9:14:26 AM- *Meandrina meandrites* (MMEA) 10 cm, healthy
9:15:12 AM- habitat has returned to low relief, scattered hardbottom
9:16:04 AM- 10 cm MCAV, healthy
9:17:15 AM- Sample 003, *Niphates digitales*, 10 cm tall grey hollow tube, whole piece, in bin 2
9:24:34 AM- 30 cm MCAV, healthy
9:25:21 AM- 40 cm MCAV, healthy
9:25:33 AM- 15 cm MCAV, healthy
9:26:20 AM- 15 cm MCAV, healthy
9:26:50 AM- 20 cm healthy MCAV
9:27:12 AM- back at the W base, 33.5 m depth, habitat still rugose hardbottom with a 1 m ledge and low slope
9:27:54 AM- MMEA, 15 cm healthy
9:28:59 AM- MMEA, 15 cm, gorgeous and healthy
9:29:45 AM- MCAV 30 cm, healthy
9:30:05 AM- MCAV, a lot of old dead covered in encrusting sponge, live tissue is healthy
9:30:31 AM- CNAT, 15 cm healthy
9:30:56 AM- MMEA, 10 cm healthy

Dive Site: Florida, Tortugas Bank, Deepwater Reef, West Flank of Bank, Outside of TER North, Block #46, Station FK-16, ROV 19-16, UNCW 788; 20-VIII-19-1

9:32:43 AM- Sample 004, 10 cm *Niphates digitales*, grey hollow vase, in bin 3
9:44:27 AM- Dominant species have changed to more sponges than coral; we have reached a 1-2 m drop off with scattered hardbottom in sand
9:46:47 AM- MCAV 10 cm healthy
9:47:36 AM- large boulder/mound covered in CCA, sponges like *Xesto* and *Agilis*, and gorgonians
9:48:29 AM- 20 cm MCAV, healthy
9:48:40 AM- 20 cm MCAV, healthy
9:48:57 AM- something that is white, not sure what it is; sheared off corallites?
9:50:45 AM- MCAV 30 cm
9:52:39 AM- 20 cm *Agaricia lamarki* (ALAM), healthy
9:53:20 AM- 50-60 cm MCAV with exposed skeleton, recently new dead, not active disease
9:54:11 AM- SSID 15 cm unhappy, patchy white lesions
9:55:16 AM- 10 cm MCAV, healthy
9:55:33 AM- 10 cm MCAV, healthy
9:56:59 AM- 10 cm MCAV, healthy
9:58:46 AM- 30 cm MCAV, healthy
10:00:05 AM- MCAV 20 cm, healthy
10:00:13 AM- 30 cm MCAV healthy
10:00:26 AM- 15 cm MCAV healthy
10:02:38 AM- bleached MCAV 10 cm
10:04:31 AM- SINT 10 cm, healthy
10:05:34 AM- MCAV missed 2
10:05:50 AM- MCAV 30 cm healthy
10:06:01 AM- MCAV 20 cm healthy
10:06:40 AM- MCAV 15 cm, light but healthy
10:07:22 AM- 20 cm MCAV, healthy
10:08:33 AM- habitat has significantly flattened out, scattered hardbottom
10:09:24 AM- coming down a 10% slope
10:12:38 AM- 2 cm MCAV, healthy
10:12:51 AM- Sample 005, white planar elongate branching gorgonian, in bin 4
10:19:04 AM- heading for a ledge, still scattered hardbottom
10:20:47 AM- HD E over the reef
10:22:59 AM- MCAV 15 cm, MMEA 10 cm, both healthy
10:23:26 AM- 20 cm MCAV, healthy
10:24:40 AM- 20 cm MCAV healthy
10:24:53 AM- 20 cm MCAV, 20 cm MCAV
10:25:16 AM- 30 cm MCAV, possibly diseased, upper top edge has characteristic white margin; 30.7 m; 5 cm white margin with green algae coming in
10:29:11 AM- 300 cm MCAV, healthy with old dead tissue
10:29:28 AM- 20 cm MCAV healthy
10:29:56 AM- 20 cm MCAV healthy
10:31:11 AM- MCAV 30 cm healthy
10:31:31 AM- MCAV 20 cm; disease margin on the edge; 2 cm wide, 10 cm long; 30.6 m
10:35:06 AM- MCAV 20 cm, healthy
10:35:42 AM- MCAV 15 cm, healthy
10:35:52 AM- MCAV 20 cm, healthy
10:37:16 AM- 30 cm MCAV healthy
10:37:40 AM- MCAV 20 cm, healthy; SINT 15 cm healthy

Dive Site: Florida, Tortugas Bank, Deepwater Reef, West Flank of Bank, Outside of TER North, Block #46, Station FK-16, ROV 19-16, UNCW 788; 20-VIII-19-1

10:38:14 AM- 40 cm MCAV bleached
10:38:41 AM- 30 cm MCAV behind bleached one, healthy
10:39:15 AM- MCAV 20 cm paling
10:40:19 AM- 15 cm MCAV, healthy
10:40:37 AM – 20 cm MCAV
10:41:28 AM- 15 cm MCAV healthy
10:44:46 AM- 50 cm MCAV, healthy
10:45:28 AM- ALAM bleaching, 15 cm
10:46:51 AM- PAST, 15 cm healthy
10:48:04 AM- AAGA 10 cm healthy
10:48:33 AM- MCAV 20 cm healthy
10:49:39 AM- 30 cm MCAV healthy
10:50:01 AM- MCAV 15 cm healthy
10:50:36 AM- MCAV 40 cm, MCAV 25 cm both healthy
10:51:37 AM- 25 and 10 cm MCAV both healthy
10:51:49 AM- 15 and 30 cm MCAV both healthy
10:52:29 AM- MCAV 10 cm healthy
10:54:01 AM- 28 m depth, at the top of the reef, high ruosity on a rock ledge, *Pseudoterogorgia* dominated, algal cover is high
10:55:08 AM- MCAV 20 cm with *Cliona deletrix* overgrowing; MCAV 15 cm bleaching
10:57:20 AM- MCAV 40 cm with dead zone in the middle
10:57:59 AM- MCAV 10 cm healthy
10:58:43 AM- AAGA 15 cm bleached, possible disease?
10:59:34 AM- 20 cm MCAV, healthy
11:01:42 AM- 40+ cm MCAV, 4 cm disease margin on the top
11:02:13 AM- End dive, off bottom at 27 m; 78 m from the W base; habitat was rock ledge diminated by *Pseudoterigorgia*, *Dictyota*, *CCA*, *Agelas*, and *Xestospongia*

Human Debris:

Plastic Bag

Dive Site: Florida, Tortugas Bank, Deepwater Reef, West Flank of Bank, Outside of TER North, Block #46, Station FK-16, ROV 19-16, UNCW 788; 20-VIII-19-1

CPCe Percent Cover Analysis:

CPCe Analysis was not completed for this dive.

Dive Site: Florida, Tortugas Bank, Deepwater Reef, West Flank of Bank, Outside of TER North, Block #46, Station FK-16, ROV 19-16, UNCW 788; 20-VIII-19-1

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. P/A = Presence/Absence from visual sightings during the dive, Sam = Samples (number collected) of benthic macro-biota and substrate from ROV 19-16.

Taxa	ROV 19-16 P/A	Sam.
Biota	X	5
Algae	X	1
Algae	X	1
Cyanobacteria	X	
Chlorophyta	X	
Chlorophyta	X	
Chlorophyta- Filamentous Green	X	
<i>Halimeda</i> sp.	X	
Penicillus sp.	X	
<i>Rhizocephalus oblongus</i> (Decaisne) Kützing, 1849	X	
<i>Udotea</i> sp.	X	
<i>Valonia</i> sp.	X	
Ochrophyta	X	1
<i>Dictyota</i> sp.	X	
<i>Lobophora</i> sp.	X	1
Ochrophyta	X	
<i>Sargassum</i> sp.	X	
Rhodophyta	X	
Corallinophycidae	X	
<i>Peyssonnelia</i> sp.	X	
Rhodophyta	X	
Porifera	X	3
Porifera	X	3
Demospongiae	X	3
<i>Agelas citrina</i> Gotera & Alcolado, 1987	X	
<i>Agelas clathrodes</i> (Schmidt, 1870)	X	
<i>Agelas conifera</i> (Schmidt, 1870)	X	
<i>Agelas sceptrum</i> (Lamarck, 1815)	X	
<i>Agelas tubulata</i> Lehnert & van Soest, 1996	X	
<i>Aiolochoxia crassa</i> (Hyatt, 1875)	X	
<i>Amphimedon compressa</i> Duchassaing & Michelotti, 1864	X	
<i>Aplysina cauliformis</i> (Carter, 1882)	X	
<i>Aplysina fistularis</i> (Pallas, 1766)	X	
<i>Aplysina lacunosa</i> (Lamarck, 1814)	X	
<i>Callyspongia (Cladochalina) aculeata</i> (Linnaeus, 1759)	X	

Dive Site: Florida, Tortugas Bank, Deepwater Reef, West Flank of Bank, Outside of TER North, Block #46, Station FK-16, ROV 19-16, UNCW 788; 20-VIII-19-1

<i>Callyspongia (Claidochalina) armigera</i> (Duchassaing & Michelotti, 1864)	X	
<i>Cinachyrella kuekenthali</i> (Uliczka, 1929)	X	
<i>Clathria</i> sp.	X	
<i>Cliona caribbaea</i> Carter, 1882	X	
<i>Cliona delitrix</i> Pang, 1973	X	
<i>Cliona varians</i> (Duchassaing & Michelotti, 1864)	X	
<i>Cribrochalina vasculum</i> (Lamarck, 1814)	X	
Demospongiae	X	
<i>Erylus</i> sp.	X	
Haplosclerida FK-02	X	
<i>Iotrochota birotulata</i> (Higgin, 1877)	X	
<i>Ircinia strobilina</i> (Lamarck, 1816)	X	
<i>Monanchora arbuscula</i> (Duchassaing & Michelotti, 1864)	X	
<i>Niphates digitalis</i> (Lamarck, 1814)	X	3
<i>Niphates erecta</i> Duchassaing & Michelotti, 1864	X	
Petrosiidae	X	
<i>Ptilocaulis walpersii</i> (Duchassaing & Michelotti, 1864)	X	
<i>Spheciospongia vesparium</i> (Lamarck, 1815)	X	
<i>Spirastrella coccinea</i> (Duchassaing & Michelotti, 1864)	X	
<i>Verongula rigida</i> (Esper, 1794)	X	
<i>Xestospongia muta</i> (Schmidt, 1870)	X	
Alcyonacea - gorgonian	X	
Cnidaria- Anthozoa	X	
Alcyonacea - gorgonian	X	
<i>Antillogorgia</i> sp.	X	
<i>Ellisella elongata</i> (Pallas, 1766)	X	
<i>Ellisella</i> sp.	X	
<i>Eunicea</i> sp.	X	
<i>Iciligorgia schrammi</i> Duchassaing, 1870	X	
Plexauridae	X	
<i>Pseudoplexaura</i> sp.	X	
<i>Swiftia exserta</i> (Ellis & Solander, 1786)	X	
Antipatharia	X	
Cnidaria- Anthozoa	X	
Antipatharia	X	
<i>Stichopathes</i> sp.	X	
Coral- Scleractinia	X	
Cnidaria- Anthozoa	X	
Coral- Scleractinia	X	
<i>Agaricia agaricites</i> (Linnaeus, 1758)	X	
<i>Agaricia lamarcki</i> Milne Edwards & Haime, 1851	X	
<i>Agaricia</i> sp.	X	

Dive Site: Florida, Tortugas Bank, Deepwater Reef, West Flank of Bank, Outside of TER North, Block #46, Station FK-16, ROV 19-16, UNCW 788; 20-VIII-19-1

<i>Colpophyllia natans</i> (Houttuyn, 1772)	X	
<i>Meandrina meandrites</i> (Linnaeus, 1758)	X	
<i>Montastraea cavernosa</i> (Linnaeus, 1767)	X	
<i>Orbicella faveolata</i> (Ellis & Solander, 1786)	X	
<i>Porites astreoides</i> Lamarck, 1816	X	
<i>Siderastrea siderea</i> (Ellis & Solander, 1786)	X	
<i>Stephanocoenia intersepta</i> (Lamarck, 1836)	X	
Other	X	1
Cnidaria- Anthozoa	X	
Anthozoa - Non Coral	X	
Cnidaria	X	
Cnidaria- Hydrozoa		1
Hydrozoa		1
Hydroidolina		1
Echinodermata	X	
Crinoidea	X	
Comatulida	X	
Chordata	X	
Chordata - Invertebrate	X	
Didemnidae	X	
Human debris	X	
Human debris	X	
Human debris	X	
Human debris- Fishing Gear	X	
Long line	X	
Human debris- other	X	
Grand Total	X	5

Dive Site: Florida, Tortugas Bank, Deepwater Reef, West Flank of Bank, Outside of TER North, Block #46, Station FK-16, ROV 19-16, UNCW 788; 20-VIII-19-1

Density of Fish:

Table 2. Counts of commercial/recreational fish and visual sightings (Presence/Absence) of non-commercial fish from video transects at dive site ROV 19-16.

Status/Class/Order/Family/Tax Name (authority)	ROV 19-16 No. or P/A
Target	7
Actinopterygii	7
Perciformes	6
Lutjanidae	1
<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper	1
Serranidae	5
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	2
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp	3
Scorpaeniformes	1
Scorpaenidae	1
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	1
Chordata - Vertebrate	X
Actinopterygii	X
Aulopiformes	X
Synodontidae	X
<i>Synodus intermedius</i> (Spix & Agassiz, 1829) - Sand Diver	X
Beryciformes	X
Holocentridae	X
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	X
Perciformes	X
Acanthuridae	X
<i>Acanthurus chirurgus</i> (Bloch, 1787) - Doctorfish	X
<i>Acanthurus coeruleus</i> Bloch & Schneider, 1801 - Blue Tang	X
<i>Acanthurus tractus</i> Poey, 1860 - Ocean Surgeonfish	X
Apogonidae	X
<i>Apogon binotatus</i> (Poey, 1867) - Barred Cardinalfish	X
<i>Apogon pseudomaculatus</i> Longley, 1932 - Twospot Cardinalfish	X
Carangidae	X
<i>Carangoides bartholomaei</i> (Cuvier, 1833) - Yellow Jack	X
<i>Caranx crysos</i> (Mitchill, 1815) - Blue Runner	X
<i>Caranx ruber</i> (Bloch, 1793) - Bar Jack	X
<i>Seriola rivoliana</i> Valenciennes, 1833 - Almaco Jack	X
Chaetodontidae	X
<i>Chaetodon capistratus</i> Linnaeus, 1758 - Foureye Butterflyfish	X
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	X

Dive Site: Florida, Tortugas Bank, Deepwater Reef, West Flank of Bank, Outside of TER North, Block #46, Station FK-16, ROV 19-16, UNCW 788; 20-VIII-19-1

<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	X
<i>Chaetodon striatus</i> Linnaeus, 1758 - Banded Butterflyfish	X
Gobiidae	X
<i>Coryphopterus punctipectophorus</i> Springer, 1960 - Spotted Goby	X
<i>Coryphopterus</i> sp. - Goby	X
<i>Elacatinus oceanops</i> Jordan, 1904 - Neon Goby	X
Haemulidae	X
<i>Haemulon album</i> Cuvier, 1830 - White Margate	X
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	X
Labridae	X
<i>Bodianus rufus</i> (Linnaeus, 1758) - Spanish Hogfish	X
<i>Halichoeres bivittatus</i> (Bloch, 1791) - Slippery Dick	X
<i>Halichoeres cyanocephalus</i> (Bloch, 1791) - Yellowcheek Wrasse	X
<i>Halichoeres</i> sp. - Wrasse	X
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	X
<i>Thalassoma bifasciatum</i> (Bloch, 1791) - Bluehead	X
Mullidae	X
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	X
Pomacanthidae	X
<i>Holacanthus bermudensis</i> Goode, 1876 - Blue Angelfish	X
<i>Holacanthus ciliaris</i> (Linnaeus, 1758) - Queen Angelfish	X
<i>Holacanthus tricolor</i> (Bloch, 1795) - Rock Beauty	X
<i>Pomacanthus arcuatus</i> (Linnaeus, 1758) - Gray Angelfish	X
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	X
Pomacentridae	X
<i>Chromis cyanea</i> (Poey, 1860) - Blue Chromis	X
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reef fish	X
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	X
<i>Chromis scotti</i> Emery, 1968 - Purple Reef fish	X
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damselfish	X
<i>Stegastes variabilis</i> (Castelnau, 1855) - Cocoa Damselfish	X
Scaridae	X
<i>Scarus</i> sp. - Parrotfish	X
<i>Scarus iseri</i> (Bloch, 1789) - Striped Parrotfish	X
<i>Scarus vetula</i> Bloch & Schneider, 1801 - Queen Parrotfish	X
<i>Sparisoma atomarium</i> (Poey, 1861) - Greenblotch Parrotfish	X
<i>Sparisoma rubripinne</i> (Valenciennes, 1840) - Yellowtail Parrotfish	X
Serranidae	X
<i>Epinephelus morio</i> (Valenciennes, 1828) - Red Grouper	X
<i>Hypoplectrus puella</i> (Cuvier, 1828) - Barred Hamlet	X
<i>Hypoplectrus unicolor</i> (Walbaum, 1792) - Butter Hamlet	X
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	X

Dive Site: Florida, Tortugas Bank, Deepwater Reef, West Flank of Bank, Outside of TER North, Block #46, Station FK-16, ROV 19-16, UNCW 788; 20-VIII-19-1

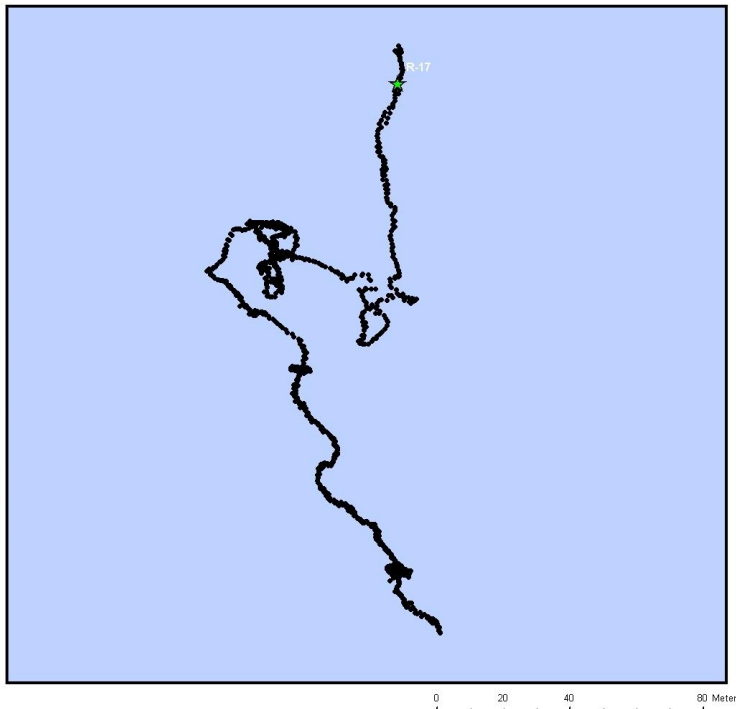
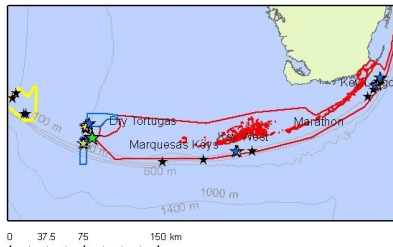
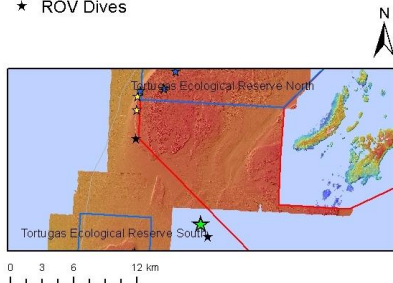
<i>Serranus tabacarius</i> (Cuvier, 1829) - Tobaccofish	X
<i>Serranus tigrinus</i> (Bloch, 1790) - Harlequin Bass	X
<i>Serranus tortugarum</i> Longley, 1935 - Chalk Bass	X
Sparidae	X
<i>Calamus calamus</i> (Valenciennes, 1830) - Saucereye Porgy	X
<i>Calamus</i> sp. - Porgy	X
Tetraodontiformes	X
Ostraciidae	X
<i>Acanthostracion</i> sp. - Cowfish	X
<i>Lactophrys triqueter</i> (Linnaeus, 1758) - Smooth Trunkfish	X
Tetraodontidae	X
<i>Canthigaster rostrata</i> (Bloch, 1786) - Sharpnose Puffer	X
Grand Total	X

Dive Site: Florida, Tortugas, Deep Patch Reef, Goliath Grouper Hole, Outside FKNMS, Block #66, Site FK-17, ROV 19-17, UNCW 789; 20-VIII-19-2

General Location and Dive Track:

Florida, Tortugas, Deep Patch Reef, Goliath Grouper Hole, Outside FKNMS, Block #66, Site FK-17, ROV 19-17, UNCW 789

- ★ R-17
- DiveTracks
- ★ Scuba
- ★ Tech Dive
- ★ ROV Dives
- Pulley Ridge
- TER
- FKNMS
- SPA



Site Overview:

Project: 2019 CIOERT Cruise
Vessel: R/V Walton Smith
Principal Investigator: John Reed
PI Contact Info: 5600 U.S. 1, North, Fort Pierce, FL 34946

Scientific Observers: John Reed, Stephanie Farrington, Shirley Pomponi, M. Dennis Hanisak, Jason White, Don Liberatore, Megan Conkling, Eric Glidden, Alexis Sturm, Ian Combs, Katherine Beckett

