Day -1: 1.31.2005
Nancy Foster Mission Cruise Update #1

The Nancy Foster and her crew completed mobilization of the multibeam and ROV equipment while the ship was tied up to the Gordon A. Finch Molasses Pier on the south shore of St. Croix. Mobilization included mounting of the transducer head, which emits and receives the acoustic signal, to the newly fabricated pole.

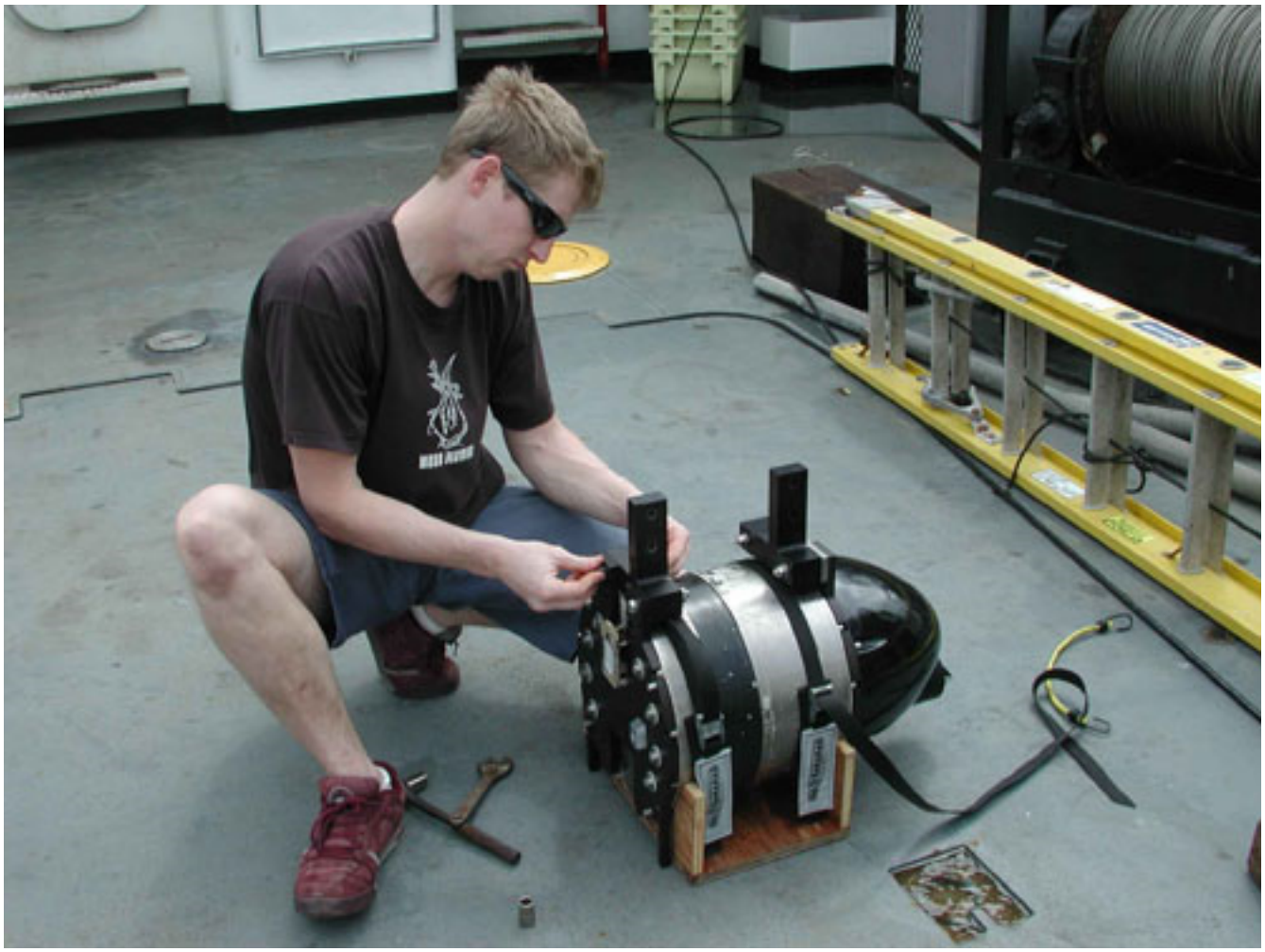


Figure 1 shows Hydrographer, Jay Lazar, assembling the transducer head. The pole is hung amidship along the port side extending the transducer head below the keel of the vessel.

Figure 2 shows the multibeam pole being hoisted for attachment to the Nancy Foster.

The Nancy Foster also hosted two groups of local students and teachers. Ten high schools students from various public schools of St. Croix, several elementary students, and 15 teachers/chaperones were given a tour of the ship. The scientific team and ship officers also gave an introduction to the seafloor characterization using multi-beam technology, ground truthing the benthic habitats with the Remotely Operated Vehicle (ROV), and history/ecology of the Buck Island Reef National Monument, and a tour of the ship.

Figure 3 shows Jeff Williams, ROV Operator, explaining the features of the Phantom S2 ROV to several elementary students.

Day 2: 2.1.2005
Nancy Foster Mission Cruise Update #2

The Nancy Foster and her crew began mid-water mapping and seafloor Characterization activities in and around the Buck Island Reef National Monument (St. Croix, USVI) at 0830 on Tuesday, February 1. Once under way, the first priority was to conduct a “patch test” to verify the alignment differences between the sonar and the 3-D motion of the ship. The calibration was conducted by running reciprocal lines over flat bottom, and also up a slope over a distinct reef feature within Lang Bank on the East side of St. Croix. Water depths were approximately 25 meters. These correction factors are necessary to maintain a high standard of quality and accuracy in the multibeam sonar data.

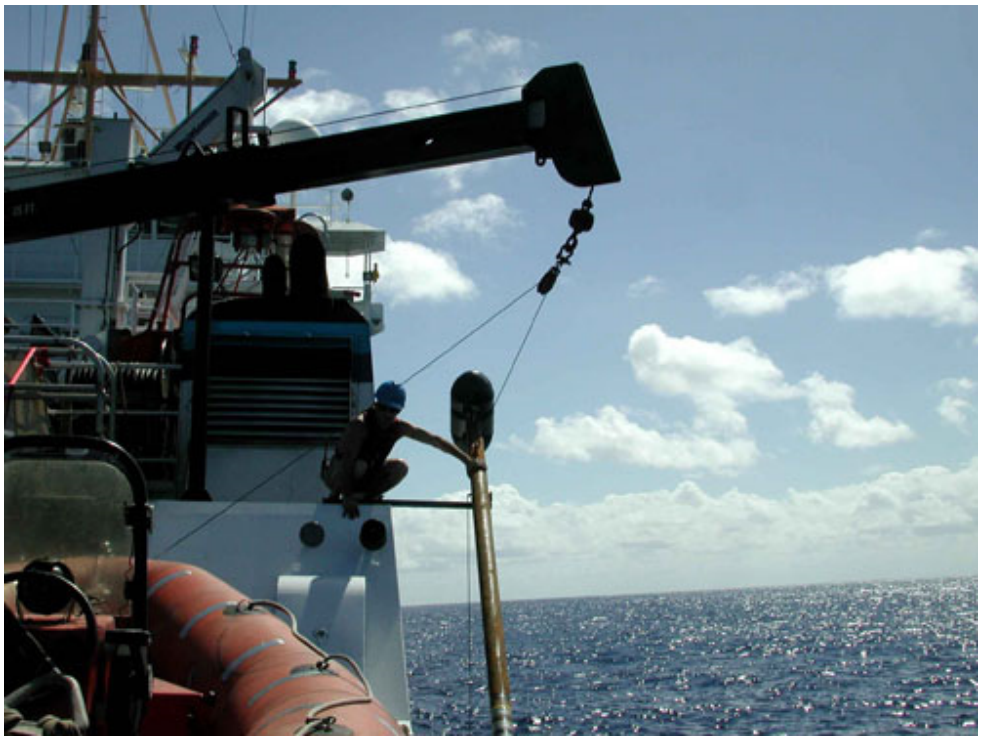


Figure 1, the Chief Bosun prepares to deploy the multibeam pole for surveying.

Once the team of hyrdrographers were satisfied with the results of the multibeam calibration, the ship steamed to Buck Island and began surveying the Channel. Two multibeam survey lines were successfully completed by sunset, and Remotely Operated Vehicle operations began. Figure 1, Scott and Jay conduct a CTD cast at Buck Island (see Island in Background).

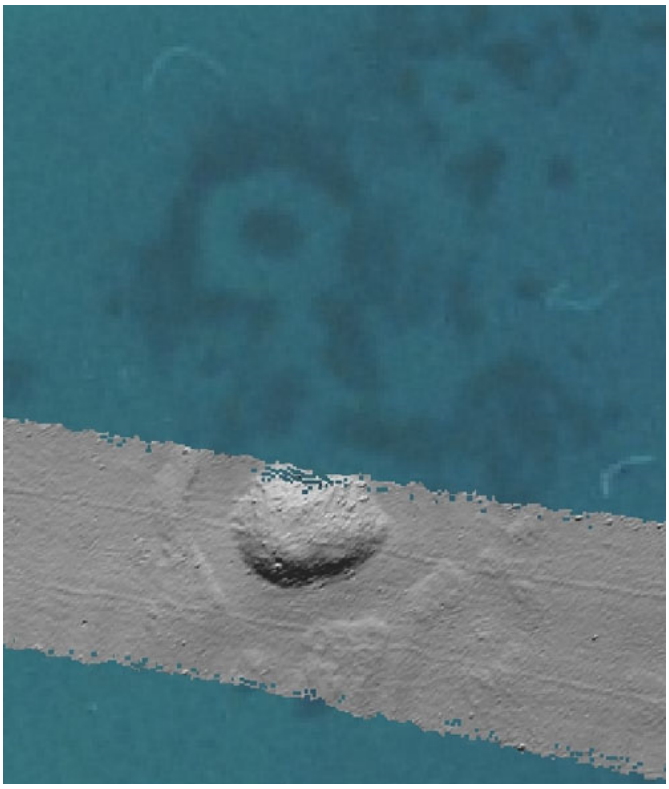


Figure 2, bathymetry (greyscale) of a Patch reef (coral) in Buck Island Channel with NOAA air photo in the background. The patch reef is surrounded by a sand halo, and it by a seagrass bed.

Figure 3, sunset off St. Croix. Paradise…

Day 3: 2.2.2005
Nancy Foster Mission CruiseUpdate #3

The Nancy Foster and her crew finished multibeam and ROV operations around Buck Island Reef National Monument and Salt River Bay National Historical Park and Ecological Preserve (St. Croix, USVI) at 1900 on Wednesday, February 2. Graphics of the data will be available tomorrow. The ship will steam to Grammanik Bank south of St. Thomas at 1900 hour.

The ROV team worked through the night to complete 2 ground-truthing and 4 accuracy assessment transect lines on the north and west sides of Buck Island.

Figure 1 depicts deployment of the Phantom S2 ROV over the starboard side (Glen Taylor and Jeff Williams UNCW/NURP).

Approximately 8 km of ROV video data was collected.

