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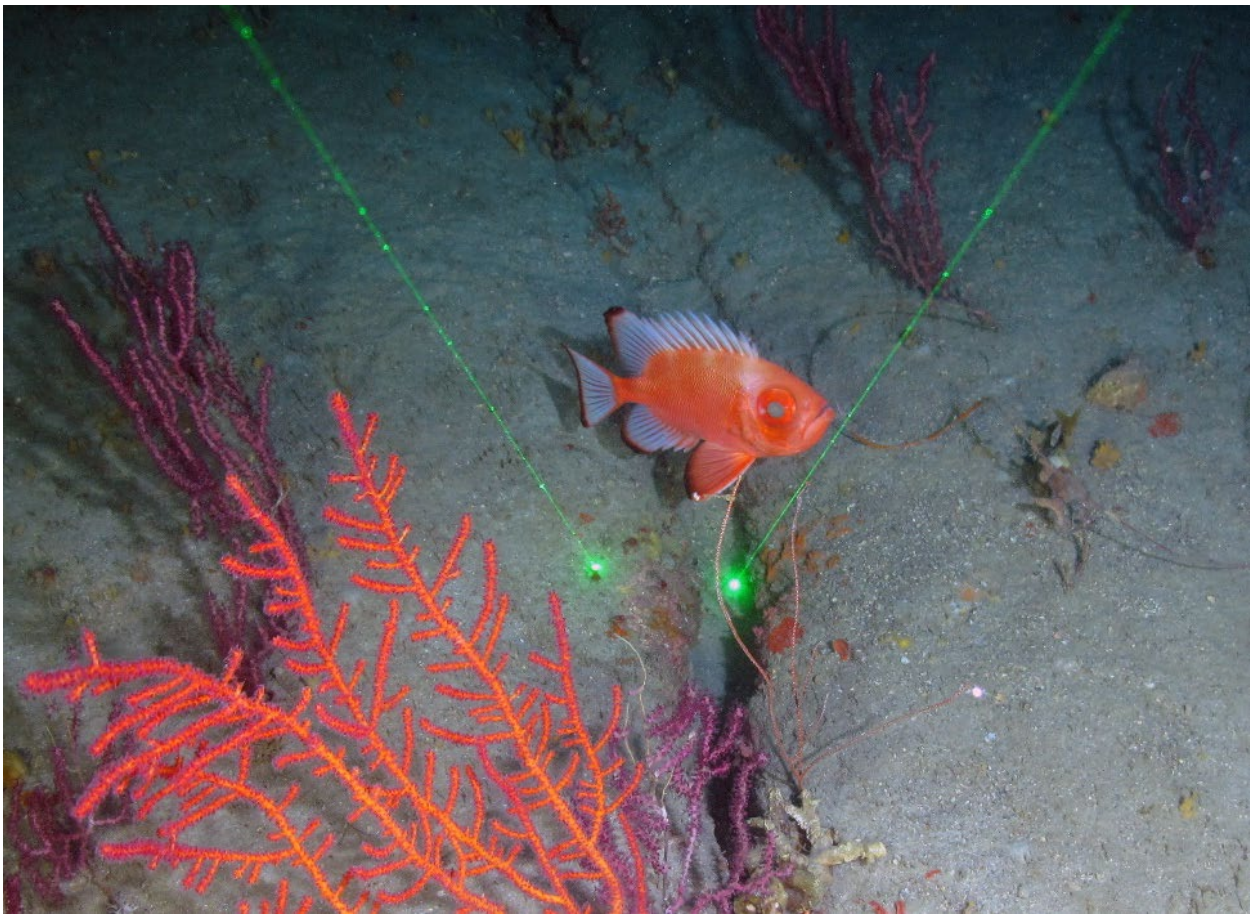
Cruise Report:
MDBC Expedition R/V *Point Sur*, October 4–8, 2021



September 2022

DWH MDBC Cruise Report 2022-01

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For more information on MDBC Restoration, please visit:

https://coastalscience.noaa.gov/project/scientific-support-for-mesophotic-and-deep-benthic-community-restoration-in-the-gulf-of-mexico/

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Disclaimer

Cruise Report:
MDBC Expedition R/V *Point Sur*,
October 4–8, 2021

Coral Propagation Technique Development Project

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DWH MDBC Cruise Report 2022-01

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Deepwater Horizon **Mesophotic and Deep Benthic Communities Restoration**

This report is part of the NOAA Mesophotic and Deep Benthic Communities (MDBC) Series of publications that share the results of work conducted by the *Deepwater Horizon* MDBC restoration projects.

The 2010 *Deepwater Horizon* oil spill was an unprecedented event. Approximately 3.2 million barrels of oil were released into the deep ocean over nearly three months. The plume of oil moved throughout the water column, formed surface slicks that cumulatively covered an area the size of Virginia, and washed oil onto at least 1,300 miles of shoreline habitats. More than 770 square miles (2,000 square kilometers) of deep benthic habitat were injured by the oil spill, including areas surrounding the *Deepwater Horizon* wellhead and parts of the Pinnacles Trend mesophotic reef complex, located at the edge of the continental shelf.

Under the Oil Pollution Act, state and federal natural resource trustees conducted a Natural Resource Damage Assessment (NRDA). The Trustees assessed damages, quantifying the unprecedented injuries to natural resources and lost services. They also developed a programmatic restoration plan to restore injured resources and compensate the public for lost services.

In April 2016, a settlement was finalized that included up to $8.8 billion in funding for the *Deepwater Horizon* Trustees to restore the natural resource injuries caused by the oil spill as described in their programmatic restoration plan, Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement. The *Deepwater Horizon* Open Ocean Trustee Implementation Group is responsible for restoring natural resources and their services within the Open Ocean Restoration Area that were injured by the oil spill. The Open Ocean Trustees include NOAA, U.S. Department of the Interior, U.S. Environmental Protection Agency, and U.S. Department of Agriculture.

In 2019, the Open Ocean Trustee Implementation Group committed more than $126 million to implement four restoration projects to address the injury to MDBC. The MDBC projects are: Mapping, Ground-Truthing, and Predictive Habitat Modeling; Habitat Assessment and Evaluation; Coral Propagation Technique Development; and Active Management and Protection. NOAA and the Department of the Interior are implementing the projects, in cooperation with a range of partners, over eight years.

Together, the projects take a phased approach to meet the challenges involved in restoring deep-sea habitats. Challenges to restoration include a limited scientific understanding of these communities, limited experience with restoration at the depths at which these communities occur, and remote locations that limit accessibility.

More information about *Deepwater Horizon* restoration and the MDBC restoration projects is available at: www.gulfspillrestoration.noaa.gov.

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Background

The Submerged Acquisition of Living Tissue (SALT 1) Expedition (RV *Point Sur* PS-22-08) was the first to sail for Mesophotic Deep Benthic Communities (MDBC) projects. Staff at NOAA and U.S. Geological Survey (USGS) traveled by air and over ground from Charleston, SC and Gainesville, FL to Gulfport, MS to meet the remotely operated vehicle (ROV) *Mohawk* team from University of North Carolina (UNC), Wilmington in October 2021. The team embarked on the research vessel RV *Point Sur* for five days from October 4–8, using the ROV *Mohawk* to sample corals from 50 to 70 m depth.

The primary purpose of the mission was to obtain live corals from mesophotic depths to support the Coral Propagation Technique Development (CPT) project. The cruise supported the objective of propagating corals, by providing two federal laboratories with material for husbandry and experimentation. SALT 1 was the first of multiple cruises aboard the RV *Point Sur*, under the MDBC portfolio of projects. SALT 2 followed in June of 2022, with a longer list of objectives.

Objectives of Mission

The primary objectives of the SALT 1 field expedition aboard RV *Point Sur* were to: survey benthic habitat using an ROV, collect live and preserved coral samples, and maintain these at cold temperatures. These objectives were quantified as follows:

a. Acquire n=33 live samples of propagation target species for husbandry
    i. Maintain these alive in refrigerated conditions at 20°C
    ii. Also collect live rock
b. Acquire n=30 snips for genetic target species
    i. Preserve these in molecular grade ethanol and maintain at -80°C
c. Survey large aggregations of gorgonian corals identified in previous explorations
    i. Verify these aggregations in terms of species identity, density, and extent
d. Ship live material to federal laboratories

Science Team

Table 1. Participant list for RV *Point Sur* PS-22-08.

Name	Role	Affiliation	Email
Peter Etnoyer	Chief Scientist	NOAA	peter.etnoyer@noaa.gov
Janessy Frometa	Biologist	CSS, Inc under contract to NOAA	janessy.frometa@noaa.gov
Eric Glidden	ROV operator	UNCW	gliddene@uncw.edu
Will Jenkins	Biologist	USGS	wjenkins@usgs.gov
Trevor Horwell	Observer	AIS, Inc	trevorhaisinc@gmail.com
Jason White	ROV Operator	UNCW	whitejh@uncw.edu

Operations

The cruise itinerary included mobilization and shore side visits on October 3 and 4. All NOAA COVID testing requirements were adhered to. The ship departed at 18:00 hours CST (all hours are in Central Standard Time) on October 4, and returned to shore on October 8. A participant list and the full itinerary are provided in Tables 1 and 2.

Daily operations began with a CTD (conductivity, temperature, and depth) cast at 08:00 hours to collect water for coral husbandry and water chemistry. This was followed by ROV dives to a series of targets known to have large aggregations of octocorals. The targets were provided by Dr. Will Patterson at University of Florida. Diving operations were concluded in the late afternoon to allow time to depart the whale zone, Rice's whale (*Balaenoptera ricei*) core distribution area (CDA), by sunset.

Environmental compliance was completed in advance. An observer was brought aboard to meet requirements for operations within the Rice's whale CDA, see Figure 1. Consultations were held with NOAA's Office of Protected Resources and a Scientific Research Permit was obtained from NOAA Fisheries Southeast Regional Office (SERO).

Table 2. Itinerary for PS-22-08. CDA = Rice's whale core distribution area.

Date	Operations	Comment
10/3/2021	Mobilize ROV	UNCW ROV team aboard RV *Point Sur* in Gulfport
10/4/2021	Science party joins, ship departs at 18:00	Etnoyer tours MS Aquarium. Science party embarks. Total 3 science, 2 ROV, 1 observer, 6 ship's crew
10/5/2021	CTD and ROV	Survey outside CDA at KK site and DeSoto Rim 19
10/6/2021	CTD and ROV	Survey inside CDA at Pensacola Edge sites PE01, PE04
10/7/2021	ROV only	Survey inside CDA at Yellow Gravel sites YG04, YG14
10/8/2021	Demobilize ROV, tour MS Science Center, transport live corals	Live corals arrive Gainesville, FL by 18:00
10/9/2021	Receive live corals	Live corals arrive Charleston, SC by 18:00

Locations

Six different locations were visited in three days, as shown in Table 3 and Figure 1 below.

Table 3. Dive list for RV *Point Sur* cruise labeled PS-22-08. Dive numbers are consecutive. The ROV operator dive numbers started at 943. Coordinates and depths are for dive start position.

Date	Dive	Locality	Time (CST)	Latitude	Longitude	Depth (m)	Duration (h:min)	Samples
10/5/2021	1	KK site	9:08:10	30.12343	-86.87086	51.9	1:20	9
10/5/2021	2	DSR 19	13:19	30.1214	-86.8804	52	2:56	14
10/6/2021	3	PE 01	10:15	29.851	-87.2835	68	1:25	5
10/6/2021	4	PE 01	13:32	29.85002	-87.28601	66.4	1:08	9
10/6/2021	5	PE 04	15:26	29.8483	-87.3033	62	0:54	3
10/7/2021	6	YG 14	9:18	29.69672	-87.37526	68.6	1:49	6
10/7/2021	7	YG 04	11:58	29.70189	-87.35931	73.2	0:27	0

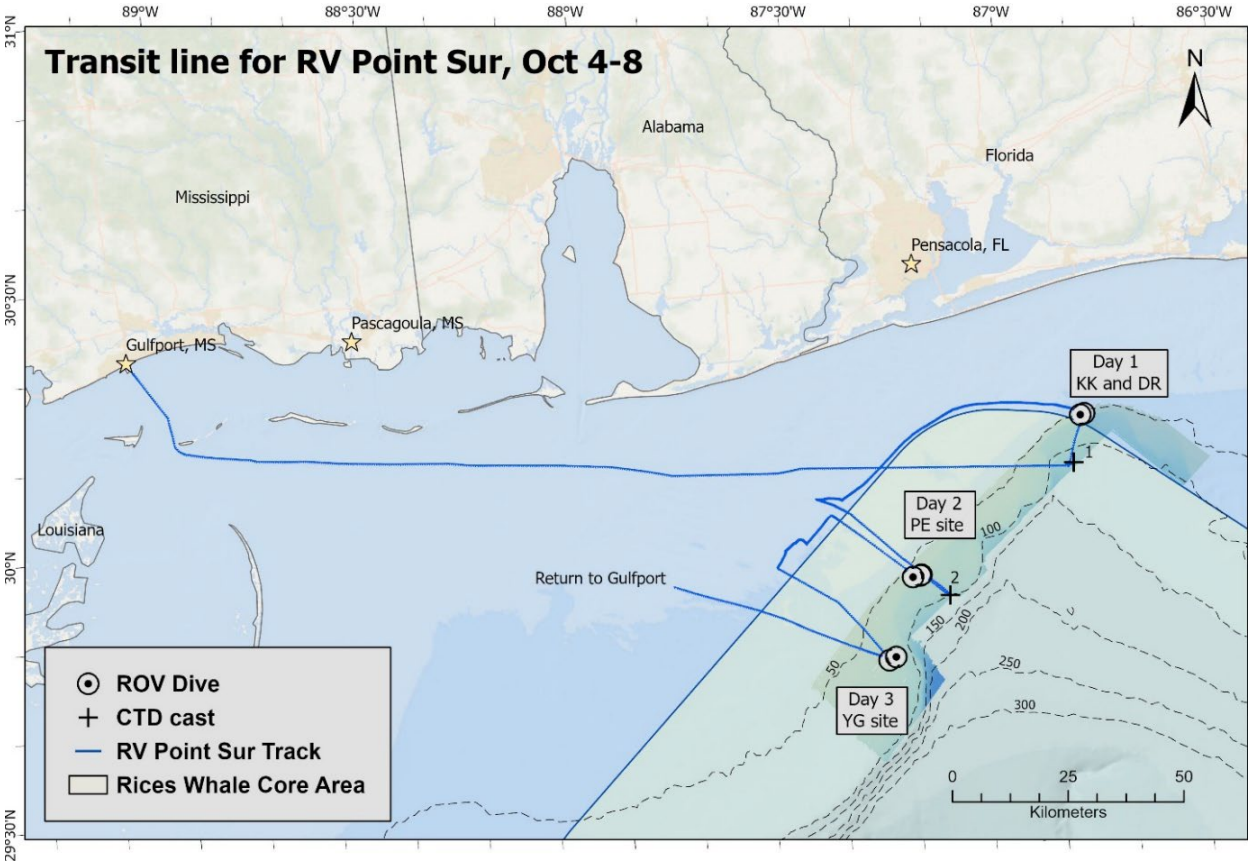

Figure 1. A map of the RV *Point Sur* ships track (in blue) in relation to the Rice's whale core distribution area (CDA; shaded). Dive locations are shown as circles, and CTD (conductivity, temperature, and depth) locations at crosses.

Results and Discussion

The Submerged Acquisition of Living Tissue (SALT 1) expedition accomplished all the primary objectives. The team surveyed benthic habitat using an ROV, collected live and preserved coral samples with an ROV, and maintained these at cold temperatures. Corals were safely transported to federal labs where they continue to be used for studies to this day.

One objective was not accomplished—collection of 'live rock'—because grain size was too fine for the manipulator. This objective was discontinued for future cruises. Several sites were not visited or surveyed—DeSoto Rim (DSR) 12 and 24, Pensacola Edge (PE) 05, and Yellow Gravel (YG) 03 and 15 were not visited or surveyed.

The following is a summary of activities and accomplishments:

a. Seven ROV dives were made over 3 days (Table 3)
b. A total of 46 coral samples were collected (Table 4)
    i. 34 live colonies; white *Muricea pendula*, red *Swiftia exserta*, and yellow Plexauridae
    ii. 12 genetic samples; *Thesea nivea, Ellisella, Bebryce,* and *Placogorgia*
c. Three CTD-O casts collected water for chemistry and husbandry (Table 5)
d. A small number of survey lines were done, for annotation
    i. A 350 m plus survey line at Desoto Rim 19, with lasers on for quantification and then off, for broadcast at local aquaria and outreach through social media. The highlights included soft corals, angel fish, nurse shark, and jellyfish.
    ii. A 500 m survey line was done at Pensacola Edge 4 and Yellow Gravel 14
e. Two site visits were made by Dr. Peter Etnoyer while on location in Gulfport
    i. Mississippi State Aquarium with Dr. Alexa Delaune, VP of Veterinary Services
    ii. Mississippi Science Center with Captain Nic Allen

Data Accessibility

The data, maps, or samples from this field mission will be held by NOAA and USGS participants. The digital information (raw data, nav files, CTD casts, still images) can be accessed through NOAA's Data Integration Visualization Exploration and Reporting (DIVER) platform described below.

Processed, detailed, and quality-controlled information on coral occurrences will be reported to NOAA's National Database of Deep-Sea Corals and Sponges. Information about the biological samples is available upon direct request by email to the Chief Scientist.

Information to access data and other products from this field mission will be made available on the DIVER web page: Mesophotic and Deep Benthic Communities Portfolio.

Tissue Samples

Table 4. Sample list for RV *Point Sur* cruise labeled as PS-22-08. Sample IDs are truncated for the table; the full ID appends cruise and dive number. Date and time are local (central time). etoh = ethyl alcohol; Frz = frozen.

ID	Scientific name	Date	Time (CST)	Latitude	Longitude	Depth (m)	Live	95% etoh	Frz	Dry
S1	*Muricea pendula*	10/5	9:34	30.1233	-86.8712	51.9	X			
S2	*Muricea pendula*	10/5	9:46	30.12349	-86.87085	52	X	X	X	
S3	*Muricea pendula*	10/5	9:57	30.12308	-86.87097	52	X			
S4	*Muricea pendula*	10/5	10:03	30.12299	-86.87111	52	X			
S5	*Muricea pendula*	10/5	10:08	30.12296	-86.87105	52	X			
S6	*Muricea pendula*	10/5	10:16	30.12298	-86.87126	52.3	X			
S7	*M. pendula?*	10/5	10:19	30.12298	-86.87126	52.3		X	X	
S8	*Thesea nivea*	10/5	10:24	30.12298	-86.87126	52.3				
S9	*Muricea pendula*	10/5	10:32	30.12299	-86.87123	52.3	X			X
S10	*Muricea pendula*	10/5	13:46	30.1212	-86.8804	51	X			
S11	*Muricea pendula*	10/5	13:54	30.1215	-86.8806	51	X			
S12	*Muricea pendula*	10/5	13:58	30.1215	-86.8806	51	X			
S13	*Muricea pendula*	10/5	14:07	30.12156	-86.8804	51	X			
S14	*Muricea pendula*	10/5	14:12	30.12167	-86.8804	51	X			
S15	*Muricea pendula*	10/5	14:15	30.12167	-86.8804	51	X			
S16	*Thesea nivea*	10/5	14:23	30.12148	-86.88049	51		X	X	
S17	*Placogorgia sp.*	10/5	14:32	30.12138	-86.88111	51		X	X	
S18	*Muricea pendula*	10/5	14:44	30.12144	-86.8815	51		X	X	
S19	*Muricea pendula*	10/5	14:57	30.12144	-86.8815	51		X	X	
S20	*Muricea pendula*	10/5	15:03	30.12144	-86.8815	51		X	X	
S21	*Ellisella sp.*	10/5	15:12	30.12112	-86.8819	52		X	X	
S22	*M. pendula*?	10/5	15:17	30.12112	-86.8819	52		X	X	
S23	*Thesea nivea*	10/5	15:28	30.12112	-86.8819	52		X	X	
S24	*Swiftia exserta*	10/6	10:54	29.8502	-87.2855	63.5	X	X	X	
S25	*Swiftia exserta*	10/6	11:05	29.8502	-87.2855	63.5	X	X	X	X
S26	*Swiftia exserta*	10/6	11:13	29.8502	-87.2855	63.5	X	X	X	
S27	*Swiftia exserta*	10/6	11:25	29.8502	-87.2855	63.5	X	X	X	
S27b	*Swiftia exserta*	na	na	na	na	na	X	X	X	
S28	*Swiftia exserta*	10/6	11:35	29.8502	-87.2855	63.5	X	X	X	
S29	*Swiftia exserta*	10/6	13:56	29.85008	-87.28585	66.4	X	X	X	

ID	Scientific name	Date	Time (CST)	Latitude	Longitude	Depth (m)	Live	95% etoh	Frz	Dry
S30	*Swiftia exserta*	10/6	14:01	29.85008	-87.28585	66.4		X	X	
S31	*Swiftia exserta*	10/6	14:05	29.85008	-87.28585	66.4		X	X	
S32	*Swiftia exserta*	10/6	14:09	29.85021	-87.28609	66		X	X	
S33	*Swiftia exserta*	10/6	14:11	29.85021	-87.28609	66	X	X	X	
S34	*Swiftia exserta*	10/6	14:22	29.85	-87.28599	66		X	X	
S35	*Swiftia exserta*	10/6	14:27	29.85	-87.28599	66		X	X	
S36	*Swiftia exserta*	10/6	14:33	29.85	-87.28599	66	X	X	X	
S37	*Swiftia exserta*	10/6	14:35	29.8501	-87.2858	66	X	X	X	
S38	*Bebryce sp.*	10/6	15:34	29.84906	-87.30273	57.7		X	X	
S39	*Bebryce sp.*	10/6	15:58	29.84906	-87.30273	57.7		X	X	
S40	*Placogorgia sp.*	10/6	16:19	29.8496	-87.30163	57		X	X	
S41	*Plexauridae*	10/7	9:37	29.69679	-87.37576	68.6	X			
S42	*Plexauridae*	10/7	9:45	29.69681	-87.37583	68.7	X			
S43	*Placogorgia atlantica*	10/7	10:20	29.69672	-87.37507	69	X			
S44	*Plexauridae*	10/7	10:26	29.69655	-87.37493	69.1	X			
S45	*Plexauridae*	10/7	10:29	29.69648	-87.37493	69.1	X			
S46	*M. pendula?*	10/7	11:04	29.69691	-87.37272	69.8	X			

Water Samples

The results from the water chemistry analysis of water collected by ROV and CTD are used to help establish target levels for parameters in our mesophotic aquaria systems. Water samples were collected into 250 ml plastic bottles and stored at 3°C temperature for one day before analysis of phosphates (PO_4), nitrates (NO_3), and nitrites (NO_2). Data were analyzed by Will Jenkins at USGS using a Hach DR3900 system on board the vessel. Calcium (Ca), Magnesium (Mg), and Ammonia (NH_3) used Red Sea test kits, 14 days post-acquisition. Results of the Hach system analysis are shown in Table 5. Results from the CTD-O (-oxygen) are shown in Figures 2 and 3.