Ship Position System: DGPS
Data Management: Access Database
Report Analyst: John Reed or Stephanie Farrington
Date Compiled: 10/6/2021

Dive Overview:

Date of Dive: 8/20/2019
ROV: Mohawk ROV
ROV Navigation: TrackLink
ROV Sensors: Temperature (°C), Salinity (PSU), pH, Conductivity, Depth (m)

Purpose: ROV image transects and collections

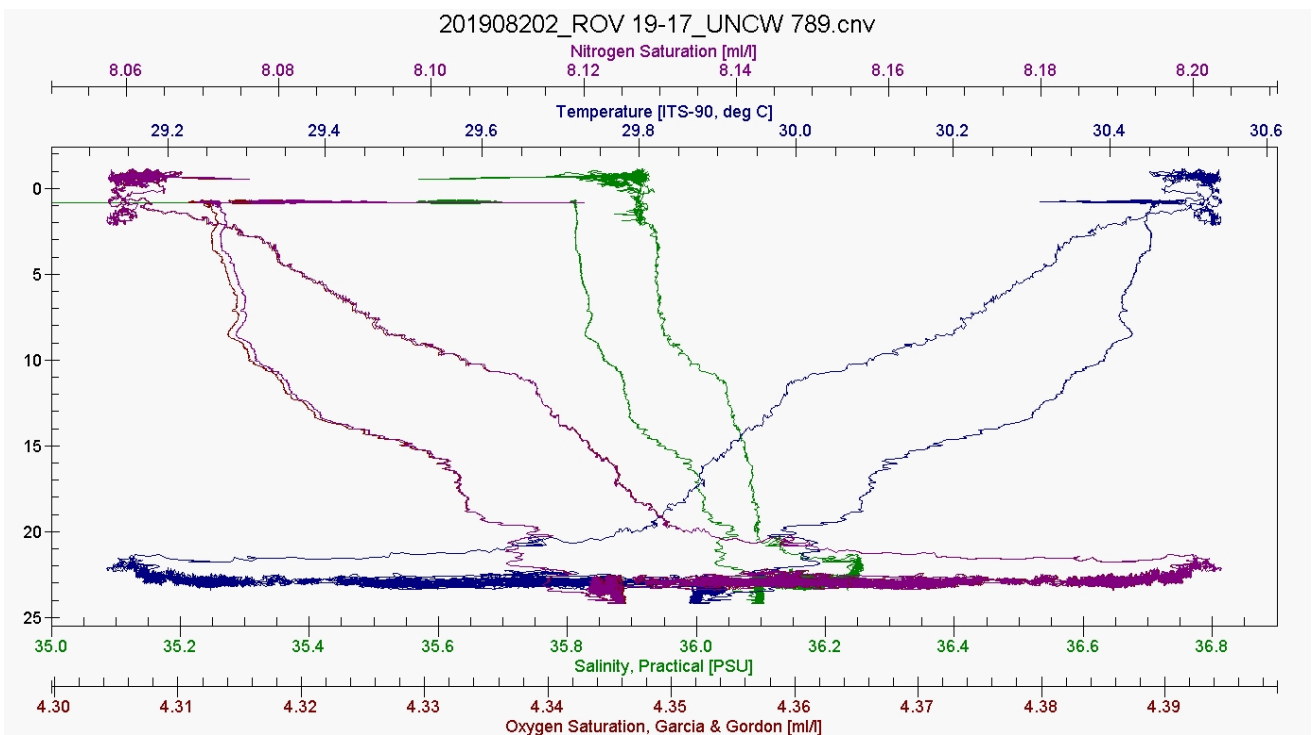
Digital Photos: 179
Distance (km): 0.3
Sonar Data: None Available
DVD:
Hard Drive:

Dive Site: Florida, Tortugas, Deep Patch Reef, Goliath Grouper Hole, Outside FKNMS, Block #66, Site FK-17, ROV 19-17, UNCW 789; 20-VIII-19-2

Dive Data:

Minimum Bottom Depth (m):	23.9	Total Transect Length (km):	0.334
Maximum Bottom Depth (m):	25.3	Surface Current (kn):	0.9
On Bottom (Time- GMT):	13:11	On Bottom (Lat/Long):	24.547°N; -83.0372°W
Off Bottom (Time- GMT):	14:11	Off Bottom (Lat/Long):	24.5454°N; -83.0372°W
Physical (bottom); Temp (°C):	29.2	Salinity: 36.25	Visibility (ft): 32.81 Current (kn): 0.1

Physical Environment:



Temperature, Salinity and Depth were collected with a Sea-Bird CTD attached to the ROV (recording descent, bottom and ascent). The ranges of the bottom data recorded during ROV 19-17 are as follows: Depth Maximum: 24.2 m, Temperature: 29.1-30.5 °C, Salinity: 35.8-36.3 PSU, and Oxygen Saturation: 4.3-4.4 ml/l.

Dive Site: Florida, Tortugas, Deep Patch Reef, Goliath Grouper Hole, Outside FKNMS, Block #66, Site FK-17, ROV 19-17, UNCW 789; 20-VIII-19-2

Dive Imagery:



Figure 1: 24°32.7895'N;83°2.25'W: -25 m
School of Gray Snapper, *Lutjanus griseus*



Figure 2: 24°32.7945'N;83°2.2536'W: -24.7 m
Montastraea cavernosa and *Siderastrea* sp. (top)



Figure 3: 24°32.7946'N;83°2.2526'W: -24.7 m
Meandrina meandrites



Figure 4: 24°32.7895'N;83°2.2522'W: -24.8 m
Montastraea cavernosa



Figure 5: 24°32.7878'N;83°2.255'W: -24.8 m
Diploria brain coral with *Cliona* encrusting sponge



Figure 6: 24°32.7712'N;83°2.2476'W: -25.1 m
Niphates erecta and *Callyspongia aculeata* sponges

Dive Site: Florida, Tortugas, Deep Patch Reef, Goliath Grouper Hole, Outside FKNMS, Block #66, Site FK-17, ROV 19-17, UNCW 789; 20-VIII-19-2

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 20-VIII-19-2; Florida, Tortugas, deep patch reef, Goliath grouper hole, outside FKNMS, Block #66, Site FK-17, ROV 19-17, UNCW 789; 24- 25 m

Objectives- Previous dives by Reed et al., 2017 Pulley Ridge project, with point count photo transects in 2014. Objectives of this dive are to collect and document with video and digital still photos of samples of macrobiota for taxonomy, genetics, cell culture and biomedical research; documentation of coral disease or bleaching.

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. Coral, sponge and algal data were recorded in separate Access databases which were compiled with the benthic database. A Fastcat 49 CTD on the ROV continuously recorded, temperature, depth, conductivity, and salinity. ROV collection skid was used with 5-function manipulator to collect samples.

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, strobe on, 1/250th sec, auto focus, white balance- fish mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Non-quantitative photos for habitat and species identifications were logged. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged.

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

Depth range: 25-24.4 m

Florida, Gulf of Mexico, TER Block 66, Goliath grouper pit, low-moderate hard bottom and patch reefs, 25 m; outside TER and FKNMS

Weather- Partly cloudy, seas: 1-2 ft from E, wind 8.8 kn from 135.6, air- 29.92 C, surface water- 30.74 C, salinity- 36.00 PSU, surface current 0.9 kn from SE, bottom current 0.1 from SE

1:08:11 PM- Launch

1:12:26 PM- On bottom, hard pavement with sediment on top, low relief and fairly low rugosity, 24.4 m depth; 50% cover of biota, *Pseudoterigorgia*, *Pterogorgia*, and *Dictyota* dominant

1:19:24 PM- Very sandy, scattered hard bottom, gorgonian dominant

1:20:49 PM- heading W toward a grouper pit

1:23:46 PM- fish activity increasing, lots of snapper, grouper; habitat high rugosity, 1 m relief, rock ledge

1:24:58 PM- Nurse shark eating something

1:27:32 PM- coral cover increased, dominated by MCAV, some MMEA and CNAT; ~30% cover

1:31:47 PM- *Pseudodiploria strigosa* (PSTR), overgrown by a *Cliona*

1:34:29 PM- the habitat quickly breaks down once you get off of this small ledge

1:40:47 PM- back in the sand and pavement, low slope, gorgonian and algal dominated

1:45:49 PM- Sample 001 collecting *Niphates erecta*, soft lavender rope, 10 cm piece, in bin 4

2:08:38 PM- Sample 002, *Lotrochota birotulata*, yellow and black rope sponge, in bin 4

2:10:35 PM- continuing S to find more sponges and coral

2:11:04 PM- off bottom, ending dive due to a squall; 25 m, pavement with sediment, some rubble pieces

Dive Site: Florida, Tortugas, Deep Patch Reef, Goliath Grouper Hole, Outside FKNMS, Block #66,
Site FK-17, ROV 19-17, UNCW 789; 20-VIII-19-2

dominated by *Pseudoterogorgia*, *Dictyota*, and *Xestospongia*

Dive Site: Florida, Tortugas, Deep Patch Reef, Goliath Grouper Hole, Outside FKNMS, Block #66, Site FK-17, ROV 19-17, UNCW 789; 20-VIII-19-2

CPCe Percent Cover Analysis:

CPCe Analysis was not completed for this dive.

Dive Site: Florida, Tortugas, Deep Patch Reef, Goliath Grouper Hole, Outside FKNMS, Block #66, Site FK-17, ROV 19-17, UNCW 789; 20-VIII-19-2

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. %= Percent Cover from CPCe analysis, Den= Density of Scleractinia from CPCe ARA analysis, P/A = Presence/Absence from visual sightings during the dive, Sam = Samples (number collected) of benthic macro-biota and substrate from ROV 19-17.

Taxa	ROV 19-17	
	P/A	Sam.
Biota	X	2
Algae	X	
Algae	X	
Cyanobacteria	X	
Chlorophyta	X	
<i>Halimeda</i> sp.	X	
<i>Udotea</i> sp.	X	
Ochrophyta	X	
<i>Dictyota</i> sp.	X	
<i>Lobophora</i> sp.	X	
<i>Sargassum</i> sp.	X	
Porifera	X	2
Porifera	X	2
Demospongiae	X	2
<i>Aplysina cauliformis</i> (Carter, 1882)	X	
<i>Callyspongia (Cladochalina) aculeata</i> (Linnaeus, 1759)	X	
<i>Callyspongia (Cladochalina) plicifera</i> (Lamarck, 1814)	X	
<i>Cliona delitrix</i> Pang, 1973	X	
<i>Cliona varians</i> (Duchassaing & Michelotti, 1864)	X	
<i>Iotrochota birotulata</i> (Higgin, 1877)	X	1
<i>Niphates amorpha</i> Van Soest, 1980	X	
<i>Niphates digitalis</i> (Lamarck, 1814)	X	
<i>Niphates erecta</i> Duchassaing & Michelotti, 1864	X	1
<i>Spheciospongia vesparium</i> (Lamarck, 1815)	X	
<i>Xestospongia muta</i> (Schmidt, 1870)	X	
Alcyonacea - gorgonian	X	
Cnidaria- Anthozoa	X	
Alcyonacea - gorgonian	X	
<i>Eunicea</i> sp.	X	
Plexauridae	X	
<i>Pseudopterogorgia</i> sp.	X	
Coral- Scleractinia	X	
Cnidaria- Anthozoa	X	
Coral- Scleractinia	X	
<i>Meandrina meandrites</i> (Linnaeus, 1758)	X	

Dive Site: Florida, Tortugas, Deep Patch Reef, Goliath Grouper Hole, Outside FKNMS, Block #66, Site FK-17, ROV 19-17, UNCW 789; 20-VIII-19-2

<i>Montastraea cavernosa</i> (Linnaeus, 1767)	X	
<i>Orbicella faveolata</i> (Ellis & Solander, 1786)	X	
<i>Porites astreoides</i> Lamarck, 1816	X	
<i>Pseudodiploria strigosa</i> (Dana, 1846)	X	
<i>Siderastrea radians</i> (Pallas, 1766)	X	
<i>Siderastrea siderea</i> (Ellis & Solander, 1786)	X	
<i>Stephanocoenia intersepta</i> (Lamarck, 1836)	X	
Other	X	
Chordata	X	
<i>Eudistoma</i> sp.	X	
Grand Total	X	2

Dive Site: Florida, Tortugas, Deep Patch Reef, Goliath Grouper Hole, Outside FKNMS, Block #66, Site FK-17, ROV 19-17, UNCW 789; 20-VIII-19-2

Density of Fish:

Table 2. Counts of commercial/recreational fish and visual sightings (Presence/Absence) of non-commercial fish from video transects at dive site ROV 19-17.

Status/Class/Order/Family/Tax Name (authority)	ROV 19-17 P/A
Target	10
Actinopterygii	10
Perciformes	8
Lutjanidae	2
Lutjanus analis (Cuvier, 1828) - Mutton Snapper	1
Lutjanus campechanus (Poey, 1860) - Red Snapper	1
Serranidae	6
Cephalopholis cruentata (Lacepède, 1802) - Graysby	1
Mycteroperca phenax Jordan & Swain, 1884 - Scamp	5
Scorpaeniformes	2
Scorpaenidae	2
Pterois volitans (Linnaeus, 1758) - Lionfish	2
Chordata - Vertebrate	X
Actinopterygii	X
Beryciformes	X
Holocentridae	X
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	X
Perciformes	X
Acanthuridae	X
<i>Acanthurus coeruleus</i> Bloch & Schneider, 1801 - Blue Tang	X
<i>Acanthurus tractus</i> Poey, 1860 - Ocean Surgeonfish	X
Blenniidae	X
<i>Parablennius marmoratus</i> (Poey, 1876) - Seaweed blenny	X
Carangidae	X
<i>Seriola rivoliana</i> Valenciennes, 1833 - Almaco Jack	X
Chaetodontidae	X
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	X
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	X
Gobiidae	X
<i>Coryphopterus personatus</i> (Jordan & Thompson, 1905) - Masked Goby	X
Haemulidae	X
<i>Anisotremus virginicus</i> (Linnaeus, 1758) - Porkfish	X
<i>Haemulon album</i> Cuvier, 1830 - White Margate	X
Labridae	X
<i>Bodianus rufus</i> (Linnaeus, 1758) - Spanish Hogfish	X

Dive Site: Florida, Tortugas, Deep Patch Reef, Goliath Grouper Hole, Outside FKNMS, Block #66, Site FK-17, ROV 19-17, UNCW 789; 20-VIII-19-2

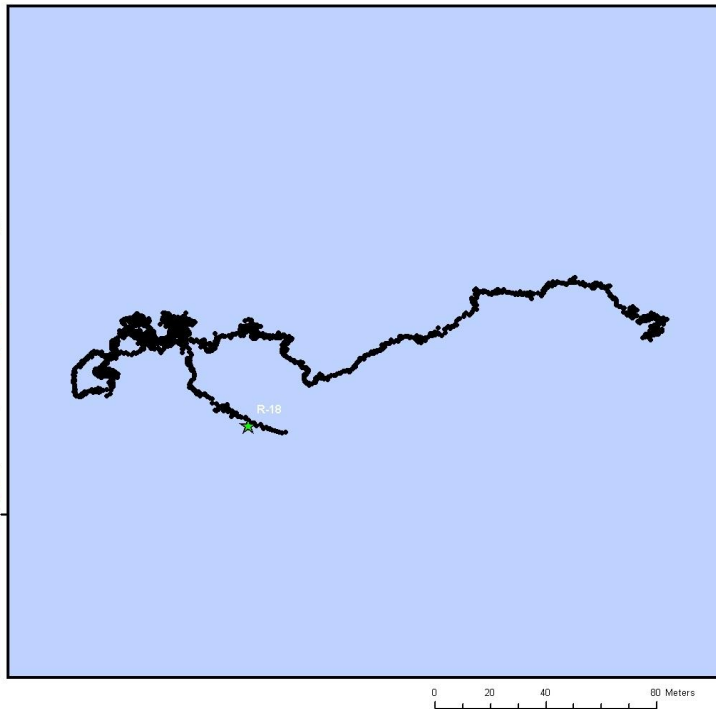
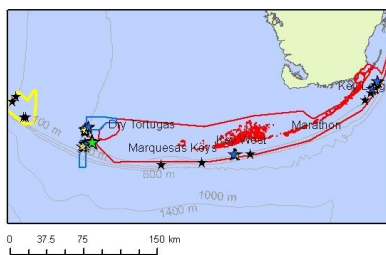
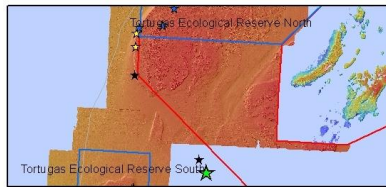
<i>Halichoeres bivittatus</i> (Bloch, 1791) - Slippery Dick	X
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	X
<i>Thalassoma bifasciatum</i> (Bloch, 1791) - Bluehead	X
Lutjanidae	X
<i>Lutjanus griseus</i> (Linnaeus, 1758) - Grey Snapper	X
Pomacanthidae	X
<i>Pomacanthus arcuatus</i> (Linnaeus, 1758) - Gray Angelfish	X
Pomacentridae	X
<i>Chromis cyanea</i> (Poey, 1860) - Blue Chromis	X
<i>Chromis multilineata</i> (Guichenot, 1853) - Brown Chromis	X
<i>Chromis scotti</i> Emery, 1968 - Purple Reeffish	X
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damselfish	X
<i>Stegastes variabilis</i> (Castelnau, 1855) - Cocoa Damselfish	X
Scaridae	X
<i>Scarus</i> sp. - Parrotfish	X
<i>Scarus iseri</i> (Bloch, 1789) - Striped Parrotfish	X
<i>Sparisoma aurofrenatum</i> (Valenciennes, 1840) - Redband Parrotfish	X
Serranidae	X
<i>Hypoplectrus unicolor</i> (Walbaum, 1792) - Butter Hamlet	X
<i>Serranus tigrinus</i> (Bloch, 1790) - Harlequin Bass	X
<i>Serranus tortugarum</i> Longley, 1935 - Chalk Bass	X
Tetraodontiformes	X
Tetraodontidae	X
<i>Canthigaster rostrata</i> (Bloch, 1786) - Sharpnose Puffer	X
Elasmobranchii	X
Orectolobiformes	X
Ginglymostomatidae	X
<i>Ginglymostoma cirratum</i> (Bonnaterre, 1788) - Nurse Shark	X
Grand Total	X

Dive Site: Florida, Tortugas, Deep Patch Reef, Outside FKNMS, Block 68, Site FK-18, ROV 19-18, UNCW 790; 20-VIII-19-3

General Location and Dive Track:

Florida, Tortugas, Deep Patch Reef, Outside FKNMS, Block 68, Site FK-18, ROV 19-18, UNCW 790

- ★ R-18
- DiveTracks
- ★ Scuba
- ★ Tech Dive
- ★ ROV Dives
- Pulley Ridge
- TER
- FKNMS
- SPA



Site Overview:

Project: 2019 CIOERT Cruise
Vessel: R/V Walton Smith
Principal Investigator: John Reed
PI Contact Info: 5600 U.S. 1, North, Fort Pierce, FL 34946

Scientific Observers: John Reed, Stephanie Farrington, Shirley Pomponi, M. Dennis Hanisak, Jason White, Don Liberatore, Megan Conkling, Eric Glidden, Alexis Sturm, Ian Combs, Katherine Beckett

Ship Position System: DGPS
Data Management: Access Database
Report Analyst: John Reed or Stephanie Farrington
Date Compiled: 10/6/2021

Dive Overview:

Date of Dive: 8/20/2019
ROV: Mohawk ROV
ROV Navigation: TrackLink
ROV Sensors: Temperature (°C), Salinity (PSU), pH, Conductivity, Depth (m)

Purpose: ROV image transects and collections

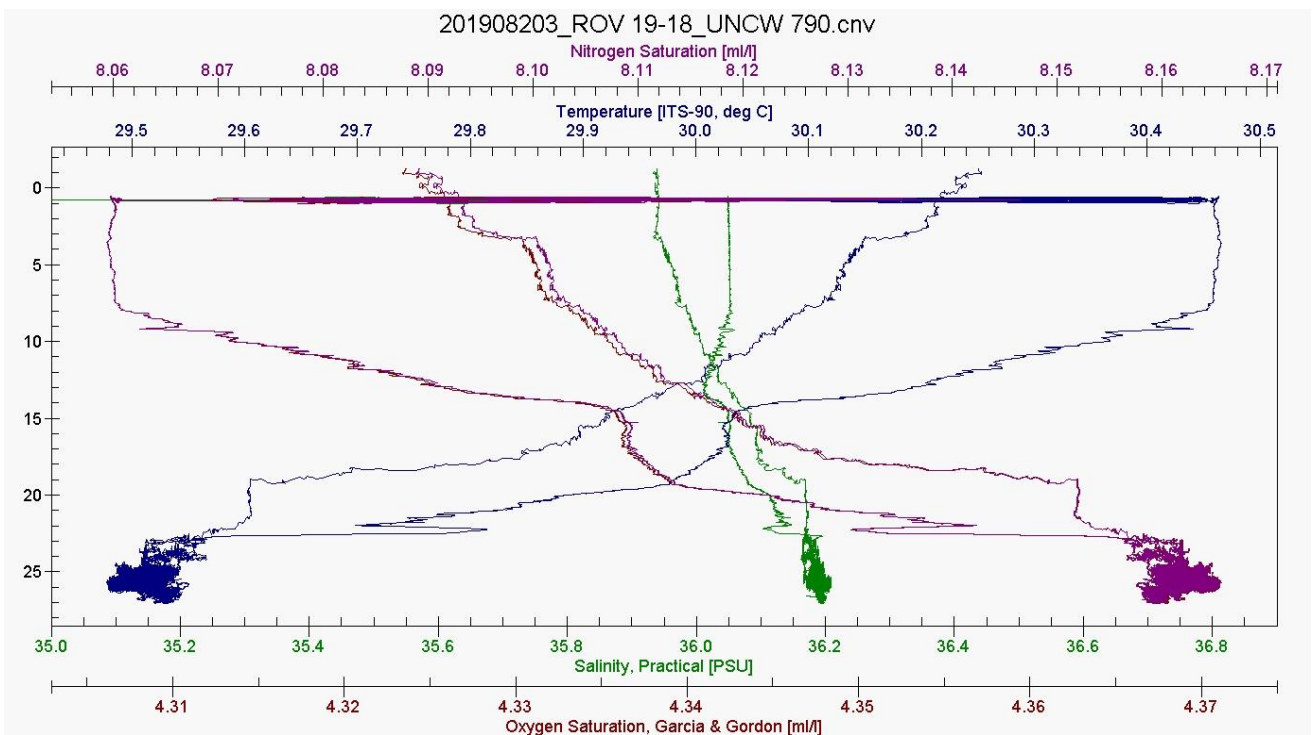
Digital Photos: 296
Distance (km): 0.4
Sonar Data: None Available
DVD:
Hard Drive:

Dive Site: Florida, Tortugas, Deep Patch Reef, Outside FKNMS, Block 68, Site FK-18, ROV 19-18, UNCW 790; 20-VIII-19-3

Dive Data:

Minimum Bottom Depth (m): 23.9	Total Transect Length (km): 0.440
Maximum Bottom Depth (m): 27.2	Surface Current (kn): 0.9
On Bottom (Time- GMT): 15:05	On Bottom (Lat/Long): 24.5364°N; -83.0296°W
Off Bottom (Time- GMT): 17:04	Off Bottom (Lat/Long): 24.5367°N; -83.0283°W
Physical (bottom); Temp (°C): 29.5	Salinity: 36.19 Visibility (ft): Current (kn): N/A

Physical Environment:



Temperature, Salinity and Depth were collected with a Sea-Bird CTD attached to the ROV (recording descent, bottom and ascent). The ranges of the bottom data recorded during ROV 19-18 are as follows: Depth Maximum: 27 m, Temperature: 29.5-30.5 °C, Salinity: 35.9-36.2 PSU, and Oxygen Saturation: 4.3-4.4 ml/l.