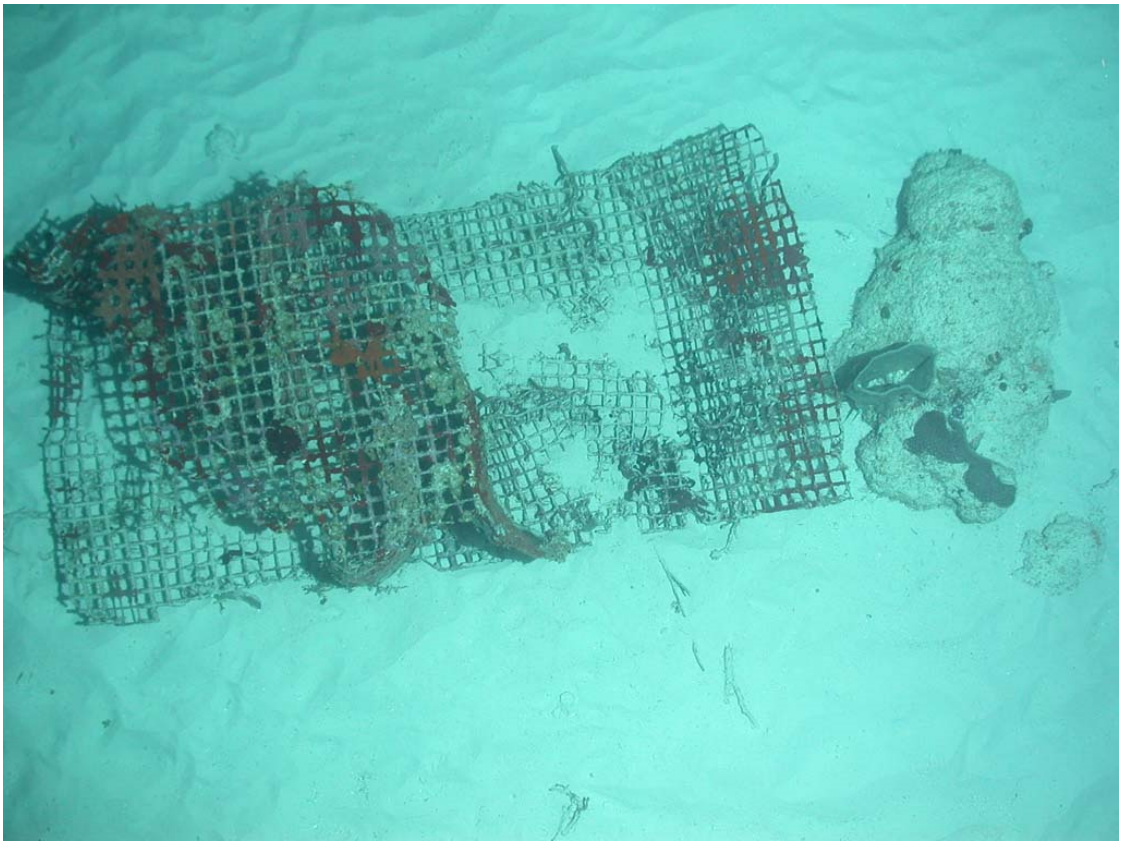


Figure 2 depicts 1 of the 3 fish traps observed from the ROV in a mid-depth (~60 m) sand channel between reefs on the north side of Buck Island.

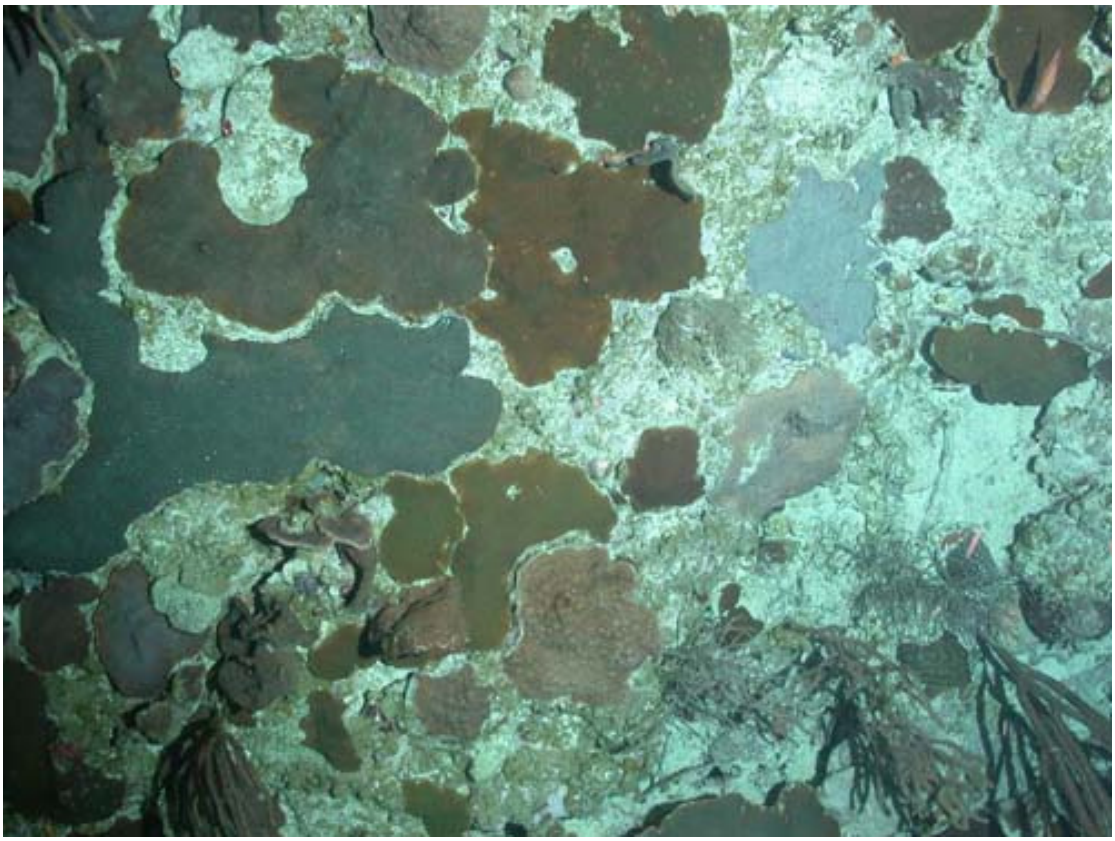


Figure 3 depicts an area of high diversity and percent cover of hard coral on a stretch of reef north of Buck Island.

Day 4: 2.3.2005
Nancy Foster Mission Cruise Update #4

The Nancy Foster and her crew finished multibeam operations on Grammanik Bank at 1300 hour after steaming there the night of 2.2.05. Approximately 3 square nautical miles of multibeaming was completed. Given that the team is ahead of schedule, we will continue multibeaming the topographic ridge along the shelf break due east of Grammanik Bank.

After some initial technical difficulties, the ROV started video transects within Grammanik Bank at 1500 hour. Coral cover has been very high and the ROV has demonstrated tremendous versatility and maneuverability. The scientific team has been working diligently to analyze the plethora of video and underwater digital stills.

Figure 1 depicts the biologists and CO reviewing real-time ROV video acquisition over Grammanik Bank.

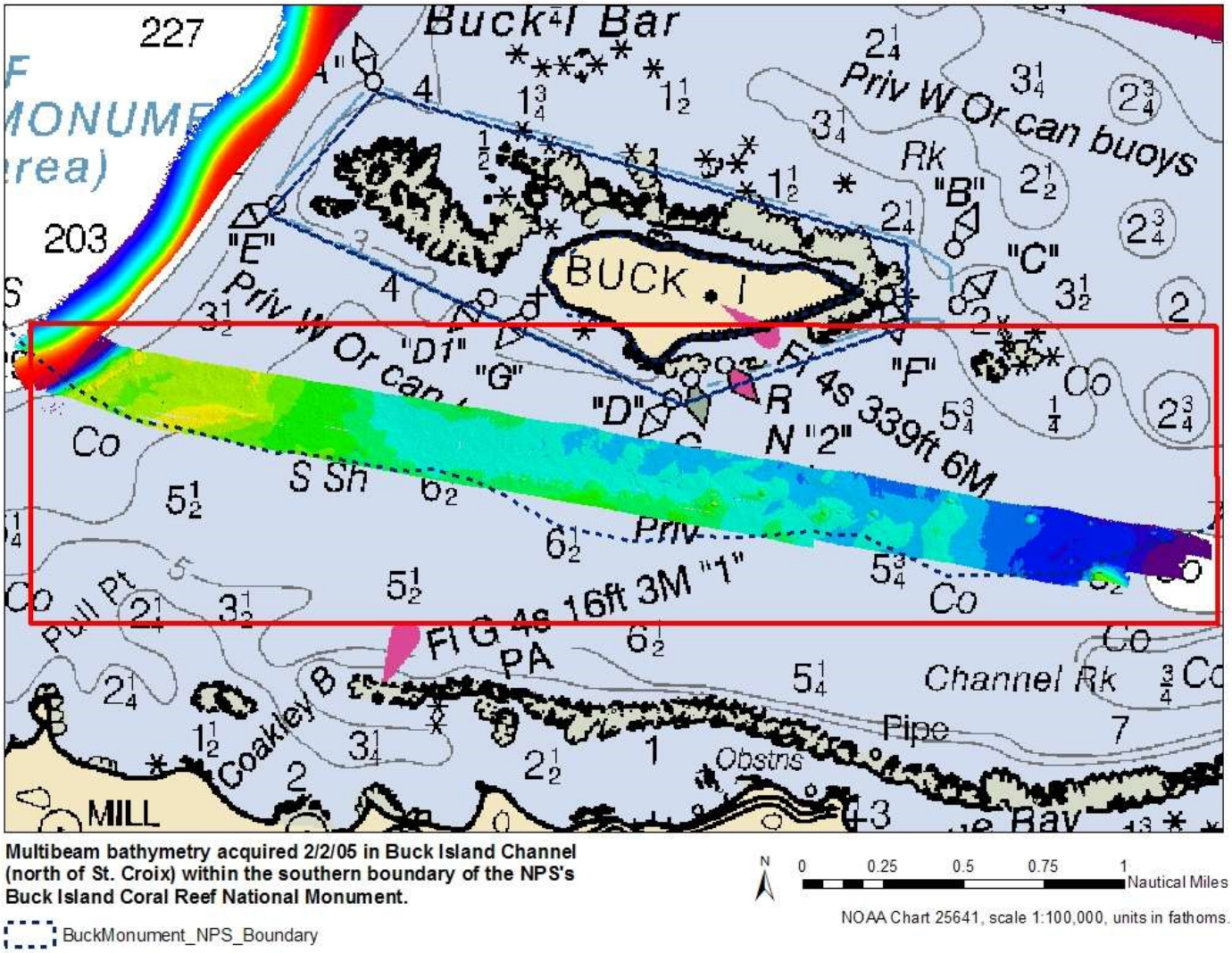


Figure 2 depicts the seafloor that was successfully surveyed by multibeam within the channel south of Buck Island. Approximately 1.3 and .5 square nautical miles of area were surveyed within Buck Island Reef National Monument and Salt River Bay National Historical Park and Ecological Preserve, respectively.

Figure 3 depicts the channel approach to Salt River Bay (left side in the distance and surrounding hills) over the starboard bow of the Nancy Foster.