Table 5. Water chemistry analysis of water collected by ROV and CTD aboard PS-22-08.

Event	NH_3 (mg/L)	NO_2^- (mg/L)	NO_3^- (mg/L)	$[PO_4]^{3-}$ (mg/L)	Mg (ppm)	Ca (ppm)	Alkalinity (dKH)
Dive 1	0.00	0.00	0.70	0.07	1440.00	410.00	7.17
Dive 2	0.00	0.00	0.40	0.05	1600.00	450.00	7.39
Dive 3	0.00	0.00	0.60	0.04	1600.00	450.00	7.39
Dive 4	0.00	0.00	0.50	0.04	1480.00	450.00	8.06
Dive 5	0.00	0.00	0.40	0.06	1550.00	410.00	7.84
Dive 6	0.00	0.00	0.60	0.07	1600.00	440.00	7.84
CTD 2	na	na	na	na	1560.00	440.00	7.84
CTD 3	na	na	na	na	1600.00	460.00	8.06

As expected, ammonia and nitrite levels were undetectable. Ca, alkalinity, and Mg were within expected ranges and comparable to commercially available salts used for the aquarium systems. Nitrates and phosphates were also within expected ranges. The analysts note the importance of maintaining these nutrients at similar levels in laboratory aquaria. They may be an essential food source for the corals and/or their symbionts.

It is possible that, given the unknown factor of how much surface water was mixing with the water in ROV biobox and suction canisters) the actual bottom water levels of phosphates and nitrates may be higher as nutrients may accumulate at lower depths and in reef environments due the higher abundance of marine organisms present.

For future cruises, it would be prudent to ensure that dedicated equipment capable of collecting discrete water samples from the sites of coral collections is available.

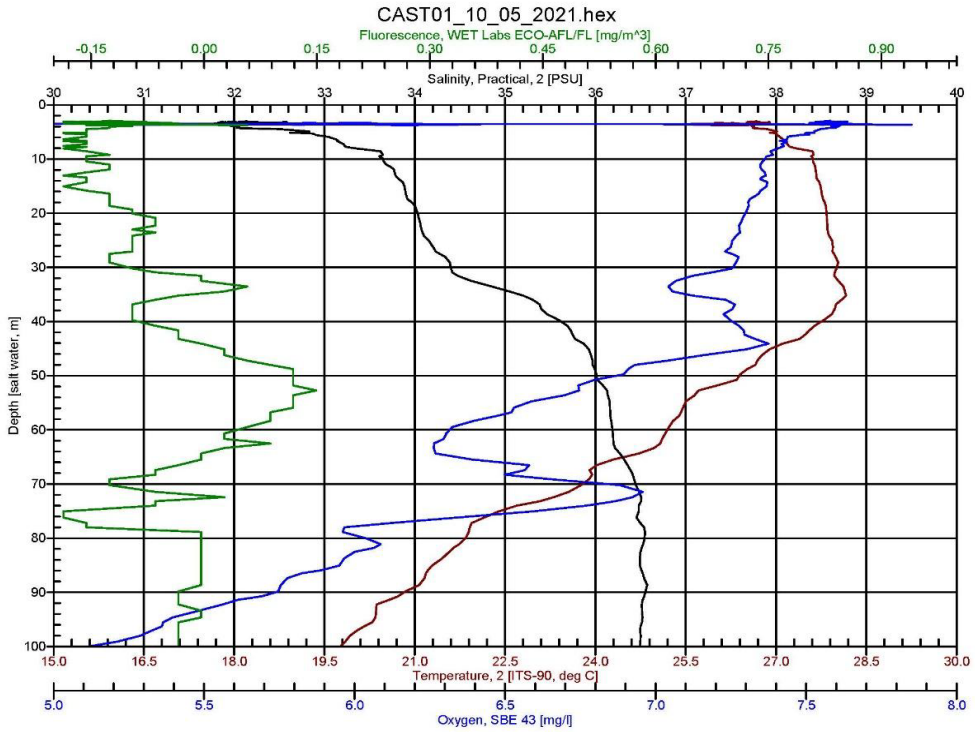

Figure 2. A water column profile. Temperature is red, oxygen is blue, salinity is black, fluorescence is green.

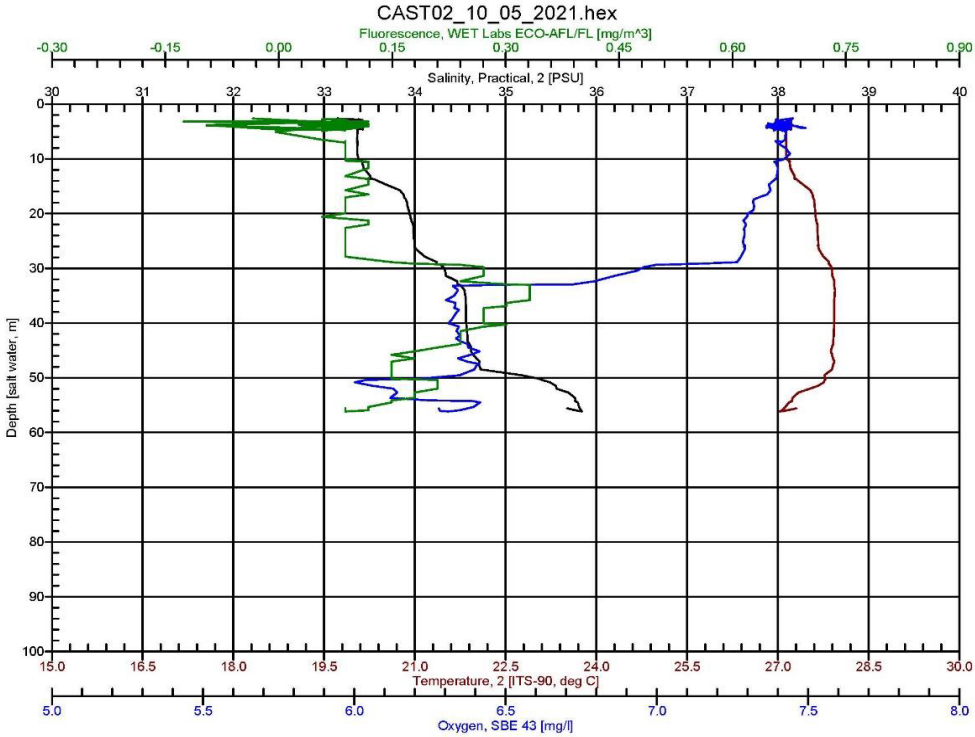

Figure 3. A water column profile showing temperature in red, oxygen in blue, salinity in black, and fluorescence in green. The depth of dive 1 was 50 m, with temperatures near 27°C.

Post-Cruise Activities

The following activities took place shortly after the cruise, including a number of important observations:

- Corals arrived at the labs in Gainesville and Charleston, and acclimated to the tanks. Spawning activity was observed in *Swiftia* on the full moon of October 20, at both labs.
- Data on colony gender, size, and health of colonies was reported in sample sheets.
- Etnoyer shipped ROV hard drive by mail to NOAA's National Centers for Environmental Information (NCEI). This was returned to NCCOS in July 2022.
- Images of coral samples and water chemistry by Jenkins were appended to this report.
- Maps were generated for each dive by Salgado were appended to this report.
- Observation logs from the ship and observer were added to Google Drive.
- Transect video segments from Dive 944 were uploaded to the cloud for annotation tests.
- Sample 43b was deprecated for species identification using SEM by Andrew Shuler at Hollings Marine Lab (HML). The species diagnosis was *Placogorgia atlantica.*
- Follow up call was held with Mississippi Aquarium's Dr. Alexa DeLaune and the lab teams.
- Recommendations were made MGM regarding mapping activities at De Soto Rim.
- Questions for operations in Rice's whale CDA with NMFS SERO were discussed and resolved for future cruises: How to maximize night time operations? Should we revise the scientific research permit to remove 'live rock'? Under which circumstances, if any, could a vessel run ROV or autonomous underwater vehicle (AUV) operations at night?
- Answers to these questions were: slow transits were deemed acceptable at night at ROV speeds (less than 2 knots), and revising the permit to exclude live rock and black corals exempted the cruise from Scientific Research Permit.

Dive Summaries

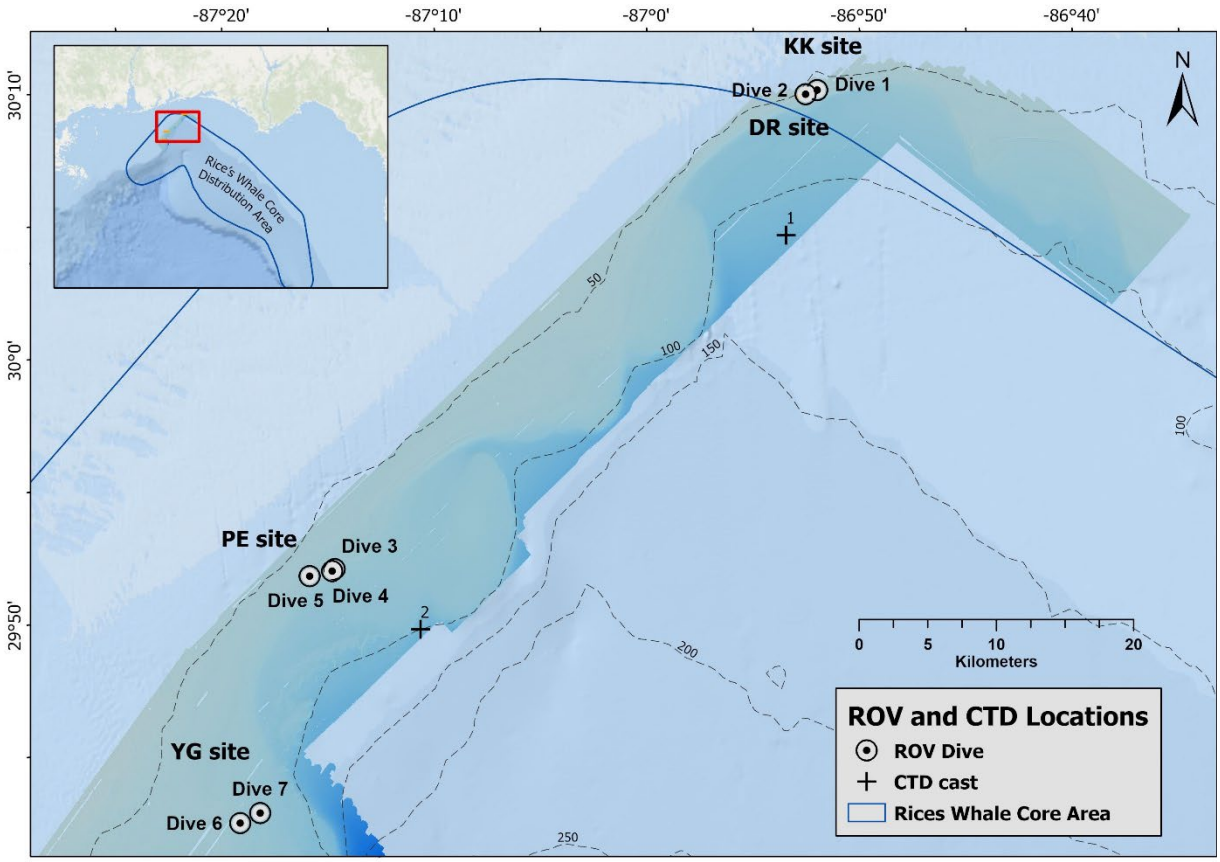

Figure 4. A map showing seven dives conducted over the course of three days of field operations October 5–7, 2021. Bathymetry from previous multibeam surveys by USGS shows as shaded green-blue. The main frame is located in the northwest corner of the Rice's whale CDA, as shown in in the inset.

Mission Overview

The first day targeted KK site and DeSoto Rim, the second day surveyed Pensacola Edge (PE) sites, the last day surveyed Yellow Gravel (YG) sites. The dashed line shows the Rice's whale CDA.

The first area of operations was at the northern extent of the Rice's whale area, at KK site and De Soto Rim (DR, Figure 4). A CTD cast was made in advance of the dive to a) assess CTD-O and fluorescence, and b) collect water for coral husbandry and water chemistry. CTD cast 1 was to 115 m at location 30.03262, -86.9136 at 07:26 hours (Figure 2). The position is at the 100 m isobath, south of the dive target.

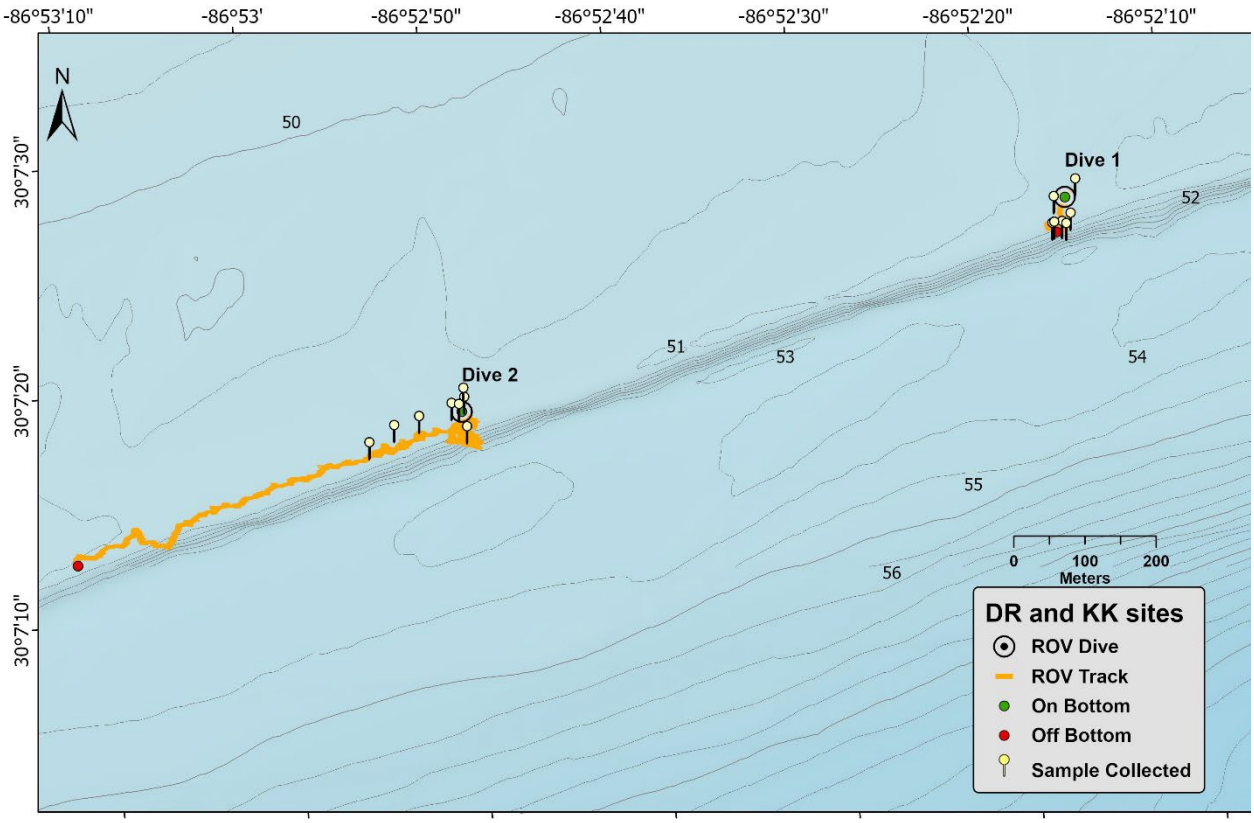

Figure 5. A map showing two dive locations on the first day of field operations, on October 5, 2021. The first day surveyed KK site (Dive 1, or 943) and DeSoto Rim (Dive 2, or 944). Dive two had a long transect.

Dive 1 – KK site, east southeast of Pensacola, FL. Oct 5, 2021.

For the first dive, the ROV launched at 09:10 hours and was on bottom at 09:18 hours. The dive surveyed a 100 m radius area at 52 m depth. Dive duration was 1 hr 20 min. Bottom temperature was 26°C at a depth of 50 m. This was a bounce dive with minimal transit. Navigation was compromised by bubbles from the ship's propellers.

The dive was located on the shallow side of a small escarpment (Figure 5), with topography characterized by a low relief rocky ledge feature, based on maps of topographic relief. The rocky ledge was observed by the ROV where they were expected from the maps. The relief of the features was as predicted, at 1–2 m relief. We recovered 9 samples—6 subsamples of live white *Hypnogorgia* (= *Muricea*), one whole large *Hypnogorgia*, one small snip of an orange *Hypnogorgia*, and on whole *Thesea nivea*. No quantitative video transects were done.

In general, abundance of fish was moderate and abundance of corals was high. Coral species observed in order of abundance were *Thesea nivea, Ellisella elongata, Muricea pendula, Antipathes furcate*, and unidentified Plexauridae. No colonies showed obvious evidence of injury. Fish species included queen angelfish, bigeyes, wrasse bass, amberjacks and lionfish. There was one aggregation of red snapper observed in the distance. One pile of rope/line gear was observed.

Dive 2 – DeSoto Rim 19 site, south of Pensacola, FL. Oct 5, 2021.

The second dive of the expedition surveyed a 600 m extent, almost entirely at 52 m depth, with one excursion deeper to 58 m depth and one shallower to 50 m depth. The site was north of the Rice's whale CDA and west of the previous KK site. The target area is by a low relief rocky ledge feature, with sand areas shoreward and boulders deeper and seaward.

One CTD cast was made to a) assess CTD-O and fluorescence, and b) collect water for coral husbandry and water chemistry. CTD cast 2 was to 50 m at location 30.11902, -86.88133 and 12:41 hours CTD (Figure 3). The ROV CTD sensor was not operational.

The dive was on bottom at 13:14 hours. Dive duration was 3 hours. Bottom temperature was 26°C at a depth of 50 m. This was a sampling dive with a 500 m westward transit at the end. The dive sampled on the shallow edge of a small escarpment. The relief of the features was as predicted, at 1–2 m relief. We recovered 14 samples—6 samples of live white *Hypnogorgia* (= *Muricea*), and eight small snips of: *Thesea nivea, Placogorgia, Hypnogorgia*, and one *Ellisella*. *Hypnogorgia* was observed in colors of white, orange, yellow.

One long (500 m) semi-quantitative video transect was done for the purpose of shore-based annotation (Figure 5). The lasers were turned off occasionally for best quality video, but heading and height above bottom were maintained, so view area should be comparable. The transect showed a continuous, homogenous assemblage of octocorals along the DeSoto Rim. Highlights of the transit were a nurse shark and a jellyfish with attendant school of small silversides.

In general, abundance of fish was moderate and abundance of corals was high. Coral species observed in order of abundance were *Thesea nivea, Ellisella elongata, Muricea pendula, Antipathes furcata, Antipathes atlantica,* and a few unidentified Plexauridae. A variety of sponges were also present in small aggregations. Few coral colonies showed obvious evidence of injury. Fish species included queen angelfish, butterflyfish, bigeyes, wrasse bass, bluehead wrasse, snapper, lionfish, and nurse shark. There were occasional aggregations of snapper and baitfish.

Trash was more prevalent on this dive, presumably due to the larger area surveyed. Two large anchors were observed, as well as rope, a sinker, a home-made plastic buoy from a laundry detergent bottle, a tire, and a trash bag.