Dive Site: Florida, Tortugas, Deep Patch Reef, Outside FKNMS, Block 68, Site FK-18, ROV 19-18, UNCW 790; 20-VIII-19-3

Dive Imagery:



Figure 1: 24°32.2036'N;83°1.7908'W: -26.6 m
Montastraea cavernosa



Figure 2: 24°32.2011'N;83°1.7921'W: -26.6 m
Siderastrea coral, *Xestospongia muta* (left), and
Geodia neptuni (right)



Figure 3: 24°32.2009'N;83°1.7433'W: -26.9 m
Geodia neptuni - Loggerhead sponge



Figure 4: 24°32.196'N;83°1.7666'W: -26.4 m
Montastraea cavernosa



Figure 5: 24°32.2107'N;83°1.7189'W: -27 m
Xestospongia muta



Figure 6: 24°32.2009'N;83°1.7973'W: -26.7 m
Desmapsama anchorata, over a *Xestospongia muta*

Dive Site: Florida, Tortugas, Deep Patch Reef, Outside FKNMS, Block 68, Site FK-18, ROV 19-18, UNCW 790; 20-VIII-19-3

Dive Notes:

Objectives, Site Description, Habitat, Fauna:

Site/Objectives:

Site #- 20-VIII-19-3; Tortugas, deep patch reef, outside FKNMS, Block #68, Outside FKNMS, Block 68, Site FK-18, ROV 19-18, UNCW 790; 24- 27 m

Objectives- Previous dives by Reed et al., 2017 Pulley Ridge project, with point count photo transects in 2014. Objectives of this dive are to collect and document with video and digital still photos of samples of macrobiota for taxonomy, genetics, cell culture and biomedical research; documentation of coral disease or bleaching.

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. Coral, sponge and algal data were recorded in separate Access databases which were compiled with the benthic database. A Fastcat 49 CTD on the ROV continuously recorded, temperature, depth, conductivity, and salinity. ROV collection skid was used with 5-function manipulator to collect samples.

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, strobe on, 1/250th sec, auto focus, white balance- fish mode. Both cameras had 10-cm parallel lasers for scale (green- still; red- video). Non-quantitative photos for habitat and species identifications were logged. Screen grabs were made from High-Def video with time/date stamp as filenames and also logged.

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

Depth range: 25-24.4 m

Florida, Gulf of Mexico, TER Block 68, low-moderate hard bottom and patch reefs, 25 m; outside TER and FKNMS

Weather- Partly cloudy, seas: 1-3 ft from SE, wind 8.4 kn from 121.4, air- 29.94 C, surface water- 30.75 C, salinity- 36.24 PSU, surface current 0.9 kn from SE, bottom current from

3:00 PM- Launch

3:04 PM- bottom in sight

3:04 PM- On bottom; sediment with scattered hardbottom, 26.7m depth, 70% biota cover, dominated by Dictyota and other alga, with sponges (*Agelas clathrodes*, *Niphates digitalis*, *Callyspongia placifera*, *Amphimedon compressa*, *Iotrochota birotulata*, *Aiolochoxia crassa*) and gorgonians (*Antillologorgia*, Plexaurids, *Pterogorgia anceps* dense); algae- *Dictyota*, *Caulerpa*, dense cyanobacteria all over sediment. Varies from pavement with sediment veneer and cobble to ½ m relief rocks and ledges; dominated by *Antillologorgia*, Plexaurids, sponges, *Montastraea cavernosa*, *Siderastrea siderea*, *Meandrina meandrites*

3:12 PM- Sample 001, *Amphimedon compressa*, red rope 30 cm piece, in bin 2

3:18 PM- Sample 002, *Niphates erecta*, lavender rope, 15 cm piece, in bin 2

3:22 PM- rocks have increased in size, and coral cover is increasing, MCAV dominant

3:24 PM- Sample 003, *Iotrochota birotulata*, yellow and black rope sponge 15 cm piece, in bin 1

3:27 PM- Sample 004, *Amphimedon compressa*, red rope 20 cm

30 cm and 10 cm *Orbicella faveolata*

3:37 PM- Sample 005, *Niphates erecta*, lavender rope, had some tunicate encrusting, 15 cm in bin 2

Dive Site: Florida, Tortugas, Deep Patch Reef, Outside FKNMS, Block 68, Site FK-18, ROV 19-18, UNCW 790; 20-VIII-19-3

3:42 PM- We are now on rock ledge, low relief but good HB cover; patch reef interspersed with sand
3:44 PM- dragged by the ship
3:48 PM- dragging continues....
3:50 PM- Sample 006, *Amphimedon compressa* 10 cm tall, bin 2
3:59 PM- bleachy sickly MCAV
4:02 PM- still patchy HB covered with biota
4:03 PM- MCAV 15 cm, not looking so good, covered in sediment and paled
4:04 PM- Sample 007, *Iotrochota* yellow black sponge, 10 cm, in bin 1
4:17 PM- heading E, now flatter sediment with some rubble
4:21 PM- back on a rock ridge, low relief and slope but high rugosity; high
4:24 PM- Sample 008, *Iotrochota birotulata* 25 cm piece, yellow and black in bin 1
4:34 PM- there are a lot of indicators of a stressed environment here- *Cliona* growing over coral, other sponges that are indicators
4:54 PM- Sample 009, *Axinella* sp, 10 cm bushy orange, in B2
5:03 PM- Sample 010, Cyanobacteria in S2 & S3 (microscope shows it to be *Lyngbya*)
5:04 PM- End Dive, off bottom

Dive Site: Florida, Tortugas, Deep Patch Reef, Outside FKNMS, Block 68, Site FK-18, ROV 19-18, UNCW 790; 20-VIII-19-3

CPCe Percent Cover Analysis:

CPCe Analysis was not completed for this dive.

Dive Site: Florida, Tortugas, Deep Patch Reef, Outside FKNMS, Block 68, Site FK-18, ROV 19-18, UNCW 790; 20-VIII-19-3

Percent Cover of Benthic Macro-Biota and Substrate:

Table 1. P/A = Presence/Absence from visual sightings during the dive, Sam = Samples (number collected) of benthic macro-biota and substrate from ROV 19-18.

Taxa	ROV 19-18	
	P/A	Sam.
Biota	X	10
Algae	X	1
Algae- unid. macroalgae	X	
Cyanobacteria	X	1
Chlorophyta	X	
<i>Halimeda</i> sp.	X	
<i>Udotea</i> sp.	X	
Ochrophyta	X	
<i>Dictyota</i> sp.	X	
<i>Lobophora</i> sp.	X	
<i>Sargassum</i> sp.	X	
Rhodophyta	X	
Corallinophycidae	X	
Porifera	X	9
Porifera	X	9
Demospongiae	X	9
<i>Agelas citrina</i> Gotera & Alcolado, 1987	X	
<i>Agelas clathrodes</i> (Schmidt, 1870)	X	
<i>Agelas dispar</i> Duchassaing & Michelotti, 1864	X	
<i>Agelas sventres</i> Lehnert & van Soest, 1996	X	
<i>Agelas tubulata</i> Lehnert & van Soest, 1996	X	
<i>Agelas wiedenmayeri</i> Alcolado, 1984	X	
<i>Aiolochoxia crassa</i> (Hyatt, 1875)	X	
<i>Amphimedon compressa</i> Duchassaing & Michelotti, 1864	X	3
<i>Aplysina cauliformis</i> (Carter, 1882)	X	
<i>Aplysina cf. fulva</i> (Pallas, 1766)	X	
<i>Aplysina lacunosa</i> (Lamarck, 1814)	X	
<i>Axinella</i> sp.		1
Axinellidae	X	
<i>Callyspongia (Cladochalina) aculeata</i> (Linnaeus, 1759)	X	
<i>Callyspongia (Cladochalina) plicifera</i> (Lamarck, 1814)	X	
<i>Cliona delitrix</i> Pang, 1973	X	
<i>Cliona varians</i> (Duchassaing & Michelotti, 1864)	X	
<i>Cribrochalina vasculum</i> (Lamarck, 1814)	X	
<i>Desmapsamma anchorata</i> (Carter, 1882)	X	

Dive Site: Florida, Tortugas, Deep Patch Reef, Outside FKNMS, Block 68, Site FK-18, ROV 19-18, UNCW 790; 20-VIII-19-3

<i>Dragmacidon reticulatum</i> (Ridley & Dendy, 1886)	X	
<i>Dysidea etheria</i> Laubenfels, 1936	X	
<i>Geodia neptuni</i> (Sollas, 1886)	X	
<i>Iotrochota birotulata</i> (Higgin, 1877)	X	3
<i>Ircinia campana</i> (Lamarck, 1814)	X	
<i>Ircinia strobilina</i> (Lamarck, 1816)	X	
<i>Niphates amorpha</i> Van Soest, 1980	X	
<i>Niphates digitalis</i> (Lamarck, 1814)	X	
<i>Niphates erecta</i> Duchassaing & Michelotti, 1864	X	2
Niphatidae	X	
<i>Ptilocaulis walpersii</i> (Duchassaing & Michelotti, 1864)	X	
<i>Sphaciospongia vesparium</i> (Lamarck, 1815)	X	
<i>Spirastrella coccinea</i> (Duchassaing & Michelotti, 1864)	X	
<i>Spirastrella hartmani</i> Boury-Esnault, Klautau, Bézac, Wulff & Solé-Cava, 1999	X	
<i>Verongula rigida</i> (Esper, 1794)	X	
<i>Xestospongia muta</i> (Schmidt, 1870)	X	
Alcyonacea - gorgonian	X	
Cnidaria- Anthozoa	X	
Alcyonacea - gorgonian	X	
<i>Antillologorgia</i> sp.	X	
<i>Ellisella elongata</i> (Pallas, 1766)	X	
<i>Eunicea</i> sp.	X	
<i>Pseudoplexaura</i> sp.	X	
Coral- Scleractinia	X	
Cnidaria- Anthozoa	X	
Coral- Scleractinia	X	
<i>Agaricia agaricites</i> (Linnaeus, 1758)	X	
<i>Meandrina meandrites</i> (Linnaeus, 1758)	X	
<i>Montastraea cavernosa</i> (Linnaeus, 1767)	X	
<i>Mycetophyllia</i> sp.	X	
<i>Orbicella faveolata</i> (Ellis & Solander, 1786)	X	
<i>Porites astreoides</i> Lamarck, 1816	X	
<i>Siderastrea siderea</i> (Ellis & Solander, 1786)	X	
<i>Stephanocoenia intersepta</i> (Lamarck, 1836)	X	
Other	X	
Arthropoda	X	
Crustacea	X	
<i>Panulirus argus</i> (Latreille, 1804)	X	
Cnidaria- Anthozoa	X	
Anthozoa - Non Coral	X	
Cnidaria	X	

Dive Site: Florida, Tortugas, Deep Patch Reef, Outside FKNMS, Block 68, Site FK-18, ROV 19-18, UNCW 790; 20-VIII-19-3

Echinodermata	X	
Echinoidea	X	
<i>Diadema antillarum</i> Philippi, 1845	X	
Chordata	X	
Chordata - Invertebrate	X	
Ascidiacea- unidentified	X	
<i>Eudistoma</i> sp.	X	
Human debris	X	
Human debris- other	X	
Grand Total	X	10

Dive Site: Florida, Tortugas, Deep Patch Reef, Outside FKNMS, Block 68, Site FK-18, ROV 19-18, UNCW 790; 20-VIII-19-3

Density of Fish:

Table 2. Counts of commercial/recreational fish and visual sightings (Presence/Absence) of non-commercial fish from video transects at dive site ROV 19-18.

Status/Class/Order/Family/Tax Name (authority)	ROV 19-18 No. or P/A
Target	2
Actinopterygii	2
Perciformes	2
Lutjanidae	1
<i>Ocyurus chrysurus</i> (Bloch, 1791) - Yellowtail Snapper	1
Serranidae	1
<i>Epinephelus morio</i> (Valenciennes, 1828) - Red Grouper	1
Chordata - Vertebrate	X
Actinopterygii	X
Aulopiformes	X
Synodontidae	X
<i>Synodus intermedius</i> (Spix & Agassiz, 1829) - Sand Diver	X
Perciformes	X
Acanthuridae	X
<i>Acanthurus coeruleus</i> Bloch & Schneider, 1801 - Blue Tang	X
<i>Acanthurus tractus</i> Poey, 1860 - Ocean Surgeonfish	X
Apogonidae	X
<i>Apogon binotatus</i> (Poey, 1867) - Barred Cardinalfish	X
Carangidae	X
<i>Caranx ruber</i> (Bloch, 1793) - Bar Jack	X
Chaetodontidae	X
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	X
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	X
Gobiidae	X
<i>Coryphopterus punctipectophorus</i> Springer, 1960 - Spotted Goby	X
<i>Coryphopterus</i> sp. - Goby	X
<i>Elacatinus oceanops</i> Jordan, 1904 - Neon Goby	X
Haemulidae	X
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	X
Labridae	X
<i>Halichoeres bivittatus</i> (Bloch, 1791) - Slippery Dick	X
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	X
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	X
<i>Thalassoma bifasciatum</i> (Bloch, 1791) - Bluehead	X
Mullidae	X

Dive Site: Florida, Tortugas, Deep Patch Reef, Outside FKNMS, Block 68, Site FK-18, ROV 19-18, UNCW 790; 20-VIII-19-3

<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	X
Opistognathidae	X
<i>Opistognathus</i> sp. - Jawfish	X
Pomacanthidae	X
<i>Holacanthus bermudensis</i> Goode, 1876 - Blue Angelfish	X
<i>Holacanthus ciliaris</i> (Linnaeus, 1758) - Queen Angelfish	X
<i>Pomacanthus arcuatus</i> (Linnaeus, 1758) - Gray Angelfish	X
Pomacentridae	X
<i>Chromis cyanea</i> (Poey, 1860) - Blue Chromis	X
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reef fish	X
<i>Chromis multilineata</i> (Guichenot, 1853) - Brown Chromis	X
<i>Chromis scotti</i> Emery, 1968 - Purple Reef fish	X
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damselfish	X
<i>Stegastes variabilis</i> (Castelnau, 1855) - Cocoa Damselfish	X
Priacanthidae	X
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	X
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye	X
Scaridae	X
<i>Cryptotomus roseus</i> Cope, 1871 - Bluelip Parrotfish	X
<i>Scarus iseri</i> (Bloch, 1789) - Striped Parrotfish	X
<i>Sparisoma atomarium</i> (Poey, 1861) - Greenblotch Parrotfish	X
Serranidae	X
<i>Hypoplectrus unicolor</i> (Walbaum, 1792) - Butter Hamlet	X
<i>Serranus tigrinus</i> (Bloch, 1790) - Harlequin Bass	X
Sparidae	X
<i>Calamus calamus</i> (Valenciennes, 1830) - Saucereye Porgy	X
Tetraodontiformes	X
Tetraodontidae	X
<i>Canthigaster rostrata</i> (Bloch, 1786) - Sharpnose Puffer	X

APPENDIX 2

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 HBOI CIOERT cruise to the Florida Keys National Marine Sanctuary and Tortugas Ecological Reserves. Still images captured from the photo transects were analyzed using CPCe[®] software to determine relative percent cover of benthic biota and habitat types.

Group/Phylum/Class/Taxa - Authority	ROV 19-01	ROV 19-02	ROV 19-03	ROV 19-04	ROV 19-05	ROV 19-06	ROV 19-07	ROV 19-09	ROV 19-10	Total
Biota	57.77%	58.77%	68.71%	45.82%	69.58%	7.28%	47.17%	5.65%	8.24%	42.504%
Algae	23.82%	37.40%	14.91%	18.48%	53.42%	0.25%	6.91%	0.05%		18.475%
Algae	3.47%	6.72%	1.56%	4.86%	5.75%		1.10%			2.818%
Algae- unid. macroalgae	3.47%	6.72%	1.56%	4.86%	5.75%		1.10%			2.818%
Cyanobacteria	1.43%	2.33%	0.92%	1.37%	0.03%		1.21%			0.837%
Chlorophyta	4.62%	3.03%	0.29%	2.56%	0.82%					1.415%
<i>Caulerpa chemnitzia</i> (Esper) J.V.Lamouroux, 1809		0.03%			0.03%					0.008%
<i>Caulerpa racemosa</i> (Forsskål) J.Agardh, 1873	0.03%	0.17%			0.26%					0.054%
Chlorophyta	0.09%	1.06%	0.06%	0.29%	0.20%					0.205%
Chlorophyta- Turf Algae	0.03%									0.004%
<i>Codium</i> sp.					0.03%					0.004%
<i>Halimeda</i> sp.	4.44%	0.57%	0.22%	2.15%	0.30%					0.981%
<i>Rhipocephalus phoenix</i> (J.Ellis & Solander) Kützing, 1843		0.20%								0.023%
<i>Udotea cyathiformis</i> Decaisne, 1842		1.00%		0.09%						0.128%
<i>Udotea dixonii</i> D.S.Littler & M.M.Littler, 1990				0.03%						0.004%
<i>Udotea</i> sp.	0.03%									0.004%
Ochrophyta	11.01%	22.76%	9.34%	6.66%	45.04%	0.19%	2.47%	0.05%		11.580%
<i>Dictyopteris justii</i> J.V.Lamouroux, 1809					5.72%					0.674%
<i>Dictyota</i> sp.	6.85%	13.94%	4.43%	3.87%	11.50%		1.59%			5.019%
<i>Lobophora</i> sp.	1.19%	1.73%	3.54%	0.06%	2.96%					1.139%
Phaeophyceae	2.65%	2.46%	1.37%	1.43%	11.17%		0.88%			2.360%
<i>Sargassum</i> sp.	0.03%	0.07%		0.17%	0.49%	0.19%		0.05%		0.109%
<i>Spatoglossum schroederi</i> (C.Agardh) Kützing, 1859	0.30%	4.56%		1.13%	13.21%					2.279%
Rhodophyta	3.29%	2.56%	2.80%	3.03%	1.77%	0.06%	2.14%			1.825%
<i>Amphiroa rigida</i> J.V.Lamouroux, 1816		0.37%		0.06%	0.03%					0.054%
<i>Amphiroa</i> sp.					0.03%					0.004%
Corallinophycidae	2.49%	1.46%	2.01%	2.44%	1.45%	0.06%	1.10%			1.310%
Rhodophyta	0.79%	0.73%	0.80%	0.52%	0.26%		1.04%			0.457%
Porifera	12.56%	14.71%	16.44%	8.76%	11.96%	0.06%	7.62%	0.14%	2.86%	8.922%
Demospongiae	12.56%	14.71%	16.25%	8.41%	11.96%	0.06%	7.62%	0.14%	2.86%	8.852%
<i>Acanthella cubensis</i> (Alcolado, 1984)	0.09%	0.03%								0.016%
<i>Acanthella vaceleti</i> van Soest & Stentoft, 1988				0.09%						0.012%
<i>Agelas citrina</i> Gotera & Alcolado, 1987		1.46%			0.69%					0.252%
<i>Agelas clathrodes</i> (Schmidt, 1870)	0.03%	0.03%	0.03%		0.03%					0.016%
<i>Agelas conifera</i> (Schmidt, 1870)	0.09%	0.03%	0.99%	0.17%	0.30%					0.194%
<i>Agelas dispar</i> Duchassaing & Michelotti, 1864		0.03%		0.03%	0.03%					0.012%
<i>Agelas sceptrum</i> (Lamarck, 1815)							0.05%			0.004%
<i>Agelas</i> sp.	0.06%	0.10%	0.25%	0.03%	0.03%					0.058%
<i>Agelas sventres</i> Lehnert & van Soest, 1996		0.03%	0.03%	0.12%	0.03%					0.027%
<i>Agelas tubulata</i> Lehnert & van Soest, 1996		0.10%	0.25%	0.03%	0.07%					0.054%
<i>Agelas wiedenmayeri</i> Alcolado, 1984		0.63%	0.10%		0.03%					0.089%
<i>Aiolochroia crassa</i> (Hyatt, 1875)	0.15%		0.22%	0.03%	0.07%		0.16%			0.070%
<i>Aiolochroia</i> sp.	0.03%									0.004%
<i>Amphimedon compressa</i> Duchassaing & Michelotti, 1864	0.58%	0.27%	0.22%	0.32%	0.46%		0.38%			0.256%
<i>Amphimedon</i> sp.- PR-01				0.03%	0.03%					0.008%
<i>Amphimedon</i> sp.	0.06%		0.06%	0.29%	0.03%					0.058%
<i>Aplysina cauliformis</i> (Carter, 1882)	0.64%	0.73%	1.63%	0.23%	1.28%		0.33%			0.570%
<i>Aplysina</i> sp.				0.06%						0.008%
<i>Batzella rubra</i> (Alcolado, 1984)	0.15%		0.10%	0.06%	0.07%					0.047%
<i>Callyspongia</i> (<i>Callyspongia</i>) <i>fallax</i> Duchassaing & Michelotti, 1864	0.21%				0.07%					0.035%
<i>Callyspongia</i> (<i>Cladochalina</i>) <i>aculeata</i> (Linnaeus, 1759)	0.06%		0.29%	0.03%						0.047%
<i>Callyspongia</i> (<i>Cladochalina</i>) <i>alcoladoi</i> Busutil, García-Hernández, Díaz & Pomponi, 2018			0.03%							0.004%
<i>Callyspongia</i> (<i>Cladochalina</i>) <i>plicifera</i> (Lamarck, 1814)	0.03%		0.03%		0.03%					0.012%
<i>Cinachyrella kuekenthalii</i> (Uliczka, 1929)			0.38%							0.047%
<i>Clathria</i> sp.				0.06%						0.008%
<i>Cliona delitrix</i> Pang, 1973	0.03%		0.10%							0.016%
<i>Cliona varians</i> (Duchassaing & Michelotti, 1864)	0.24%	0.10%			0.13%		0.05%			0.062%
Demospongiae	3.19%	3.96%	4.33%	3.52%	2.43%	0.06%	1.87%	0.14%	1.51%	2.550%
<i>Desmapsamma anchorata</i> (Carter, 1882)	0.03%									0.004%
Dictyoceratida			0.03%		0.03%					0.008%
<i>Discodermia dissoluta</i> Schmidt, 1880				0.03%						0.004%
<i>Dragmacidon</i> sp.	0.03%									0.004%
<i>Dysidea etheria</i> Laubenfels, 1936	0.06%			0.06%	0.03%					0.019%
<i>Dysidea lehnerti</i> Van Soest & Hooper, 2020	0.06%									0.008%
<i>Geodia neptuni</i> (Sollas, 1886)	0.06%	0.07%			0.39%		0.60%			0.105%
<i>Hymedesia</i> sp.									0.07%	0.012%
<i>Iotrochota birotulata</i> (Higgin, 1877)					0.20%					0.023%
<i>Ircinia campana</i> (Lamarck, 1814)			0.03%							0.004%
<i>Ircinia</i> sp.	0.03%				0.03%		0.05%			0.012%
<i>Ircinia strobilina</i> (Lamarck, 1816)	0.03%									0.004%