Day 5: 2.4.2005
Nancy Foster Mission Cruise Update #5

The Nancy Foster and her crew finished exceeded survey estimates of the time required for Grammanik Bank. Consequently, the team made good use of the extra time by extending the survey area due east of Grammanik Bank. Approximately eight hours of acquisition was conducted along the topographic ridge running in a north-easterly direction proximal to the shelf break (Grammanik Bank-east).

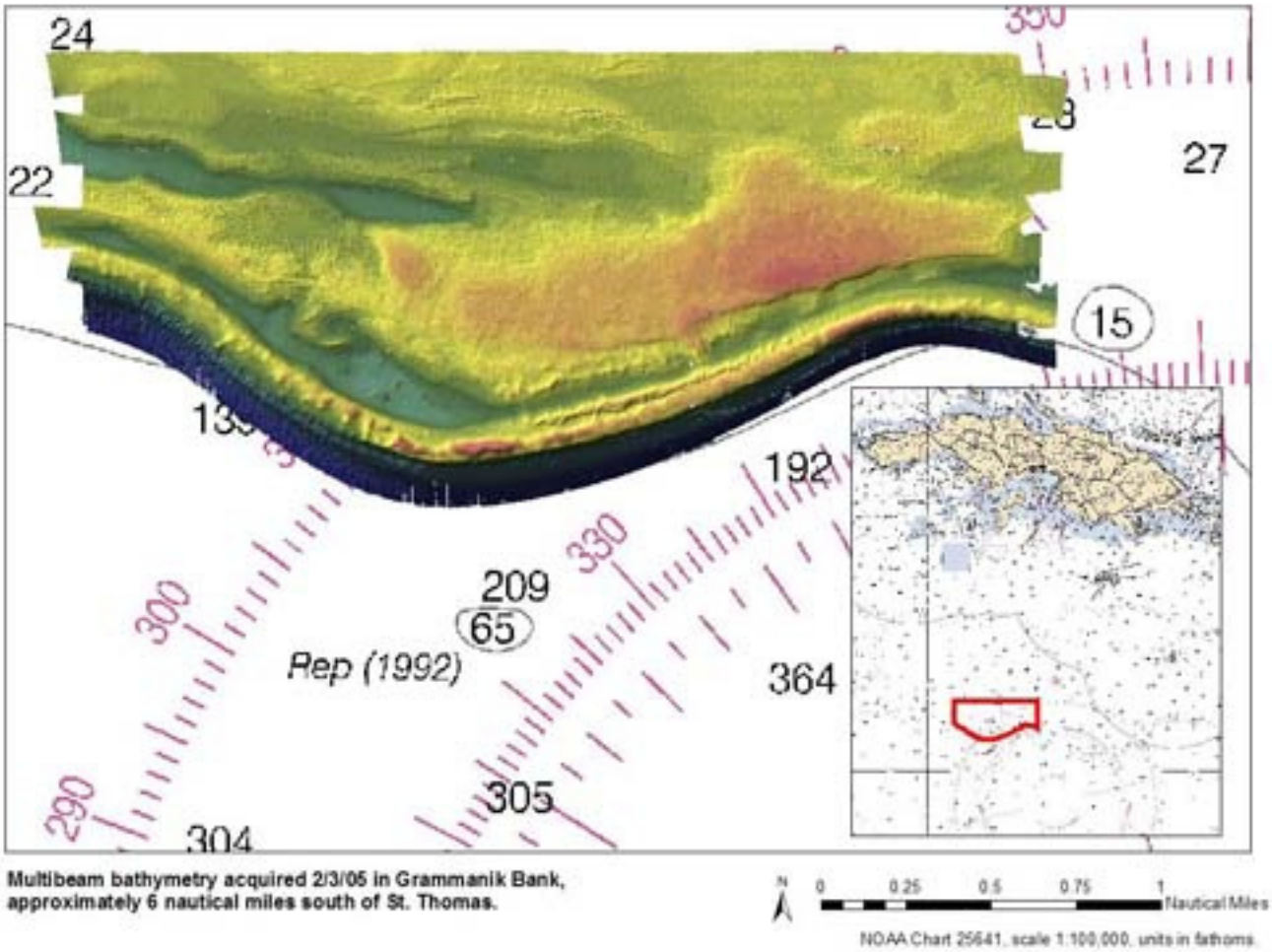


Figure 1 depicts the multibeam acquired for Grammanik Bank. The color scheme depicts changes in topography. The acquisition extended to the full range of the Reson 8101 ER in this situation (approximately 240 meters) capturing the top edge of the shelf ridge as shown in the southernmost boundary of the graphic (blue colors). The Bank itself is depicted with red coloration (approximate depth 40 meters).

The ROV team completed the acquisition of two additional transect lines for Grammanik Bank. The ROV made use of the multibeam data collected the day before for real-time display and navigation of the ROV.

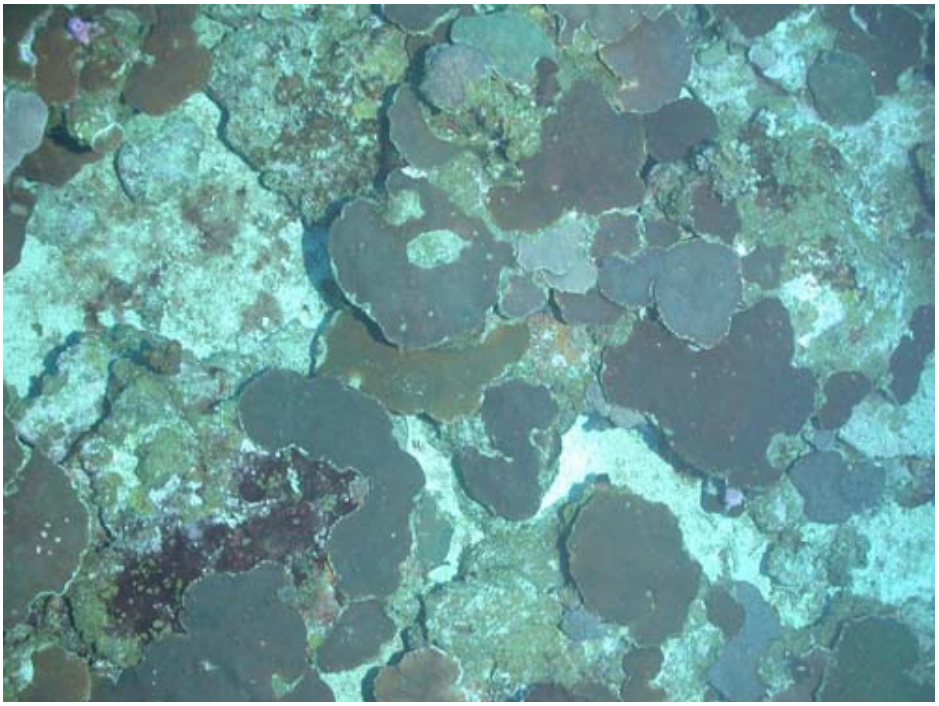


Figure 2 shows Montastraea coral along with algae and a few sponges lie atop a rugged bottom 100 feet deep at Grammnanik Bank. The extensive coral cover is a sign of a healthy reef and serves as important habitat for fish and invertebrates.

Figure 3 shows a downward view from the top of the insular shelf ledge at Grammanik Bank at a depth of ~90 m. Agaricia coral, sponges, and other encrusting organisms were plentiful at the shelf break at this site.

Day 6: 2.5.2005
Nancy Foster Mission Cruise Update #6

The Nancy Foster and her crew finished multibeam acquisition of the area labeled NPS Monument Offshore (see cruise plan). Successful completion of this area makes major progress towards NOAA's commitment to survey the NPS Virgin Islands National Coral Reef Monument. Figure 1 depicts the bathymetry acquired on 2.2.05 for the Salt River Bay National Historical Park and Ecological Preserve. We hope to be able to revisit Salt River next year with a launch and shallow water multibeam to continue mapping within the Bay proper. But the present work will allow NOAA scientist to extend NOAA habitat mapping work near completion in the Bay.

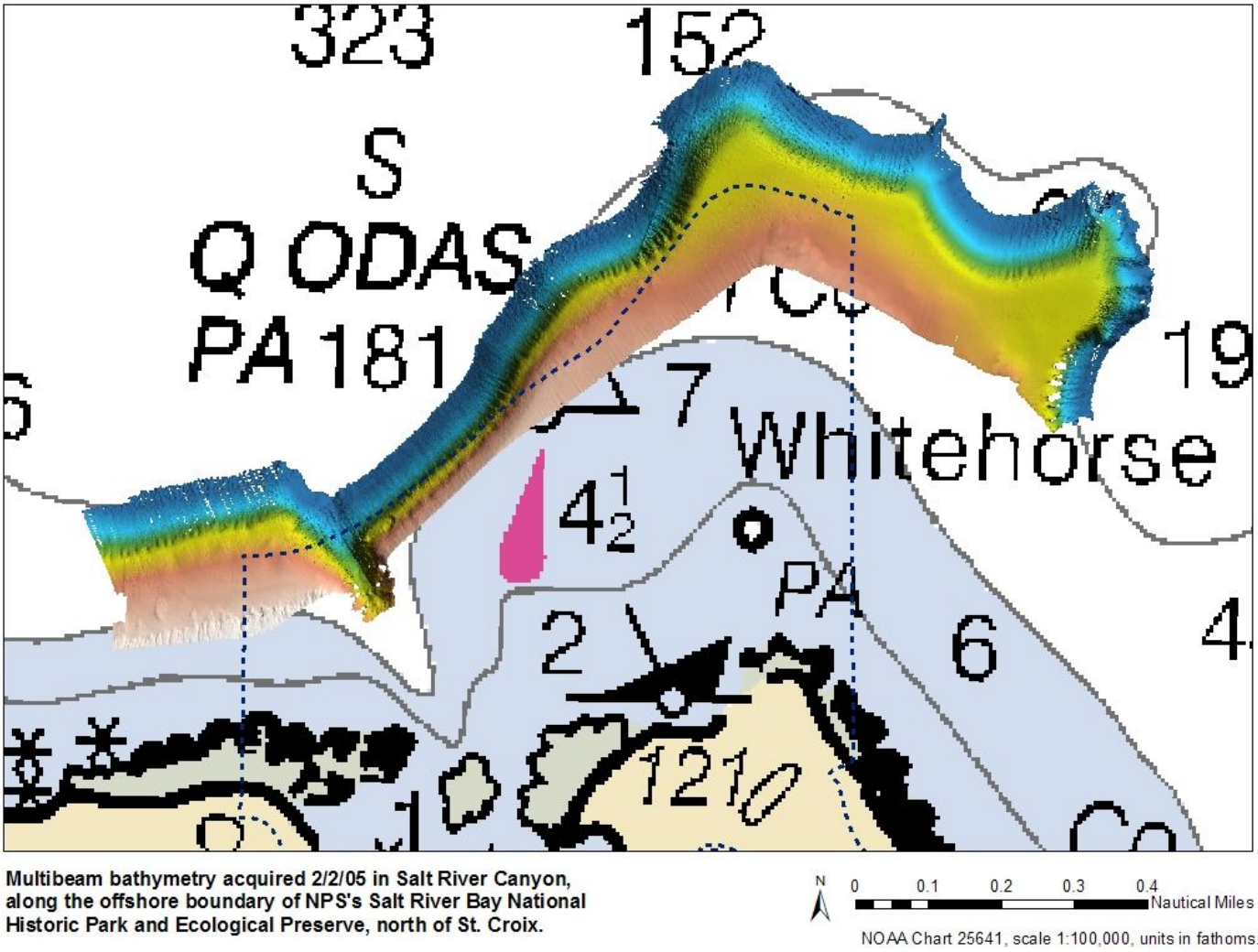


Figure 1. Multibeam bathymetry off Salt River Bay National Historical Park and Ecological Preserve.