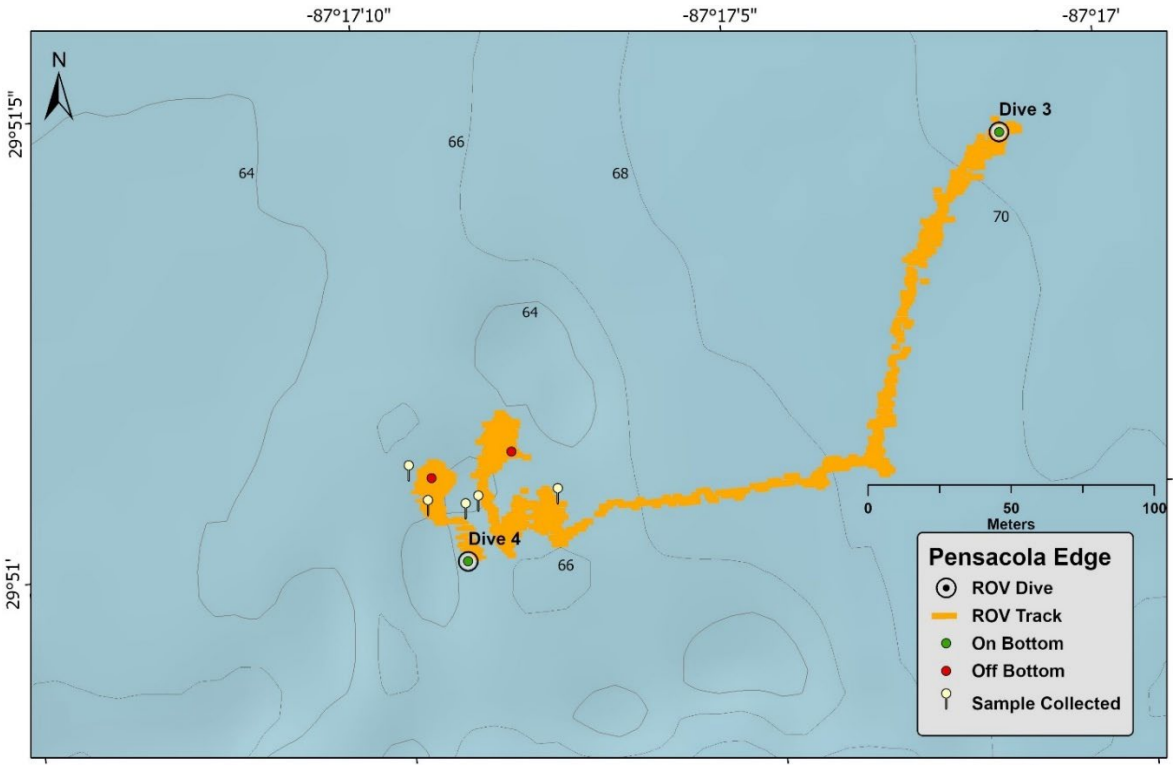

Figure 6. A map showing two dives at Pensacola Edge 01 on October 6, 2021. The first dive (Dive 3) landed 100 m east-northeast of the target. The next (Dive 4) reacquired the target. Numbers are depth in meters.

Dive 3 – Pensacola Edge 1, further south of Pensacola. Oct 6, 2021

The dive location is within a shipping channel to Pensacola (Figure 6). The location was provided by Dr Will Patterson of UF. It was characterized by high abundance of *Swiftia exserta* corals, based on previous surveys. No ships or mammals were observed during the transit operations. One CTD cast was made to a) assess CTD-O and fluorescence, and b) collect water for coral husbandry and water chemistry. CTD cast 3 was to 100 m at location 29.808, -87.22263 and 09:00 hours CST. ROV CTD was not operational.

The dive was on bottom at 10:15 hours and ended by 11:41 hours. Dive duration was 1 hr 25 min. Bottom temperature was 26°C at a depth of 50 m. This was a sampling dive with minimal transit. The dive landed in sand and transited west towards a rocky outcrop covered with a dense aggregation of *Swiftia exserta* at 29.8504, -87.2855 and 65 m depth. The dive recovered 5 colonies for husbandry. Observations of fish and invertebrates included octopus, grouper, jacks, tilefish, lionfish, and angelfish. No trash or fishing gear was observed.

Dive 4 – Pensacola Edge 1, further south of Pensacola. Oct 6, 2021

The dive location is within a shipping channel to Pensacola (Figure 6). The location was identical to the previous dive—a rocky outcrop characterized by high abundance of *Swiftia exserta* corals. No ships or mammals were observed during the transit operations. The dive was on bottom at 13:32 hours CST. Dive duration was 1 hr 8 min. This was a sampling dive with no transit. The dive recovered 9 samples of *Swiftia exserta* as small snips for genetics.

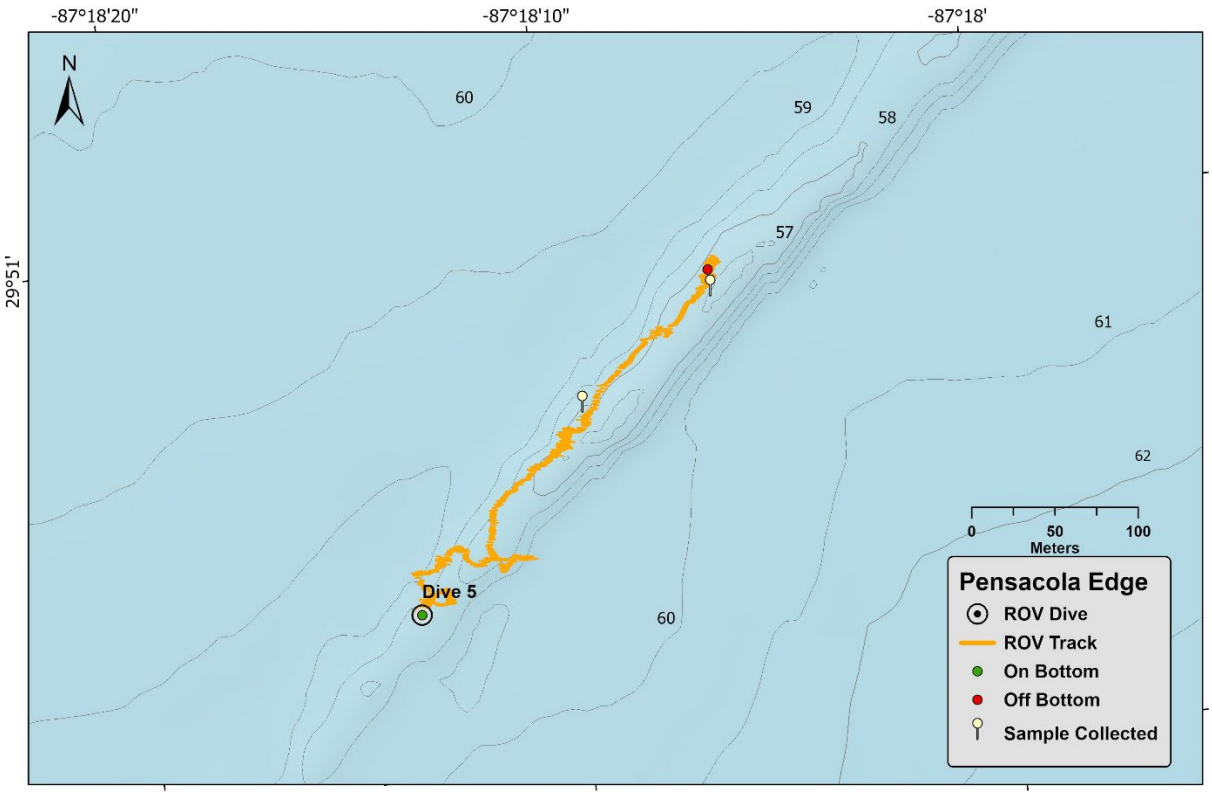

Figure 7. A map showing Dive 5 at Pensacola Edge 4 on October 6, 2021. Numbers show depth in meters.

Dive 5 – Pensacola Edge 4, further south of Pensacola. Oct 6, 2021

The dive location is west of the shipping channel to Pensacola at coordinates 29.8483, -87.3033 (Figure 7). The location was provided by Will Patterson, UF based on previous surveys. No ships or mammals were observed during the operation.

The dive was on bottom at 15:20 hours CST and off bottom at 16:20 hours. Dive duration was 1 hr. This was a transit dive with few samples. The transit began at 15:37 hours from position 29.84826, -87.30348 and depth of 62 m, with heading of 040. The transit surveyed a rocky linear feature with sparse corals and sponges, some rather large. Three samples were collected—two *Bebryce* and one *Placogorgia*.

Fish species included a dolphin at the surface, and snapper at depth. Several large colonies of white *Muricea* (= *Hypnogorgia*) and cf. *Tenacetipathes* were seen. Sponges were present in a few different species. Small corals were conspicuous. They included *Madracis*, *Bebryce, Villogorgia, Placogorgia*, among others. Only a small portion of the outcrop was seen, much more remains to explore. The dive concluded with the sample of *Placogorgia* from a very large, barren colony with a basket star attached, and scant living tissue on the distal tips.

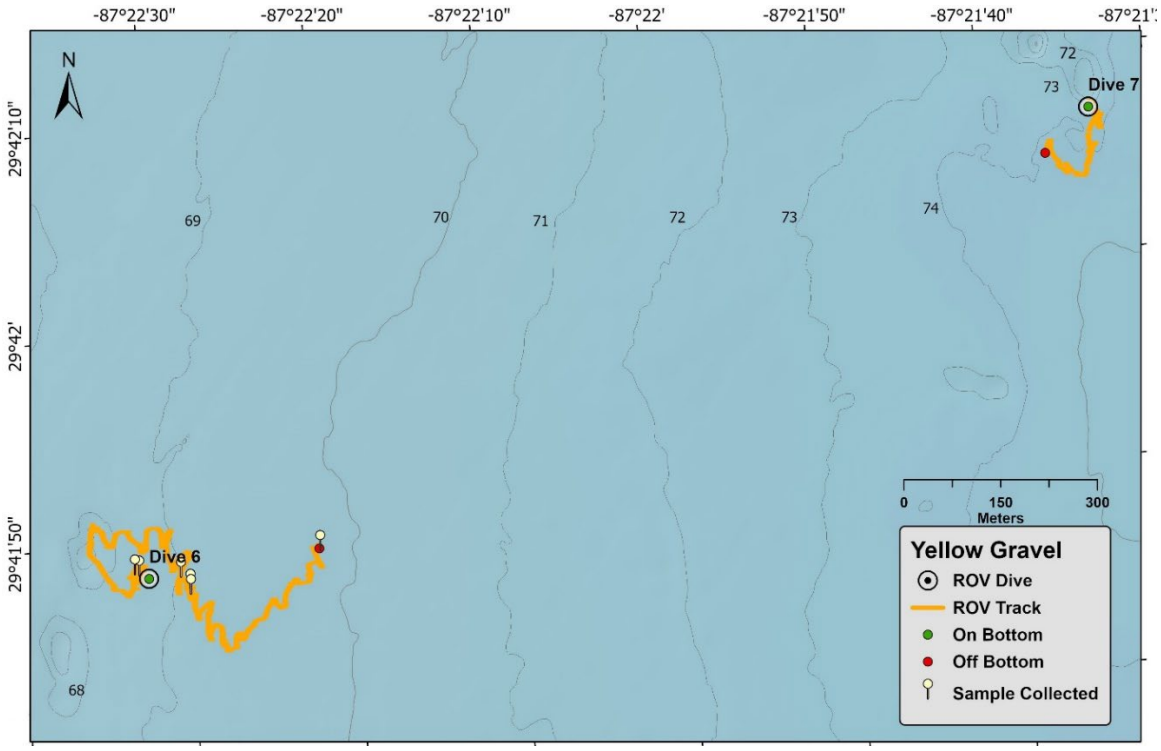

Figure 8. A map showing two dives at Yellow Gravel on October 7, 2021. Dive 6 was 1 hr 50 min duration. Dive 7 briefly surveyed YG 4, before it was cut short. Numbers show depth in meters.

Dive 6 – Yellow Gravel 14, further south of all sites visited. Oct 7, 2021

The sixth dive took place at sites further southeast from Pensacola and began at Yellow Gravel 14 (YG14) at coordinates 29.6988, -87.3752, at a depth of 68.6 m (Figure 8). The location was given by Dr. Will Patterson, UF and previously characterized to contain various species of interest such as *Muricea pendula*, *Thesea nivea*, and *Placogorgia/Paramuricea* spp., among others.

The dive was on bottom at 9:18 hours CST and off bottom at 11:07 hours, a dive duration of 1 hr 49 min. The site contained mostly sandy bottom with colonies of *Antipathes* spp. and yellow Plexaurids sparsely distributed throughout. The ROV traveled northwest towards site YG3, but few corals were encountered. Once the ROV transited southeast, more frequent rocky patch reefs approximately 1m in size were observed. These contained crinoids, octocorals (*Thesea nivea*, *Bebryce* sp., yellow plexaurids), black corals (*Antipathes furcata*, *A. gracilis*, and *Stichopathes* whips), and reef fish (short big eye, angel fish). A moray eel was observed in one of the rocky patches. An anchor line was encountered at 10:39 hours. The ROV followed along the anchor line until the end of the dive.

Two markers were dropped on the Hypack system: one labeled “Purple town” which consisted of a larger aggregation of purple colonies (*Thesea nivea*, possibly *Muricea pendula*), and another labeled “10:40:10” which consisted of a large aggregation of *Thesea nivea* and yellow Plexaurids. A total of six octocorals, five yellow plexaurids and one orange plexaurid (presumably *M. pendula*), were collected throughout the dive, and kept alive for husbandry in Gainesville and Charleston labs. This brought total number of tissue samples to 49. See examples shown in Figure 9 and Appendix 1.

Dive 7 – Yellow Gravel 4. Oct 7, 2021

The dive location was at coordinates 29.7019, -87.3588 (Figure 8), which had been provided by Will Patterson, UF as a possible location with high abundance of *Muricea pendula*, *Thesea nivea*, yellow Plexauridae, *Bebryce grandis*, *Ellisela elongata*, *Muriceides hirta*, and *Scleracis* sp. No ships or mammals were observed during this dive.

The ROV was on bottom at 11:58 hours CST and off bottom 12:15 hours. The dive was limited to 17 minutes due to technical difficulties with the ROV (water in umbilical caused electrical short and loss of communication with ROV). Transit began at 12:00 hours at a depth of 73 m. The transit was directed towards the first patch reef which was visible. Collection of one *Muricea pendula* colony was attempted but contact with ROV was lost in the process.

Habitat was quite similar to Yellow Gravel 14, consisting of sandy bottom with isolated rocky patch reefs (1–2 m in diameter). Patch reefs were sparsely populated with *Muricea* sp., *Thesea nivea*, yellow Plexauridae, black corals and sea whips. Fish congregated around these patch reefs such as snappers, bigeye, and butterfly fish. First patch reef (where ROV landed) had an eel, fireworms and unknown small fish occupying the same cavity. Dive ended with a dead ROV recovery.

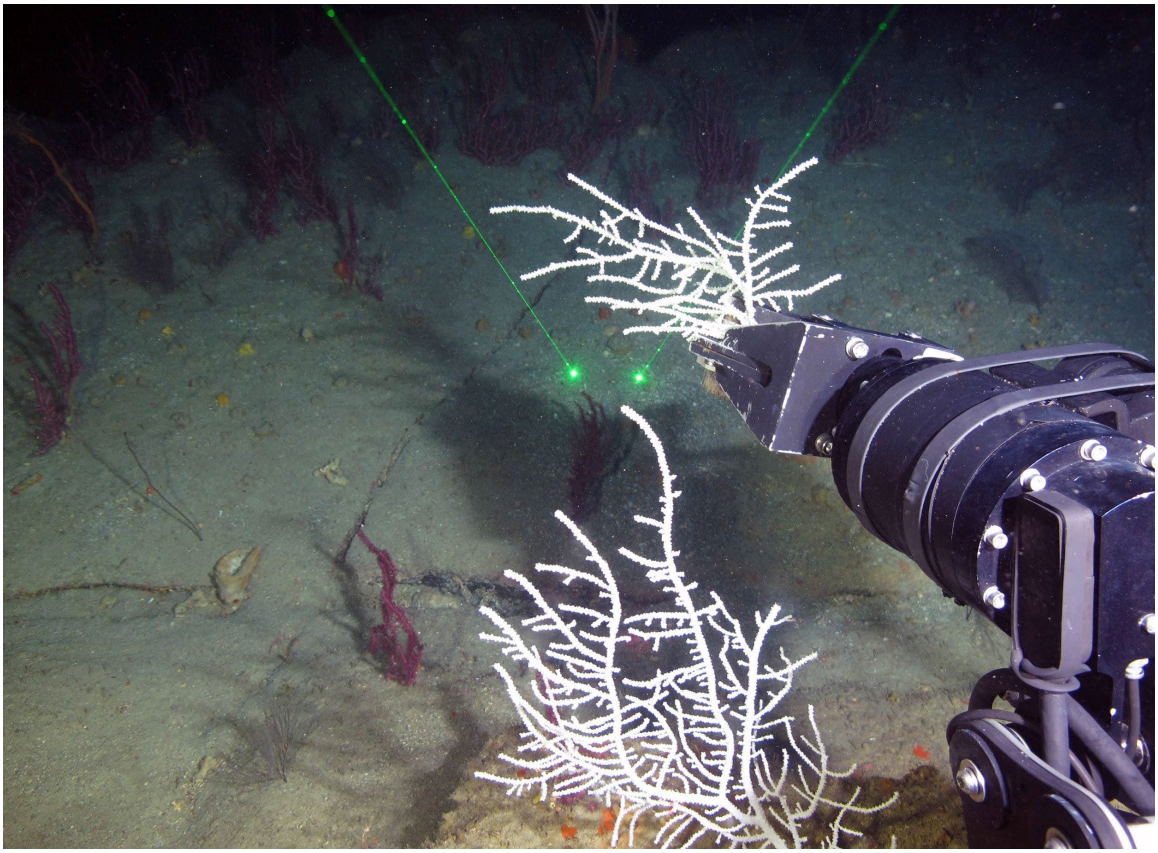

Figure 9. Sample collection of *Muricea pendula*. Dive is 943. Sample is S5. Depth is 52 m. Lasers are 10 cm.

Appendix 1 – Sample Images

NOTE: Lasers are 10 cm apart

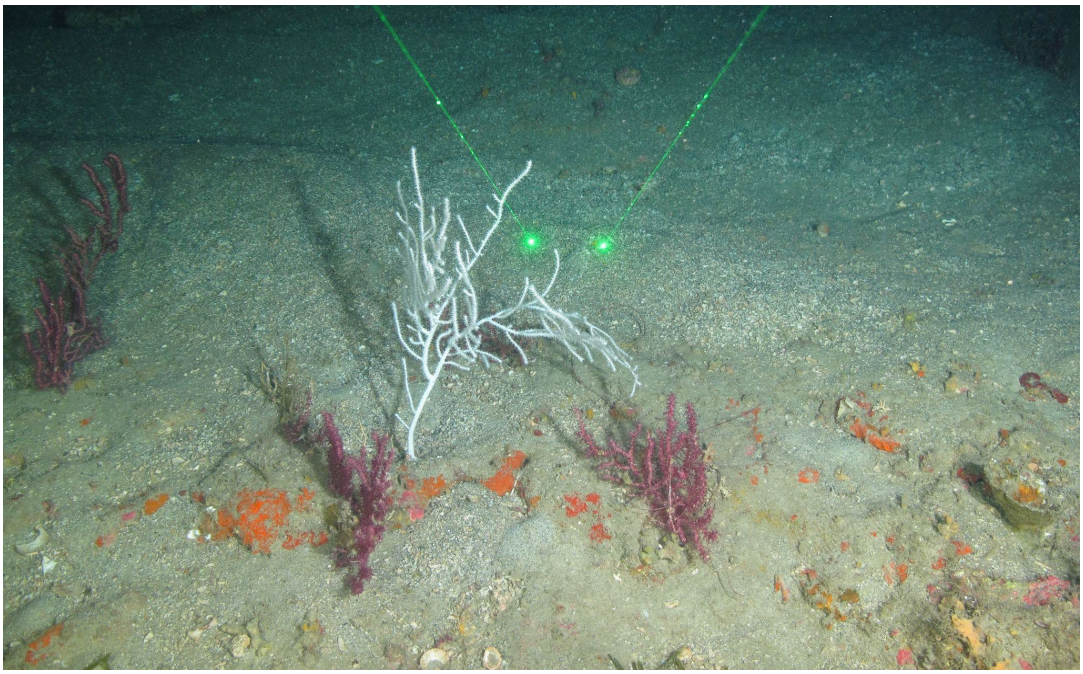

Figure A1. *In situ* image of *Muricea pendula* (PS-22-Dive01-S01) sample from KK site at 52 m.

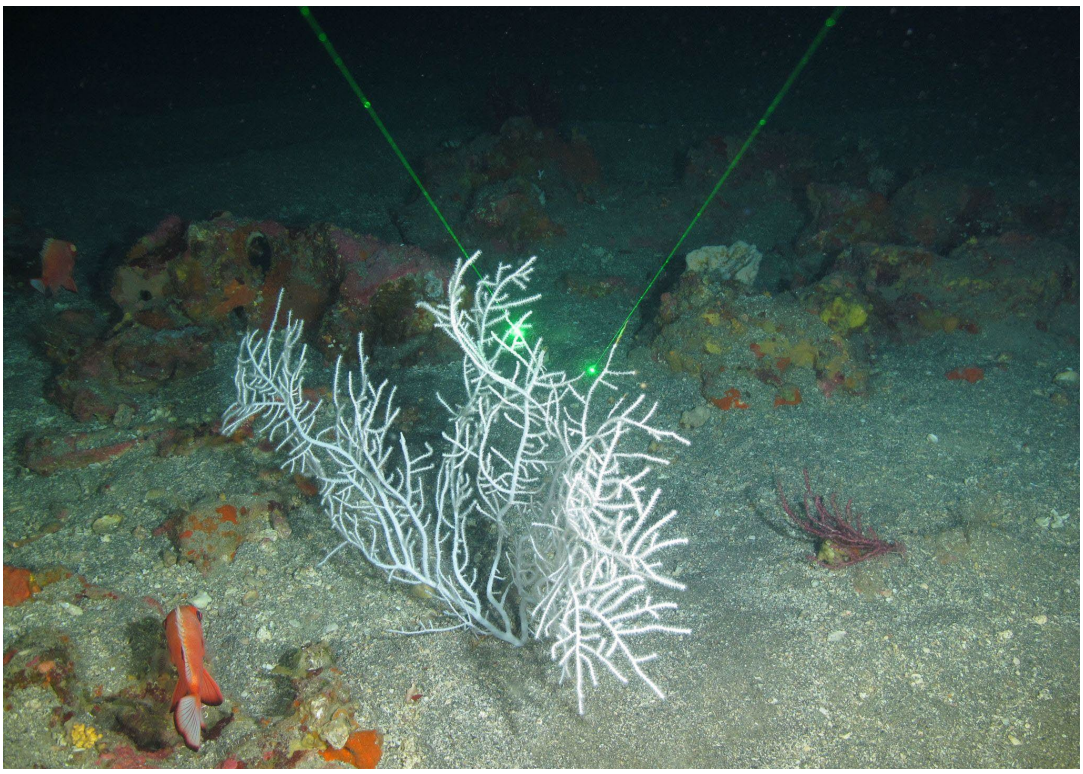

Figure A2. *In situ* image of *Muricea pendula* (PS-22-Dive01-S02) sample from KK site at 52 m.