Group/Phylum/Class/Taxa - Authority	ROV 19-01	ROV 19-02	ROV 19-03	ROV 19-04	ROV 19-05	ROV 19-06	ROV 19-07	ROV 19-09	ROV 19-10	Total
Microcionidae	0.03%									0.004%
<i>Mananchora arbuscula</i> (Duchassaing & Michelotti, 1864)	0.03%		0.06%	0.12%	0.07%		0.16%			0.047%
<i>Mycale (Arenochalina) laxissima</i> (Duchassaing & Michelotti, 1864)		0.03%								0.004%
<i>Mycale (Mycale) laevis</i> (Carter, 1882)	0.15%		0.10%		0.03%					0.035%
<i>Myrmekioderma rea</i> (Laubenfels, 1934)	0.12%		0.19%		0.13%					0.054%
<i>Neopetrosia ovata</i> Van Soest, Meesters & Becking, 2014	0.03%									0.004%
<i>Niphates alba</i> van Soest, 1980	0.30%	0.17%	0.25%	0.06%	0.30%					0.132%
<i>Niphates arenata</i> Rützler, Piantoni, van Soest & Díaz, 2014			0.06%							0.008%
<i>Niphates digitalis</i> (Lamarck, 1814)	0.55%	0.07%	0.67%	0.38%	0.36%		0.33%			0.275%
<i>Niphates erecta</i> Duchassaing & Michelotti, 1864	0.88%	0.30%	0.54%	0.76%	0.76%					0.403%
<i>Niphates</i> sp.	0.24%	0.20%	0.13%	0.03%						0.074%
<i>Oceanapia bartschi</i> (Laubenfels, 1934)	0.52%	0.07%			0.03%					0.078%
Petrosiidae	0.06%	0.10%	0.16%	0.12%	0.13%		0.05%			0.074%
<i>Phorbas amaranthus</i> Duchassaing & Michelotti, 1864	0.06%								0.14%	0.031%
Poecilosclerida									1.05%	0.174%
<i>Ptilocaulis</i> sp.			0.03%							0.004%
<i>Ptilocaulis walpersii</i> (Duchassaing & Michelotti, 1864)	0.03%	0.17%			0.07%					0.031%
<i>Rhizaxinella clava</i> (Schmidt, 1870)									0.09%	0.016%
<i>Scopalina ruetzleri</i> (Wiedenmayer, 1977)			0.06%							0.008%
<i>Smenospongia echina</i> (Laubenfels, 1934)			0.03%				0.11%			0.012%
<i>Sphecospongia vesparium</i> (Lamarck, 1815)		0.30%	0.06%		0.03%					0.047%
<i>Spirastrella coccinea</i> (Duchassaing & Michelotti, 1864)	0.76%	0.50%	1.59%	0.38%	0.30%		0.82%			0.492%
<i>Spirastrella hartmani</i> Boury-Esnault, Klautau, Bézac, Wulff & Sc	0.09%									0.012%
<i>Spirastrella</i> sp.	0.12%		0.03%							0.019%
<i>Stromatospongia</i> sp.			0.16%							0.019%
<i>Svenzea zeai</i> (Alvarez, van Soest & Rützler, 1998)			0.89%							0.109%
<i>Topsentia ophiraphidites</i> (Laubenfels, 1934)			0.19%		0.07%					0.031%
<i>Verongula</i> sp.			0.03%		0.03%					0.008%
<i>Verongula</i> sp. FK-01 ^M	0.06%		0.22%							0.035%
<i>Xestospongia muta</i> (Schmidt, 1870)	2.53%	5.22%	1.66%	1.40%	3.12%		2.63%			1.872%
<i>Xestospongia</i> sp.	0.03%				0.03%					0.008%
Homoscleromorpha			0.19%	0.35%						0.070%
<i>Plakinastrella onkodes</i> Uliczka, 1929			0.03%							0.004%
<i>Plakartia angulospiculatus</i> (Carter, 1879)			0.16%	0.35%						0.066%
Cnidaria- Hydrozoa	1.16%	0.40%	1.08%	1.66%	0.16%	4.45%	0.88%	1.84%	2.26%	1.434%
Hydrozoa	1.16%	0.40%	1.08%	1.66%	0.16%	4.45%	0.88%	1.84%	2.26%	1.434%
<i>Gymnangium</i> sp.	0.21%	0.17%								0.047%
Hydroidolina	0.79%	0.20%	0.29%	1.66%	0.16%	4.45%	0.82%	1.84%	2.26%	1.263%
<i>Millepora alcicornis</i> Linnaeus, 1758	0.15%	0.03%	0.80%				0.05%			0.124%
Cnidaria- Anthozoa	15.58%	4.46%	33.37%	14.52%	1.87%	0.94%	18.21%	2.30%	1.68%	10.534%
Alcyonacea - Alcyoniina	0.03%						0.05%	0.18%		0.023%
Alcyoniina	0.03%						0.05%	0.14%		0.019%
<i>Nidalia</i> sp.								0.05%		0.004%
Alcyonacea - gorgonian	12.69%	3.86%	28.87%	13.91%	1.25%		10.81%	0.32%	1.05%	8.542%
Alcyonacea- gorgonian				0.06%				0.09%	0.05%	0.023%
<i>Antillogorgia bipinnata</i> (Verrill, 1864)	0.06%									0.008%
<i>Antillogorgia</i> sp.	5.48%	0.77%	16.16%	3.38%			0.11%			3.209%
<i>Carijoa riisei</i> (Duchassaing & Michelotti, 1860)			0.25%							0.031%
<i>Ellisella elongata</i> (Pallas, 1766)	0.18%	0.37%		0.06%	0.07%					0.081%
<i>Erythropodium caribaeorum</i> (Duchassaing & Michelotti, 1860)	1.31%	0.23%	9.27%	2.15%	0.79%		0.71%			1.752%
<i>Eunicea</i> sp.	0.03%	0.03%	0.51%	0.12%			0.82%			0.143%
<i>Iciligorgia schrammi</i> Duchassaing, 1870	3.47%		0.92%	0.52%						0.624%
<i>Muricea</i> sp.							0.11%			0.008%
<i>Nicella</i> sp.	0.03%	0.77%		0.12%						0.109%
Plexauridae	0.27%	0.33%	0.76%	2.71%	0.33%		0.82%			0.624%
<i>Pseudoplexaura</i> sp.	1.61%	1.16%	0.99%	4.77%	0.07%		8.23%			1.686%
<i>Pterogorgia</i> sp.		0.20%								0.023%
<i>Swiftia exserta</i> (Ellis & Solander, 1786)	0.24%			0.03%						0.035%
<i>Thesea grandiflora</i> Deichmann, 1936									0.98%	0.163%
<i>Thesea rubra</i> Deichmann, 1936								0.23%	0.02%	0.023%
Anthozoa - Non Coral					0.07%			0.09%	0.23%	0.054%
Actiniaria								0.09%		0.008%
<i>Condylactis gigantea</i> (Weinland, 1860)					0.03%					0.004%
Corallimorpharia									0.23%	0.039%
<i>Ricordea florida</i> Duchassaing & Michelotti, 1860					0.03%					0.004%
Antipatharia	0.06%		0.03%	0.09%		0.94%		1.56%		0.213%
Antipatharia	0.06%		0.03%			0.06%		0.09%		0.023%
<i>Antipathes furcata</i> Gray, 1857						0.82%		0.14%		0.062%
<i>Stichopathes luetkeni</i> Brook, 1889								0.97%		0.081%
<i>Stichopathes</i> sp.				0.09%		0.06%		0.37%		0.047%

Group/Phylum/Class/Taxa - Authority	ROV 19-01	ROV 19-02	ROV 19-03	ROV 19-04	ROV 19-05	ROV 19-06	ROV 19-07	ROV 19-09	ROV 19-10	Total
Coral- Scleractinia	2.80%	0.60%	4.46%	0.52%	0.56%		7.35%	0.14%	0.40%	1.701%
<i>Agaricia agaricites</i> (Linnaeus, 1758)	0.15%	0.07%	0.99%	0.03%			0.16%			0.163%
<i>Agaricia amarcki</i> Milne Edwards & Haime, 1851	1.67%		0.13%		0.30%		1.54%			0.372%
<i>Agaricia</i> sp.	0.03%						0.22%			0.019%
<i>Helioseris cucullata</i> (Ellis & Solander, 1786)	0.03%									0.004%
<i>Madracis decactis</i> (Lyman, 1859)	0.12%		0.10%				0.22%			0.043%
<i>Madracis senaria</i> Wells, 1973			0.06%	0.03%			2.80%			0.209%
<i>Meandrina meandrites</i> (Linnaeus, 1758)							0.05%			0.004%
<i>Montastraea cavernosa</i> (Linnaeus, 1767)	0.27%	0.40%	1.02%	0.20%	0.26%		0.05%			0.267%
<i>Mycetophyllia aliciae</i> Wells, 1973	0.12%			0.06%						0.023%
<i>Orbicella faveolata</i> (Ellis & Solander, 1786)	0.12%		1.53%							0.202%
Scleractinia- unid solitary				0.03%			0.05%	0.14%	0.40%	0.085%
<i>Siderastrea siderea</i> (Ellis & Solander, 1786)	0.03%		0.41%				1.04%			0.128%
<i>Stephanocoenia intersepta</i> (Lamarck, 1836)	0.24%	0.13%	0.22%	0.17%			1.21%			0.182%
Mollusca				0.12%						0.016%
Bivalvia				0.03%						0.004%
<i>Spondylus</i> sp.				0.03%						0.004%
Gastropoda				0.09%						0.012%
<i>Tenagodus</i> sp.				0.09%						0.012%
Annelida		0.07%	0.13%	0.06%		0.06%		0.05%		0.039%
Annelida								0.05%		0.004%
Polychaeta		0.07%	0.13%	0.06%		0.06%				0.035%
Sabellidae		0.07%	0.13%	0.06%		0.06%				0.035%
Arthropoda	0.06%		0.03%					0.05%	0.09%	0.031%
Chelicerata								0.05%	0.02%	0.008%
<i>Anoplodactylus lentus</i> Wilson, 1878								0.05%	0.02%	0.008%
Crustacea	0.06%		0.03%						0.07%	0.023%
Anomura									0.05%	0.008%
<i>Stenorhynchus seticornis</i> (Herbst, 1788)	0.06%		0.03%						0.02%	0.016%
Bryozoa	0.03%		0.32%				0.22%			0.058%
Bryozoa	0.03%		0.32%				0.22%			0.058%
<i>Canda</i> sp.	0.03%		0.29%				0.22%			0.054%
Echinodermata								0.05%	0.42%	0.074%
Holothuroidea									0.02%	0.004%
Ophiuroidea								0.05%	0.40%	0.070%
<i>Asteropora (Asteropora) annulata</i> Örsted & Lütken in: Lütken, 1856								0.05%		0.004%
<i>Ophioderma devaneyi</i> Hendler & Miller, 1984									0.40%	0.066%
Chordata	0.88%	0.50%	0.80%	0.38%	1.15%	1.25%	0.38%		0.60%	0.659%
Chordata - Invertebrate	0.61%	0.17%	0.41%	0.23%	0.49%		0.11%			0.244%
Ascidacea- unidentified	0.06%	0.10%	0.41%	0.17%	0.23%		0.11%			0.128%
<i>Botryllus</i> sp.	0.09%	0.07%		0.06%	0.20%					0.050%
Didemnidae	0.09%				0.07%					0.019%
<i>Trididemnum solidum</i> (Van Name, 1902)	0.37%									0.047%
Fish	0.27%	0.33%	0.38%	0.15%	0.66%	1.25%	0.27%		0.60%	0.415%
Detritus	3.19%	0.53%	0.61%	0.87%	0.26%	0.06%	12.67%	1.15%	0.21%	1.721%
UNKNOWN	0.49%	0.70%	1.02%	0.99%	0.76%	0.19%	0.27%	0.05%	0.12%	0.543%
Human debris		0.23%	0.10%	0.06%	0.23%				0.81%	0.209%
Human debris		0.23%	0.10%	0.06%	0.23%				0.81%	0.209%
Human debris- Fishing Gear		0.13%	0.10%	0.06%	0.23%				0.72%	0.182%
Anchor line									0.07%	0.012%
Fish line/gear		0.13%	0.10%	0.06%					0.42%	0.105%
Line from lobster/crab pot					0.03%				0.02%	0.008%
Trap					0.20%					0.023%
Trawl net									0.21%	0.035%
Human debris- other		0.10%							0.09%	0.027%
Bare Hard Bottom Substrate	36.08%	32.41%	28.14%	46.78%	23.75%	40.40%	51.40%	7.90%	63.61%	38.218%
Bare Hard Bottom Substrate	36.08%	32.41%	28.14%	46.78%	23.75%	40.40%	51.40%	7.90%	63.61%	38.218%
Dead Coral			0.03%							0.004%
Bare dead coral plate			0.03%							0.004%
Hard bottom	36.08%	32.41%	28.11%	46.78%	23.75%	40.40%	51.40%	7.90%	63.61%	38.214%
Bare rock	34.90%	25.76%	28.11%	44.81%	19.94%	6.46%	51.34%	7.54%	61.28%	34.055%
Bare rubble/cobble	1.19%	6.66%		1.98%	3.81%	33.94%	0.05%	0.37%	2.33%	4.159%
Bare Soft Bottom Substrate	6.15%	8.59%	3.06%	7.33%	6.44%	52.32%	1.43%	86.44%	27.34%	19.068%
Grand Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

APPENDIX 3

Scleractinian Corals Documented at Mesophotic Coral Reef Sites

List of colonial, zooxanthellate Scleractinia documented at mesophotic coral reef dive sites (>30 m depths) during 2019 HBOI CIOERT cruise to the Florida Keys National Marine Sanctuary and Tortugas Ecological Reserves. All scleractinian corals that were identified from the visual video observations during the dives, as well as the CPCe ARA density data from the ROV photo transects are included. Taxonomy, coordinates, depth and dive number are provided for each coral colony.

Family	Taxonomy	Latitude	Longitude	Depth (m)	Dive	Source
-	Scleractinia- unid colonial	25.219198	-80.192966	-40.5	ROV 19-01	Density
-	Scleractinia- unid colonial	25.15497	-80.232976	-31.4	ROV 19-03	Density
-	Scleractinia- unid colonial	25.155055	-80.233022	-31	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.217214	-80.194151	-37.4	ROV 19-01	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.217622	-80.193986	-34.9	ROV 19-01	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.217628	-80.193972	-35.1	ROV 19-01	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.218081	-80.193674	-36.5	ROV 19-01	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.218123	-80.193666	-35.7	ROV 19-01	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.218201	-80.193633	-36.4	ROV 19-01	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.218288	-80.193631	-36.2	ROV 19-01	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.219188	-80.192962	-40.9	ROV 19-01	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.219181	-80.192973	-40.3	ROV 19-01	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.217214	-80.194151	-37.4	ROV 19-01	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.217622	-80.193986	-34.9	ROV 19-01	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.218201	-80.193633	-36.4	ROV 19-01	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.218287	-80.193624	-36	ROV 19-01	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.159412	-80.220206	-42.2	ROV 19-02	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.152597	-80.234789	-32.4	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.15264	-80.234627	-32.5	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.152708	-80.234501	-32.1	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.152792	-80.234418	-33.3	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.152834	-80.234377	-32.6	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.152835	-80.234341	-33.5	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.15286	-80.234286	-33.4	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.152941	-80.234033	-33.3	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.153039	-80.233889	-34.1	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.153236	-80.233792	-32.9	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.153385	-80.233719	-32.7	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.153387	-80.233739	-32.4	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.153496	-80.233533	-32.1	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.153501	-80.233522	-32.1	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.153639	-80.233357	-32	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.153644	-80.233369	-31.6	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.154781	-80.23297	-31.6	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.154911	-80.232947	-31.9	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.154916	-80.232971	-31.7	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.154952	-80.232961	-31.7	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.15497	-80.232976	-31.4	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.154992	-80.232961	-32.3	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.155	-80.233003	-31.2	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.155029	-80.233019	-30.9	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.155193	-80.233081	-31.6	ROV 19-03	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.152637	-80.234644	-32.8	ROV 19-03	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.152793	-80.234412	-33.2	ROV 19-03	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.152833	-80.234341	-33.2	ROV 19-03	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.152864	-80.234286	-33.7	ROV 19-03	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.153602	-80.233296	-34	ROV 19-03	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.153967	-80.232882	-32.1	ROV 19-03	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.154023	-80.23291	-31.9	ROV 19-03	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.154129	-80.233019	-32	ROV 19-03	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.154183	-80.233035	-32.3	ROV 19-03	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.154484	-80.232982	-33.6	ROV 19-03	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.155094	-80.233082	-32.8	ROV 19-03	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.155232	-80.233064	-33.2	ROV 19-03	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.155362	-80.232832	-32.4	ROV 19-03	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.1558	-80.232497	-31.1	ROV 19-03	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.155821	-80.232478	-31	ROV 19-03	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.15264	-80.234627	-32.5	ROV 19-03	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.152792	-80.234418	-33.3	ROV 19-03	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.152834	-80.234377	-32.6	ROV 19-03	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.15286	-80.234286	-33.4	ROV 19-03	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.152941	-80.234033	-33.3	ROV 19-03	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.153639	-80.233357	-32	ROV 19-03	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.153644	-80.233369	-31.6	ROV 19-03	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.154781	-80.23297	-31.6	ROV 19-03	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.154911	-80.232947	-31.9	ROV 19-03	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.154916	-80.232971	-31.7	ROV 19-03	Percent Cover