Grammanik Bank, Feb 3-4. A remotely operated vehicle (ROV) was used to investigate the benthic habitat of an area spanning 15 square kilometers of Grammanik Bank. Six transects, totaling 11 km, ran at oblique angles to provide video and camera stills of the variety of seafloor types in the area. The digital still camera was downward pointing with two red laser beams spaced 10 cm apart to illustrate the scale of corals, sponges and even fish captured in each image. The observed habitat ranged in depth from 60 to 500 feet, and included a steep precipice along the southern edge of the bank.

A diverse assemblage of hard corals approached 100% cover over a vast ridge 200 meters north of the shelf break. The dominant morphology of corals consisted of plate forms which formed a cascade of loosely overlap-

ping layers over a meter thick in many areas. The coral canopy and three dimensional skeletal structure of the living reef formed a labyrinth of habitats in which numerous fish species were seen. Despite the presence of a beautiful living reef and some small fish, large conspicuous fish were notably absent, either wary of the ROV and safely out of view or simply not present. Also striking to the science crew was the presence of several traps, lines, and cables that lay across the reef structure. The encrusting organisms upon them indicated that these human objects had been in place for a considerable length of time. Derelict fish traps have been an unfortunate but familiar site to the science crew on nearly every trip to the bottom with the ROV. One such encrusted trap line, long forgotten by its human tender, lay over the edge of the shelf inviting the eye into the depths below.

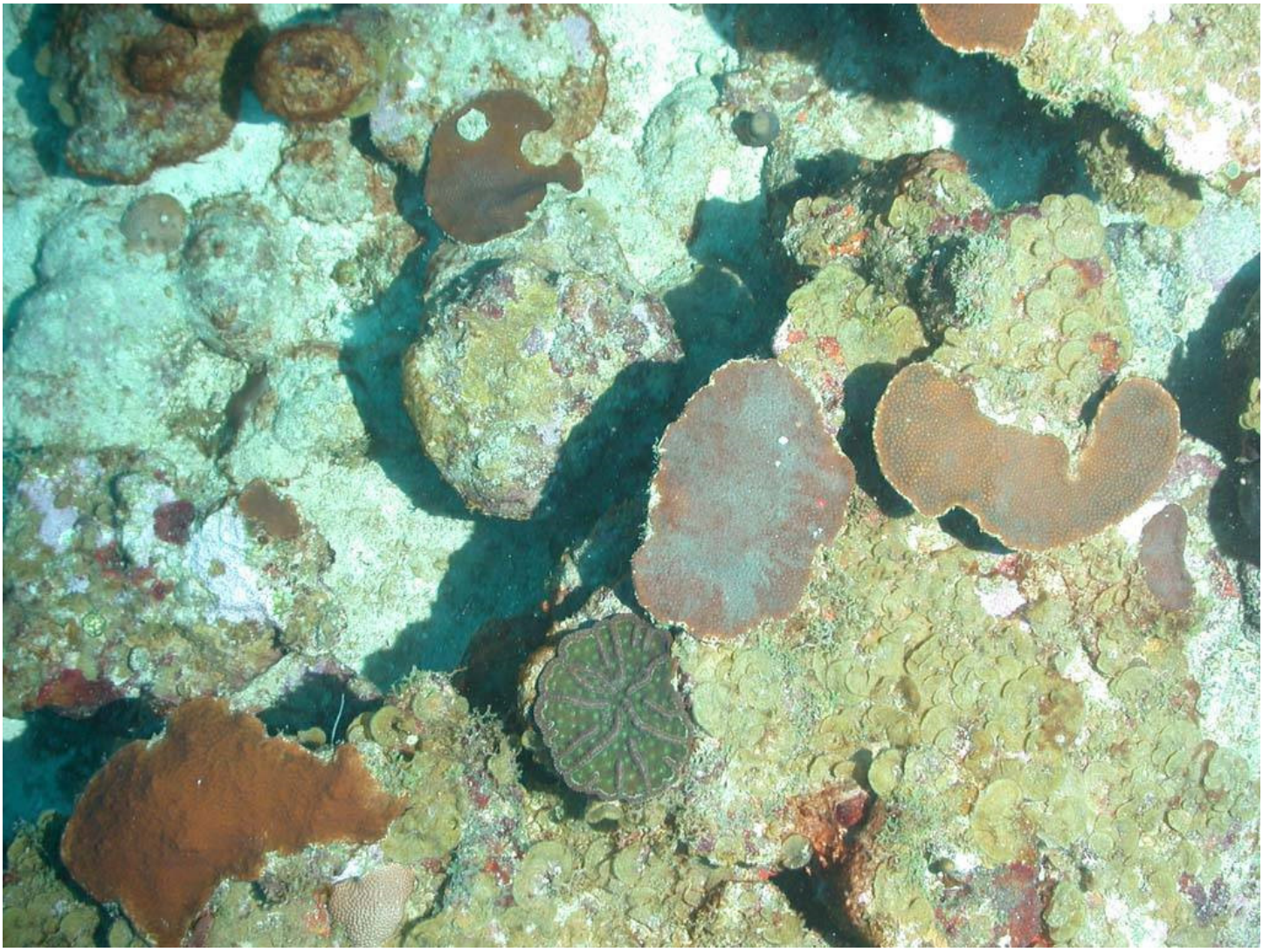


Figure 2 depicts at least 3 different species of coral are visible over the complex terrain. A beautiful specimen of knobby cactus coral (Mycetophyllia aliciae) is located just below the center.

Once over the shelf break, the ROV turned to face the wall of the shelf and descended backwards while documenting a new community of organisms growing on the wall and in its many small caves and indentations. The ROV's flood lights and articulating cameras were essential for maneuvering down the wall and filming the deep water organisms. An occasional glance at the downward pointing digital still camera revealed only the red lasers extending into the infinity of darkness and unseen depths beyond. The science and ROV crew reluctantly stopped at 500 feet down the canyon wall as this was the limit of the multibeam acquisition, at least for this year.

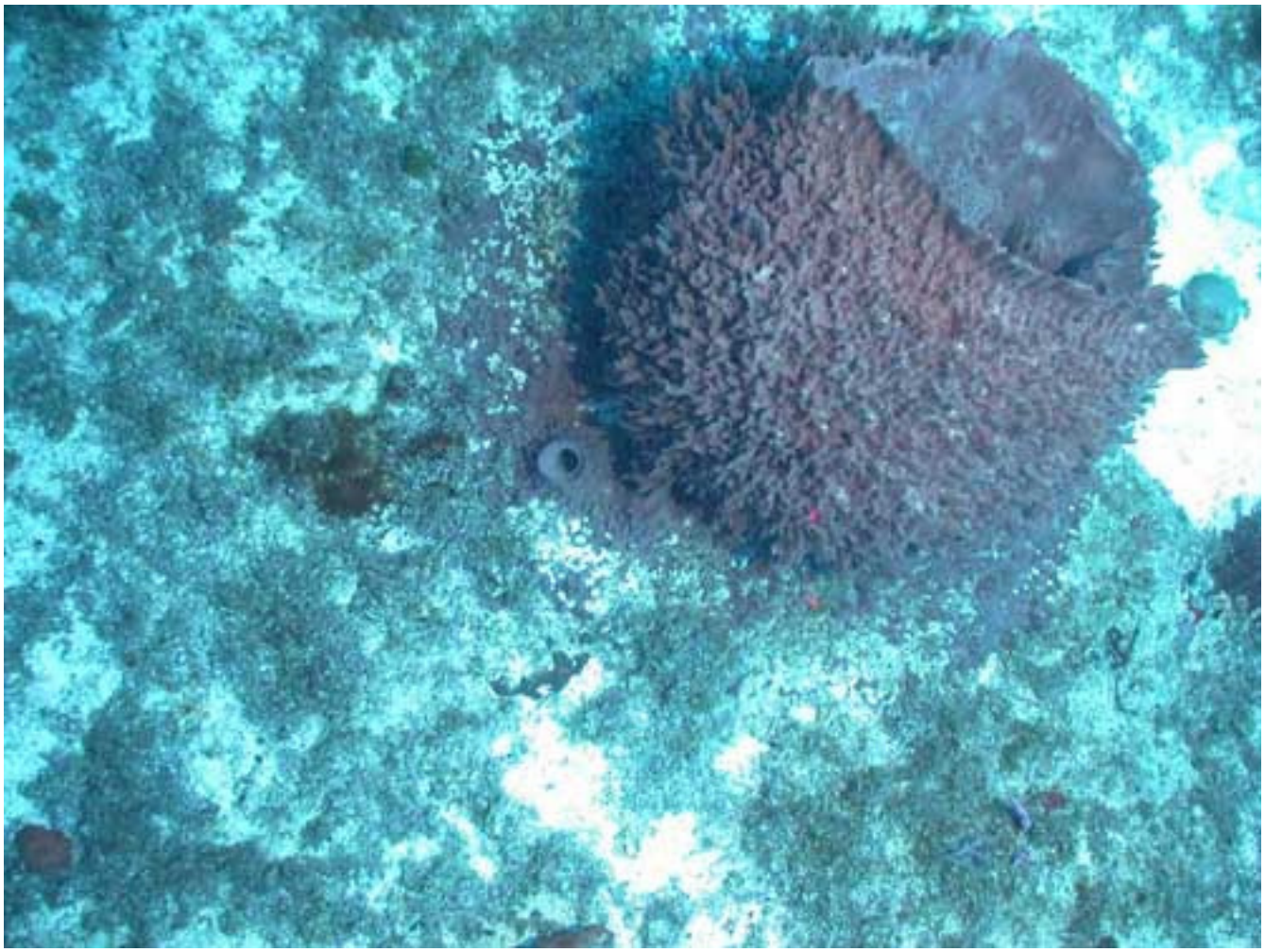


Figure 3 shows a giant barrel sponge (Xestospongia muta) dominates a background of algal turf and macroalgae. The size of this sponge indicates it is approximately 50 years old! Both of these photos were taken within Grammanik Bank.

Day 7: 2.6.2005
Nancy Foster Mission Cruise Update #7

The Nancy Foster and her crew finished multibeam acquisition of the area labeled NPS Monument Offshore (see cruise plan). Successful completion of this area makes major progress towards NOAA's commitment to survey the NPS Virgin Islands National Coral Reef Monument.