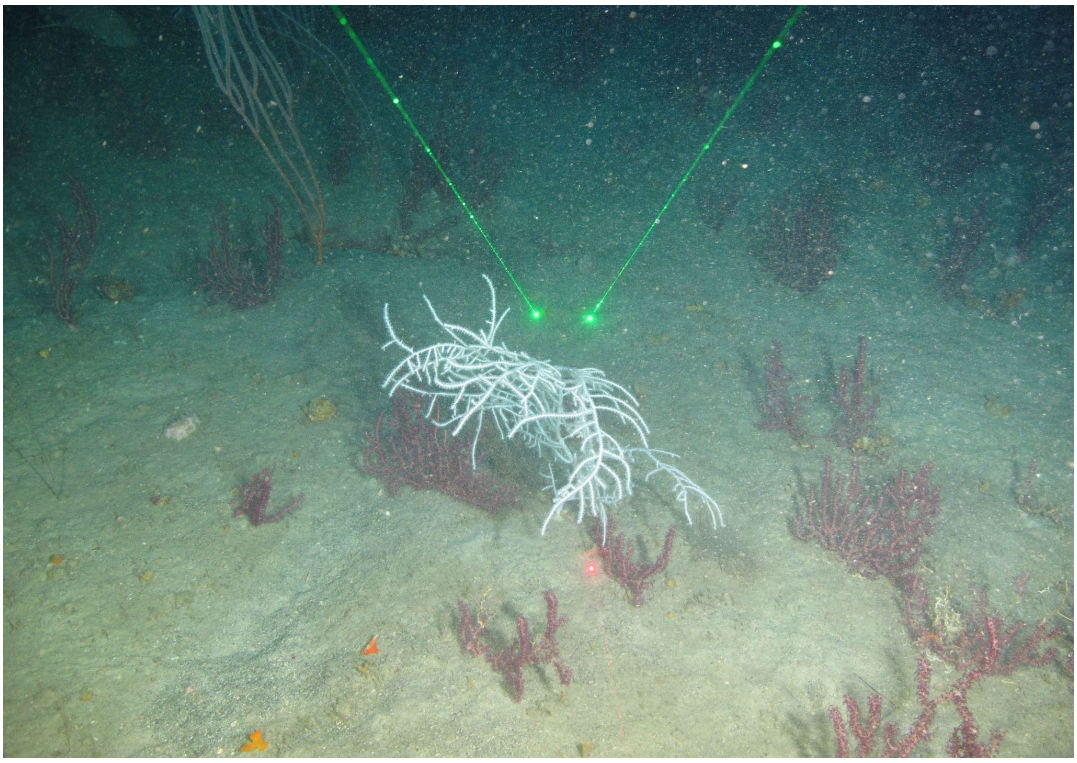

Figure A3. *In situ* image of *Muricea pendula* (PS-22-Dive01-S03) sample from KK site at 52 m.

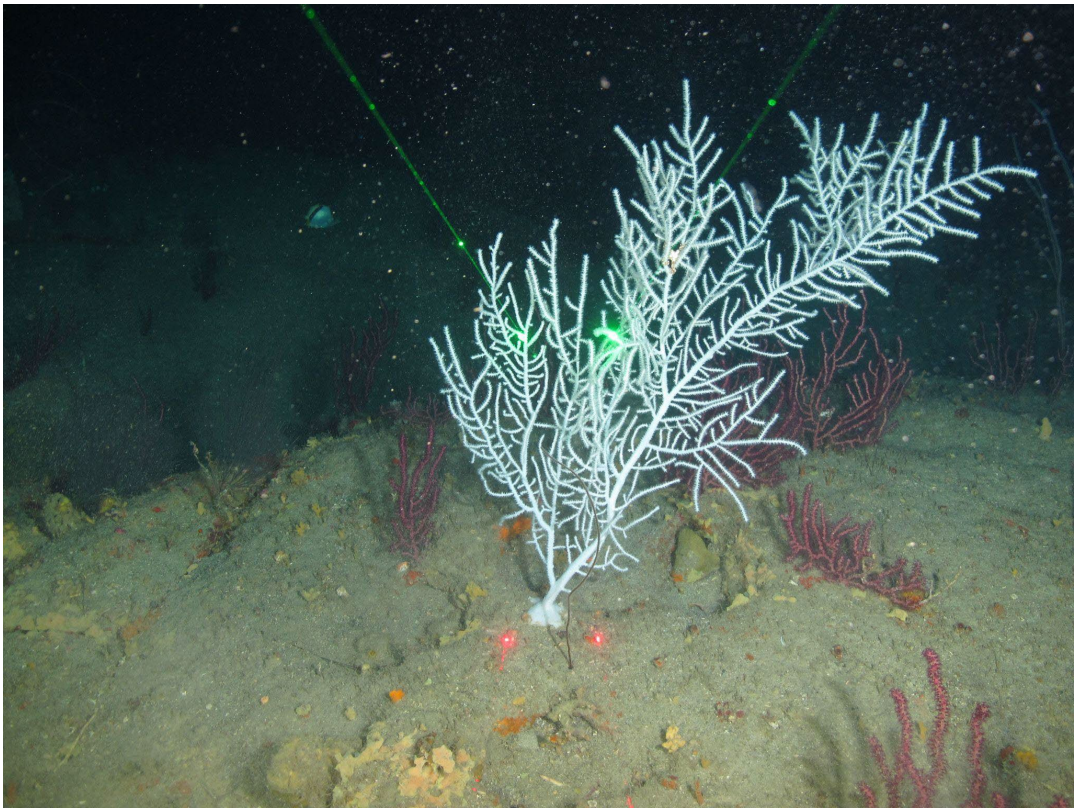

Figure A4. *In situ* image of *Muricea pendula* (PS-22-Dive01-S04) sample from KK site at 52 m.

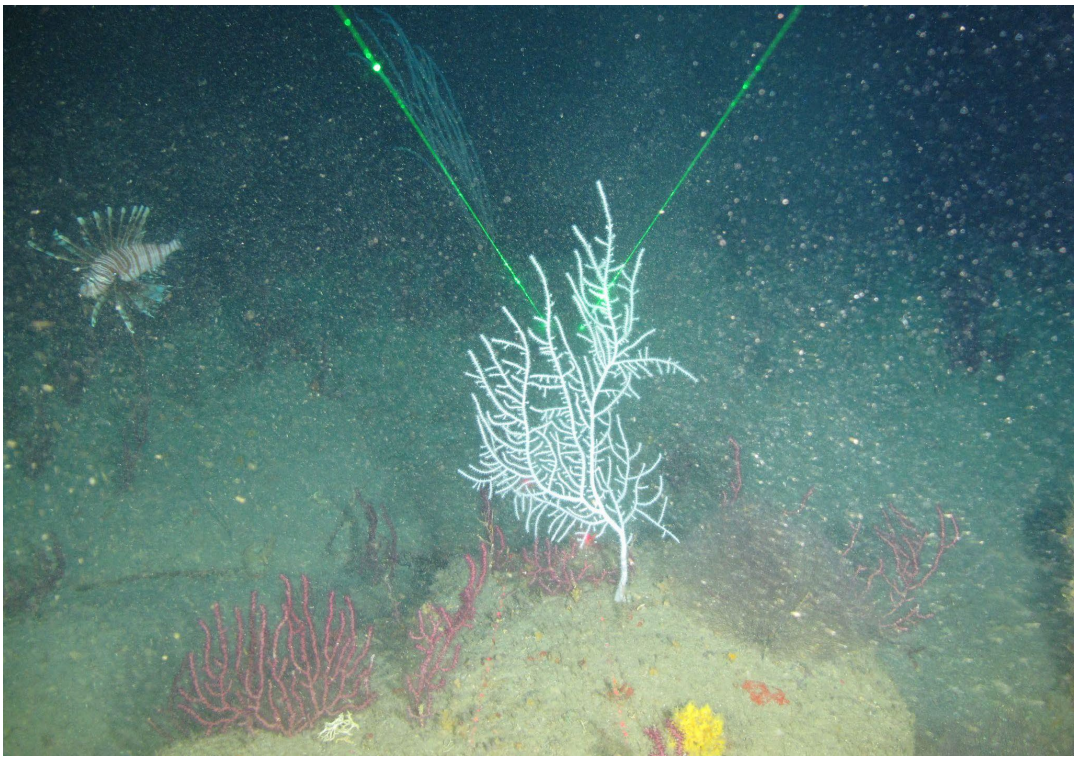

Figure A5. *In situ* image of *Muricea pendula* (PS-22-Dive01-S05) sample from KK site at 52 m.

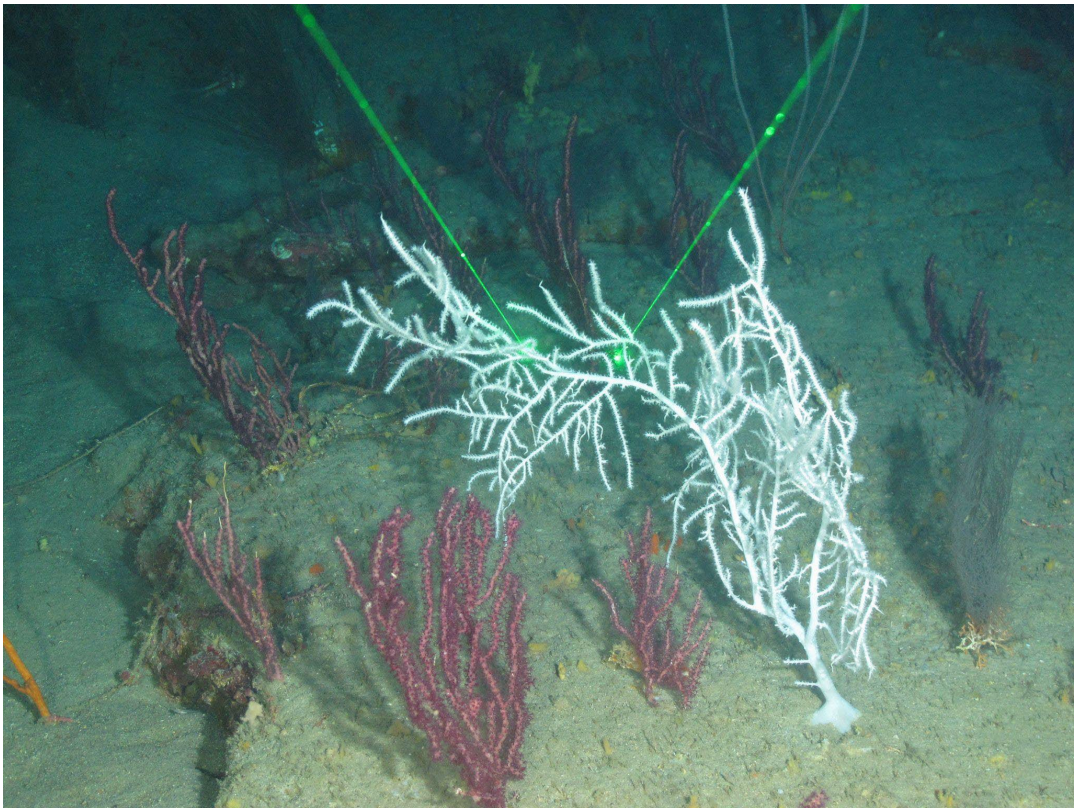

Figure A6. *In situ* image of *Muricea pendula* (PS-22-Dive01-S06) sample from KK site at 52 m.

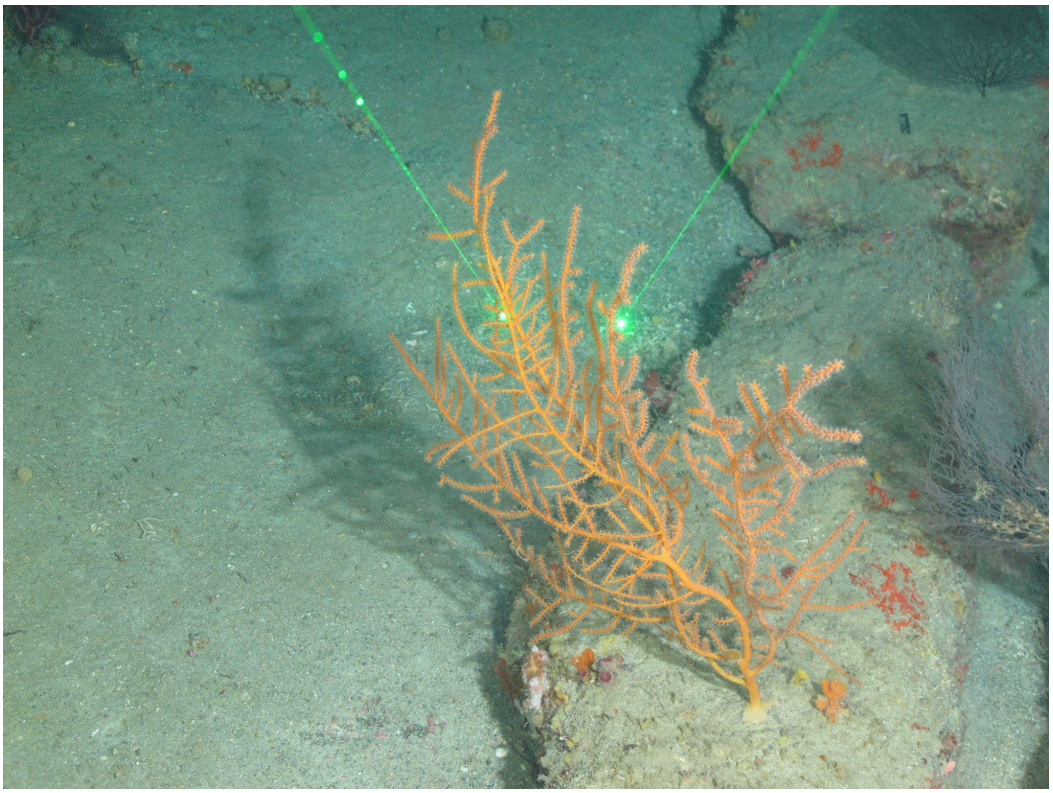

Figure A7. *Muricea pendula* (PS-22-Dive01-S07; orange morph) sample from KK site at 52 m.

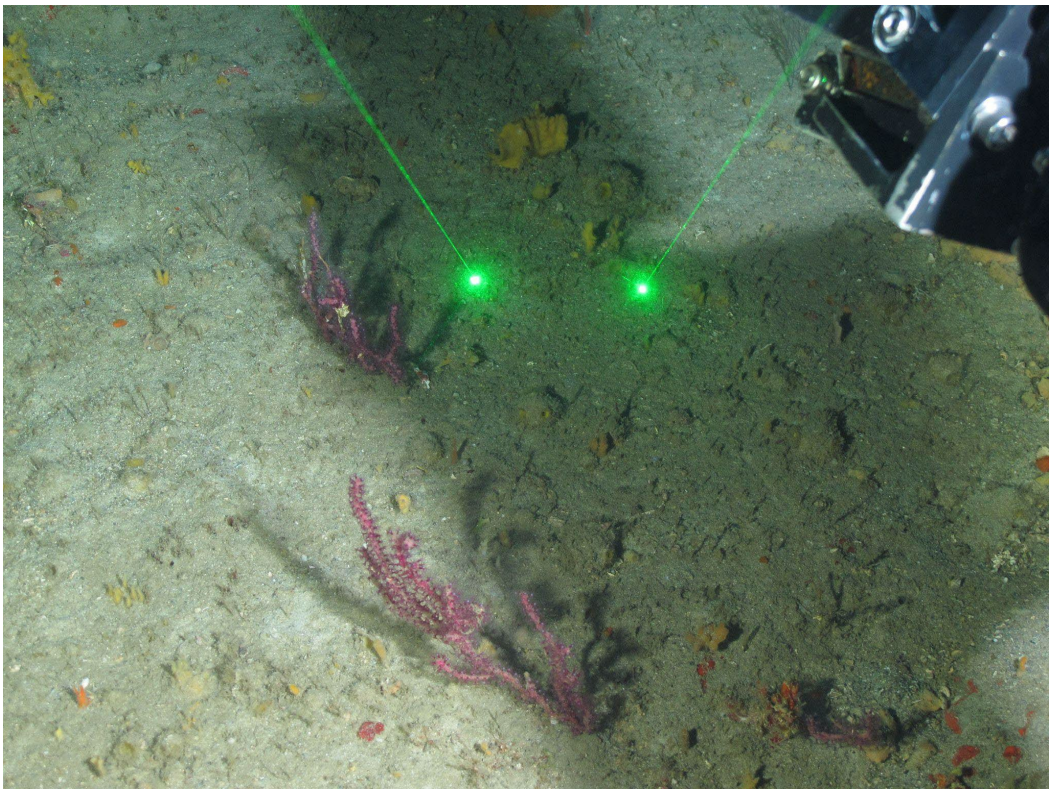

Figure A8. *In situ* image of *Thesea nivea* (PS-22-Dive01-S08) sample from KK site at 52 m.

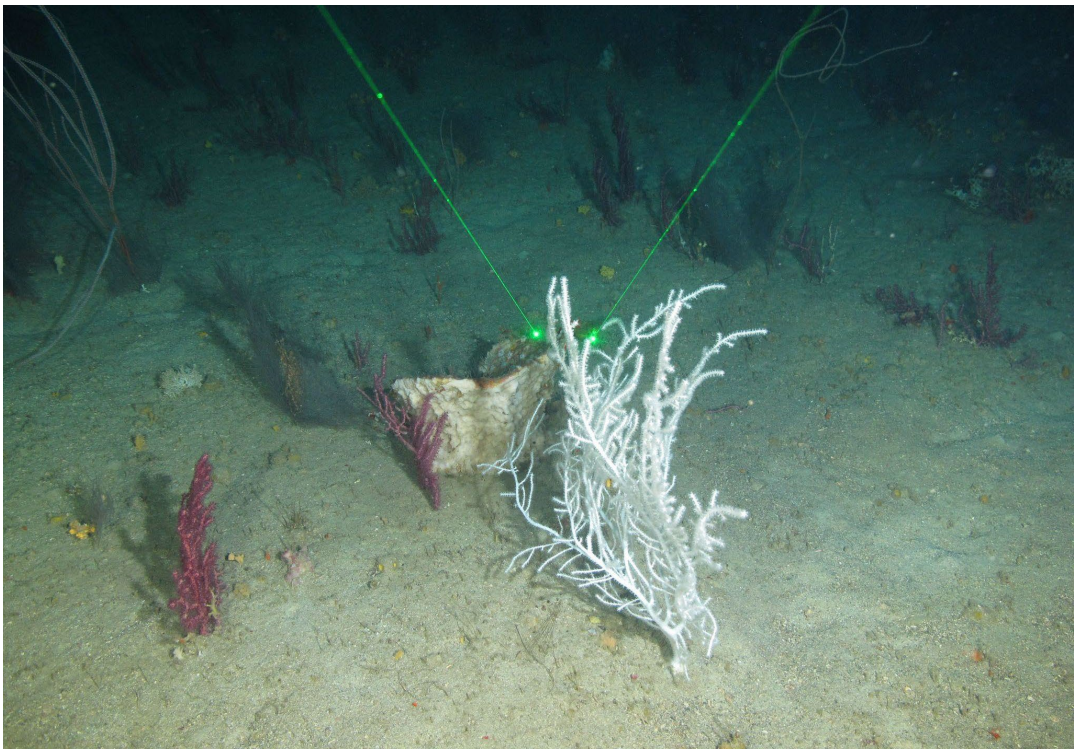

Figure A9. *In situ* image of *Muricea pendula* (PS-22-Dive01-S09) sample from KK site at 52 m.