Family	Taxonomy	Latitude	Longitude	Depth (m)	Dive	Source
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.154952	-80.232961	-31.7	ROV 19-03	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.15497	-80.232976	-31.4	ROV 19-03	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.155029	-80.233019	-30.9	ROV 19-03	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.155193	-80.233081	-31.6	ROV 19-03	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.108658	-80.264178	-45.1	ROV 19-04	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.109072	-80.262209	-48.3	ROV 19-04	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	25.108658	-80.264178	-45.1	ROV 19-04	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	24.492595	-81.594392	-31.6	ROV 19-07	Density
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	24.492456	-81.593923	-34.7	ROV 19-07	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	24.492492	-81.593943	-34.6	ROV 19-07	Percent Cover
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	24.612068	-83.099595	-30.3	ROV 19-16	Live Observation
Agariciidae	Agaricia agaricites (Linnaeus, 1758)	24.615535	-83.100941	-33.9	ROV 19-16	Live Observation
Agariciidae	Agaricia fragilis Dana, 1848	25.218183	-80.193648	-36.6	ROV 19-01	Live Observation
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.21735	-80.194142	-38.4	ROV 19-01	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.217622	-80.193986	-34.9	ROV 19-01	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.217635	-80.193859	-37.4	ROV 19-01	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.217825	-80.193712	-37.3	ROV 19-01	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.217832	-80.193705	-37.4	ROV 19-01	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.217853	-80.193704	-37.3	ROV 19-01	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.217935	-80.193672	-37	ROV 19-01	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.217962	-80.193652	-36.6	ROV 19-01	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.218201	-80.193633	-36.4	ROV 19-01	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.218218	-80.193634	-36	ROV 19-01	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.218266	-80.193627	-36.1	ROV 19-01	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.218288	-80.193631	-36.2	ROV 19-01	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.218431	-80.193453	-37.4	ROV 19-01	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.219198	-80.192966	-40.5	ROV 19-01	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.219375	-80.192892	-40.9	ROV 19-01	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.219377	-80.192874	-41.2	ROV 19-01	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.217752	-80.193716	-37.7	ROV 19-01	Live Observation
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.217856	-80.193702	-37.3	ROV 19-01	Live Observation
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.218534	-80.193436	-36.9	ROV 19-01	Live Observation
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.218617	-80.193219	-40.6	ROV 19-01	Live Observation
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.219181	-80.192973	-40.3	ROV 19-01	Live Observation
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.219378	-80.192871	-41.3	ROV 19-01	Live Observation
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.21735	-80.194142	-38.4	ROV 19-01	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.217622	-80.193986	-34.9	ROV 19-01	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.217635	-80.193859	-37.4	ROV 19-01	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.217825	-80.193712	-37.3	ROV 19-01	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.217832	-80.193705	-37.4	ROV 19-01	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.217935	-80.193672	-37	ROV 19-01	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.217962	-80.193652	-36.6	ROV 19-01	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.218123	-80.193666	-35.7	ROV 19-01	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.218201	-80.193633	-36.4	ROV 19-01	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.218218	-80.193634	-36	ROV 19-01	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.218266	-80.193627	-36.1	ROV 19-01	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.218288	-80.193631	-36.2	ROV 19-01	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.218431	-80.193453	-37.4	ROV 19-01	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.219198	-80.192966	-40.5	ROV 19-01	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.219375	-80.192892	-40.9	ROV 19-01	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.157794	-80.220859	-45.8	ROV 19-02	Live Observation
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.155193	-80.233081	-31.6	ROV 19-03	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.152597	-80.234789	-32.4	ROV 19-03	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.155193	-80.233081	-31.6	ROV 19-03	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.036563	-80.320585	-42.9	ROV 19-05	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.036555	-80.320588	-42.8	ROV 19-05	Live Observation
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.036563	-80.320585	-42.9	ROV 19-05	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	25.037397	-80.320328	-43.5	ROV 19-05	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	24.492409	-81.594599	-32.8	ROV 19-07	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	24.492487	-81.593866	-34	ROV 19-07	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	24.492605	-81.594259	-31.5	ROV 19-07	Density
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	24.492481	-81.593874	-34	ROV 19-07	Live Observation
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	24.492594	-81.594247	-31.7	ROV 19-07	Live Observation
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	24.492487	-81.593866	-34	ROV 19-07	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	24.492605	-81.594259	-31.5	ROV 19-07	Percent Cover
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	24.612395	-83.09974	-32	ROV 19-16	Live Observation
Agariciidae	Agaricia lamarcki Milne Edwards & Haime, 1851	24.614204	-83.100374	-32.6	ROV 19-16	Live Observation

Family	Taxonomy	Latitude	Longitude	Depth (m)	Dive	Source
Agariciidae	Agaricia sp.	25.217622	-80.193986	-34.9	ROV 19-01	Density
Agariciidae	Agaricia sp.	25.217635	-80.193859	-37.4	ROV 19-01	Density
Agariciidae	Agaricia sp.	25.217832	-80.193705	-37.4	ROV 19-01	Density
Agariciidae	Agaricia sp.	25.217935	-80.193672	-37	ROV 19-01	Density
Agariciidae	Agaricia sp.	25.218081	-80.193674	-36.5	ROV 19-01	Density
Agariciidae	Agaricia sp.	25.218123	-80.193666	-35.7	ROV 19-01	Density
Agariciidae	Agaricia sp.	25.217962	-80.193652	-36.6	ROV 19-01	Live Observation
Agariciidae	Agaricia sp.	25.21835	-80.193672	-36.1	ROV 19-01	Live Observation
Agariciidae	Agaricia sp.	25.218534	-80.193436	-36.9	ROV 19-01	Live Observation
Agariciidae	Agaricia sp.	25.217622	-80.193986	-34.9	ROV 19-01	Percent Cover
Agariciidae	Agaricia sp.	25.159339	-80.219279	-47.7	ROV 19-02	Live Observation
Agariciidae	Agaricia sp.	25.155047	-80.23302	-30.7	ROV 19-03	Density
Agariciidae	Agaricia sp.	25.151888	-80.231667	-36.1	ROV 19-03	Live Observation
Agariciidae	Agaricia sp.	25.152549	-80.234077	-34.5	ROV 19-03	Live Observation
Agariciidae	Agaricia sp.	25.152562	-80.233882	-33.9	ROV 19-03	Live Observation
Agariciidae	Agaricia sp.	25.152578	-80.233692	-33.1	ROV 19-03	Live Observation
Agariciidae	Agaricia sp.	25.152616	-80.233213	-33.1	ROV 19-03	Live Observation
Agariciidae	Agaricia sp.	25.152833	-80.234341	-33.2	ROV 19-03	Live Observation
Agariciidae	Agaricia sp.	25.153236	-80.23379	-32.9	ROV 19-03	Live Observation
Agariciidae	Agaricia sp.	25.153395	-80.233721	-32.4	ROV 19-03	Live Observation
Agariciidae	Agaricia sp.	25.153466	-80.233678	-32.9	ROV 19-03	Live Observation
Agariciidae	Agaricia sp.	25.15362	-80.233072	-34	ROV 19-03	Live Observation
Agariciidae	Agaricia sp.	25.153923	-80.232888	-32.2	ROV 19-03	Live Observation
Agariciidae	Agaricia sp.	25.154801	-80.232971	-31.9	ROV 19-03	Live Observation
Agariciidae	Agaricia sp.	25.155529	-80.232698	-31.9	ROV 19-03	Live Observation
Agariciidae	Agaricia sp.	25.155703	-80.232534	-32.6	ROV 19-03	Live Observation
Agariciidae	Agaricia sp.	25.155849	-80.23261	-31.9	ROV 19-03	Live Observation
Agariciidae	Agaricia sp.	25.037199	-80.3205	-43.3	ROV 19-05	Live Observation
Agariciidae	Agaricia sp.	25.037626	-80.318559	-48.5	ROV 19-05	Live Observation
Agariciidae	Agaricia sp.	25.037646	-80.31852	-48.9	ROV 19-05	Live Observation
Agariciidae	Agaricia sp.	25.037716	-80.320359	-42.2	ROV 19-05	Live Observation
Agariciidae	Agaricia sp.	24.492456	-81.593923	-34.7	ROV 19-07	Live Observation
Agariciidae	Agaricia sp.	24.4925	-81.594146	-32.9	ROV 19-07	Live Observation
Agariciidae	Agaricia sp.	24.492409	-81.594599	-32.8	ROV 19-07	Percent Cover
Agariciidae	Agaricia sp.	24.492487	-81.593866	-34	ROV 19-07	Percent Cover
Agariciidae	Agaricia sp.	24.615324	-83.100902	-33.2	ROV 19-16	Live Observation
Agariciidae	Agaricia undata (Ellis & Solander, 1786)	25.035078	-80.320994	-44.3	ROV 19-05	Live Observation
Agariciidae	Helioseris cucullata (Ellis & Solander, 1786)	25.217962	-80.193652	-36.6	ROV 19-01	Density
Agariciidae	Helioseris cucullata (Ellis & Solander, 1786)	25.217962	-80.193652	-36.6	ROV 19-01	Percent Cover
Agariciidae	Helioseris cucullata (Ellis & Solander, 1786)	25.037628	-80.31853	-48.7	ROV 19-05	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.217303	-80.194167	-38	ROV 19-01	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.217622	-80.193986	-34.9	ROV 19-01	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.217853	-80.193704	-37.3	ROV 19-01	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.217874	-80.193698	-37.4	ROV 19-01	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.217935	-80.193672	-37	ROV 19-01	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.217962	-80.193652	-36.6	ROV 19-01	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.218081	-80.193674	-36.5	ROV 19-01	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.21816	-80.193656	-36.6	ROV 19-01	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.218288	-80.193631	-36.2	ROV 19-01	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.21856	-80.19301	-43.3	ROV 19-01	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.219049	-80.19299	-41.2	ROV 19-01	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.219473	-80.192691	-43	ROV 19-01	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.217305	-80.194167	-38.1	ROV 19-01	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.218563	-80.193387	-37.9	ROV 19-01	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.218592	-80.193428	-37.9	ROV 19-01	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.218834	-80.192936	-42.9	ROV 19-01	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.217197	-80.194147	-38	ROV 19-01	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.217853	-80.193704	-37.3	ROV 19-01	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.218081	-80.193674	-36.5	ROV 19-01	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.21856	-80.19301	-43.3	ROV 19-01	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.219049	-80.19299	-41.2	ROV 19-01	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.219419	-80.192821	-41.8	ROV 19-01	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.157695	-80.2212	-43.6	ROV 19-02	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.157735	-80.221012	-45.5	ROV 19-02	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.159316	-80.220395	-41.4	ROV 19-02	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.15934	-80.220335	-41.7	ROV 19-02	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.159419	-80.220203	-42.5	ROV 19-02	Density

Family	Taxonomy	Latitude	Longitude	Depth (m)	Dive	Source
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.157695	-80.2212	-43.6	ROV 19-02	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.15934	-80.220335	-41.7	ROV 19-02	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.159419	-80.220203	-42.5	ROV 19-02	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.152601	-80.234743	-33.3	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.152657	-80.234555	-32.4	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.152708	-80.234501	-32.1	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.152834	-80.234377	-32.6	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.153156	-80.23379	-33	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.153156	-80.23379	-32.9	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.153236	-80.233792	-32.9	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.153311	-80.233789	-32.8	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.153496	-80.233549	-32.1	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.153501	-80.233522	-32.1	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.153644	-80.233369	-31.6	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.15469	-80.232943	-32.5	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.154781	-80.23297	-31.6	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.154891	-80.232946	-32.2	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.154911	-80.232947	-31.9	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.154916	-80.232971	-31.7	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.155029	-80.233019	-30.9	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.155055	-80.233022	-31	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.155071	-80.233065	-32.4	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.155079	-80.233052	-32	ROV 19-03	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.153569	-80.232905	-34.1	ROV 19-03	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.153574	-80.233266	-34	ROV 19-03	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.154484	-80.232982	-33.6	ROV 19-03	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.155362	-80.232832	-32.4	ROV 19-03	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.155703	-80.232534	-32.6	ROV 19-03	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.152601	-80.234743	-33.3	ROV 19-03	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.152708	-80.234501	-32.1	ROV 19-03	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.153156	-80.23379	-33	ROV 19-03	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.154911	-80.232947	-31.9	ROV 19-03	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.155071	-80.233065	-32.4	ROV 19-03	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.155079	-80.233052	-32	ROV 19-03	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.108628	-80.26438	-44.5	ROV 19-04	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.10863	-80.264389	-44.4	ROV 19-04	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.108642	-80.264372	-44.7	ROV 19-04	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.108668	-80.264262	-44.7	ROV 19-04	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.108728	-80.264146	-44.8	ROV 19-04	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.108768	-80.264076	-45	ROV 19-04	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.10877	-80.263824	-46.1	ROV 19-04	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.108826	-80.263139	-48.1	ROV 19-04	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.108847	-80.2631	-47.8	ROV 19-04	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.108874	-80.263103	-47.3	ROV 19-04	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.109386	-80.262239	-46	ROV 19-04	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.108814	-80.263142	-48.2	ROV 19-04	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.108668	-80.264262	-44.7	ROV 19-04	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.108673	-80.264331	-44.2	ROV 19-04	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.10877	-80.263824	-46.1	ROV 19-04	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.108847	-80.2631	-47.8	ROV 19-04	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	25.035066	-80.320961	-43.9	ROV 19-05	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.49238	-81.594722	-33	ROV 19-07	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492386	-81.594704	-32.9	ROV 19-07	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492409	-81.594599	-32.8	ROV 19-07	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492447	-81.59455	-32.3	ROV 19-07	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492463	-81.594068	-33.7	ROV 19-07	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492471	-81.593969	-33.8	ROV 19-07	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492471	-81.593955	-33.7	ROV 19-07	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492506	-81.594192	-33	ROV 19-07	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492571	-81.594417	-31.5	ROV 19-07	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.49258	-81.594251	-31.9	ROV 19-07	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492589	-81.594396	-31.5	ROV 19-07	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492595	-81.594392	-31.6	ROV 19-07	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492616	-81.594333	-31.4	ROV 19-07	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492353	-81.594772	-32.2	ROV 19-07	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492443	-81.593824	-34.4	ROV 19-07	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492456	-81.593786	-35	ROV 19-07	Live Observation

Family	Taxonomy	Latitude	Longitude	Depth (m)	Dive	Source
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492481	-81.594506	-31.8	ROV 19-07	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492485	-81.594007	-34.1	ROV 19-07	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492488	-81.59403	-34.1	ROV 19-07	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.4925	-81.594146	-32.9	ROV 19-07	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492409	-81.594599	-32.8	ROV 19-07	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492438	-81.593794	-35	ROV 19-07	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492447	-81.593829	-34.5	ROV 19-07	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492463	-81.594068	-33.7	ROV 19-07	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.4925	-81.594001	-34.1	ROV 19-07	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492515	-81.594199	-33.2	ROV 19-07	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492589	-81.594396	-31.5	ROV 19-07	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.492605	-81.594259	-31.5	ROV 19-07	Percent Cover
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.402707	-81.920604	-112.2	ROV 19-09	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.361422	-82.324213	-95.1	ROV 19-10	Density
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.612765	-83.099838	-30.6	ROV 19-16	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.613528	-83.100121	-31.5	ROV 19-16	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.615295	-83.100875	-33.5	ROV 19-16	Live Observation
Astrocoeniidae	Stephanocoenia intersepta (Lamarck, 1836)	24.616224	-83.101039	-33.4	ROV 19-16	Live Observation
Meandrinidae	Eusmilia fastigiata (Pallas, 1766)	25.154781	-80.23297	-31.6	ROV 19-03	Density
Meandrinidae	Meandrina danae (Milne Edwards & Haime, 1848)	25.218524	-80.193056	-42.5	ROV 19-01	Live Observation
Meandrinidae	Meandrina meandrites (Linnaeus, 1758)	25.108705	-80.263224	-48.9	ROV 19-04	Density
Meandrinidae	Meandrina meandrites (Linnaeus, 1758)	25.108767	-80.263976	-44.9	ROV 19-04	Density
Meandrinidae	Meandrina meandrites (Linnaeus, 1758)	25.108825	-80.263665	-45.8	ROV 19-04	Density
Meandrinidae	Meandrina meandrites (Linnaeus, 1758)	25.037722	-80.320191	-43.3	ROV 19-05	Live Observation
Meandrinidae	Meandrina meandrites (Linnaeus, 1758)	24.492463	-81.594068	-33.7	ROV 19-07	Density
Meandrinidae	Meandrina meandrites (Linnaeus, 1758)	24.492488	-81.59403	-34.1	ROV 19-07	Live Observation
Meandrinidae	Meandrina meandrites (Linnaeus, 1758)	24.492463	-81.594068	-33.7	ROV 19-07	Percent Cover
Meandrinidae	Meandrina meandrites (Linnaeus, 1758)	24.613089	-83.100228	-33.3	ROV 19-16	Live Observation
Meandrinidae	Meandrina meandrites (Linnaeus, 1758)	24.614617	-83.10056	-33	ROV 19-16	Live Observation
Meandrinidae	Meandrina meandrites (Linnaeus, 1758)	24.614848	-83.100525	-32.7	ROV 19-16	Live Observation
Meandrinidae	Meandrina meandrites (Linnaeus, 1758)	24.615138	-83.100539	-30.5	ROV 19-16	Live Observation
Meandrinidae	Meandrina meandrites (Linnaeus, 1758)	24.615324	-83.100902	-33.2	ROV 19-16	Live Observation
Meandrinidae	Meandrina meandrites (Linnaeus, 1758)	24.61635	-83.101146	-34.2	ROV 19-16	Live Observation
Merulinidae	Orbicella annularis (Ellis & Solander, 1786)	25.217893	-80.193685	-37.8	ROV 19-01	Density
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.218431	-80.193453	-37.4	ROV 19-01	Density
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.219198	-80.192966	-40.5	ROV 19-01	Density
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.21834	-80.193636	-36.3	ROV 19-01	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.21835	-80.193713	-34.1	ROV 19-01	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.21835	-80.193672	-36.1	ROV 19-01	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.218617	-80.193219	-40.6	ROV 19-01	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.217825	-80.193712	-37.3	ROV 19-01	Percent Cover
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.218123	-80.193666	-35.7	ROV 19-01	Percent Cover
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.218366	-80.193654	-36.2	ROV 19-01	Percent Cover
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.218312	-80.193641	-36.2	ROV 19-01	Sample: 13-VIII-19-1-022
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.157693	-80.221105	-43.7	ROV 19-02	Density
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.15272	-80.234492	-32.5	ROV 19-03	Density
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.152724	-80.234489	-32.4	ROV 19-03	Density
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.152835	-80.234341	-33.5	ROV 19-03	Density
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.153396	-80.233371	-33.9	ROV 19-03	Density
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.153502	-80.233512	-32.8	ROV 19-03	Density
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.154678	-80.232938	-31.8	ROV 19-03	Density
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.152609	-80.233301	-32.8	ROV 19-03	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.152793	-80.234412	-33.2	ROV 19-03	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.153236	-80.23379	-32.9	ROV 19-03	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.153499	-80.233523	-31.9	ROV 19-03	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.153923	-80.232888	-32.2	ROV 19-03	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.153967	-80.232882	-32.1	ROV 19-03	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.154183	-80.233035	-32.3	ROV 19-03	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.154484	-80.232982	-33.6	ROV 19-03	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.154801	-80.232971	-31.9	ROV 19-03	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.155622	-80.232674	-30.8	ROV 19-03	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.155703	-80.232534	-32.6	ROV 19-03	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.155942	-80.232448	-33.6	ROV 19-03	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.15272	-80.234492	-32.5	ROV 19-03	Percent Cover
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.152724	-80.234489	-32.4	ROV 19-03	Percent Cover
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.152835	-80.234341	-33.5	ROV 19-03	Percent Cover
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.153148	-80.233799	-32.6	ROV 19-03	Percent Cover

Family	Taxonomy	Latitude	Longitude	Depth (m)	Dive	Source
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.153156	-80.23379	-33	ROV 19-03	Percent Cover
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.153156	-80.23379	-32.9	ROV 19-03	Percent Cover
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	25.154678	-80.232938	-31.8	ROV 19-03	Percent Cover
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	24.492445	-81.593825	-35	ROV 19-07	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	24.492456	-81.593923	-34.7	ROV 19-07	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	24.492488	-81.59403	-34.1	ROV 19-07	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	24.492493	-81.593948	-34	ROV 19-07	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	24.615138	-83.100539	-30.5	ROV 19-16	Live Observation
Merulinidae	Orbicella faveolata (Ellis & Solander, 1786)	24.615295	-83.100875	-33.5	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.217036	-80.194131	-38.4	ROV 19-01	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.217197	-80.194147	-38	ROV 19-01	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.217285	-80.194167	-37.9	ROV 19-01	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.217303	-80.194167	-38	ROV 19-01	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.217325	-80.19416	-38.4	ROV 19-01	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.217354	-80.194136	-38.5	ROV 19-01	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.217853	-80.193704	-37.3	ROV 19-01	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.217962	-80.193652	-36.6	ROV 19-01	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.218154	-80.193664	-36.3	ROV 19-01	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.218784	-80.192916	-43.5	ROV 19-01	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.216749	-80.194712	-36.2	ROV 19-01	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.217097	-80.194141	-38.4	ROV 19-01	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.217305	-80.194167	-38.1	ROV 19-01	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.217653	-80.193894	-37	ROV 19-01	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.217856	-80.193702	-37.3	ROV 19-01	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.217962	-80.193652	-36.6	ROV 19-01	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.218183	-80.193648	-36.6	ROV 19-01	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.21835	-80.193672	-36.1	ROV 19-01	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.218524	-80.193056	-42.5	ROV 19-01	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.218534	-80.193436	-36.9	ROV 19-01	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.218617	-80.193219	-40.6	ROV 19-01	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.218834	-80.192936	-42.9	ROV 19-01	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.21905	-80.192993	-41.1	ROV 19-01	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.219181	-80.192973	-40.3	ROV 19-01	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.219398	-80.19287	-40.9	ROV 19-01	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.219466	-80.192781	-42	ROV 19-01	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.217285	-80.194167	-37.9	ROV 19-01	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.217303	-80.194167	-38	ROV 19-01	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.218154	-80.193664	-36.3	ROV 19-01	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.218784	-80.192916	-43.5	ROV 19-01	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.219167	-80.192963	-40	ROV 19-01	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.157706	-80.221178	-43.3	ROV 19-02	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.157752	-80.221037	-45.2	ROV 19-02	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.157888	-80.220737	-45.6	ROV 19-02	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.157935	-80.220794	-45.6	ROV 19-02	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.158246	-80.220609	-43.8	ROV 19-02	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.159316	-80.220395	-41.4	ROV 19-02	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.159355	-80.220312	-41.7	ROV 19-02	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.159373	-80.220295	-41.6	ROV 19-02	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.157794	-80.220859	-45.8	ROV 19-02	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.157874	-80.22073	-46	ROV 19-02	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.157929	-80.220786	-45.2	ROV 19-02	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.158231	-80.220638	-43	ROV 19-02	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.159317	-80.220399	-41.3	ROV 19-02	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.159333	-80.220337	-41.1	ROV 19-02	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.159369	-80.220294	-41.4	ROV 19-02	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.159419	-80.220198	-42.5	ROV 19-02	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.15968	-80.219824	-42.2	ROV 19-02	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.157752	-80.221037	-45.2	ROV 19-02	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.157888	-80.220737	-45.6	ROV 19-02	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.157935	-80.220794	-45.6	ROV 19-02	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.159316	-80.220395	-41.4	ROV 19-02	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.159373	-80.220295	-41.6	ROV 19-02	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.152834	-80.234377	-32.6	ROV 19-03	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.15286	-80.234286	-33.4	ROV 19-03	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153021	-80.233916	-34	ROV 19-03	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153039	-80.233889	-34.1	ROV 19-03	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153148	-80.233799	-32.6	ROV 19-03	Density