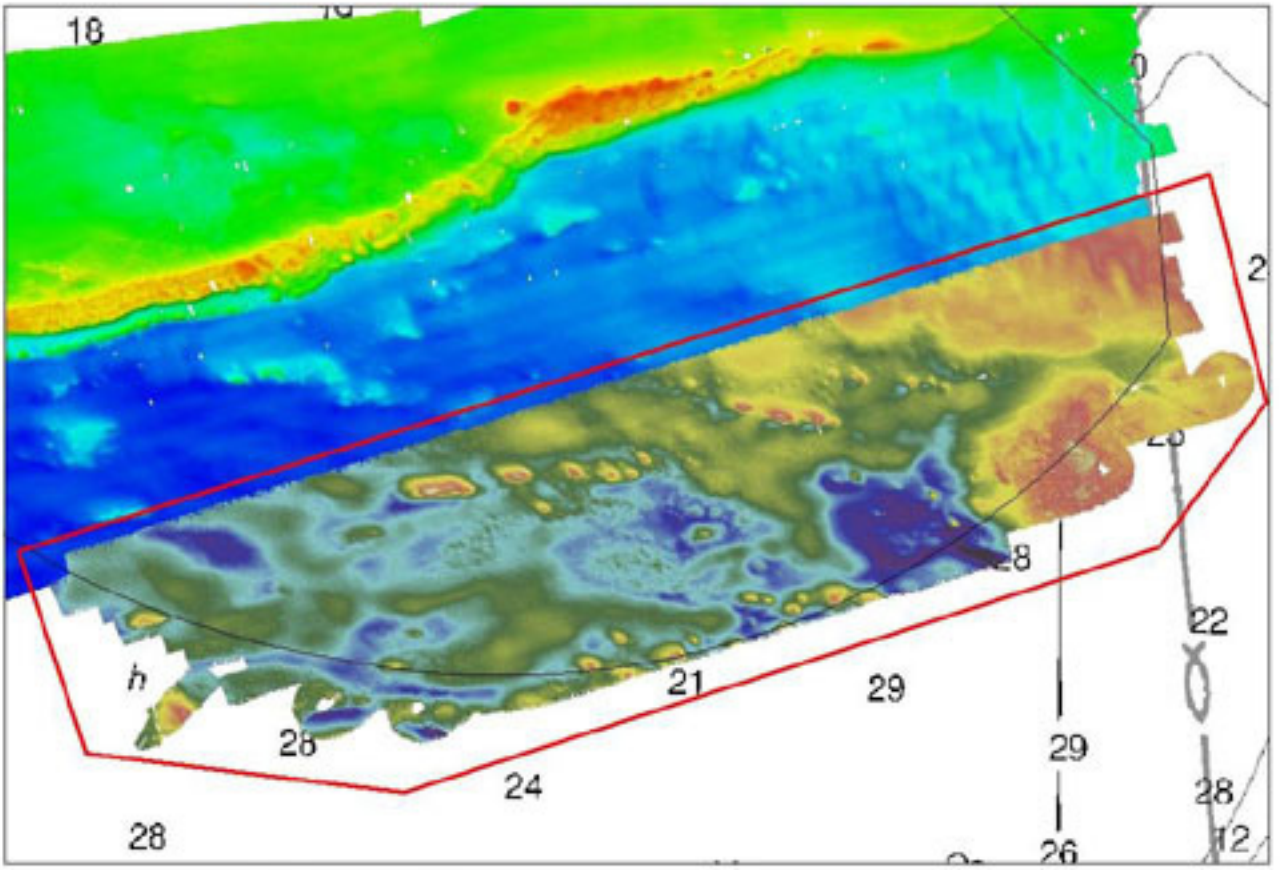


Figure 1 depicts the bathymetry acquired in the southernmost portions of the NPS Virgin Islands National Coral Reef Monument

South of St John: The ROV crew on the Nancy Foster collected its first video transects of benthic habitat data within the US Virgin Island National Coral Reef Monument. Five transects were completed providing a visual assessment of 8.6 kilometers of habitat. The majority of transects were perpendicular to a wide elevated ridge that ran northeast to southwest (called the mid-shelf reef) off the coast of St John. The underwater video and photographs were critical for showing the transition between sand and coral and the corresponding sonar images.

The ROV engineers earned their pay early on this day. During the routine equipment check prior to the first dive of the day, reports from the bridge indicated that several fish trap buoys had been deployed in the planned path of the ROV. Maneuvering among the many new and derelict traps and lines was successful for a while, however, soon the ROV slowed and became less responsive to steering commands from the ROV crew above. A tilt of the camera revealed the culprit, a line to a surface float from one of the traps was taught across the frame of the ROV. We were stuck. While the crew tilted and turned the ROV frame using its four thrusters in an attempt to dislodge the entanglement, the science crew looked at maps of the area to determine if the traps had been set inside the Monument no fishing zone. We didnít expect to see traps inside the Monument, yet many were there.

Once free, the ROV crossed the mid shelf reef five times on several transects in the area. Not as much coral cover on reefs in this area relative to the spectacular coverage seen yesterday in some places along Grammanik but impressive no less. More striking was the vast area of seafloor covered by ìrhodolithsî, small cobble sized

bits of coralline algae. The cobbles have a pink calcium carbonate algae that grows on one surface. A disturbance such as a hurricane rolls the cobbles exposing a fresh side. New growth begins, and the process continues. Little is known about how large an area these rhodoliths cover, how fast they grow in this area, how frequently they are disturbed, and what species of fish or invertebrates might utilize the small spaces between them. Sand tile fish, at least, take advantage of the abundant building supply, erecting small mounds of equal sized cobbles visible throughout the seascape.

Just south of St John at a depth of 100 feet purple colored yellow tube sponges (Apllysina fistularis) stretch upwards towards the sea surface (Figure 2). In the background an assortment of Lobophora and Dictyota algae cover the bottom.

Figure 2. Apllysina fistularis at 100 feet.

A sand tile fish (Malacanthus plumieri) piles up rhodoliths, coralline algae that look like small rocks, to create a hiding place in an otherwise flat, featureless environment. Rhodoliths are common in the US Virgin Island National Coral Reef Monument over expanses of flat sand (Figure 3). Once the sand tile fish abandons the mound, other fish will move in to take advantage of the refuge.

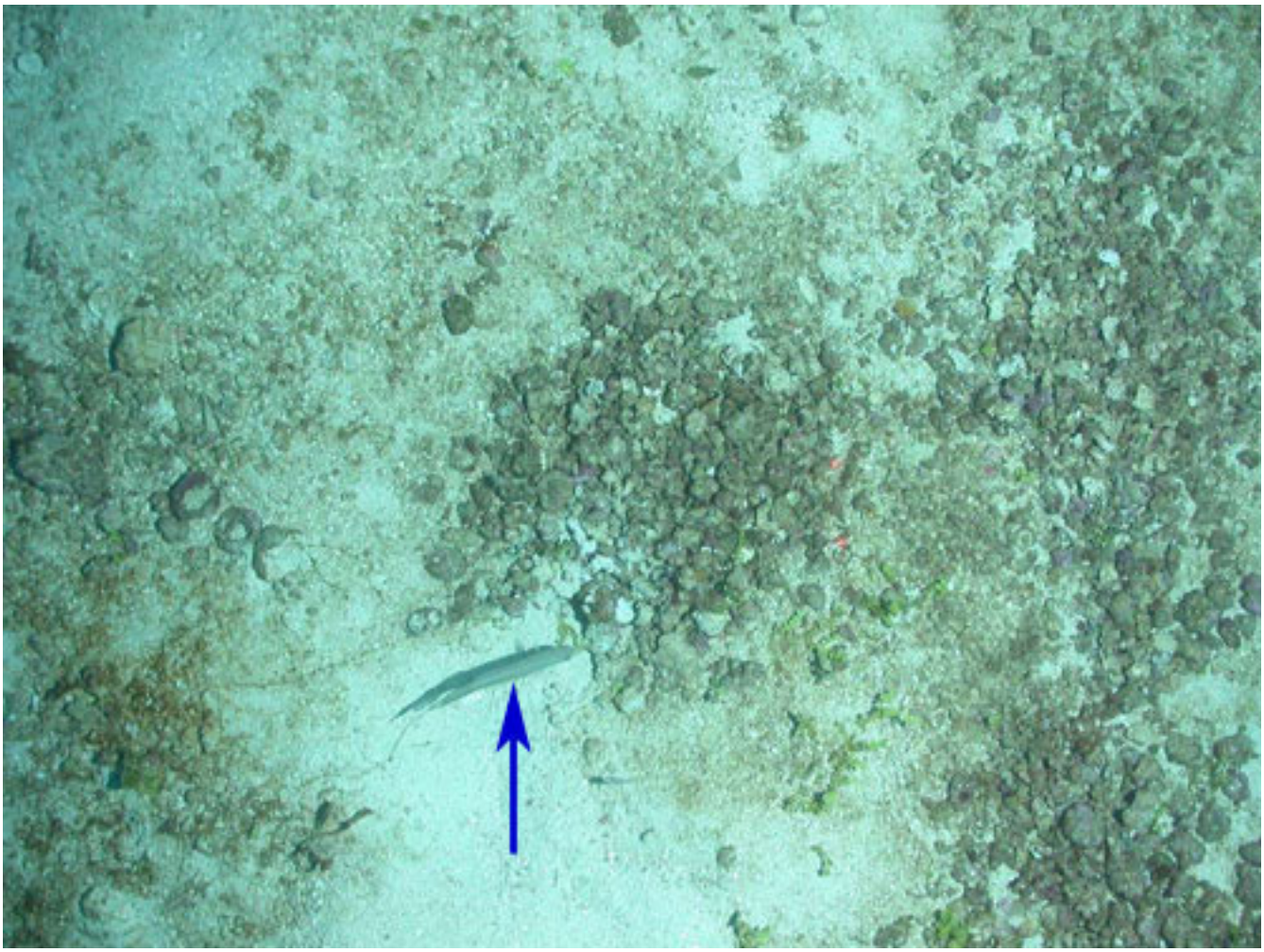
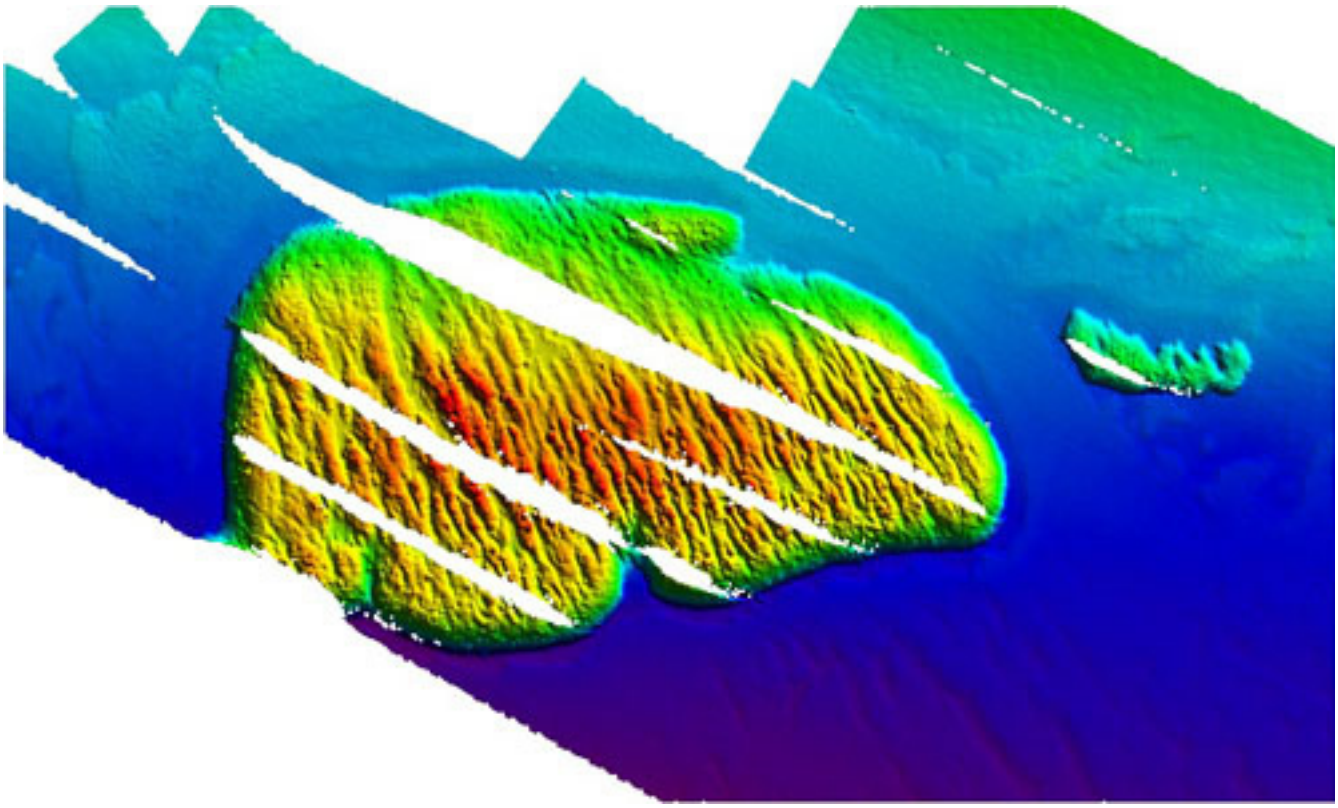