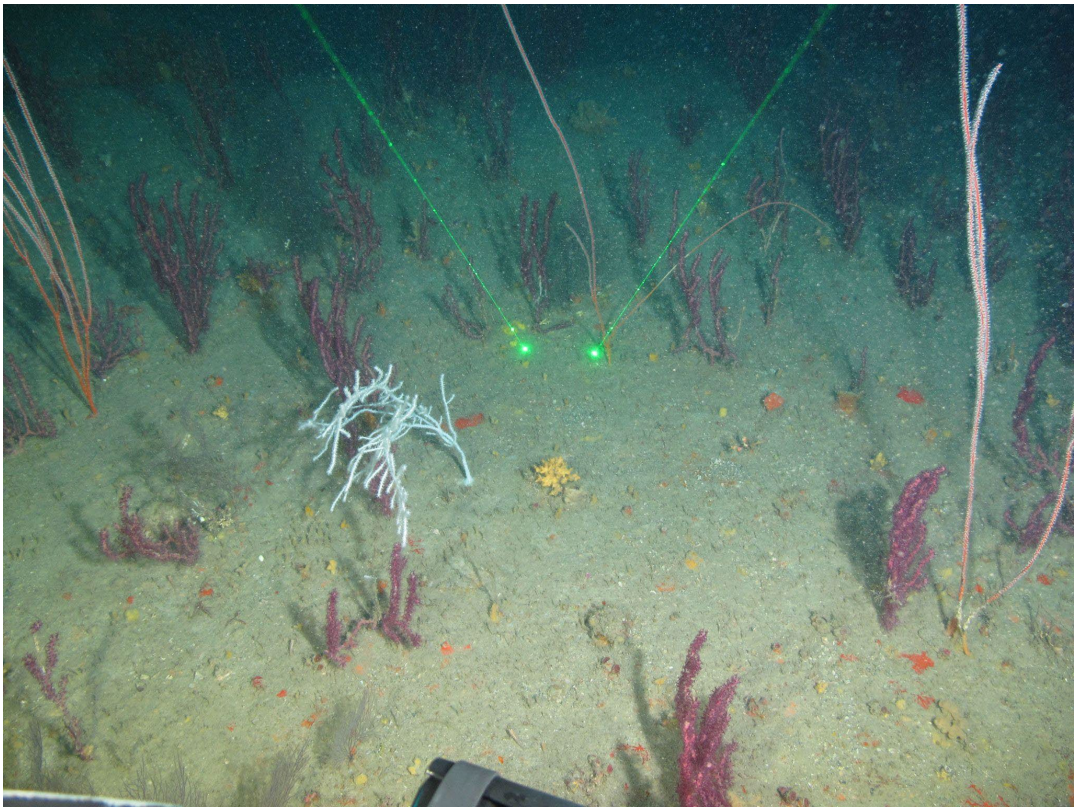

Figure A10. *In situ* image of *Muricea pendula* (PS-22-Dive02-S10) sample from DeSoto Rim 19 at 51 m.

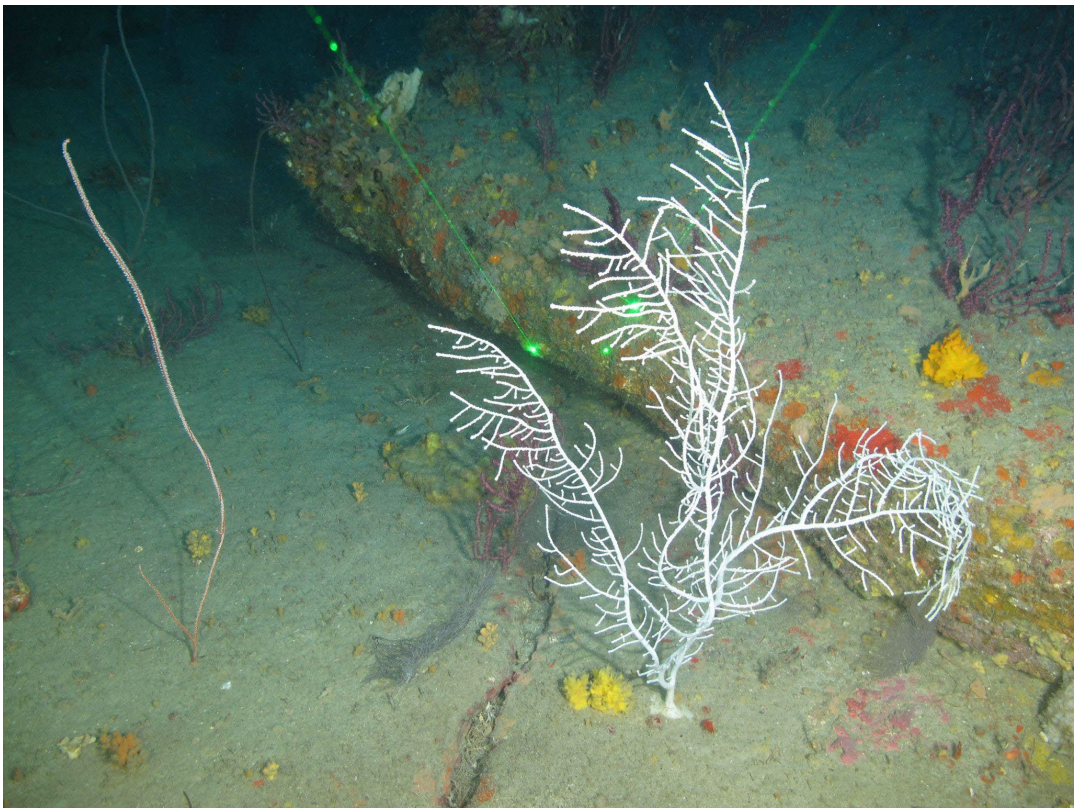

Figure A11. *In situ* image of *Muricea pendula* (PS-22-Dive02-S11) sample from DeSoto Rim 19 at 51 m.

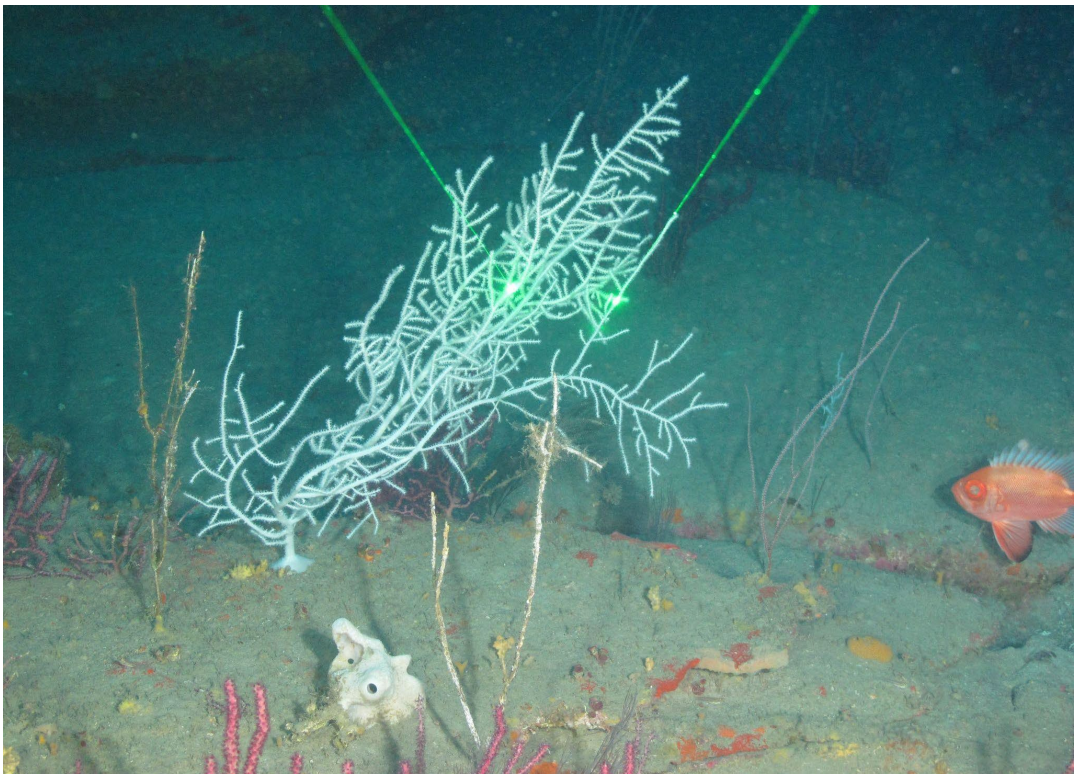

Figure A12. *In situ* image of *Muricea pendula* (PS-22-Dive02-S12) sample from DeSoto Rim 19 at 51 m.

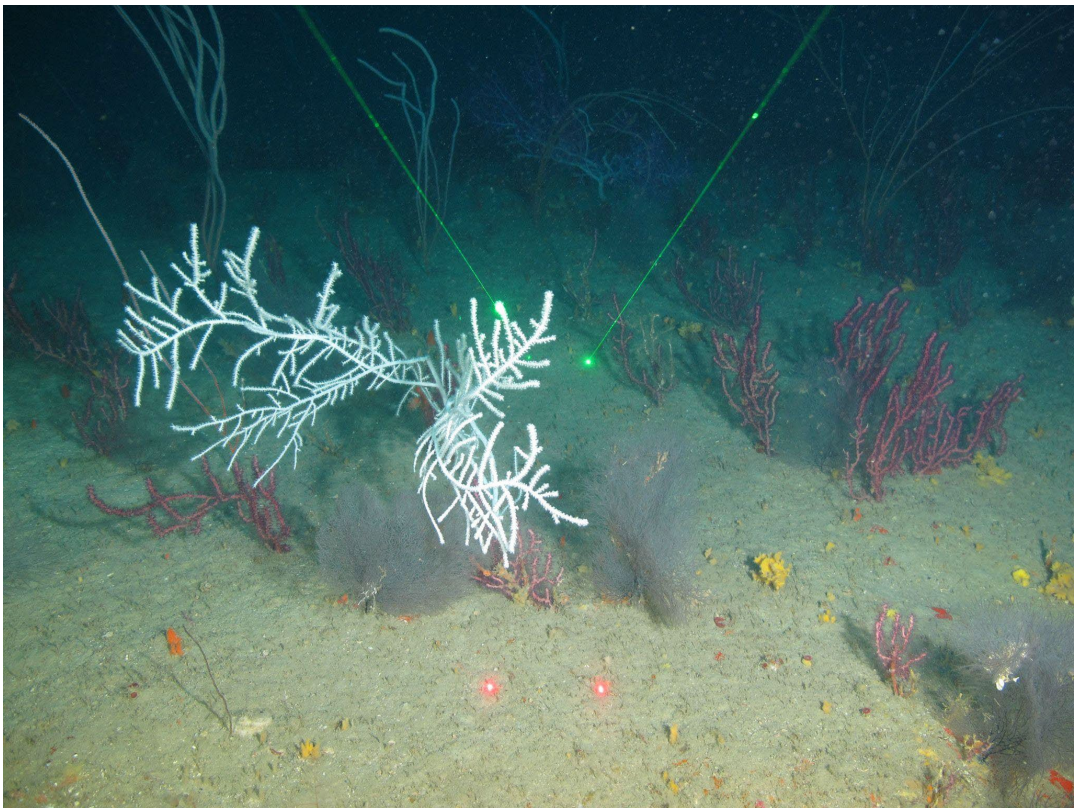

Figure A13. *In situ* image of *Muricea pendula* (PS-22-Dive02-S13) sample from DeSoto Rim 19 at 51 m.

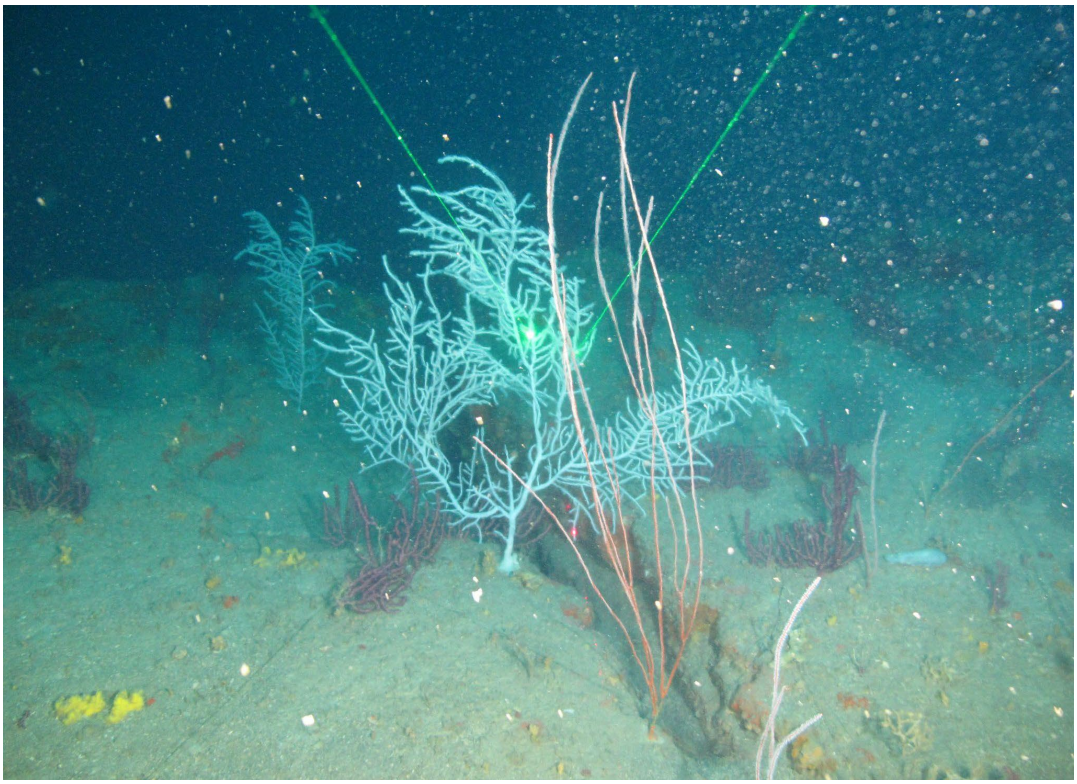

Figure A14. *In situ* image of *Muricea pendula* (PS-22-Dive02-S14) sample from DeSoto Rim 19 at 51 m.

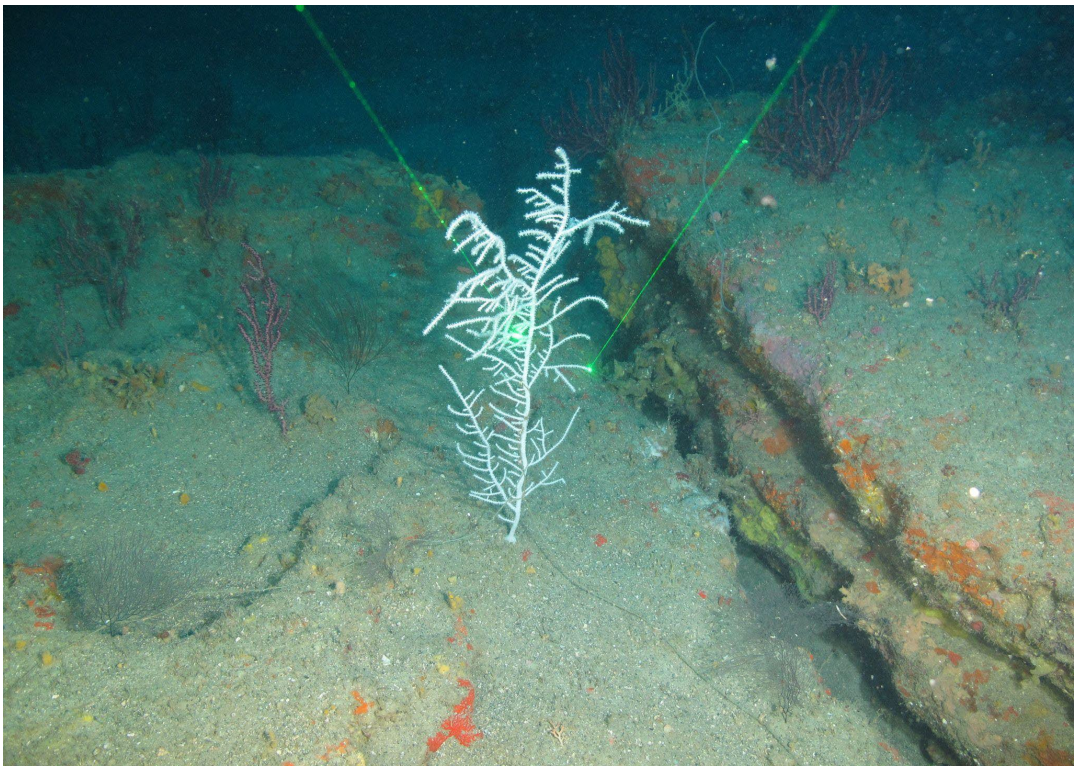

Figure A15. *In situ* image of *Muricea pendula* (PS-22-Dive02-S15) sample from DeSoto Rim 19 at 51 m.

Figure A16. *In situ* image of *Thesea nivea* (PS-22-Dive02-S16) sample from DeSoto Rim 19 at 51 m.

Figure A17. *In situ* image of *Placogorgia* sp. (PS-22-Dive02-S17) sample from DeSoto Rim 19 at 51 m.

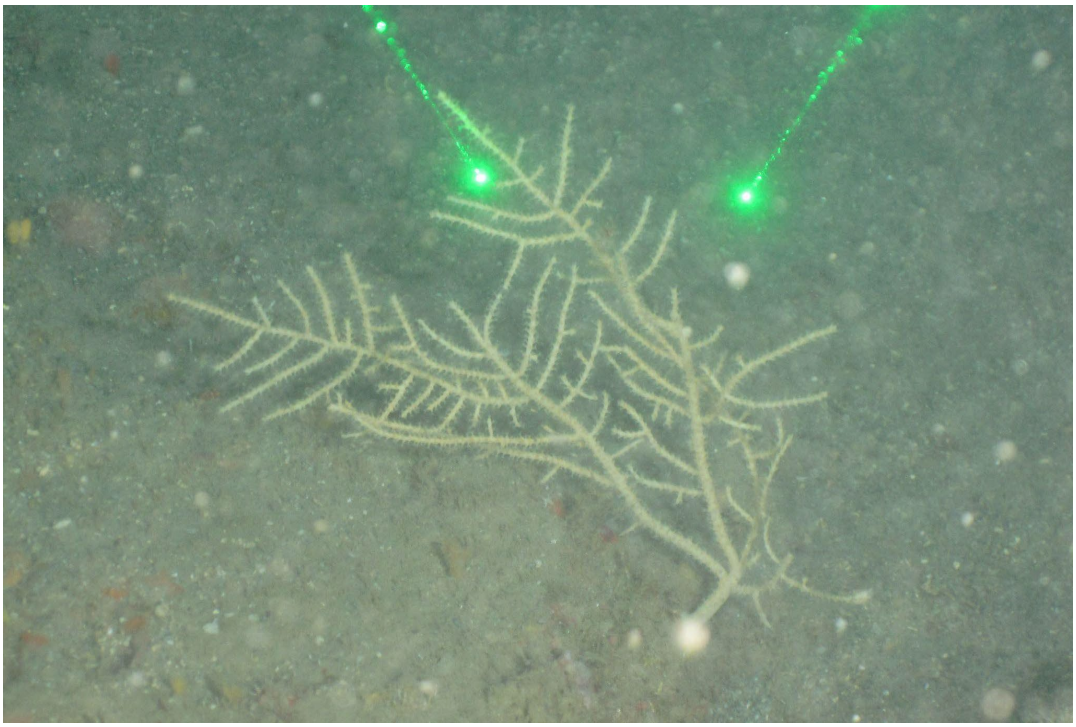

Figure A18. *In situ* image of *Muricea pendula* (PS-22-Dive02-S18) sample from DeSoto Rim 19 at 51 m.

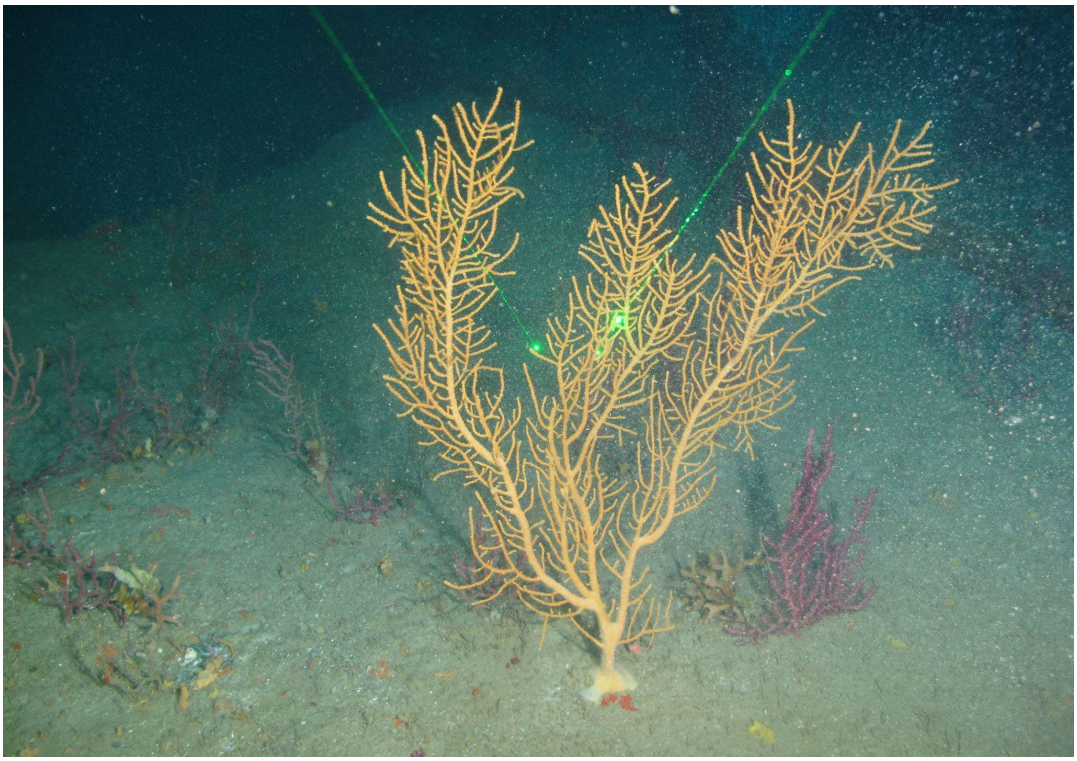

Figure A19. *In situ* image of *Muricea pendula* (PS-22-Dive02-S19) sample from DeSoto Rim 19 at 51 m.