Family	Taxonomy	Latitude	Longitude	Depth (m)	Dive	Source
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153156	-80.23379	-33	ROV 19-03	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153156	-80.23379	-32.9	ROV 19-03	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153387	-80.233739	-32.4	ROV 19-03	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153475	-80.233568	-32.1	ROV 19-03	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153629	-80.233333	-32.9	ROV 19-03	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.154761	-80.232968	-31.9	ROV 19-03	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.154835	-80.232967	-32.2	ROV 19-03	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.155029	-80.233019	-30.9	ROV 19-03	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.155071	-80.233065	-32.4	ROV 19-03	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.155086	-80.233071	-33.2	ROV 19-03	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.155193	-80.233081	-31.6	ROV 19-03	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.152549	-80.234077	-34.5	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.152557	-80.233653	-33.2	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.152578	-80.233692	-33.1	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.152833	-80.234341	-33.2	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.152864	-80.234286	-33.7	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.152996	-80.233982	-33.8	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153019	-80.233908	-34	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153127	-80.23384	-33	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153466	-80.233678	-32.9	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153491	-80.233611	-31.8	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153499	-80.233523	-31.9	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153543	-80.233459	-33.3	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.15362	-80.233198	-33.8	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153629	-80.233333	-32.9	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153629	-80.233187	-34.1	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153689	-80.232778	-34.1	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153733	-80.232793	-31.9	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.154024	-80.232842	-33.4	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.154129	-80.233019	-32	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.154183	-80.233035	-32.3	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.15424	-80.233077	-32.1	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.154416	-80.233028	-32	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.154801	-80.232971	-31.9	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.155094	-80.233082	-32.8	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.155218	-80.233079	-33	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.155308	-80.232924	-32.8	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.155438	-80.23272	-33.3	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.155529	-80.232698	-31.9	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.155601	-80.232664	-31	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.155622	-80.232674	-30.8	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.155703	-80.232534	-32.6	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.1558	-80.232497	-31.1	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.155942	-80.232448	-33.6	ROV 19-03	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.152834	-80.234377	-32.6	ROV 19-03	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.15286	-80.234286	-33.4	ROV 19-03	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153021	-80.233916	-34	ROV 19-03	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153039	-80.233889	-34.1	ROV 19-03	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.153387	-80.233739	-32.4	ROV 19-03	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.154761	-80.232968	-31.9	ROV 19-03	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.154835	-80.232967	-32.2	ROV 19-03	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.155071	-80.233065	-32.4	ROV 19-03	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.155086	-80.233071	-33.2	ROV 19-03	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.155193	-80.233081	-31.6	ROV 19-03	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.108655	-80.264361	-44.7	ROV 19-04	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.108664	-80.264268	-44.9	ROV 19-04	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.108673	-80.264331	-44.2	ROV 19-04	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.108674	-80.26429	-44.5	ROV 19-04	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.108724	-80.264153	-44.9	ROV 19-04	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.108994	-80.262238	-48.8	ROV 19-04	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.109516	-80.262271	-45.1	ROV 19-04	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.108685	-80.264239	-44.8	ROV 19-04	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.108749	-80.26354	-47.8	ROV 19-04	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.108767	-80.263958	-45.1	ROV 19-04	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.108801	-80.263703	-45.5	ROV 19-04	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.108818	-80.26315	-48.3	ROV 19-04	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.108884	-80.262737	-46.4	ROV 19-04	Live Observation

Family	Taxonomy	Latitude	Longitude	Depth (m)	Dive	Source
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.10902	-80.262201	-48.6	ROV 19-04	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.109072	-80.262209	-48.3	ROV 19-04	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.109102	-80.262222	-48.6	ROV 19-04	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.10936	-80.261914	-50.2	ROV 19-04	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.109444	-80.262132	-46.1	ROV 19-04	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.1095	-80.262197	-45.2	ROV 19-04	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.109529	-80.262271	-44.4	ROV 19-04	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.108664	-80.264268	-44.9	ROV 19-04	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.108674	-80.26429	-44.5	ROV 19-04	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.108724	-80.264153	-44.9	ROV 19-04	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.108994	-80.262238	-48.8	ROV 19-04	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.035997	-80.320752	-43.5	ROV 19-05	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.036616	-80.320499	-42.8	ROV 19-05	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.036667	-80.320498	-43	ROV 19-05	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.036997	-80.320533	-42.5	ROV 19-05	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.034764	-80.321358	-42.8	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.034845	-80.321423	-42.3	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.035	-80.321018	-43.9	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.035068	-80.320972	-44	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.0351	-80.321149	-42.6	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.035111	-80.321081	-42.7	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.035118	-80.321135	-42.7	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.035139	-80.321084	-43	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.035184	-80.320901	-43.5	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.035188	-80.32088	-44.1	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.035763	-80.320651	-45.1	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.035997	-80.320752	-43.5	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.036098	-80.320821	-43.1	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.036489	-80.320626	-42.8	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.036552	-80.320576	-42.6	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.036555	-80.320588	-42.8	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.037466	-80.320286	-43.2	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.037716	-80.320359	-42.2	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.037726	-80.320202	-43.6	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.038138	-80.319892	-43.7	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.03823	-80.319662	-45.3	ROV 19-05	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.035997	-80.320752	-43.5	ROV 19-05	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.036616	-80.320499	-42.8	ROV 19-05	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.036997	-80.320533	-42.5	ROV 19-05	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	25.037706	-80.320336	-42.4	ROV 19-05	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.492449	-81.594569	-32.8	ROV 19-07	Density
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.492449	-81.594569	-32.8	ROV 19-07	Percent Cover
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.612068	-83.099595	-30.3	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.612395	-83.09974	-32	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.612765	-83.099838	-30.6	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.612778	-83.099851	-30.1	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.612924	-83.099887	-30.7	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.612965	-83.100005	-31.1	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.613089	-83.100228	-33.3	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.613333	-83.10018	-32.9	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.613528	-83.100121	-31.5	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.613889	-83.10031	-33.7	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.614095	-83.100228	-31.2	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.614204	-83.100374	-32.6	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.614617	-83.10056	-33	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.614848	-83.100525	-32.7	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.614919	-83.100539	-32.4	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.615138	-83.100539	-30.5	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.615295	-83.100875	-33.5	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.615324	-83.100902	-33.2	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.615535	-83.100941	-33.9	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.615787	-83.10099	-33.3	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.615886	-83.100995	-32.3	ROV 19-16	Live Observation
Montastraeidae	Montastraea cavernosa (Linnaeus, 1767)	24.616224	-83.101039	-33.4	ROV 19-16	Live Observation
Mussidae	Colpophyllia natans (Houttuyn, 1772)	24.614617	-83.10056	-33	ROV 19-16	Live Observation
Mussidae	Colpophyllia natans (Houttuyn, 1772)	24.615138	-83.100539	-30.5	ROV 19-16	Live Observation
Mussidae	Mycetophyllia aliciae Wells, 1973	25.217893	-80.193685	-37.8	ROV 19-01	Density

Family	Taxonomy	Latitude	Longitude	Depth (m)	Dive	Source
Mussidae	Mycetophyllia aliciae Wells, 1973	25.217962	-80.193652	-36.6	ROV 19-01	Live Observation
Mussidae	Mycetophyllia aliciae Wells, 1973	25.217893	-80.193685	-37.8	ROV 19-01	Percent Cover
Mussidae	Mycetophyllia aliciae Wells, 1973	25.108655	-80.264361	-44.7	ROV 19-04	Density
Mussidae	Mycetophyllia aliciae Wells, 1973	25.108655	-80.264361	-44.7	ROV 19-04	Percent Cover
Mussidae	Scolymia cubensis (Milne Edwards & Haime, 1848)	25.109386	-80.262239	-46	ROV 19-04	Density
Oculinidae	Oculina sp.	24.499269	-81.441714	-88.1	ROV 19-06	Density
Pocilloporidae	Madracis auretenra Locke, Weil & Coates, 2007	24.361821	-82.324275	-95	ROV 19-10	Live Observation
Pocilloporidae	Madracis decactis (Lyman, 1859)	25.217197	-80.194147	-38	ROV 19-01	Density
Pocilloporidae	Madracis decactis (Lyman, 1859)	25.217214	-80.194151	-37.4	ROV 19-01	Density
Pocilloporidae	Madracis decactis (Lyman, 1859)	25.217893	-80.193685	-37.8	ROV 19-01	Density
Pocilloporidae	Madracis decactis (Lyman, 1859)	25.217256	-80.194167	-37.6	ROV 19-01	Percent Cover
Pocilloporidae	Madracis decactis (Lyman, 1859)	25.217622	-80.193986	-34.9	ROV 19-01	Percent Cover
Pocilloporidae	Madracis decactis (Lyman, 1859)	25.219198	-80.192966	-40.5	ROV 19-01	Percent Cover
Pocilloporidae	Madracis decactis (Lyman, 1859)	25.15274	-80.23446	-33.5	ROV 19-03	Density
Pocilloporidae	Madracis decactis (Lyman, 1859)	25.152835	-80.234341	-33.5	ROV 19-03	Density
Pocilloporidae	Madracis decactis (Lyman, 1859)	25.153644	-80.233369	-31.6	ROV 19-03	Density
Pocilloporidae	Madracis decactis (Lyman, 1859)	25.15274	-80.23446	-33.5	ROV 19-03	Percent Cover
Pocilloporidae	Madracis decactis (Lyman, 1859)	25.152835	-80.234341	-33.5	ROV 19-03	Percent Cover
Pocilloporidae	Madracis decactis (Lyman, 1859)	25.108655	-80.264361	-44.7	ROV 19-04	Density
Pocilloporidae	Madracis decactis (Lyman, 1859)	24.492449	-81.594569	-32.8	ROV 19-07	Density
Pocilloporidae	Madracis decactis (Lyman, 1859)	24.492449	-81.594569	-32.8	ROV 19-07	Percent Cover
Pocilloporidae	Madracis formosa Wells, 1973	25.154484	-80.232982	-33.6	ROV 19-03	Live Observation
Pocilloporidae	Madracis senaria Wells, 1973	25.217214	-80.194151	-37.4	ROV 19-01	Density
Pocilloporidae	Madracis senaria Wells, 1973	25.217285	-80.194167	-37.9	ROV 19-01	Density
Pocilloporidae	Madracis senaria Wells, 1973	25.217622	-80.193986	-34.9	ROV 19-01	Density
Pocilloporidae	Madracis senaria Wells, 1973	25.217628	-80.193972	-35.1	ROV 19-01	Density
Pocilloporidae	Madracis senaria Wells, 1973	25.218431	-80.193453	-37.4	ROV 19-01	Density
Pocilloporidae	Madracis senaria Wells, 1973	25.155071	-80.233065	-32.4	ROV 19-03	Density
Pocilloporidae	Madracis senaria Wells, 1973	25.153396	-80.23371	-33.9	ROV 19-03	Percent Cover
Pocilloporidae	Madracis senaria Wells, 1973	25.108642	-80.264372	-44.7	ROV 19-04	Percent Cover
Pocilloporidae	Madracis senaria Wells, 1973	25.035	-80.32102	-43.9	ROV 19-05	Density
Pocilloporidae	Madracis senaria Wells, 1973	24.492605	-81.594259	-31.5	ROV 19-07	Density
Pocilloporidae	Madracis senaria Wells, 1973	24.492449	-81.594569	-32.8	ROV 19-07	Percent Cover
Pocilloporidae	Madracis senaria Wells, 1973	24.49245	-81.593827	-35	ROV 19-07	Percent Cover
Pocilloporidae	Madracis senaria Wells, 1973	24.492468	-81.593844	-35	ROV 19-07	Percent Cover
Pocilloporidae	Madracis senaria Wells, 1973	24.492478	-81.593942	-34.6	ROV 19-07	Percent Cover
Pocilloporidae	Madracis senaria Wells, 1973	24.492605	-81.594259	-31.5	ROV 19-07	Percent Cover
Pocilloporidae	Madracis sp.	24.492445	-81.593825	-35	ROV 19-07	Live Observation
Poritidae	Porites astreoides Lamarck, 1816	25.157794	-80.220859	-45.8	ROV 19-02	Live Observation
Poritidae	Porites astreoides Lamarck, 1816	25.155055	-80.233022	-31	ROV 19-03	Density
Poritidae	Porites astreoides Lamarck, 1816	25.153236	-80.23379	-32.9	ROV 19-03	Live Observation
Poritidae	Porites astreoides Lamarck, 1816	25.153491	-80.233611	-31.8	ROV 19-03	Live Observation
Poritidae	Porites astreoides Lamarck, 1816	25.153543	-80.233459	-33.3	ROV 19-03	Live Observation
Poritidae	Porites astreoides Lamarck, 1816	25.154019	-80.232864	-32.2	ROV 19-03	Live Observation
Poritidae	Porites astreoides Lamarck, 1816	25.154416	-80.233028	-32	ROV 19-03	Live Observation
Poritidae	Porites astreoides Lamarck, 1816	25.155218	-80.233079	-33	ROV 19-03	Live Observation
Poritidae	Porites astreoides Lamarck, 1816	25.155438	-80.23272	-33.3	ROV 19-03	Live Observation
Poritidae	Porites astreoides Lamarck, 1816	25.155585	-80.232666	-30.8	ROV 19-03	Live Observation
Poritidae	Porites astreoides Lamarck, 1816	25.155703	-80.232534	-32.6	ROV 19-03	Live Observation
Poritidae	Porites astreoides Lamarck, 1816	25.155927	-80.232472	-32.7	ROV 19-03	Live Observation
Poritidae	Porites astreoides Lamarck, 1816	24.612395	-83.09974	-32	ROV 19-16	Live Observation
Poritidae	Porites astreoides Lamarck, 1816	24.614204	-83.100374	-32.6	ROV 19-16	Live Observation
Poritidae	Porites astreoides Lamarck, 1816	24.615787	-83.10099	-33.3	ROV 19-16	Live Observation
Poritidae	Porites astreoides Lamarck, 1816	24.616076	-83.101103	-32.6	ROV 19-16	Live Observation
Poritidae	Porites porites (Pallas, 1766)	25.154924	-80.23296	-31.5	ROV 19-03	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.217354	-80.194136	-38.5	ROV 19-01	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.217622	-80.193986	-34.9	ROV 19-01	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.217628	-80.193972	-35.1	ROV 19-01	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.21863	-80.192974	-44	ROV 19-01	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.219167	-80.192963	-40	ROV 19-01	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.219413	-80.192821	-41.9	ROV 19-01	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.217631	-80.193963	-35.5	ROV 19-01	Percent Cover
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.159343	-80.220246	-42.2	ROV 19-02	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.159522	-80.219514	-47.9	ROV 19-02	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.15264	-80.234627	-32.5	ROV 19-03	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.152657	-80.234555	-32.4	ROV 19-03	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.15274	-80.23446	-33.5	ROV 19-03	Density

Family	Taxonomy	Latitude	Longitude	Depth (m)	Dive	Source
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.152834	-80.234377	-32.6	ROV 19-03	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.153039	-80.233889	-34.1	ROV 19-03	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.153148	-80.233799	-32.6	ROV 19-03	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.153156	-80.23379	-33	ROV 19-03	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.153246	-80.233785	-33.2	ROV 19-03	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.153387	-80.233739	-32.4	ROV 19-03	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.153501	-80.233522	-32.1	ROV 19-03	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.154952	-80.232961	-31.7	ROV 19-03	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.155055	-80.233022	-31	ROV 19-03	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.15517	-80.233106	-32	ROV 19-03	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.152637	-80.234644	-32.8	ROV 19-03	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.153466	-80.233678	-32.9	ROV 19-03	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.153602	-80.233323	-33.8	ROV 19-03	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.153608	-80.233298	-34	ROV 19-03	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.153862	-80.232891	-32.8	ROV 19-03	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.15424	-80.233077	-32.1	ROV 19-03	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.154416	-80.233028	-32	ROV 19-03	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.154924	-80.23296	-31.5	ROV 19-03	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.155942	-80.232448	-33.6	ROV 19-03	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.15274	-80.23446	-33.5	ROV 19-03	Percent Cover
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.153039	-80.233889	-34.1	ROV 19-03	Percent Cover
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.153236	-80.233792	-32.9	ROV 19-03	Percent Cover
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.153246	-80.233785	-33.2	ROV 19-03	Percent Cover
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.153387	-80.233739	-32.4	ROV 19-03	Percent Cover
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.153501	-80.233522	-32.1	ROV 19-03	Percent Cover
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.155029	-80.233019	-30.9	ROV 19-03	Percent Cover
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.155055	-80.233022	-31	ROV 19-03	Percent Cover
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.108679	-80.26325	-48.9	ROV 19-04	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	25.108767	-80.263958	-45.1	ROV 19-04	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.492471	-81.593969	-33.8	ROV 19-07	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.492475	-81.593886	-34.2	ROV 19-07	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.492482	-81.59451	-32.1	ROV 19-07	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.4925	-81.594465	-32.6	ROV 19-07	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.492616	-81.594333	-31.4	ROV 19-07	Density
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.492443	-81.593824	-34.4	ROV 19-07	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.492488	-81.59403	-34.1	ROV 19-07	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.492644	-81.594317	-30.6	ROV 19-07	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.492386	-81.594704	-32.9	ROV 19-07	Percent Cover
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.492409	-81.594599	-32.8	ROV 19-07	Percent Cover
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.492447	-81.593829	-34.5	ROV 19-07	Percent Cover
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.492471	-81.593969	-33.8	ROV 19-07	Percent Cover
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.492492	-81.593943	-34.6	ROV 19-07	Percent Cover
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.4925	-81.594465	-32.6	ROV 19-07	Percent Cover
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.492515	-81.594199	-33.2	ROV 19-07	Percent Cover
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.614095	-83.100228	-31.2	ROV 19-16	Live Observation
Siderastreidae	Siderastrea siderea (Ellis & Solander, 1786)	24.61635	-83.101146	-34.2	ROV 19-16	Live Observation

APPENDIX 4

Species List of Samples Collected

Taxonomy of benthic macro-invertebrates and algae collected during the 2019 HBOI CIOERT cruise to the Florida Keys National Marine Sanctuary and Tortugas Ecological Reserves. Coordinates, depth, dive number, and HBOI museum sample number are provided for each.