Figure 3. Malacanthus plumieri (see arrow); a species that is primarily a shallow-water benthic species found on sand and rubble bottoms, and builds mounds of rubble and shell fragments near reefs and grass beds.

Day 8: 2.7.2005
Nancy Foster Mission Cruise Update #8

The Nancy Foster and her crew continued multibeam acquisition of the area labeled NPS Monument inshore (see cruise plan). This work is being conducted in conjunction with NOAA's Office Coastal Survey (OCS). Although the multibeam data is primarily being collected for seafloor characterization efforts, NOS is collecting the NPS Monument Inshore data at a higher level of confidence to meet acquisition requirements for OCS. This area was identified by OCS Charting Priority Level 2. This exercise will attempt to demonstrate the utility of NOAA scientific oceanographic vessels to conduct Integrated Ocean Mapping that is collecting oceanographic data to simultaneously satisfy multiple purposes (i.e. charting and seafloor characterization).



Although collection has not been 100% completed due to avoidance of moorings, Figure 1 depicts an area of interesting seafloor composition within a shoal just northwest of Ram's Head, St. John . The features captured appear to be Spur and Groove, hard bottom. Spur and group is defined as habitat having alternating sand and coral formations that are oriented perpendicular to the shore or bank/shelf escarpment. The coral formations (spurs) of this feature typically have a high vertical relief compared to pavement with sand channels and are separated from each other by 1-5 meters of sand or bare hardbottom (grooves), although the height and width of these elements may vary considerably. This habitat type typically occurs in the forereef or bank/shelf escarpment zone.

The second day of ROV work south of St. John produced exceptional video and photographs for two of the longest transects on our 12 day expedition. One transect crossed the mid shelf ridge inside the US Virgin Island National Coral Reef Monument, the other spanned two areas of high relief outside the Monument between the mid shelf reef and the shelf edge.

Diverse assemblages of fish species abounded. In one snapshot encompassing a square meter of benthic habitat six fish species were counted. This is extraordinary considering that there are likely more species hiding among the complex assortment of coral colonies observed in the shot. We have seen that many distant fish swim away or hide as the ROV approaches.

The first impression of the ROV team was that the reefs outside the Monument had much more coral than reefs inside. This perception was short lived. As the ROV progressed and the series of still photos flashed across the monitors in the lab aboard the Foster, the science crew noticed a disturbing trend. What was once a reef composed of 80% live coral had changed to a reef with less than 20% live coral. More alarming was the apparently recent and simultaneous loss of so much coral. Careful observation of all the photos along this transect revealed that the massive decline in live coral had occurred only within the last couple months or so. A sickly green hue covered many large colonies of agaricia, montastrea, and other plate forming species. The dead coral all had a consistently sparse growth of a thin turf algae rather than the more fleshy algal growth indicative of long dead coral. It was puzzling to see the decline of such a large amount of live coral on a reef in such deep water and so

far offshore. The depth and distance from shore should have insulated this reef from most sources of stress that have resulted in the demise of so many nearshore/shallow reefs. What disease, pollution, or natural disturbance could have resulted in the loss of so much live coral at this once magnificent reef? By the end of the dive, the science crew anxiously eyed a transect scheduled for tomorrow which passes through the same area, hopeful that damage is not widespread.

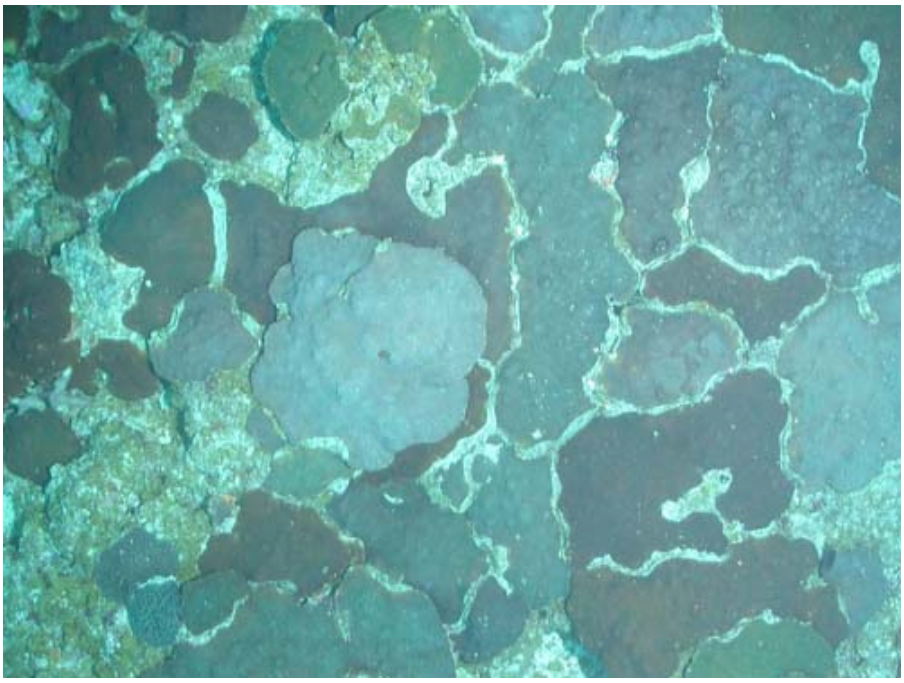
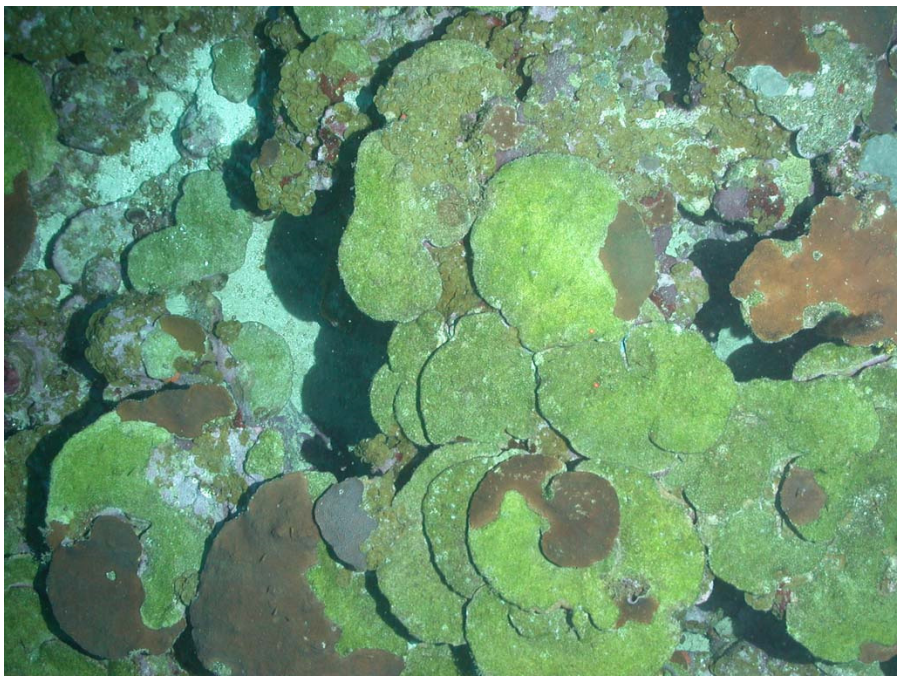


Figure 2 demonstrates numerous colonies of coral competing for space. A small gap, a few centimeters wide, separates each colony and delimits the battle zone.



What was once a flourishing coral reef has now succumbed to some unknown ailment, as shown in Figure 3. Algal turf has grown over the dead coral colonies. The extent and type of algae indicate a sudden massive loss of coral in the last few months.

Day 9: 2.8.2005
Nancy Foster Mission Cruise Update #9

The Nancy Foster and her crew continued multibeam acquisition of the area labeled NPS Monument inshore and MSR #4 (see cruise plan).