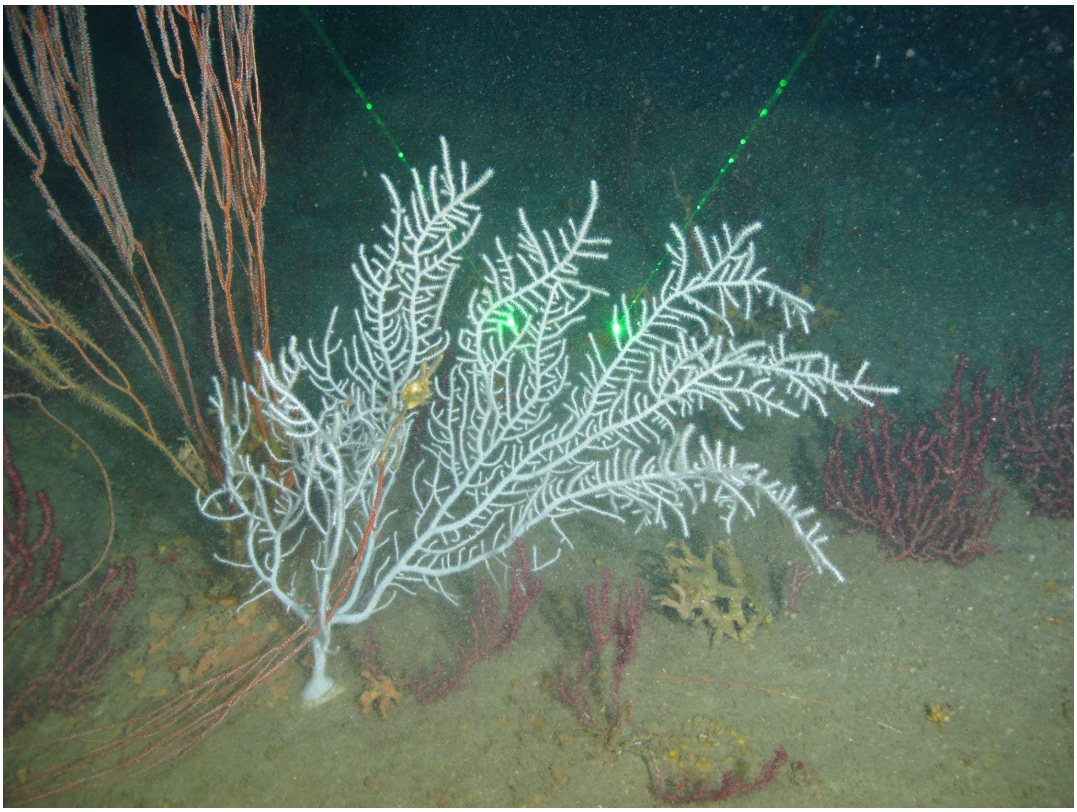

Figure A20. *In situ* image of *Muricea pendula* (PS-22-Dive02-S20) sample from DeSoto Rim 19 at 51 m.

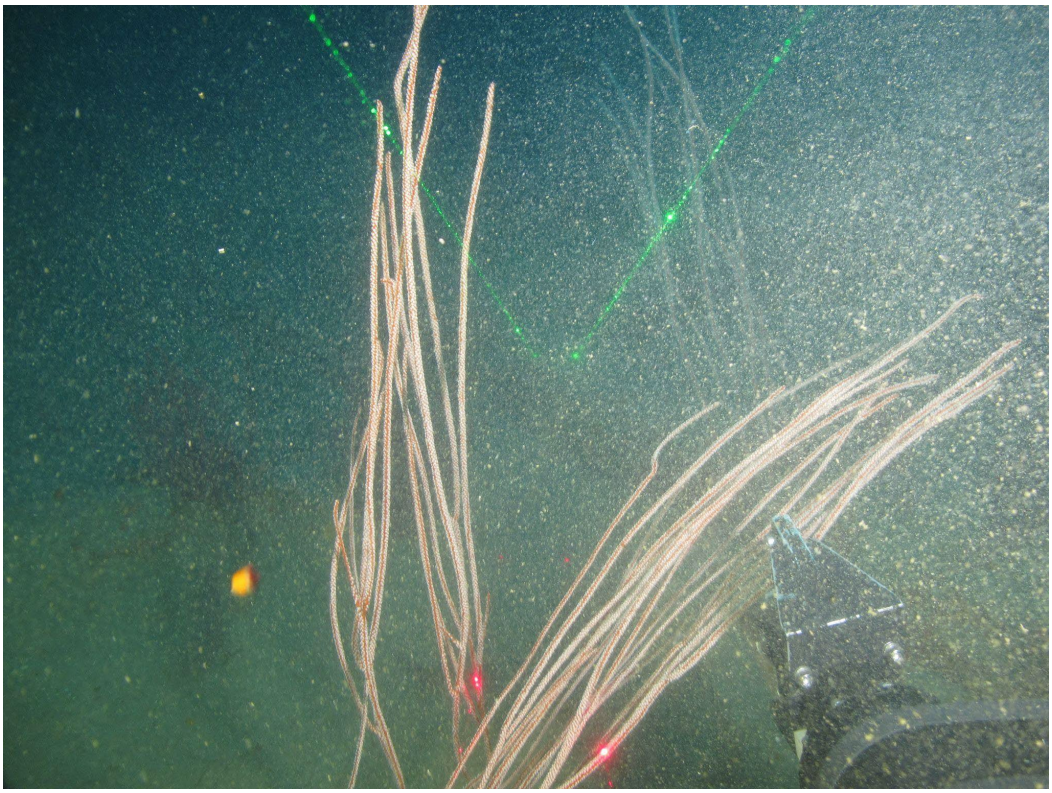

Figure A21. *In situ* image of *Ellisella* sp. (PS-22-Dive02-S21) sample from DeSoto Rim 19 at 52 m.

Figure A22. *In situ* image of *Muricea pendula* (PS-22-Dive02-S22; orange morph; requires species ID) sample from DeSoto Rim 19 at 52 m.

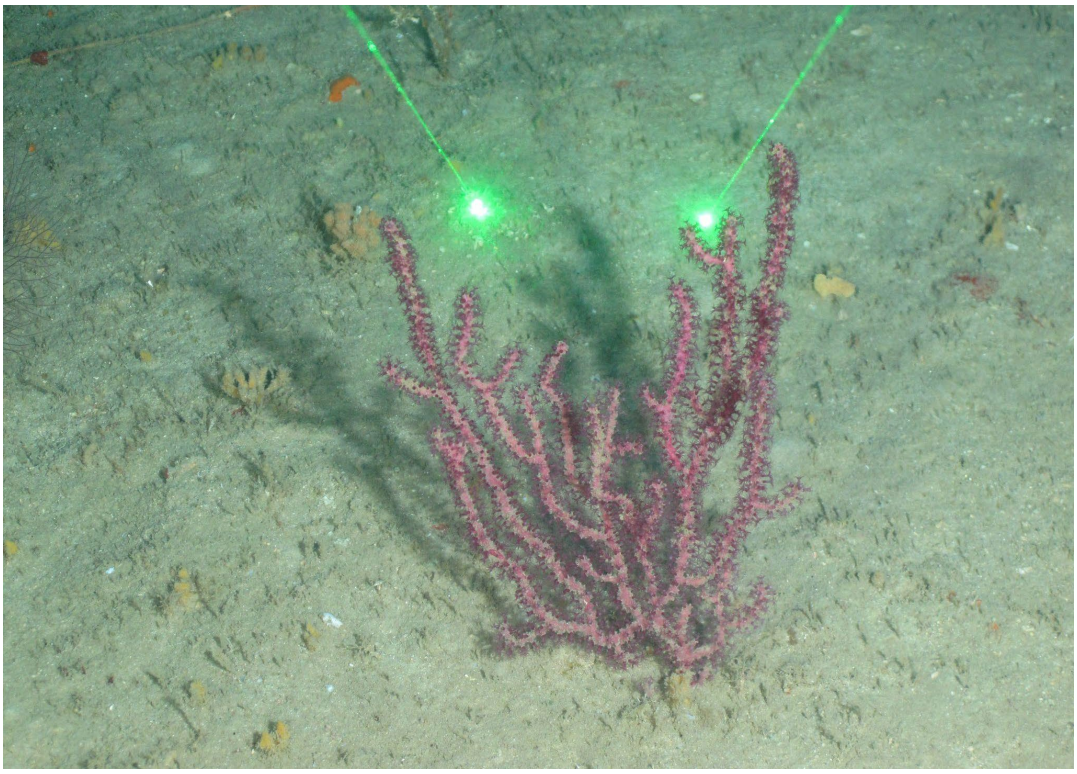

Figure A23. *In situ* image of *Thesea nivea* (PS-22-Dive02-S23) sample from DeSoto Rim 19 at 52 m.

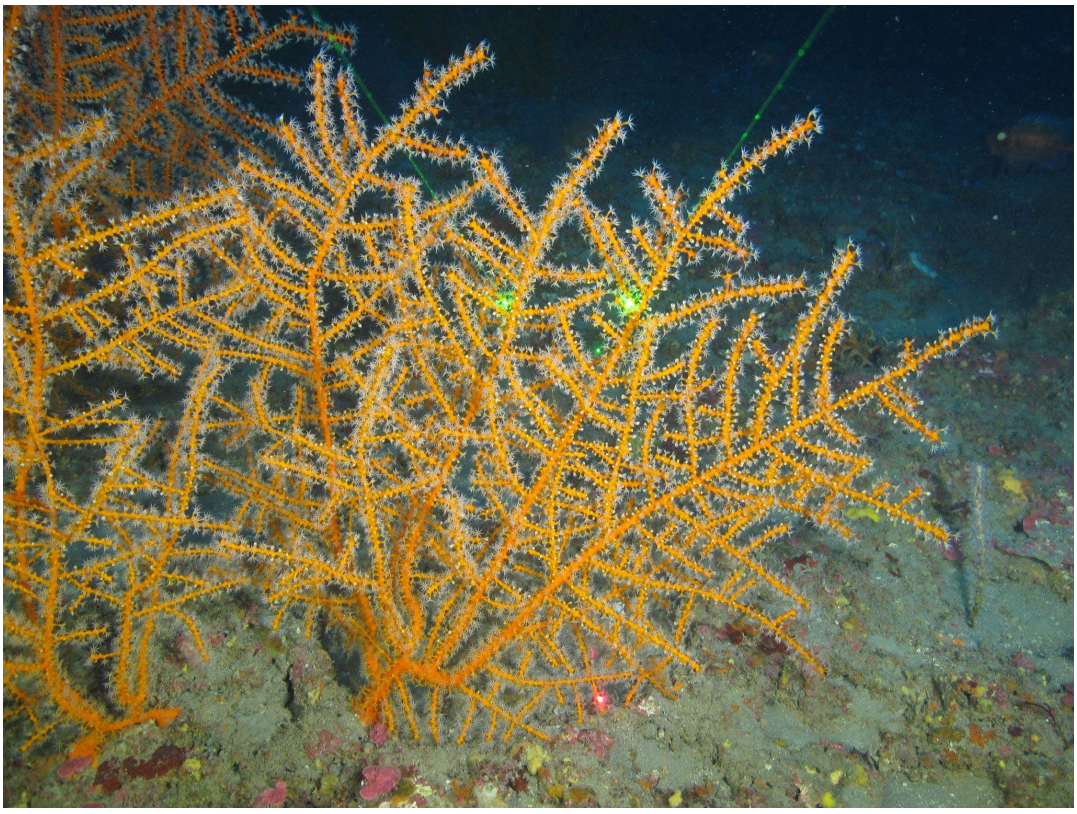

Figure A24. *In situ* image of *Swiftia exserta* (PS-22-Dive03-S24) sample from Pensacola Edge 01 at 64 m.

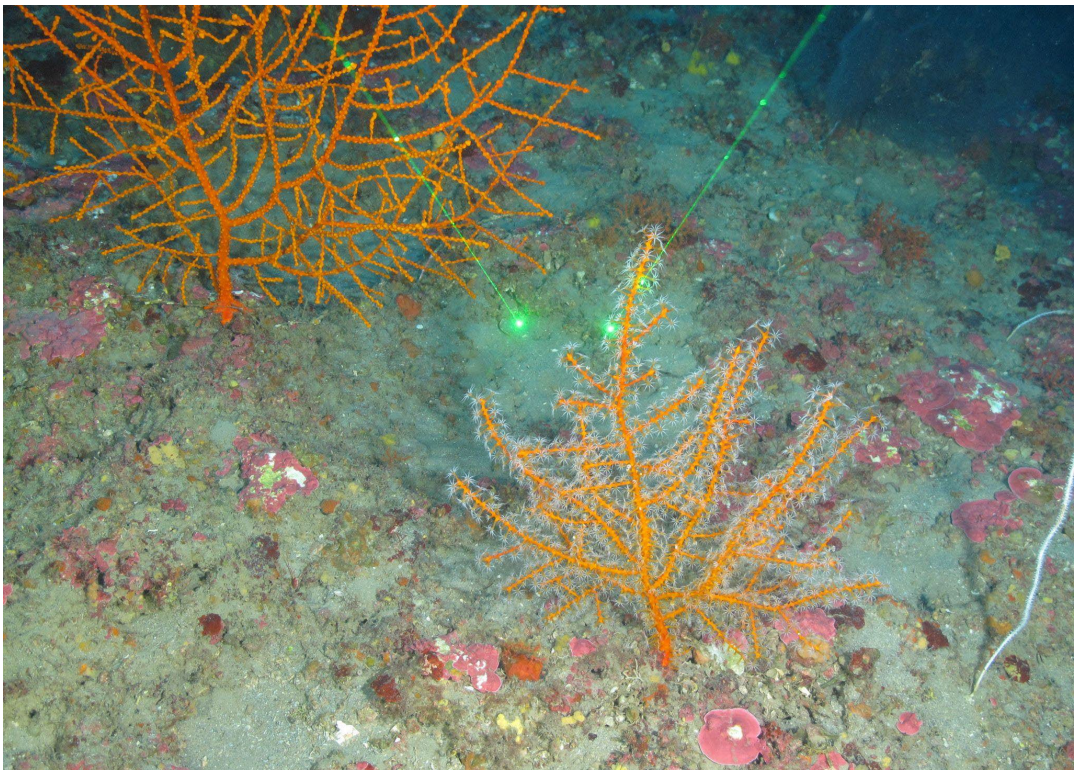

Figure A25. *In situ* image of *Swiftia exserta* (PS-22-Dive03-S25) sample from Pensacola Edge 01 at 64 m.

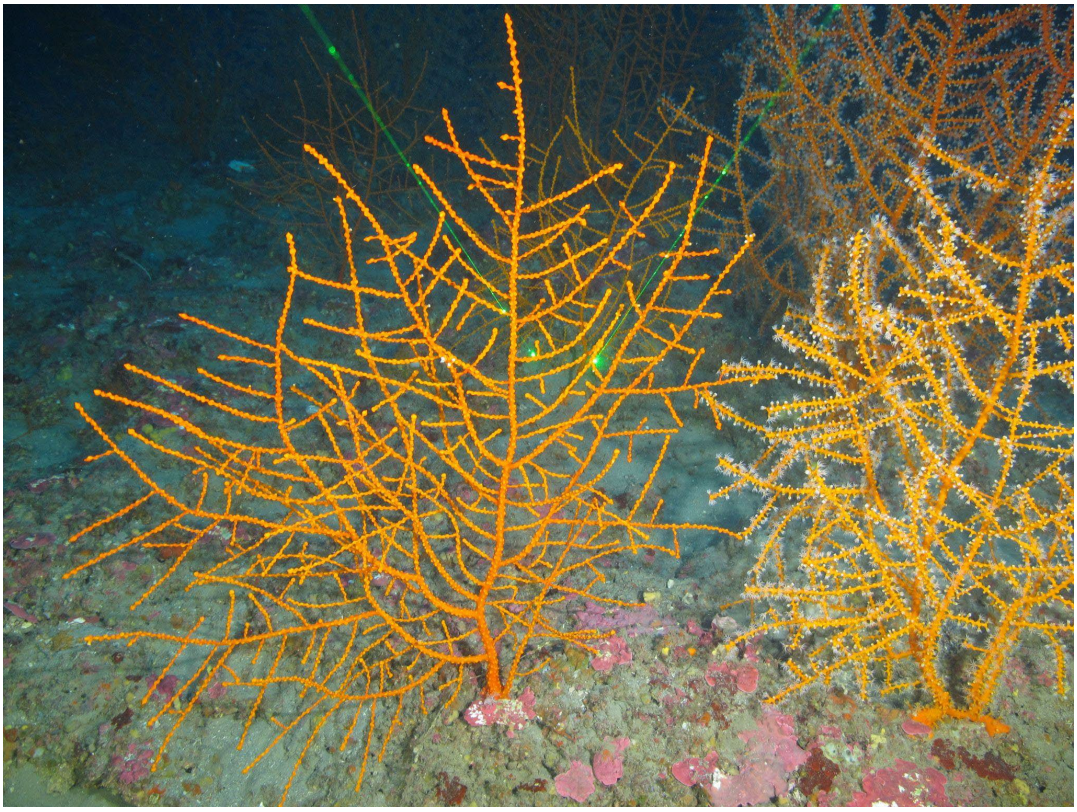

Figure A26. *In situ* image of *Swiftia exserta* (PS-22-Dive03-S26) sample from Pensacola Edge 01 at 64 m.

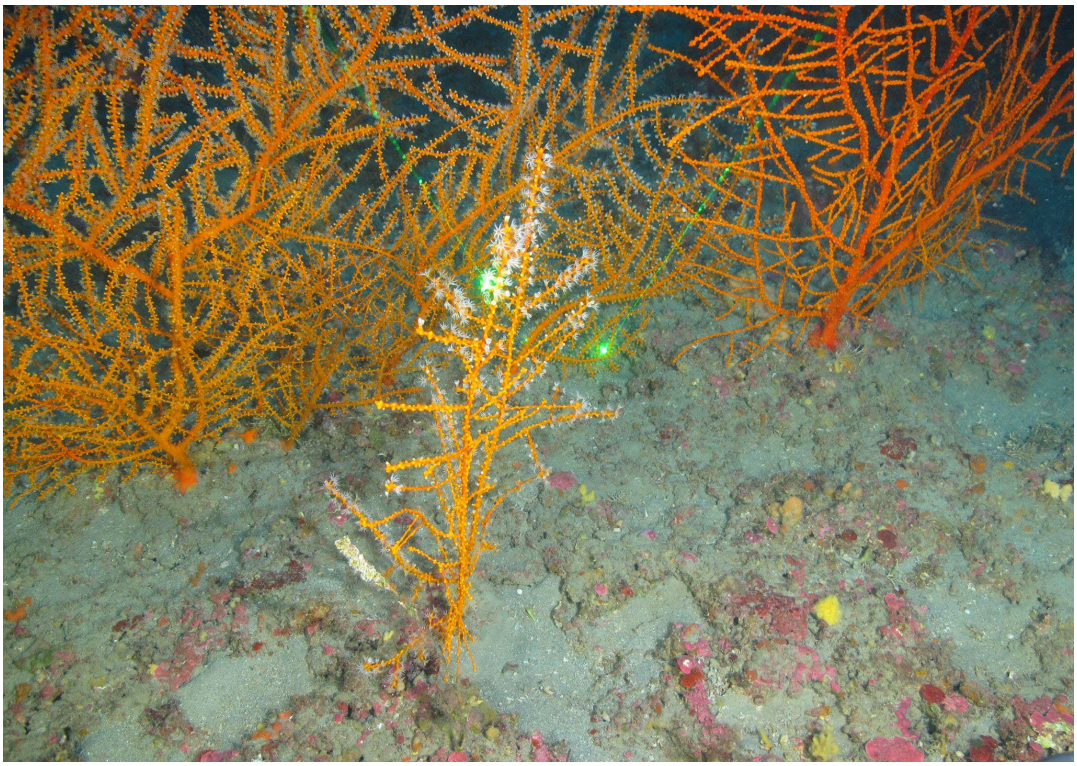

Figure A27. *In situ* image of *Swiftia exserta* (PS-22-Dive03-S27) sample from Pensacola Edge 01 at 64 m.