Dive	Sample ID	Phylum	Class	Order	Family	Field ID	Latitude	Longitude	Depth (m)
ROV 19-06	16-VIII-19-1-008	Arthropoda	Pycnogonida	Pantopoda	Phoxichilidiidae	<i>Anoplodactylus lentus</i>	24°29.9550'N	81°26.4920'W	88.2
ROV 19-06	16-VIII-19-1-010	Bryozoa	-	-	-	Bryozoa	24°29.9700'N	81°26.4370'W	88.1
ROV 19-02	14-VIII-19-1-005	Chlorophyta	Ulvophyceae	Bryopsidales	Caulerpaceae	<i>Caulerpa racemosa</i>	25°09.5470'N	80°13.1460'W	50.4
ROV 19-07	16-VIII-19-2-001	Chlorophyta	Ulvophyceae	Bryopsidales	Caulerpaceae	<i>Caulerpa sertularioides</i>	24°29.5150'N	81°35.5910'W	37.1
ROV 19-02	14-VIII-19-1-004	Chlorophyta	Ulvophyceae	Bryopsidales	Codiaceae	<i>Codium isthmocladum</i>	25°09.5530'N	80°13.1460'W	50.6
ROV 19-02	14-VIII-19-1-008	Chlorophyta	Ulvophyceae	Bryopsidales	Codiaceae	<i>Codium isthmocladum</i>	25°09.5540'N	80°13.1490'W	50.1
ROV 19-06	16-VIII-19-1-002	Chlorophyta	Ulvophyceae	Bryopsidales	Derbesiaceae	<i>Derbesia marina</i>	24°29.9690'N	81°26.4400'W	88.1
ROV 19-04	15-VIII-19-1-006	Chlorophyta	Ulvophyceae	Bryopsidales	Halimedaceae	<i>Halimeda goreau</i>	25°06.5620'N	80°15.7150'W	50.2
ROV 19-02	14-VIII-19-1-002	Chlorophyta	Ulvophyceae	Bryopsidales	Halimedaceae	<i>Halimeda gracilis</i>	25°09.5530'N	80°13.1460'W	50.6
ROV 19-07	16-VIII-19-2-003	Chlorophyta	Ulvophyceae	Bryopsidales	Udoteaceae	<i>Udotea</i> sp.	24°29.5150'N	81°35.5930'W	37.0
ROV 19-02	14-VIII-19-1-020	Chlorophyta	Ulvophyceae	Cladophorales	Anadyomenaceae	<i>Microdictyon umbilicatum</i>	25°09.5530'N	80°13.1460'W	50.6
ROV 19-04	15-VIII-19-1-002	Chordata	Ascidacea	-	-	Ascidacea- unidentified	25°06.5500'N	80°15.6887'W	53.4
ROV 19-04	15-VIII-19-1-003	Chordata	Ascidacea	-	-	Ascidacea- unidentified	25°06.5500'N	80°15.6887'W	53.4
ROV 19-01	13-VIII-19-1-016	Chordata	Ascidacea	Aplousobranchia	Didemnidae	<i>Trididemnum solidum</i>	25°13.1430'N	80°11.5780'W	41.6
ROV 19-09	17-VIII-19-2-003	Cnidaria	Anthozoa	Alcyonacea	Plexauridae	<i>Bebryce</i> sp.	24°24.1680'N	81°55.2360'W	113.0
ROV 19-04	15-VIII-19-1-010	Cnidaria	Anthozoa	Alcyonacea	Plexauridae	<i>Swiftia exserta</i>	25°06.5390'N	80°15.7430'W	48.9
ROV 19-04	15-VIII-19-1-013	Cnidaria	Anthozoa	Alcyonacea	Plexauridae	<i>Swiftia exserta</i>	25°06.5320'N	80°15.7530'W	50.4
ROV 19-01	13-VIII-19-1-014	Cnidaria	Anthozoa	Alcyonacea	Plexauridae	<i>Swiftia</i> sp.	25°13.1650'N	80°11.5690'W	42.2
ROV 19-01	13-VIII-19-1-015	Cnidaria	Anthozoa	Alcyonacea	Plexauridae	<i>Swiftia</i> sp.	25°13.1650'N	80°11.5690'W	42.0
ROV 19-10	17-VIII-19-3-001	Cnidaria	Anthozoa	Alcyonacea	Plexauridae	<i>Thesea grandiflora</i>	24°21.6190'N	82°19.4380'W	95.2
ROV 19-08	17-VIII-19-1-001	Cnidaria	Anthozoa	Alcyonacea	Plexauridae	<i>Thesea rubra</i>	24°24.0840'N	81°55.1510'W	118.0
ROV 19-06	16-VIII-19-1-001	Cnidaria	Anthozoa	Antipatharia	Antipathidae	<i>Antipathes furcata</i>	24°29.9700'N	81°26.4370'W	88.1
ROV 19-06	16-VIII-19-1-004	Cnidaria	Anthozoa	Antipatharia	Antipathidae	<i>Antipathes furcata</i>	24°29.9720'N	81°26.4450'W	87.8
ROV 19-06	16-VIII-19-1-005	Cnidaria	Anthozoa	Antipatharia	Antipathidae	<i>Antipathes furcata</i>	24°29.9490'N	81°26.5110'W	88.8
ROV 19-06	16-VIII-19-1-007	Cnidaria	Anthozoa	Antipatharia	Antipathidae	<i>Antipathes furcata</i>	24°29.9410'N	81°26.5080'W	89.5
ROV 19-09	17-VIII-19-2-001	Cnidaria	Anthozoa	Antipatharia	Antipathidae	<i>Antipathes furcata</i>	24°24.1370'N	81°55.2290'W	113.8
ROV 19-10	17-VIII-19-3-004	Cnidaria	Anthozoa	Antipatharia	Antipathidae	<i>Antipathes furcata</i>	24°21.7550'N	82°19.4840'W	93.0
ROV 19-01	13-VIII-19-1-022	Cnidaria	Anthozoa	Scleractinia	Merulinidae	<i>Orbicella faveolata</i>	25°13.0990'N	80°11.6190'W	36.5
ROV 19-16	20-VIII-19-1-005	Cnidaria	Hydrozoa	-	-	Hydroidolina	24°36.7860'N	83°06.0170'W	33.5
ROV 19-06	16-VIII-19-1-006	Cnidaria	Hydrozoa	-	-	Hydrozoa	24°29.9600'N	81°26.5000'W	87.8
ROV 19-03	14-VIII-19-2-006	Cyanobacteria	-	-	-	Cyanobacteria	25°09.1540'N	80°14.0560'W	33.0
ROV 19-18	20-VIII-19-3-010	Cyanobacteria	Cyanophyceae	Oscillatoriales	Oscillatoriaceae	<i>Lyngbya confervoides</i>	24°32.2010'N	83°01.7000'W	27.1
ROV 19-09	17-VIII-19-2-005	Echinodermata	Ophiuroidea	Euryalida	Gorgonocephalidae	<i>Asteropora (Asteropora) annulata</i>	24°24.1680'N	81°55.2360'W	113.0
ROV 19-01	13-VIII-19-1-007	Habitat	Habitat	Habitat	Hard bottom	rock	25°13.1510'N	80°11.3650'W	58.5
ROV 19-10	17-VIII-19-3-007	Habitat	Habitat	Habitat	Hard bottom	rock	24°21.7330'N	82°19.4680'W	94.8
ROV 19-02	14-VIII-19-1-003	Ochrophyta	Phaeophyceae	Dictyotales	Dictyotaceae	<i>Dictyopteria justii</i>	25°09.5530'N	80°13.1460'W	50.6
ROV 19-02	14-VIII-19-1-021	Ochrophyta	Phaeophyceae	Dictyotales	Dictyotaceae	<i>Dictyota bartayresiana</i>	25°09.5530'N	80°13.1460'W	50.6
ROV 19-03	14-VIII-19-2-003	Ochrophyta	Phaeophyceae	Dictyotales	Dictyotaceae	<i>Dictyota bartayresiana</i>	25°09.2150'N	80°13.9970'W	34.1
ROV 19-04	15-VIII-19-1-005	Ochrophyta	Phaeophyceae	Dictyotales	Dictyotaceae	<i>Dictyota bartayresiana</i>	25°06.5620'N	80°15.7150'W	50.2
ROV 19-02	14-VIII-19-1-012	Ochrophyta	Phaeophyceae	Dictyotales	Dictyotaceae	<i>Dictyota menstrualis</i>	25°09.5520'N	80°13.2200'W	41.7
ROV 19-01	13-VIII-19-1-018	Ochrophyta	Phaeophyceae	Dictyotales	Dictyotaceae	<i>Dictyota</i> sp.	25°13.1150'N	80°11.5910'W	41.4
ROV 19-01	13-VIII-19-1-021	Ochrophyta	Phaeophyceae	Dictyotales	Dictyotaceae	<i>Dictyota</i> sp.	25°13.1140'N	80°11.6050'W	38.0
ROV 19-01	13-VIII-19-1-017	Ochrophyta	Phaeophyceae	Dictyotales	Dictyotaceae	<i>Lobophora</i> sp.	25°13.1150'N	80°11.5910'W	41.4
ROV 19-01	13-VIII-19-1-020	Ochrophyta	Phaeophyceae	Dictyotales	Dictyotaceae	<i>Lobophora</i> sp.	25°13.1140'N	80°11.6050'W	38.0
ROV 19-04	15-VIII-19-1-011	Ochrophyta	Phaeophyceae	Dictyotales	Dictyotaceae	<i>Lobophora</i> sp.	25°06.5340'N	80°15.7530'W	50.0
ROV 19-05	15-VIII-19-2-003	Ochrophyta	Phaeophyceae	Dictyotales	Dictyotaceae	<i>Lobophora</i> sp.	25°02.2590'N	80°19.1140'W	48.7
ROV 19-16	20-VIII-19-1-002	Ochrophyta	Phaeophyceae	Dictyotales	Dictyotaceae	<i>Lobophora</i> sp.	24°36.9190'N	83°06.0550'W	33.2

Dive	Sample ID	Phylum	Class	Order	Family	Field ID	Latitude	Longitude	Depth (m)
ROV 19-05	15-VIII-19-2-004	Ochrophyta	Phaeophyceae	Dictyotales	Dictyotaceae	<i>Styopodium zonale</i>	25°02.2930'N	80°19.1800'W	45.3
ROV 19-05	15-VIII-19-2-006	Ochrophyta	Phaeophyceae	Fucales	Sargassaceae	<i>Sargassum hystrix</i> var. <i>buxifolium</i>	25°02.2150'N	80°19.2320'W	43.1
ROV 19-06	16-VIII-19-1-003	Platyhelminthes	-	-	-	Platyhelminthes	24°29.9690'N	81°26.4400'W	88.1
ROV 19-07	16-VIII-19-2-010	Porifera	Demospongiae	-	-	Demospongiae	24°29.5140'N	81°35.5920'W	36.9
ROV 19-02	14-VIII-19-1-017	Porifera	Demospongiae	Agelasida	Agelasidae	<i>Agelas schmidtii</i>	25°09.5770'N	80°13.1880'W	46.0
ROV 19-04	15-VIII-19-1-015	Porifera	Demospongiae	Axinellida	Axinellidae	<i>Auletta tuberosa</i>	25°06.5300'N	80°15.7890'W	48.6
ROV 19-18	20-VIII-19-3-009	Porifera	Demospongiae	Axinellida	Axinellidae	<i>Axinella</i> sp.	24°32.2050'N	83°01.6970'W	27.1
ROV 19-04	15-VIII-19-1-014	Porifera	Demospongiae	Bubarida	Dictyonellidae	<i>Acanthella cubensis</i>	25°06.5300'N	80°15.7890'W	48.6
ROV 19-01	13-VIII-19-1-003	Porifera	Demospongiae	Clionaida	Spirastrellidae	<i>Spirastrella coccinea</i>	25°13.1520'N	80°11.3680'W	58.5
ROV 19-01	13-VIII-19-1-008	Porifera	Demospongiae	Clionaida	Spirastrellidae	Spirastrellidae	25°13.1510'N	80°11.3650'W	58.5
ROV 19-07	16-VIII-19-2-006	Porifera	Demospongiae	Dictyoceratida	Thorectidae	<i>Smenospongia conulosa</i>	24°29.5480'N	81°35.6420'W	34.0
ROV 19-01	13-VIII-19-1-009	Porifera	Demospongiae	Haplosclerida	Niphatidae	<i>Amphimedon compressa</i>	25°13.1490'N	80°11.3660'W	58.5
ROV 19-18	20-VIII-19-3-001	Porifera	Demospongiae	Haplosclerida	Niphatidae	<i>Amphimedon compressa</i>	24°32.2020'N	83°01.7910'W	26.6
ROV 19-18	20-VIII-19-3-004	Porifera	Demospongiae	Haplosclerida	Niphatidae	<i>Amphimedon compressa</i>	24°32.2040'N	83°01.7910'W	26.6
ROV 19-18	20-VIII-19-3-006	Porifera	Demospongiae	Haplosclerida	Niphatidae	<i>Amphimedon compressa</i>	24°32.1950'N	83°01.8040'W	26.5
ROV 19-02	14-VIII-19-1-010	Porifera	Demospongiae	Haplosclerida	Niphatidae	<i>Amphimedon</i> sp. FK-01	25°09.5770'N	80°13.1880'W	46.0
ROV 19-04	15-VIII-19-1-008	Porifera	Demospongiae	Haplosclerida	Niphatidae	<i>Amphimedon</i> sp. FK-02	25°06.5440'N	80°15.7330'W	48.5
ROV 19-07	16-VIII-19-2-008	Porifera	Demospongiae	Haplosclerida	Niphatidae	<i>Cribrachalina vasculum</i>	24°29.5230'N	81°35.8460'W	26.5
ROV 19-16	20-VIII-19-1-001	Porifera	Demospongiae	Haplosclerida	Niphatidae	<i>Niphates digitalis</i>	24°36.9560'N	83°06.0600'W	33.0
ROV 19-16	20-VIII-19-1-003	Porifera	Demospongiae	Haplosclerida	Niphatidae	<i>Niphates digitalis</i>	24°36.8920'N	83°06.0290'W	32.7
ROV 19-16	20-VIII-19-1-004	Porifera	Demospongiae	Haplosclerida	Niphatidae	<i>Niphates digitalis</i>	24°36.8680'N	83°06.0300'W	33.0
ROV 19-17	20-VIII-19-2-001	Porifera	Demospongiae	Haplosclerida	Niphatidae	<i>Niphates erecta</i>	24°32.7710'N	83°02.2480'W	25.0
ROV 19-18	20-VIII-19-3-002	Porifera	Demospongiae	Haplosclerida	Niphatidae	<i>Niphates erecta</i>	24°32.2020'N	83°01.7910'W	26.6
ROV 19-18	20-VIII-19-3-005	Porifera	Demospongiae	Haplosclerida	Niphatidae	<i>Niphates erecta</i>	24°32.2010'N	83°01.7950'W	26.6
ROV 19-01	13-VIII-19-1-012	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia muta</i>	25°13.1560'N	80°11.4480'W	51.5
ROV 19-01	13-VIII-19-1-013	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia muta</i>	25°13.666 'N	80°11.4850'W	49.0
ROV 19-01	13-VIII-19-1-019	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia muta</i>	23°15.1110'N	80°11.5900'W	40.7
ROV 19-02	14-VIII-19-1-009	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia muta</i>	25°09.5720'N	80°11.1710'W	48.0
ROV 19-02	14-VIII-19-1-011	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia muta</i>	25°09.5510'N	80°13.2210'W	41.7
ROV 19-02	14-VIII-19-1-014	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia muta</i>	25°09.4930'N	80°13.2420'W	43.3
ROV 19-03	14-VIII-19-2-001	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia muta</i>	25°09.2230'N	80°13.9670'W	34.0
ROV 19-03	14-VIII-19-2-002	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia muta</i>	25°09.2170'N	80°13.9840'W	33.9
ROV 19-03	14-VIII-19-2-004	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia muta</i>	25°09.2170'N	80°13.9980'W	34.0
ROV 19-03	14-VIII-19-2-005	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia muta</i>	25°09.2170'N	80°13.9990'W	34.0
ROV 19-04	15-VIII-19-1-004	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia muta</i>	25°06.5600'N	80°15.7130'W	50.3
ROV 19-04	15-VIII-19-1-009	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia muta</i>	25°06.5400'N	80°15.7400'W	48.7
ROV 19-05	15-VIII-19-2-007	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia muta</i>	25°02.1900'N	80°19.2530'W	12.8
ROV 19-05	15-VIII-19-2-009	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia muta</i>	25°02.1090'N	80°19.2640'W	43.0
ROV 19-04	15-VIII-19-1-016	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia</i> sp.	25°06.5210'N	80°15.8680'W	44.2
ROV 19-05	15-VIII-19-2-001	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia</i> sp.	25°02.2590'N	80°19.1110'W	48.8
ROV 19-07	16-VIII-19-2-007	Porifera	Demospongiae	Haplosclerida	Petrosiidae	<i>Xestospongia</i> sp.	24°29.5380'N	81°35.7860'W	24.7
ROV 19-09	17-VIII-19-2-004	Porifera	Demospongiae	Poecilosclerida	-	Poecilosclerida	24°24.1680'N	81°55.2360'W	113.0
ROV 19-05	15-VIII-19-2-011	Porifera	Demospongiae	Poecilosclerida	Chondropsidae	<i>Batzella</i> cf. <i>fusca</i>	25°02.1340'N	80°19.2540'W	43.3
ROV 19-06	16-VIII-19-1-011	Porifera	Demospongiae	Poecilosclerida	Coelosphaeridae	<i>Forcepia</i> sp. FK-01	24°29.9600'N	81°26.5000'W	87.8
ROV 19-02	14-VIII-19-1-013	Porifera	Demospongiae	Poecilosclerida	Desmacididae	<i>Desmapsamma anchorata</i>	25°09.4930'N	80°13.2420'W	43.4
ROV 19-04	15-VIII-19-1-017	Porifera	Demospongiae	Poecilosclerida	Hymedesmiidae	<i>Hymedesmia (Hymedesmia) agariciicola</i>	25°06.5500'N	80°15.6887'W	53.4
ROV 19-02	14-VIII-19-1-016	Porifera	Demospongiae	Poecilosclerida	Hymedesmiidae	<i>Hymedesmia (Hymedesmia) cf. jamaicensis</i>	25°09.5770'N	80°13.1880'W	46.0

Dive	Sample ID	Phylum	Class	Order	Family	Field ID	Latitude	Longitude	Depth (m)
ROV 19-10	17-VIII-19-3-005	Porifera	Demospongiae	Poecilosclerida	Hymedesmiidae	<i>Hymedesmia</i> sp. FK-01	24°21.7330'N	82°19.4680'W	94.7
ROV 19-10	17-VIII-19-3-006	Porifera	Demospongiae	Poecilosclerida	Hymedesmiidae	<i>Hymedesmia</i> sp. FK-02	24°21.7330'N	82°19.4680'W	94.7
ROV 19-17	20-VIII-19-2-002	Porifera	Demospongiae	Poecilosclerida	lotrochotidae	<i>lotrochota birotulata</i>	24°32.7380'N	83°02.2330'W	25.1
ROV 19-18	20-VIII-19-3-003	Porifera	Demospongiae	Poecilosclerida	lotrochotidae	<i>lotrochota birotulata</i>	24°32.2040'N	83°01.7910'W	26.6
ROV 19-18	20-VIII-19-3-007	Porifera	Demospongiae	Poecilosclerida	lotrochotidae	<i>lotrochota birotulata</i>	24°32.2020'N	83°01.7970'W	26.5
ROV 19-18	20-VIII-19-3-008	Porifera	Demospongiae	Poecilosclerida	lotrochotidae	<i>lotrochota birotulata</i>	24°32.0040'N	83°01.7760'W	26.5
ROV 19-06	16-VIII-19-1-009	Porifera	Demospongiae	Poecilosclerida	Microcionidae	<i>Clathria (Thalysias) cf. minuta</i>	24°29.9700'N	81°26.4370'W	88.1
ROV 19-10	17-VIII-19-3-003	Porifera	Demospongiae	Poecilosclerida	Microcionidae	<i>Clathria (Thalysias) cf. minuta</i>	24°21.7330'N	82°19.4680'W	94.7
ROV 19-04	15-VIII-19-1-007	Porifera	Demospongiae	Poecilosclerida	Mycalidae	<i>Mycale</i> sp. FK-01	25°06.5620'N	80°15.7150'W	50.2
ROV 19-02	14-VIII-19-1-015	Porifera	Demospongiae	Scopalina	Scopaliniidae	<i>Scopalina</i> sp.	25°09.5770'N	80°13.1880'W	46.0
ROV 19-10	17-VIII-19-3-002	Porifera	Demospongiae	Suberitida	Suberitidae	<i>Rhizaxinella clava</i>	24°21.6150'N	82°19.4340'W	94.9
ROV 19-04	15-VIII-19-1-018	Porifera	Demospongiae	Suberitida	Suberitidae	<i>Terpios</i> sp. FK-01	25°06.5500'N	80°15.6887'W	53.4
ROV 19-07	16-VIII-19-2-005	Porifera	Demospongiae	Tetractinellida	Geodiidae	<i>Geodia</i> sp.	24°29.5470'N	81°35.6360'W	34.0
ROV 19-07	16-VIII-19-2-009	Porifera	Demospongiae	Tetractinellida	Geodiidae	<i>Geodia</i> sp.	24°29.5090'N	81°35.8910'W	25.1
ROV 19-03	14-VIII-19-2-007	Porifera	Demospongiae	Tetractinellida	Theonellidae	<i>Discodermia dissoluta</i>	25°09.1540'N	80°14.0170'W	34.8
ROV 19-05	15-VIII-19-2-005	Porifera	Demospongiae	Tetractinellida	Theonellidae	<i>Discodermia dissoluta</i>	25°02.2650'N	80°19.2130'W	43.4
ROV 19-05	15-VIII-19-2-010	Porifera	Demospongiae	Tetractinellida	Theonellidae	<i>Discodermia dissoluta</i>	25°02.1340'N	80°19.2540'W	43.4
ROV 19-09	17-VIII-19-2-002	Porifera	Demospongiae	Tetractinellida	Vulcanellidae	<i>Poecillastra</i> sp. FK-03	24°24.1590'N	81°55.2340'W	113.0
ROV 19-04	15-VIII-19-1-012	Porifera	Homoscleromorpha	Homosclerophorida	Plakinidae	<i>Plakortis</i> sp.	25°06.5340'N	80°15.7540'W	50.0
ROV 19-02	14-VIII-19-1-007	Rhodophyta	-	-	-	Rhodophyta	25°09.5470'N	80°13.1460'W	50.4
ROV 19-04	15-VIII-19-1-001	Rhodophyta	Floriideophyceae	-	-	Corallinophycidae	25°06.5500'N	80°15.6887'W	53.4
ROV 19-02	14-VIII-19-1-001	Rhodophyta	Floriideophyceae	Ceramiales	Wrangeliaceae	<i>Haloplegma duperreyi</i>	25°09.5530'N	80°13.1460'W	50.6
ROV 19-01	13-VIII-19-1-023	Rhodophyta	Floriideophyceae	Corallinales	-	Corallinales (Crustose Coralline)	25°13.1140'N	80°11.6050'W	38.0
ROV 19-01	13-VIII-19-1-024	Rhodophyta	Floriideophyceae	Corallinales	-	Corallinales (Crustose Coralline)	25°13.1140'N	80°11.6050'W	38.0
ROV 19-05	15-VIII-19-2-002	Rhodophyta	Floriideophyceae	Corallinales	Corallinaceae	<i>Amphiroa rigida</i>	25°02.2590'N	80°19.1120'W	48.8
ROV 19-01	13-VIII-19-1-006	Rhodophyta	Floriideophyceae	Gigartinales	Kallymeniaceae	<i>Austrokallymenia westii</i>	25°13.1510'N	80°11.3650'W	58.5
ROV 19-01	13-VIII-19-1-004	Rhodophyta	Floriideophyceae	Gracilariales	Gracilariaceae	<i>Gracilaria mammillaris</i>	25°13.1510'N	80°11.3650'W	58.7
ROV 19-07	16-VIII-19-2-002	Rhodophyta	Floriideophyceae	Gracilariales	Gracilariaceae	<i>Gracilaria</i> sp.	24°29.5140'N	81°35.5920'W	37.0
ROV 19-07	16-VIII-19-2-004	Rhodophyta	Floriideophyceae	Gracilariales	Gracilariaceae	<i>Gracilaria</i> sp.	24°29.5140'N	81°35.5940'W	37.0
ROV 19-01	13-VIII-19-1-001	Rhodophyta	Floriideophyceae	Halymeniales	Halymeniaceae	<i>Halymenia pseudofloresia</i>	25°13.1460'N	80°11.3760'W	58.0
ROV 19-01	13-VIII-19-1-002	Rhodophyta	Floriideophyceae	Halymeniales	Halymeniaceae	<i>Halymenia</i> sp.	25°13.1520'N	80°11.3690'W	58.5
ROV 19-01	13-VIII-19-1-005	Rhodophyta	Floriideophyceae	Halymeniales	Halymeniaceae	<i>Halymenia</i> sp.	25°13.1510'N	80°11.3650'W	58.5
ROV 19-01	13-VIII-19-1-010	Rhodophyta	Floriideophyceae	Halymeniales	Halymeniaceae	<i>Halymenia</i> sp.	25°13.1520'N	80°11.3680'W	58.5
ROV 19-02	14-VIII-19-1-006	Rhodophyta	Floriideophyceae	Nemastomatales	Schizymeniaceae	<i>Titanophora incrustans</i>	25°09.5470'N	80°13.1460'W	50.4
ROV 19-05	15-VIII-19-2-008	Rhodophyta	Floriideophyceae	Nemastomatales	Schizymeniaceae	<i>Titanophora incrustans</i>	25°02.1080'N	80°19.2670'W	42.2
ROV 19-01	13-VIII-19-1-011	Rhodophyta	Floriideophyceae	Peyssonneliales	Peyssonneliaceae	<i>Peyssonnelia</i> sp.	25°13.1510'N	80°11.3660'W	58.5

APPENDIX 5

Species List of Fish Populations

Species list fish that were identified from the quantitative video transects for each ROV dive during the 2019 HBOI CIOERT cruise to the Florida Keys National Marine Sanctuary and Tortugas Ecological Reserves. All fish were recorded as present/absent; commercially and recreationally important species were counted along with Lionfish.