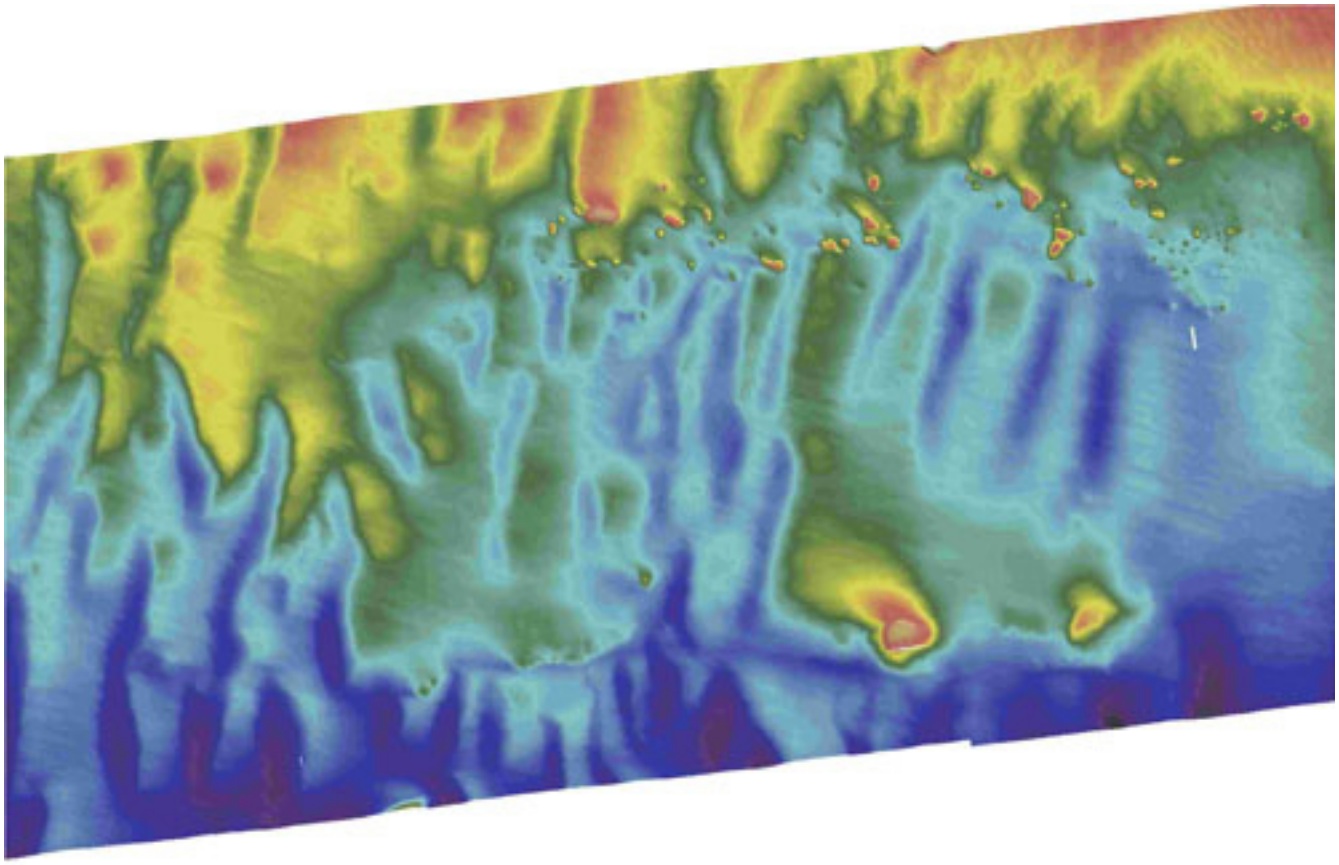


Figure 1 depicts an area in the center of NPS Inshore of undulating relief, red area indicating regions of shallower depth. The task has been difficult to survey with many moorings, ship traffic, and shallow water in close proximity to contend with. Restricted navigational range and shoals has exacerbated holes in the data collection, leading to increased time commitment to fill in the voids on subsequent passes. We look forward to closing out this area to move on to waters more navigable to the Nancy Foster. The ships crew has done an outstanding job working with us to overcome obstacles so as to meet our objectives while managing to survey in conditions that are not necessarily the most conducive to a vessel of the Nancy Foster's size. Our hats off to them!

The science crew completed four transects in an area approximately 10 km south of Pillsbury Sound, a channel separating the islands of St John and St Thomas . Three transects bisected elevated ridges covered in gorgonians and sponges and one traversed a relatively deeper, flat sand seascape. In total, the transects covered 7.2 kilometers of habitat.

Turbidity was the story today. A strong NW breeze was throwing cloudy water southeast out of Pillsbury Sound. The ROV crew winced in anticipation of the low visibility expected in such milky waters. The more interesting question to the science crew was, "How would such low water quality influence the types of fish and corals in this area?" We would soon find out. Usually we could see the seafloor during much of the ROV's decent to each site. Today, the ROV practically felt the bottom before we glimpsed its algal covered surface. We had to fly the ROV close to the bottom, and a bit slower since seafloor obstructions could appear suddenly through the murk. Despite covering features that had the vertical relief typical of once vibrant reefs, all that we saw today were

dead corals covered in fleshy algae, sparse sea whips and fans, and a handful of sponges. What had this reef looked like 20, 50 or 100 years ago?

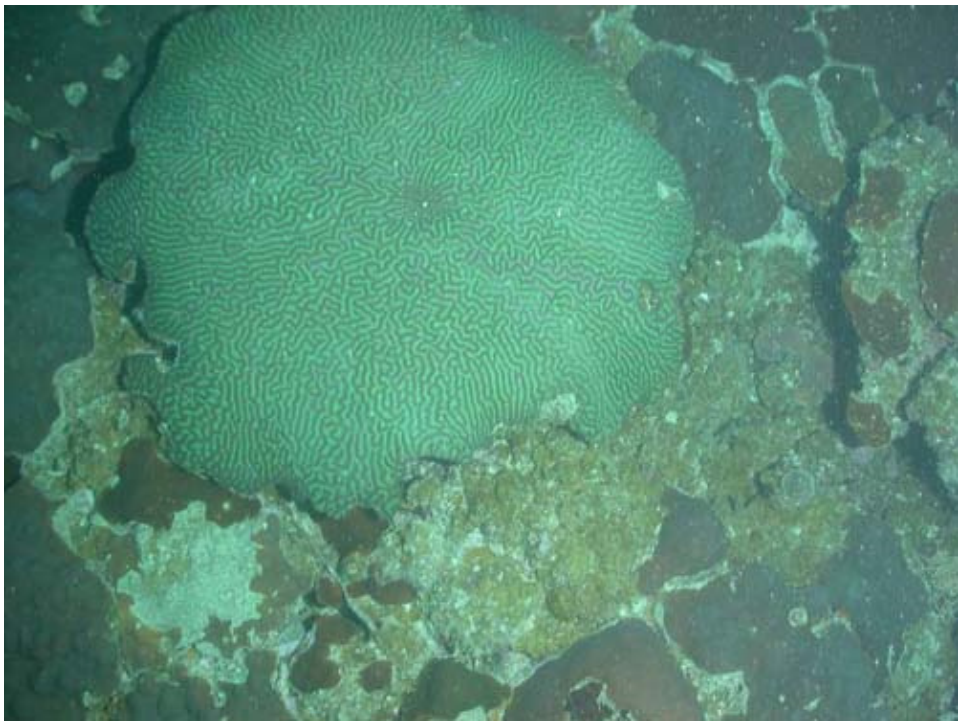


Figure 2- A large intricate colony of Symmetrical Brain Coral (Diploria strigosa) surrounded by Montastraea coral colonies. Diploria has been a rare treat in ROV pictures, while Montastraea has been much more prevalent.

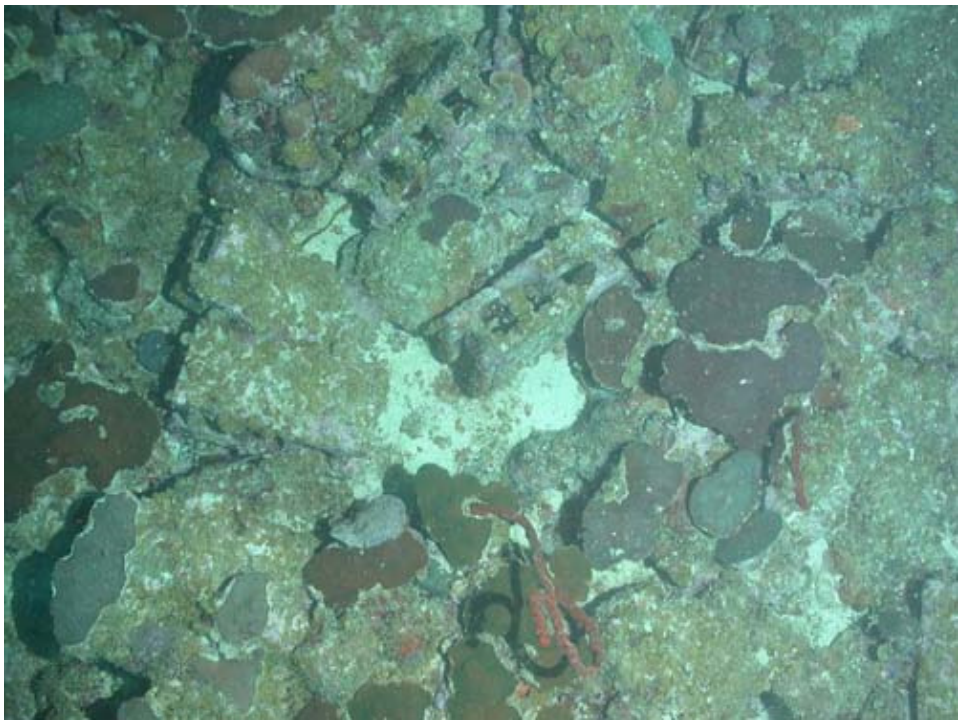


Figure 3- Several derelict concrete blocks encrusted with sponges and algae. One of many manmade materials found throughout our expedition. These types of blocks are commonly used to anchor homemade fish attracting devices, which assist fishermen in catching large fish.

Day 10: 2.9.2005
Nancy Foster Mission Cruise Update #10

Ten kilometers south of St Thomas:
The ROV and science team completed three transects along two of the northernmost ridges of the mid-shelf reef. The elevated ridges, located just south of the island of St Thomas and Pillsbury Sound, rise roughly 20 meters relative to the surrounding seafloor. Video footage revealed the ridges possessed colonized pavement scored with many parallel sand channels. The channels challenged the ROV driver who constantly had to maneuver into and out of each channel to keep a constant 2 meters from the bottom.

We were surprised to find that the ridges were relatively devoid of corals and fish. Previous transects in similar habitat revealed a high diversity of corals, sponges and fish. As extensive patches of rhodoliths glided past the camera we scratched our heads. The monotonous expanse of coralline algae was infrequently interrupted with diminutive sponges and colonies of coral. Furthermore, for the first time on this expedition we noticed a high density of sea urchins meandering across the seascape. What is different about this location? Is it the proximity to St Thomas or Pillsbury Sound? Was their some connection between the sea urchins and absence of coral? Tomorrow's transects will run over similar ridges located further west. Will the denuded terrain we observed today extend 5 km west into the benthic habitat we will observe tomorrow?

Figure 1: Starfish A Cushion Sea Star.

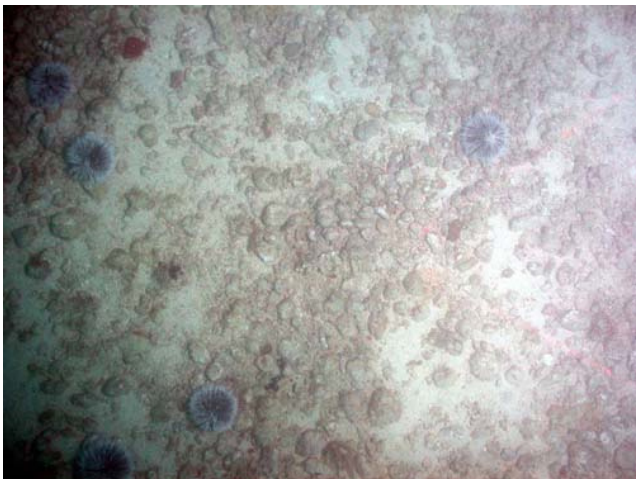


Figure 2: West Indian sea eggs. Their numbers have been greatly reduced in some locations by people harvesting them for their roe.