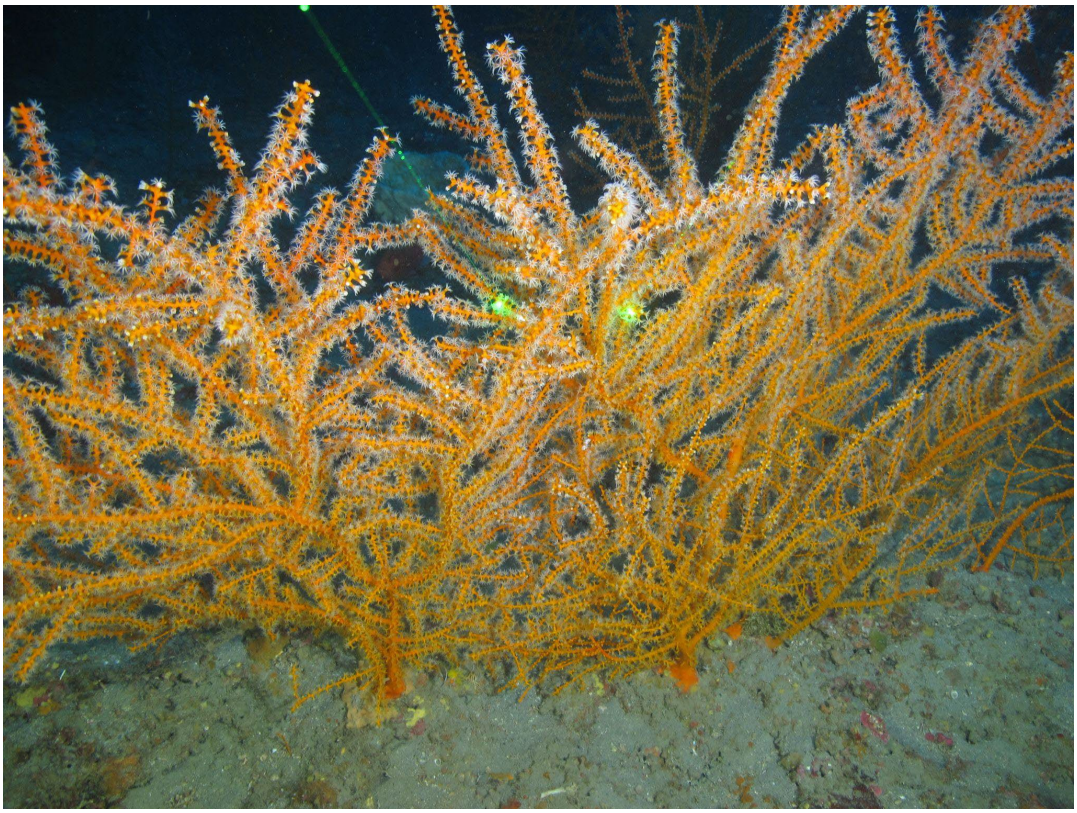

Figure A28. *In situ* image of *Swiftia exserta* (PS-22-Dive03-S28) sample from Pensacola Edge 01 at 64 m.

Figure A29. *In situ* image of *Swiftia exserta* (PS-22-Dive04-S29) sample from Pensacola Edge 01 at 66 m.

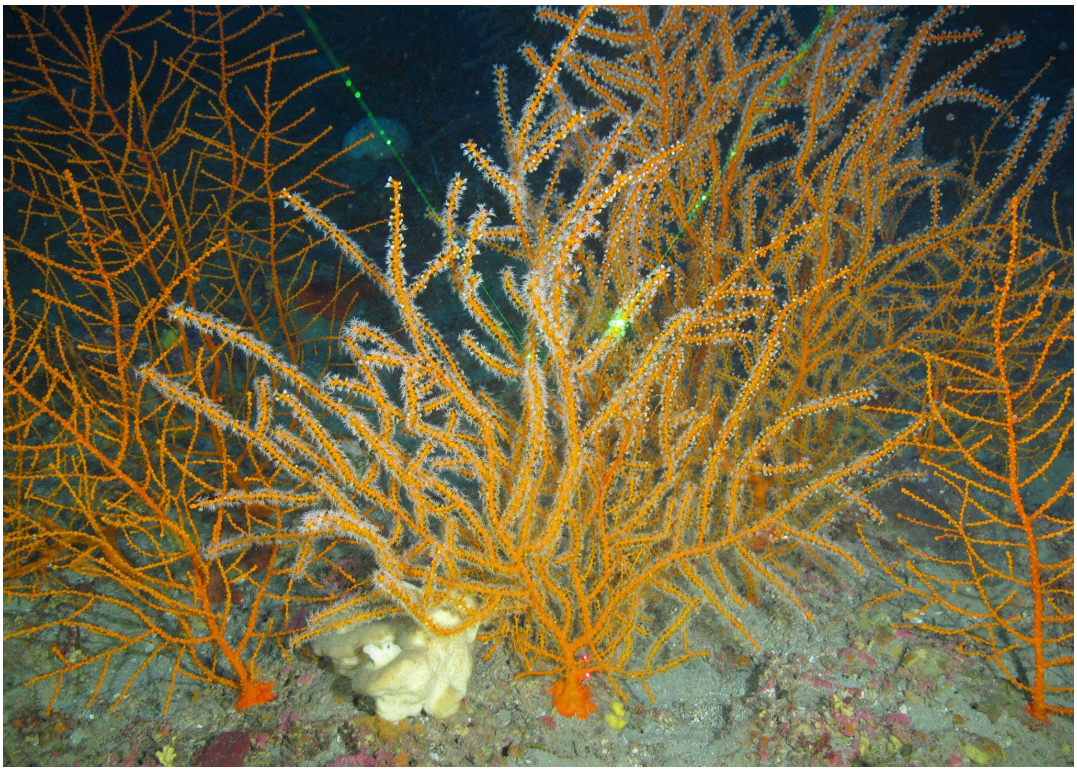

Figure A30. *In situ* image of *Swiftia exserta* (PS-22-Dive04-S30) sample from Pensacola Edge 01 at 66 m.

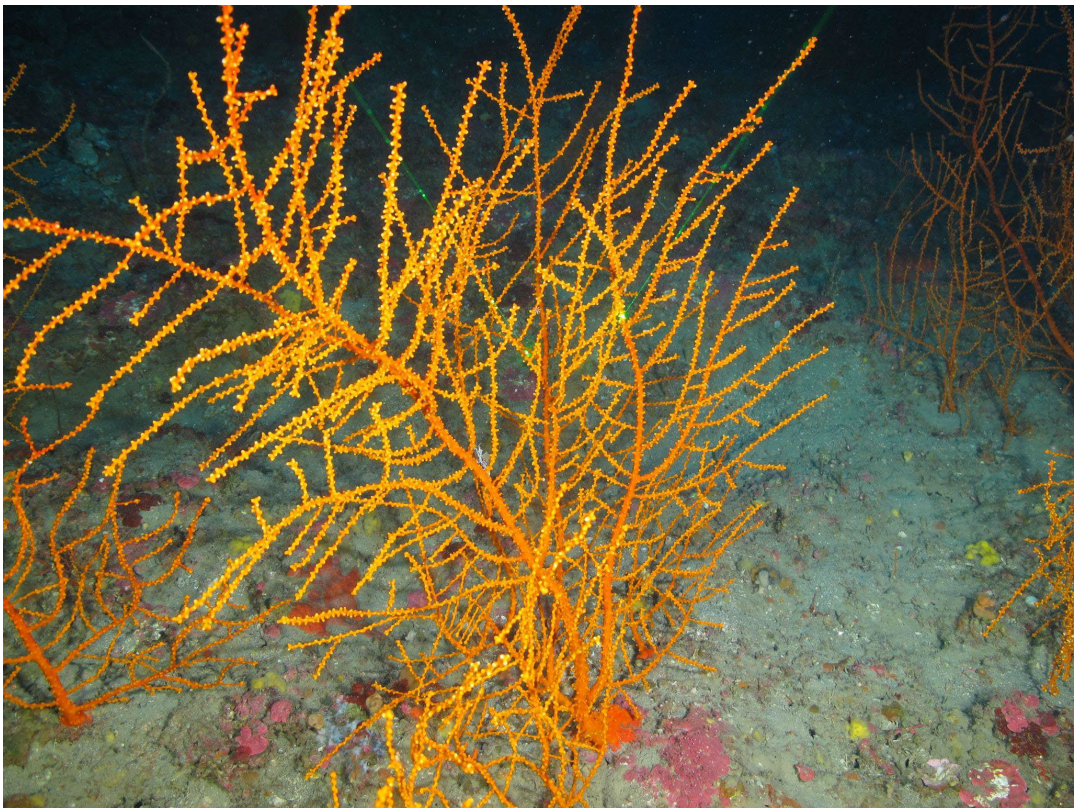

Figure A31. *In situ* image of *Swiftia exserta* (PS-22-Dive04-S31) sample from Pensacola Edge 01 at 66 m.

Figure A32. *In situ* image of *Swiftia exserta* (PS-22-Dive04-S32) sample from Pensacola Edge 01 at 66 m.

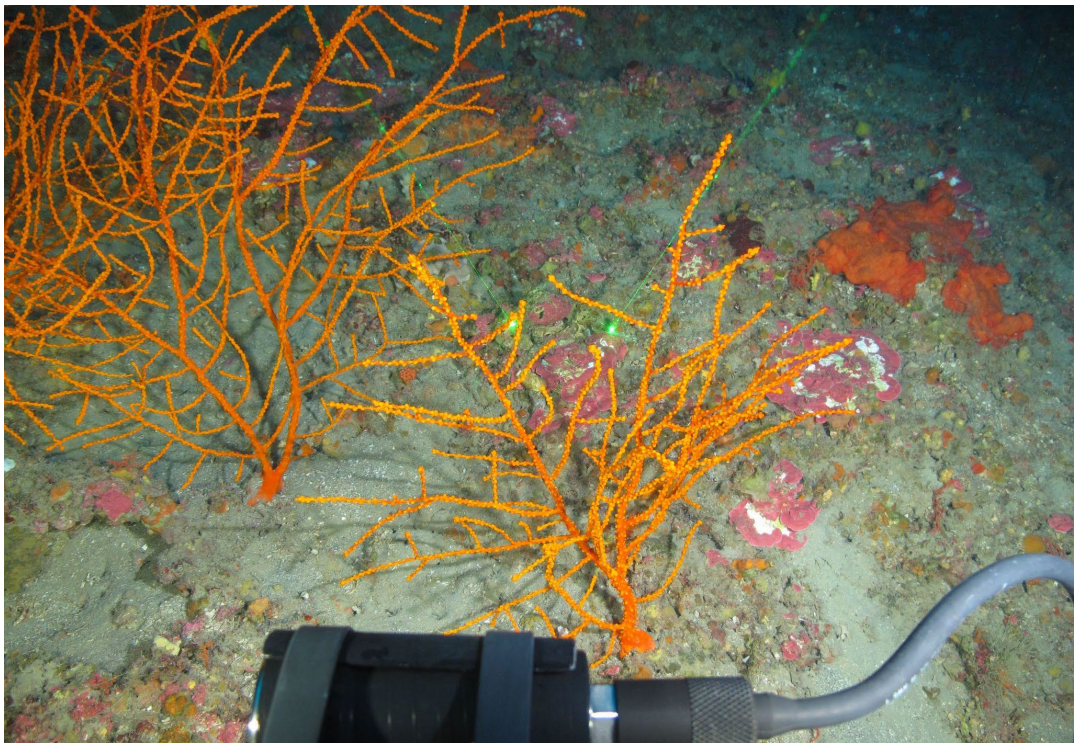

Figure A33. *In situ* image of *Swiftia exserta* (PS-22-Dive04-S33) sample from Pensacola Edge 01 at 66 m.

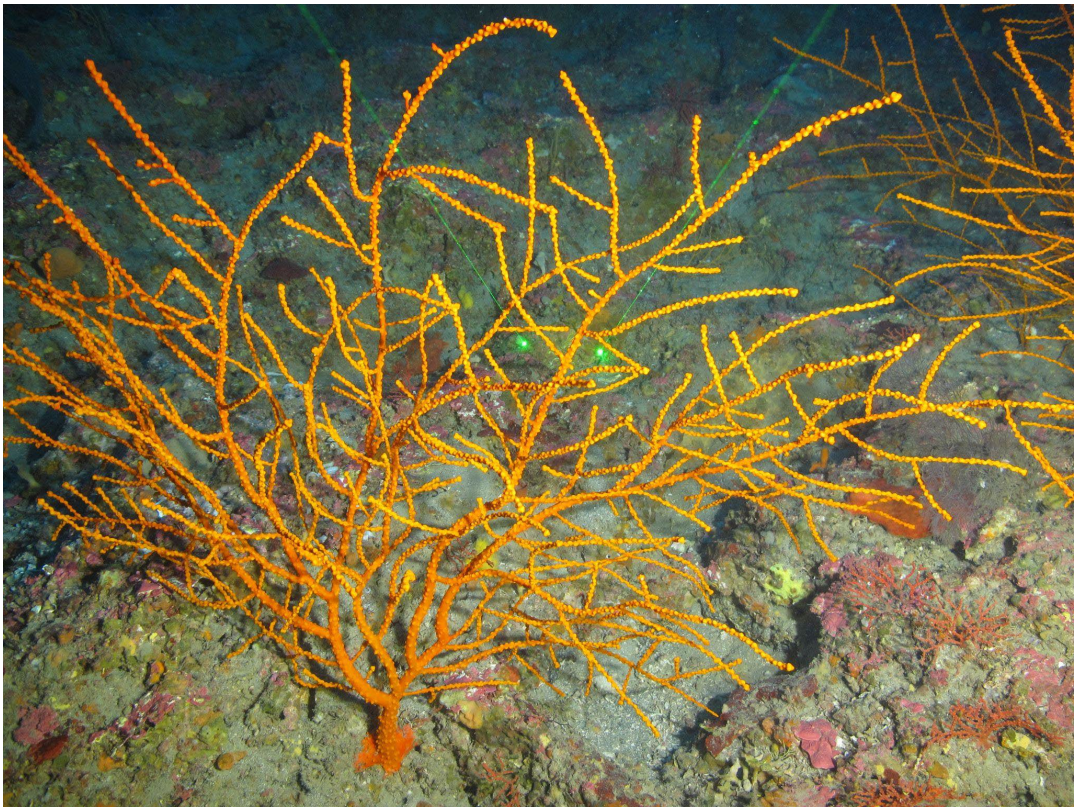

Figure A34. *In situ* image of *Swiftia exserta* (PS-22-Dive04-S34) sample from Pensacola Edge 01 at 66 m.

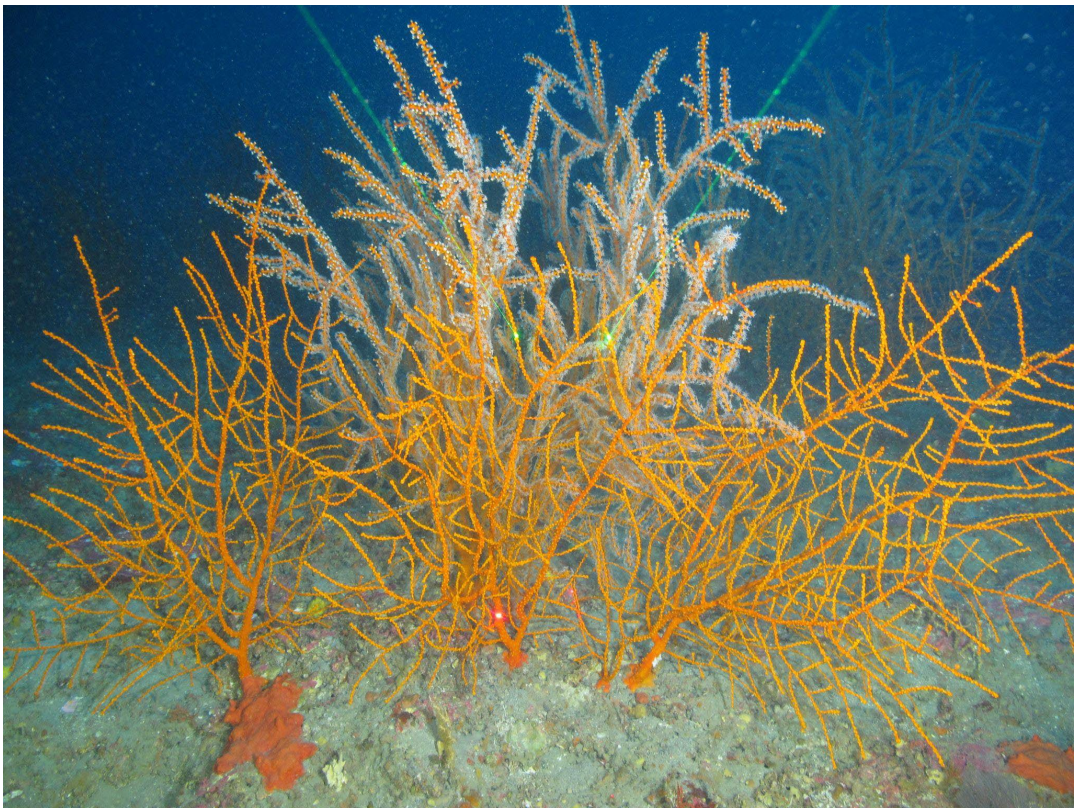

Figure A35. *In situ* image of *Swiftia exserta* (PS-22-Dive04-S35) sample from Pensacola Edge 01 at 66 m.

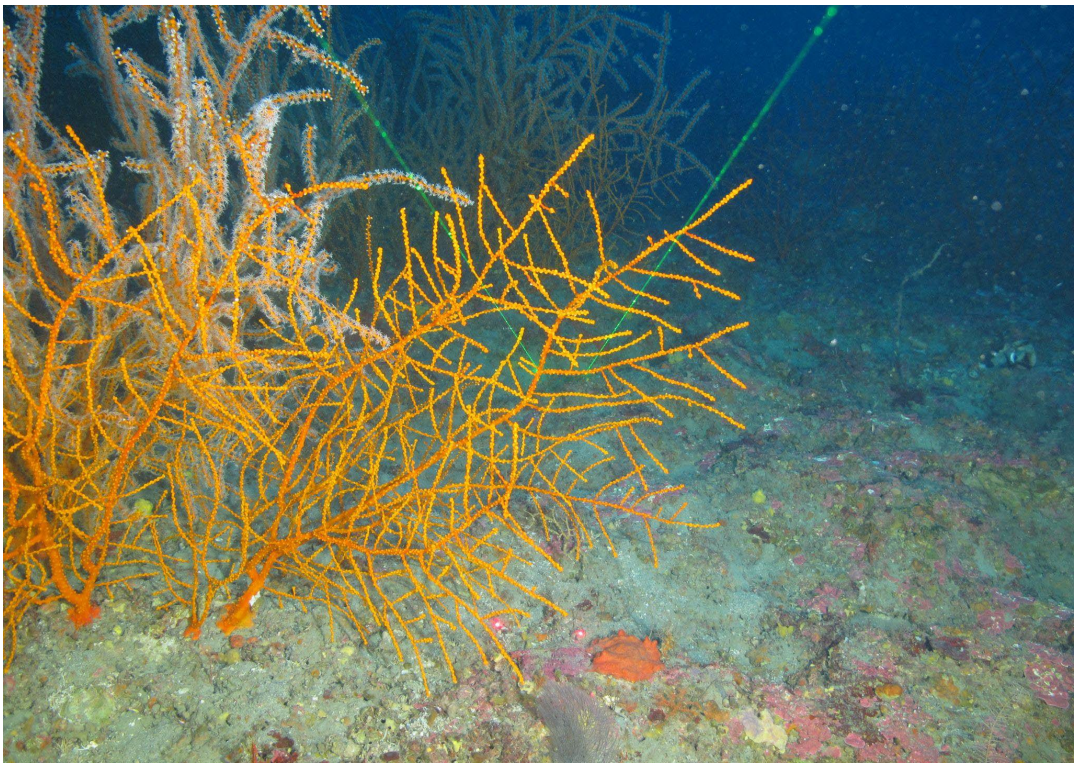

Figure A36. *In situ* image of *Swiftia exserta* (PS-22-Dive04-S36) sample from Pensacola Edge 01 at 66 m.

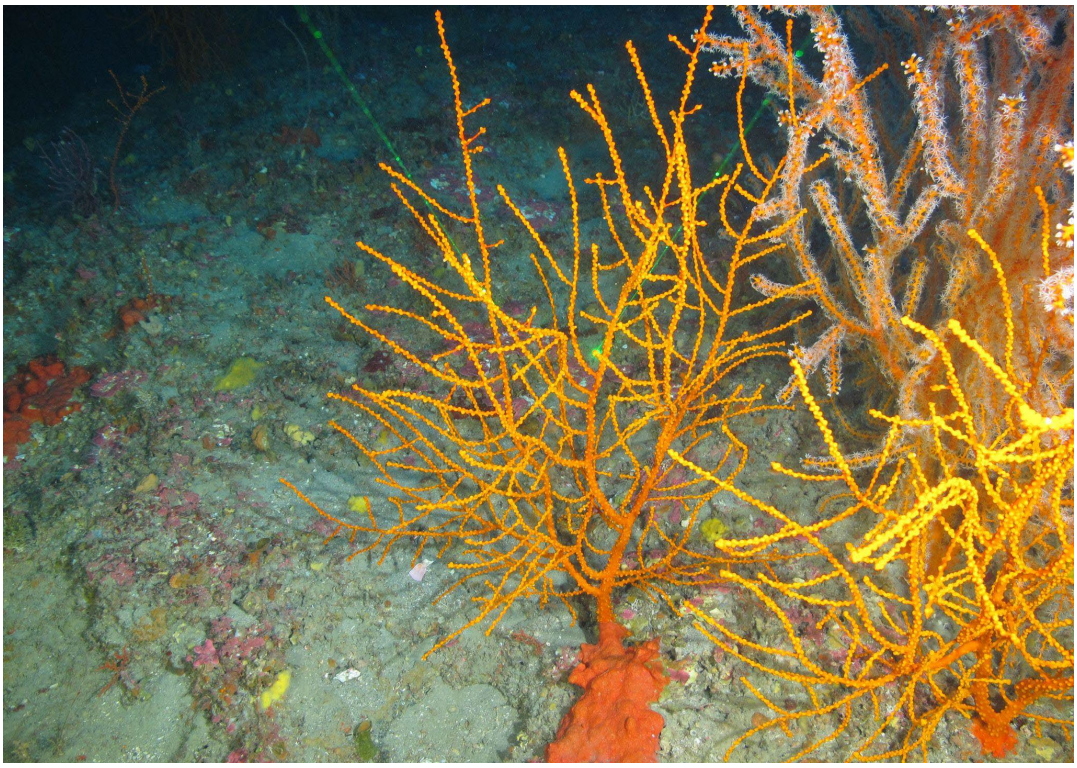

Figure A37. *In situ* image of *Swiftia exserta* (PS-22-Dive04-S37) sample from Pensacola Edge 01 at 66 m.