Status/Class/Order/Family/Tax Name (authority)	Florida Keys National Marine Sanctuary										Tortugas Eco. Res.			Total
	19-01	19-02	19-03	19-04	19-05	19-06	19-07	19-08	19-09	19-10	19-16	19-17	19-18	
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	
Commercial Species and Lionfish	17	13	9	4	8	21	3			67	7	10	2	161
Actinopterygii	17	13	9	4	8	21	3			67	7	10	2	161
Perciformes	10	6	7	4	1	20	2			67	6	8	2	133
Lutjanidae						19				63	1	2	1	86
<i>Lutjanus analis</i> (Cuvier, 1828) - Mutton Snapper												1		1
<i>Lutjanus buccanella</i> (Cuvier, 1828) - Blackfin Snapper						7				8				15
<i>Lutjanus campechanus</i> (Poey, 1860) - Red Snapper						11				3	1	1		16
<i>Lutjanus vivanus</i> (Cuvier, 1828) - Silk Snapper										52				52
<i>Ocyurus chrysurus</i> (Bloch, 1791) - Yellowtail Snapper													1	1
<i>Rhomboplites aurorubens</i> (Cuvier, 1829) - Vermilion Snapper						1								1
Serranidae	10	6	7	4	1	1	2			4	5	6	1	47
<i>Centropristis fuscus</i> Poey, 1861 - Two Spot Sea Bass										1				1
<i>Cephalopholis cruentata</i> (Lacepède, 1802) - Graysby	10	3	7	1	1		1				2	1		26
<i>Epinephelus guttatus</i> (Linnaeus, 1758) - Red Hind				3										3
<i>Epinephelus itajara</i> (Lichtenstein, 1822) - Atlantic Goliath Grouper								1						1
<i>Epinephelus morio</i> (Valenciennes, 1828) - Red Grouper		2											1	3
<i>Hyporthodus niveatus</i> (Valenciennes, 1828) - Snowy Grouper						1								1
<i>Mycteroperca phenax</i> Jordan & Swain, 1884 - Scamp										3	3	5		11
<i>Mycteroperca</i> sp. - Grouper		1												1
Scorpaeniformes	7	7	2		7	1	1				1	2		28
Scorpaenidae	7	7	2		7	1	1				1	2		28
<i>Pterois volitans</i> (Linnaeus, 1758) - Lionfish	7	7	2		7	1	1				1	2		28
Chordata - Vertebrate	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Actinopterygii	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Anguilliformes				X		X				X				X
Muraenidae				X		X				X				X
<i>Gymnothorax moringa</i> (Cuvier, 1829) - Spotted Moray				X										X
<i>Gymnothorax saxicola</i> Jordan & Davis, 1891 - Honeycomb Moray										X				X
<i>Gymnothorax</i> sp. - Morays						X								X
Aulopiformes					X	X		X		X	X		X	X
Synodontidae					X	X		X		X	X		X	X
<i>Synodus intermedius</i> (Spix & Agassiz, 1829) - Sand Diver					X	X		X		X	X		X	X
Batrachoidiformes	X													X
Batrachoididae	X													X
<i>Opsanus</i> sp. - Toadfish	X													X
Beryciformes	X	X	X	X	X		X			X	X	X		X
Holocentridae	X	X	X	X	X		X			X	X	X		X
<i>Holocentrus adscensionis</i> (Osbeck, 1765) - Squirrelfish	X	X	X	X	X						X	X		X
<i>Holocentrus rufus</i> (Walbaum, 1792) - Longspine Squirrelfish							X							X

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	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	
<i>Myripristis jacobus</i> Cuvier, 1829 - Blackbar Soldierfish			X											X
<i>Plectrypops retrospinis</i> (Guichenot, 1853) - Cardinal Soldierfish										X				X
Lophiiformes								X	X					X
Ogcocephalidae								X	X					X
<i>Ogcocephalus cubifrons</i> (Richardson, 1836) - Polka-Dot Batfish									X					X
<i>Ogcocephalus nasutus</i> (Cuvier, 1829) - Shortnose Batfish								X						X
Perciformes	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Acanthuridae	X	X	X	X	X		X				X	X	X	X
<i>Acanthurus chirurgus</i> (Bloch, 1787) - Doctorfish		X	X	X	X						X			X
<i>Acanthurus coeruleus</i> Bloch & Schneider, 1801 - Blue Tang	X	X	X	X	X		X				X	X	X	X
<i>Acanthurus tractus</i> Poey, 1860 - Ocean Surgeonfish	X	X	X		X		X				X	X	X	X
Apogonidae	X				X						X		X	X
<i>Apogon binotatus</i> (Poey, 1867) - Barred Cardinalfish											X		X	X
<i>Apogon maculatus</i> (Poey, 1860) - Flamefish	X													X
<i>Apogon pseudomaculatus</i> Longley, 1932 - Twospot Cardinalfish											X			X
<i>Apogon</i> sp. - Cardinalfish					X									X
Blenniidae												X		X
<i>Parablennius marmoratus</i> (Poey, 1876) - Seaweed blenny												X		X
Caproidae									X					X
<i>Antigonia capros</i> Lowe, 1843 - Deepbody Boarfish									X					X
Carangidae	X	X	X	X	X	X	X			X	X	X	X	X
<i>Carangoides bartholomaei</i> (Cuvier, 1833) - Yellow Jack	X	X			X	X					X			X
<i>Caranx crysos</i> (Mitchill, 1815) - Blue Runner						X					X			X
<i>Caranx ruber</i> (Bloch, 1793) - Bar Jack		X	X	X	X		X				X		X	X
<i>Caranx</i> sp. - Jack							X							X
<i>Decapterus</i> sp. - Scad	X													X
<i>Seriola dumerili</i> (Risso, 1810) - Greater Amberjack										X				X
<i>Seriola rivoliana</i> Valenciennes, 1833 - Almaco Jack						X				X	X	X		X
Chaetodontidae	X	X	X	X	X	X	X			X	X	X	X	X
<i>Chaetodon capistratus</i> Linnaeus, 1758 - Foureye Butterflyfish	X		X				X				X			X
<i>Chaetodon ocellatus</i> Bloch, 1787 - Spotfin Butterflyfish	X	X	X	X	X		X				X	X	X	X
<i>Chaetodon sedentarius</i> Poey, 1860 - Reef Butterflyfish	X	X	X	X	X		X			X	X	X	X	X
<i>Chaetodon striatus</i> Linnaeus, 1758 - Banded Butterflyfish	X	X		X			X				X			X
<i>Prognathodes aya</i> (Jordan, 1886) - Bank Butterflyfish	X					X				X				X
Ephippidae	X	X												X
<i>Chaetodipterus faber</i> (Broussonet, 1782) - Atlantic Spadefish	X	X												X
Gobiidae				X	X	X	X				X	X	X	X
<i>Coryphopterus personatus</i> (Jordan & Thompson, 1905) - Masked Goby							X					X		X
<i>Coryphopterus punctipectophorus</i> Springer, 1960 - Spotted Goby						X					X		X	X

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	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	
<i>Coryphopterus</i> sp. - Goby											X	X	X	
<i>Elacatinus oceanops</i> Jordan, 1904 - Neon Goby							X				X	X	X	
<i>Gnatholepis cauerensis</i> (Bleeker, 1853) - Goldspot Goby				X	X								X	
Haemulidae	X	X	X	X	X		X				X	X	X	
<i>Anisotremus surinamensis</i> (Bloch, 1791) - Black Margate		X		X	X		X						X	
<i>Anisotremus virginicus</i> (Linnaeus, 1758) - Porkfish												X	X	
<i>Haemulon album</i> Cuvier, 1830 - White Margate					X						X	X	X	
<i>Haemulon flavolineatum</i> (Desmarest, 1823) - French Grunt			X										X	
<i>Haemulon plumierii</i> (Lacepède, 1801) - White Grunt	X		X				X				X		X	
<i>Haemulon</i> sp. - Grunt		X											X	
<i>Haemulon striatum</i> (Linnaeus, 1758) - Striped Grunt	X												X	
Labridae	X	X	X	X	X	X	X			X	X	X	X	
<i>Bodianus pulchellus</i> (Poey, 1860) - Spotfin Hogfish	X	X	X	X	X		X			X			X	
<i>Bodianus rufus</i> (Linnaeus, 1758) - Spanish Hogfish		X	X				X				X	X	X	
<i>Clepticus parrae</i> (Bloch & Schneider, 1801) - Creole Wrasse			X	X			X						X	
<i>Decodon puellaris</i> (Poey, 1860) - Red Hogfish										X			X	
<i>Halichoeres bivittatus</i> (Bloch, 1791) - Slippery Dick	X				X	X	X				X	X	X	
<i>Halichoeres cyanocephalus</i> (Bloch, 1791) - Yellowcheek Wrasse		X		X							X		X	
<i>Halichoeres gamoti</i> Castelnau, 1855 - Green Razorfish	X												X	
<i>Halichoeres garnoti</i> (Valenciennes, 1839) - Yellowhead Wrasse	X		X		X		X						X	
<i>Halichoeres</i> sp. - Wrasse		X			X					X	X		X	
<i>Lachnolaimus maximus</i> (Walbaum, 1792) - Hogfish	X	X	X	X	X						X	X	X	
<i>Thalassoma bifasciatum</i> (Bloch, 1791) - Bluehead	X	X	X	X	X		X				X	X	X	
Lutjanidae							X					X	X	
<i>Lutjanus griseus</i> (Linnaeus, 1758) - Grey Snapper												X	X	
<i>Ocyurus chrysurus</i> (Bloch, 1791) - Yellowtail Snapper							X						X	
Malacanthidae		X			X	X				X			X	
<i>Malacanthus plumieri</i> (Bloch, 1786) - Sand Tilefish		X			X	X				X			X	
Microdesmidae	X												X	
<i>Ptereleotris calliura</i> (Jordan & Gilbert, 1882) - Blue Goby	X												X	
Mullidae	X	X		X			X				X		X	
<i>Pseudupeneus maculatus</i> (Bloch, 1793) - Spotted Goatfish	X	X		X			X				X		X	
Opistognathidae													X	
<i>Opistognathus</i> sp. - Jawfish													X	
Pomacanthidae	X	X	X	X	X		X				X	X	X	
<i>Centropyge argi</i> Woods & Kanazawa, 1951 - Cherubfish	X			X	X								X	
<i>Centropyge aurantonotus</i> Burgess, 1974 - Flameback Angelfish	X												X	
<i>Holocanthus bermudensis</i> Goode, 1876 - Blue Angelfish	X	X	X	X	X		X				X		X	
<i>Holocanthus ciliaris</i> (Linnaeus, 1758) - Queen Angelfish	X		X	X	X		X				X		X	

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	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	
<i>Holocanthus tricolor</i> (Bloch, 1795) - Rock Beauty	X	X	X	X	X		X				X			X
<i>Pomacanthus arcuatus</i> (Linnaeus, 1758) - Gray Angelfish	X	X	X	X	X		X				X	X	X	X
<i>Pomacanthus paru</i> (Bloch, 1787) - French Angelfish	X	X	X	X	X						X			X
Pomacentridae	X	X	X	X	X		X				X	X	X	X
<i>Chromis cyanea</i> (Poey, 1860) - Blue Chromis	X	X	X	X	X		X				X	X	X	X
<i>Chromis enchrysurus</i> Jordan & Gilbert, 1882 - Yellowtail Reeffish	X				X						X		X	X
<i>Chromis insolata</i> (Cuvier, 1830) - Sunshinefish	X	X			X	X		X			X			X
<i>Chromis multilineata</i> (Guichenot, 1853) - Brown Chromis												X	X	X
<i>Chromis scotti</i> Emery, 1968 - Purple Reeffish	X			X							X	X	X	X
<i>Stegastes adustus</i> (Troschel, 1865) - Dusky Damsel			X	X				X						X
<i>Stegastes partitus</i> (Poey, 1868) - Bicolor Damsel	X	X	X	X	X			X			X	X	X	X
<i>Stegastes variabilis</i> (Castelnau, 1855) - Cocoa Damsel	X							X			X	X	X	X
Priacanthidae	X					X				X			X	X
<i>Priacanthus arenatus</i> Cuvier, 1829 - Bigeye	X					X				X			X	X
<i>Pristigenys alta</i> (Gill, 1862) - Short Bigeye										X			X	X
Scaridae	X	X	X	X	X		X				X	X	X	X
<i>Cryptotomus roseus</i> Cope, 1871 - Bluelip Parrotfish													X	X
<i>Scarus</i> sp. - Parrotfish											X	X		X
<i>Nicholsina usta</i> (Valenciennes, 1840) - Emerald Parrotfish	X													X
<i>Scarus coelestinus</i> Valenciennes, 1840 - Midnight Parrotfish					X	X								X
<i>Scarus coeruleus</i> (Edwards, 1771) - Blue Parrotfish								X						X
<i>Scarus iseri</i> (Bloch, 1789) - Striped Parrotfish				X	X			X			X	X	X	X
<i>Scarus taeniopterus</i> Lesson, 1829 - Princess Parrotfish	X			X										X
<i>Scarus vetula</i> Bloch & Schneider, 1801 - Queen Parrotfish			X					X			X			X
<i>Sparisoma atomarium</i> (Poey, 1861) - Greenblotch Parrotfish	X	X	X			X					X		X	X
<i>Sparisoma aurofrenatum</i> (Valenciennes, 1840) - Redband Parrotfish	X			X				X				X		X
<i>Sparisoma rubripinne</i> (Valenciennes, 1840) - Yellowtail Parrotfish											X			X
<i>Sparisoma viride</i> (Bonnaterre, 1788) - Stoplight Parrotfish				X										X
Serranidae	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Anthiadae - Sea Bass: Groupers And Fairy Basslets (Fam.)										X				X
<i>Centropristis ocyurus</i> (Jordan & Evermann, 1887) - Bank Sea Bass						X		X	X					X
<i>Diplectrum formosum</i> (Linnaeus, 1766) - Sand Perch				X										X
<i>Epinephelus morio</i> (Valenciennes, 1828) - Red Grouper											X			X
<i>Hemanthias vivanus</i> (Jordan & Swain, 1885) - Red Barbier						X								X
<i>Hypoplectrus puella</i> (Cuvier, 1828) - Barred Hamlet											X			X
<i>Hypoplectrus randallorum</i> Lobel, 2011 - Tan Hamlet	X													X
<i>Hypoplectrus</i> sp. - Hamlet	X	X												X
<i>Hypoplectrus unicolor</i> (Walbaum, 1792) - Butter Hamlet	X			X				X			X	X	X	X
<i>Liopropoma eukrines</i> (Starck & Courtenay, 1962) - Wrasse Bass										X				X

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	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	
<i>Pronotogrammus martinicensis</i> (Guichenot, 1868) - Roughtongue Bass										X				X
<i>Rypticus saponaceus</i> (Bloch & Schneider, 1801) - Greater Soapfish	X													X
<i>Rypticus</i> sp. - Soapfish							X							X
<i>Serranus annularis</i> (Günther, 1880) - Orangeback Bass	X			X	X						X			X
<i>Serranus atrobranchus</i> (Cuvier, 1829) - Blackear bass										X				X
<i>Serranus baldwini</i> (Evermann & Marsh, 1899) - Lantern Bass					X									X
<i>Serranus notospilus</i> Longley, 1935 - Saddle Bass								X						X
<i>Serranus phoebe</i> Poey, 1851 - Tattler						X		X	X	X				X
<i>Serranus tabacarius</i> (Cuvier, 1829) - Tobaccofish			X	X							X			X
<i>Serranus tigrinus</i> (Bloch, 1790) - Harlequin Bass	X		X		X						X	X	X	X
<i>Serranus tortugarum</i> Longley, 1935 - Chalk Bass	X	X		X	X						X	X		X
Sparidae	X				X						X		X	X
<i>Calamus calamus</i> (Valenciennes, 1830) - Saucereye Porgy	X										X		X	X
<i>Calamus</i> sp. - Porgy					X						X			X
<i>Diplodus argenteus</i> (Valenciennes, 1830) - Silver Porgy	X													X
Sphyraenidae	X			X										X
<i>Sphyraena barracuda</i> (Edwards, 1771) - Great Barracuda	X			X										X
Scorpaeniformes						X			X	X				X
Scorpaenidae						X			X	X				X
<i>Scorpaena</i> sp. - Rock/scorpean/rosefish						X			X	X				X
Triglidae									X					X
<i>Prionotus</i> sp. - Searobin									X					X
Syngnathiformes			X											X
Aulostomidae			X											X
<i>Aulostomus maculatus</i> Valenciennes, 1841 - Atlantic Trumpetfish			X											X
Tetraodontiformes	X	X	X	X	X	X	X			X	X	X	X	X
Balistidae			X	X	X		X							X
<i>Balistes caprisicus</i> Gmelin, 1789 - Grey Triggerfish			X	X	X		X							X
Diodontidae					X									X
<i>Diodon holocanthus</i> Linnaeus, 1758 - Longspined Porcupinefish					X									X
Monacanthidae	X	X	X			X								X
<i>Aluterus monoceros</i> (Linnaeus, 1758) - Unicorn Leatherjacket Filefish						X								X
<i>Cantherhines macrocerus</i> (Hollard, 1853) - Whitespotted Filefish	X		X											X
<i>Cantherhines pullus</i> (Ranzani, 1842) - Orangespotted Filefish	X													X
<i>Monacanthus tuckeri</i> Bean, 1906 - Slender Filefish	X													X
<i>Stephanolepis hispidus</i> (Linnaeus, 1766) - Planehead Filefish		X	X											X
Ostraciidae	X	X	X	X	X		X				X			X
<i>Acanthostracion polygonius</i> Poey, 1876 - Honeycomb Cowfish		X			X									X
<i>Acanthostracion</i> sp. - Cowfish											X			X

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<i>Lactophrys trigonus</i> (Linnaeus, 1758) - Buffalo Trunkfish					X									X
<i>Lactophrys triqueter</i> (Linnaeus, 1758) - Smooth Trunkfish	X	X	X	X	X		X				X			X
Tetraodontidae	X	X	X	X	X	X	X			X	X	X	X	X
<i>Canthigaster rostrata</i> (Bloch, 1786) - Sharpnose Puffer	X	X	X	X	X		X			X	X	X	X	X
<i>Sphoeroides</i> sp. - Pufferfish						X								X
Elasmobranchii					X						X			X
Myliobatiformes					X									X
Urotrygonidae					X									X
<i>Urobatis jamaicensis</i> (Cuvier, 1816) - Yellow Stingray					X									X
Orectolobiformes												X		X
Ginglymostomatidae												X		X
<i>Ginglymostoma cirratum</i> (Bonnaterre, 1788) - Nurse Shark												X		X
Grand Total	X	X	X	X	X	X	X	X	X	X	X	X	X	X