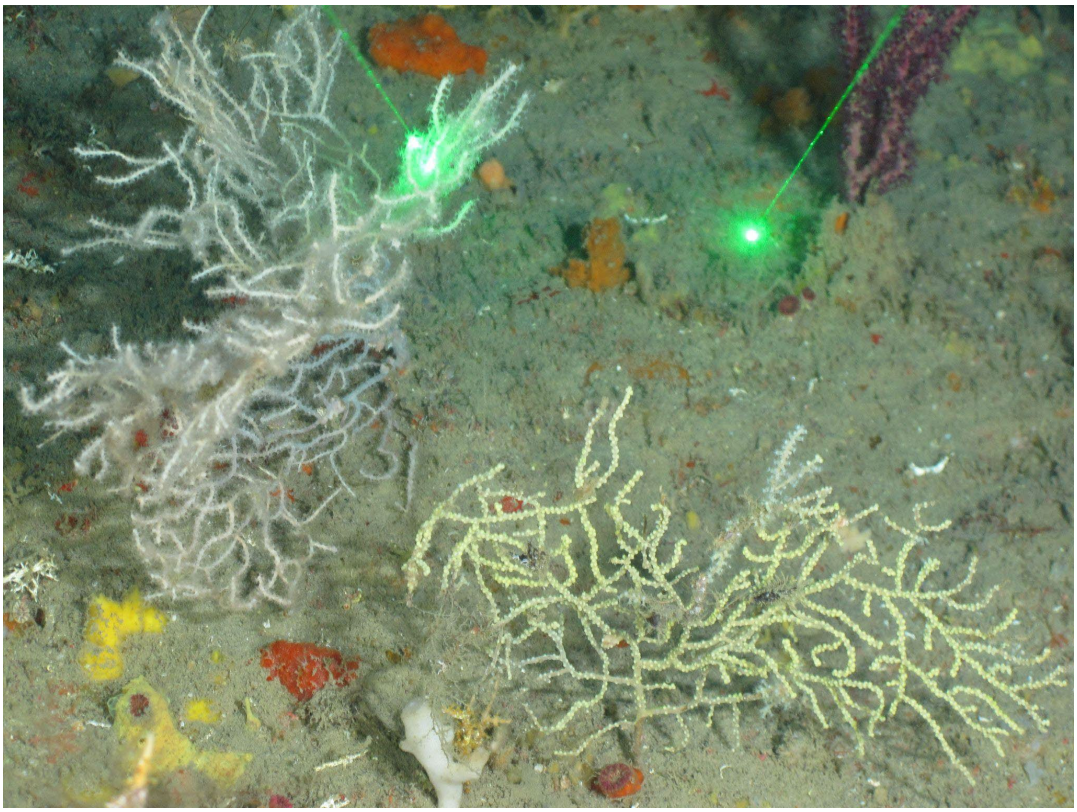

Figure A38. *In situ* image of *Bebryce* sp. (PS-22-Dive05-S38) sample from Pensacola Edge 04 at 58 m.

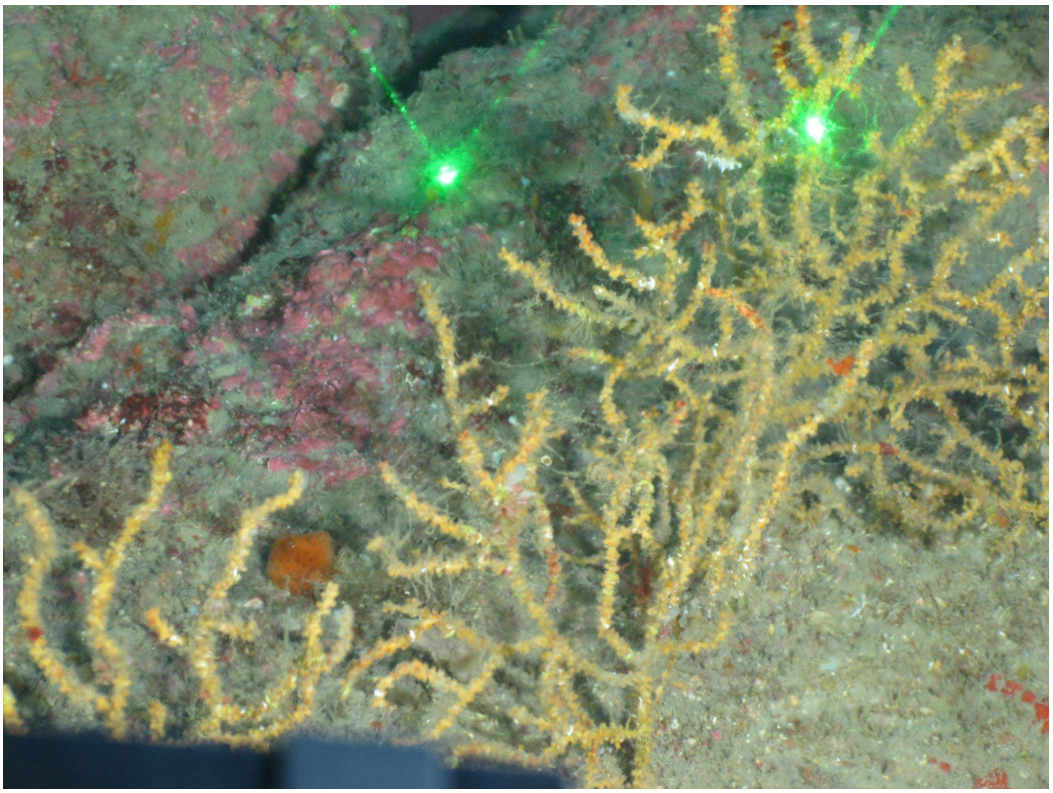

Figure A39. *In situ* image of *Bebryce* sp. (PS-22-Dive05-S39) sample from Pensacola Edge 04 at 58 m.

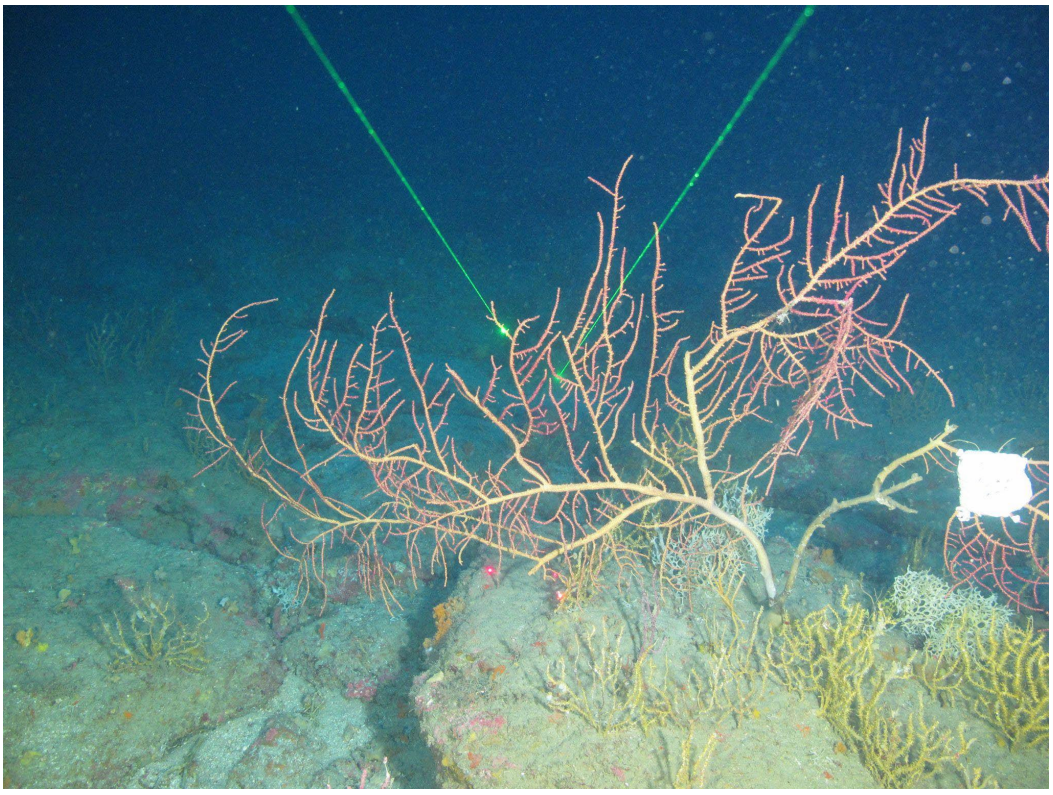

Figure A40. *In situ* image of *Placogorgia* sp. (PS-22-Dive05-S40) sample from Pensacola Edge 04 at 57 m.

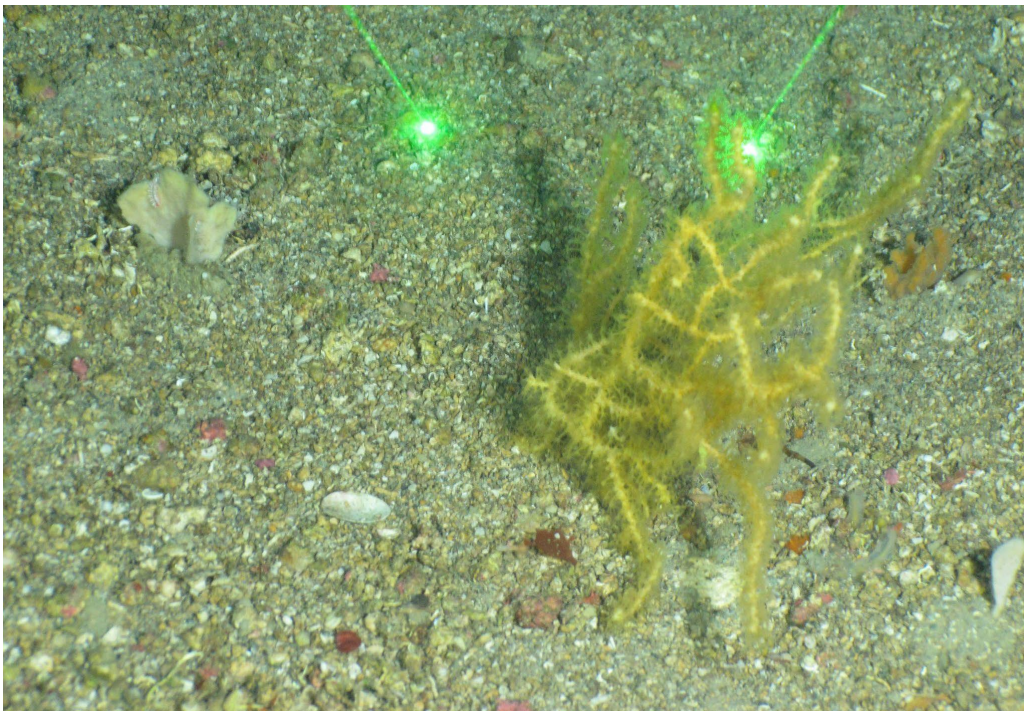

Figure A41. Unidentified yellow plexaurid (PS-22-Dive06-S41) sample from Yellow Garden 14 at 69 m.

Figure A42. *In situ* image of an unidentified yellow plexaurid (PS-22-Dive06-S42) sample from Yellow Garden 14 at 69 m.

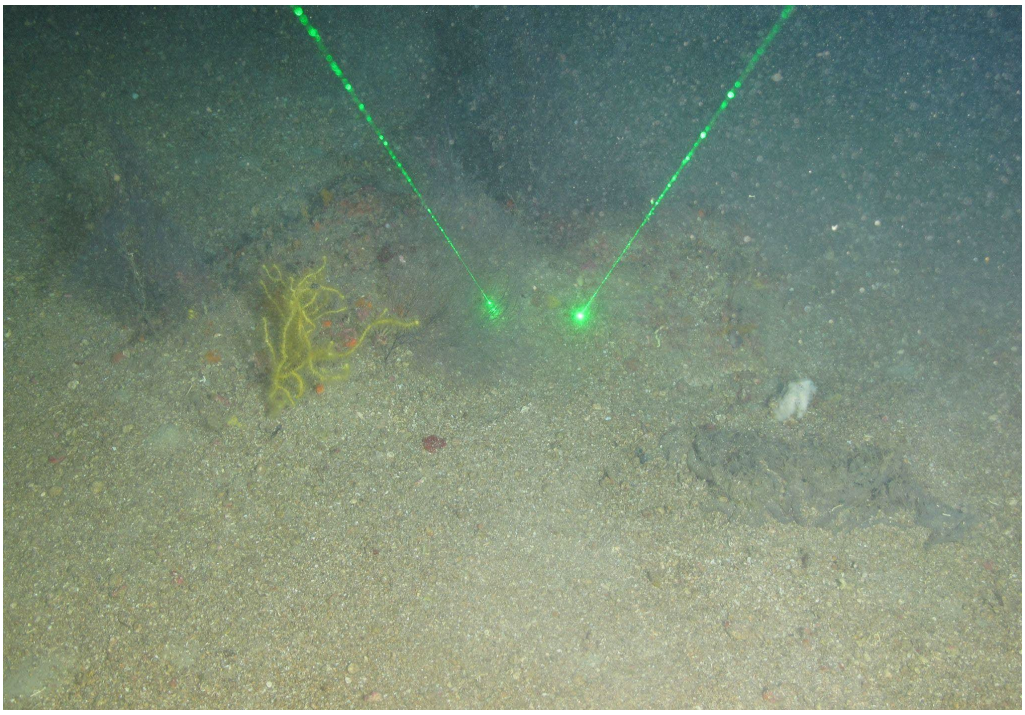

Figure A43. *In situ* image of a yellow plexaurid (PS-22-Dive06-S43) octocoral from Yellow Garden 14 at 69 m. The sample was tentatively identified as *Placogorgia atlantica* based upon gross morphology.

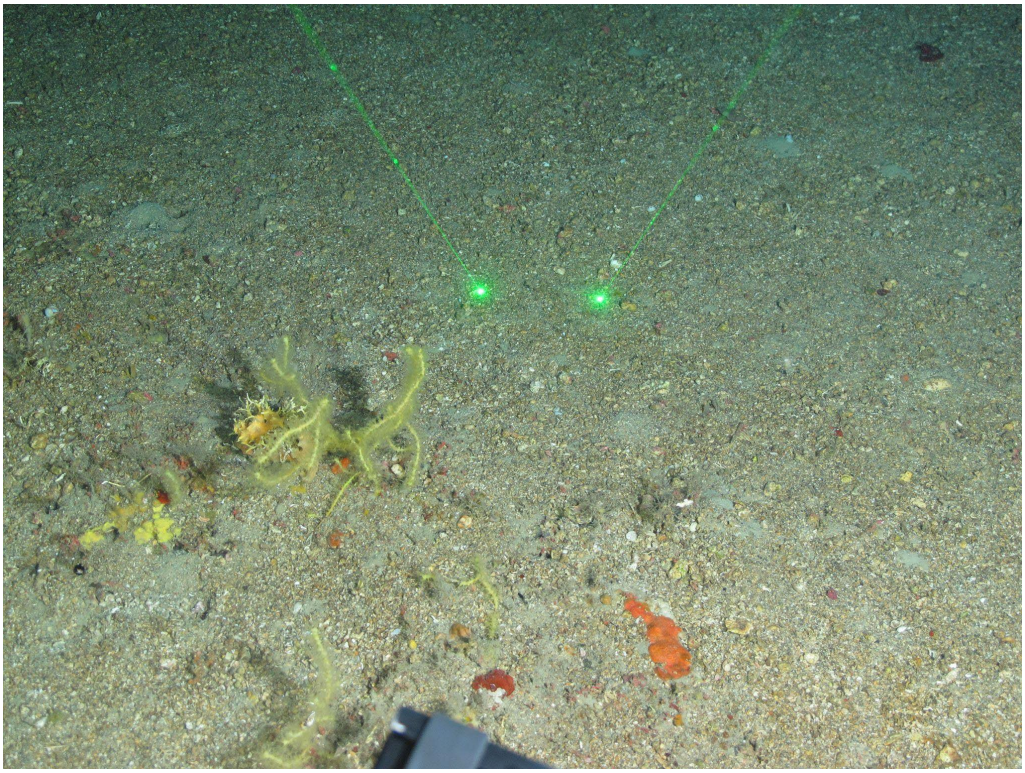

Figure A44. *In situ* image of an unidentified yellow plexaurid (PS-22-Dive06-S44) sample from Yellow Garden 14 at 69 m.

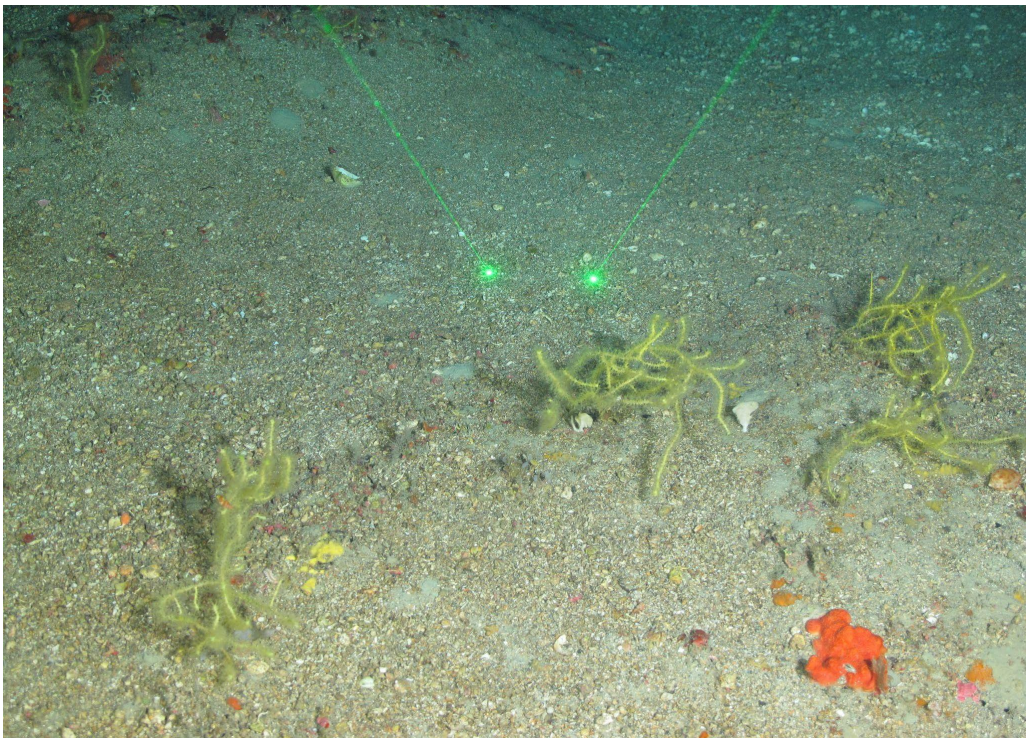

Figure A45. *In situ* image of an unidentified yellow plexaurid (PS-22-Dive06-S45) sample from Yellow Garden 14 at 69 m.

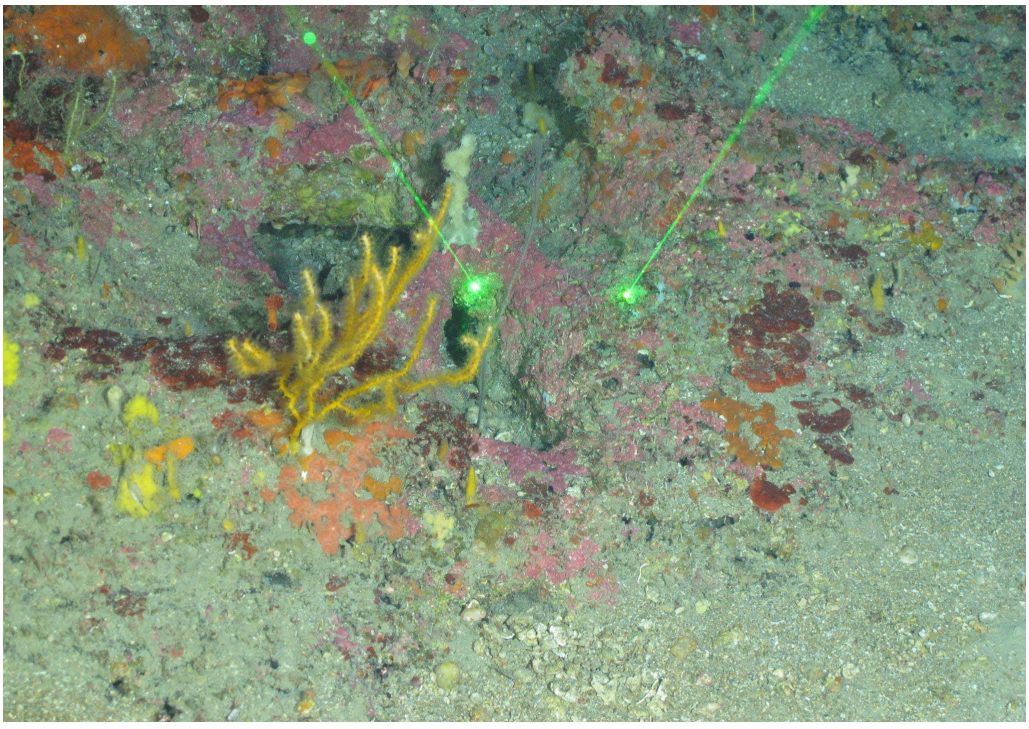

Figure A46. *In situ* image of *Muricea pendula* (PS-22-Dive06-S46; orange morph; requires species ID verification) sample from Yellow Garden 14 at 70 m.


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