Day 11: 2.10.2005
Nancy Foster Mission Cruise Update #11

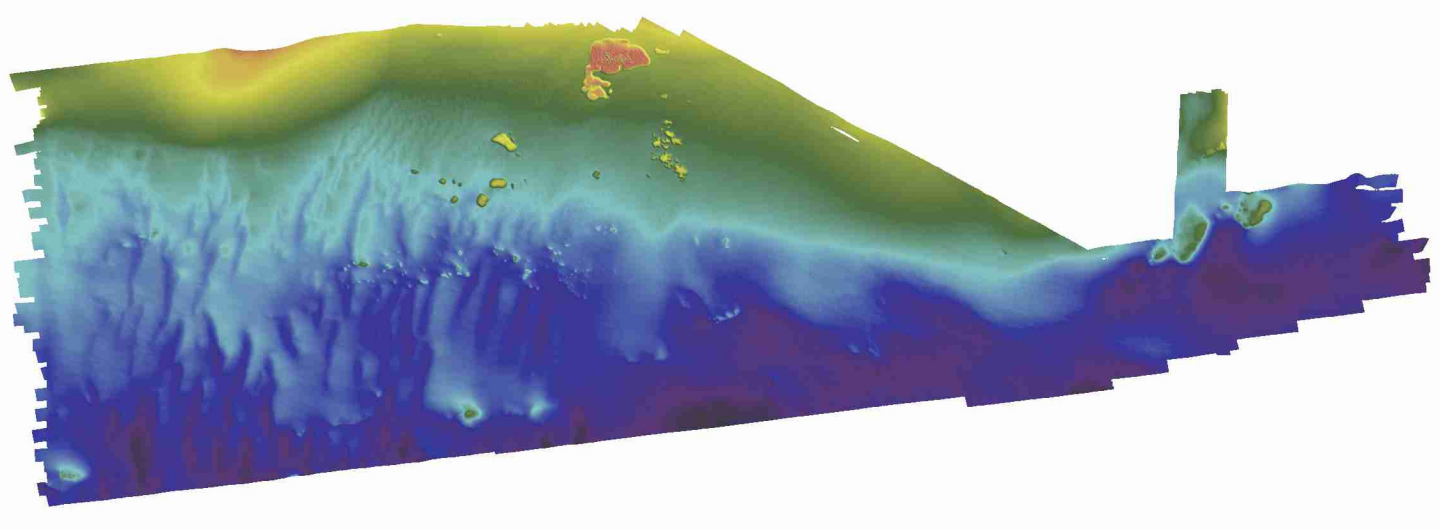


Figure 1 shows the completed acquisition of NPS Inshore survey area. All have been quite pleased with the result and efficiency of data collection. We hope that it will serve NOAA Office of Coastal Services purposes for charting as greatly as it will the National Park Service and NOS for fulfilling the objective of seafloor characterization. The area represents a full range of habitats- flat and monotonous depositional areas with scattered macroalgae, areas of relatively high relief patch reefs with a complement of diverse soft and hard corals, a plethora of rhodolith field, and exceptional spur and groove in inshore areas. Well ahead of expectations, the team moves on to areas to the west in hopes of creating continuous multibeam coverage along the South shore of St. John and St. Thomas.

South of St. Thomas - The day ended with the science crew covering over 6 kilometers of habitat with three transects. Two transects east of Frenchcap Cay and one transect east of Capella Island investigated elevated mid-shelf ridges.

As was the surprise yesterday, much of the video along the ridges revealed a moon-like flat seascape. Infrequently sponges and corals seemed to gasp for breath amid a sea of rhodoliths and macroalgae. In some spots, it appeared as though the rhodoliths were a foot deep. None of the scientists had ever seen so many.

We occasionally glimpsed islands of high diversity. In these exceptional locations encrusting sponges and coral were shaded by dense forests of lush gorgonians. Fish darted among the vertical corals and some stopped to timidly peer from semi-concealed positions at the curious ROV gliding above.

The science team is working like a tuned, well-oiled machine. The ROV now slides into and out of the water and glides along predetermined transects effortlessly. We have now completed 90% of this year's objectives. In the next few days we believe there will be time to collect additional data.

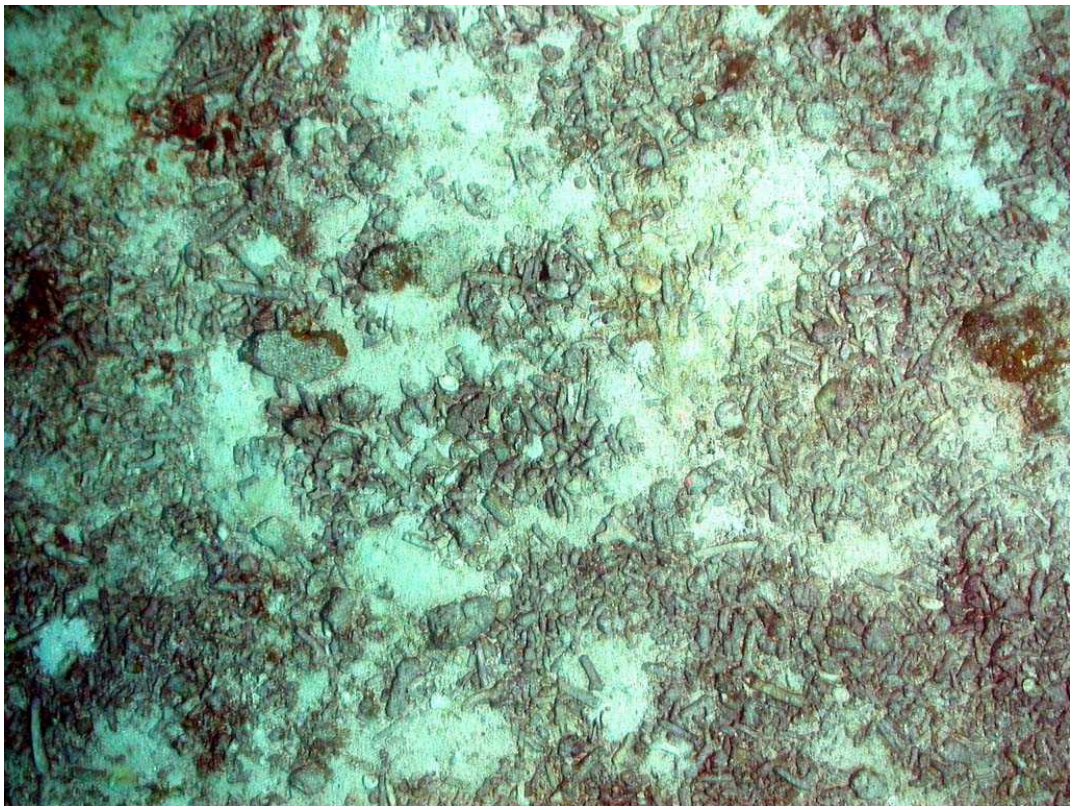


Figure 2 – Coral debris covers a sandy depression south of St John. The unseen elevated ridges surrounding this depression were once rich with coral life, but now are cluttered with macroalgae.

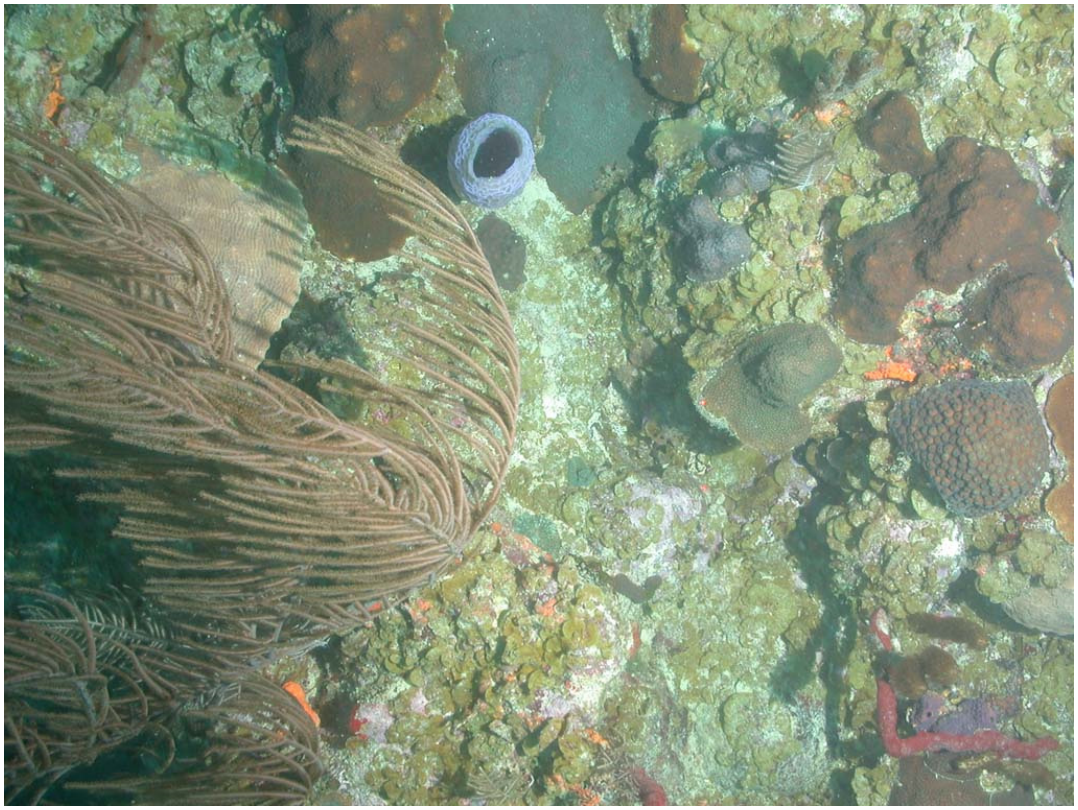


Figure 3 – A diverse assortment of corals and sponges covers a small patch reef. This slightly elevated site appeared as an oasis within a sea of rhodoliths, serving as an ephemeral respite from a flat unadorned monotony.

Day 12: 2.11.2005
Nancy Foster Mission Cruise Update #12

South of St Thomas:
The ROV team conducted four transects in the region of Frenchcap Cay. Two perpendicular transects crossed just north of the cay, so close the Nancy Foster passed within several hundred meters of land. Two other transects were completed several kilometers to the east on a slightly elevated ridge. Eight kilometers of habitat were investigated.

The science crew was extremely pleased to see a healthy reef overflowing with marine life around Frenchcap Cay. The reef stretched out a couple of kilometers from the Cay¹s shore and we were lucky enough to traverse several kilometers of it. The reef was densely covered in encrusting and plate stony coral, enormous vase sponges, neon tube sponges and thick gorgonians. Only Grammanik Bank appeared to rival this coral density. Fish darted among the gorgonians and through the voids around corals. We were even fortunate enough to see a sea turtle pass in front of the ROV and a sting ray lying in a small patch of sand. Schools of fish were frequently observed and some rarer species of fish, like the Spotted Drum, were noticed. This area seemed to be exploding with life.

An unfortunate event came at the end of our last transect of the day. We saw a large object off in the distance. After seeing so many organisms, all of the science crew were squinting their eyes imagining a large marine animal. As the shape approached, the silhouette sharpened and we could see the regular austere outline of a man-made object. It was yet another fish trap! It is too bad this was our last vision of a reef paradise.

Figure 1: A stingray lies on the bottom, hidden by a thin veneer of sand toward the right hand side of this snapshot.

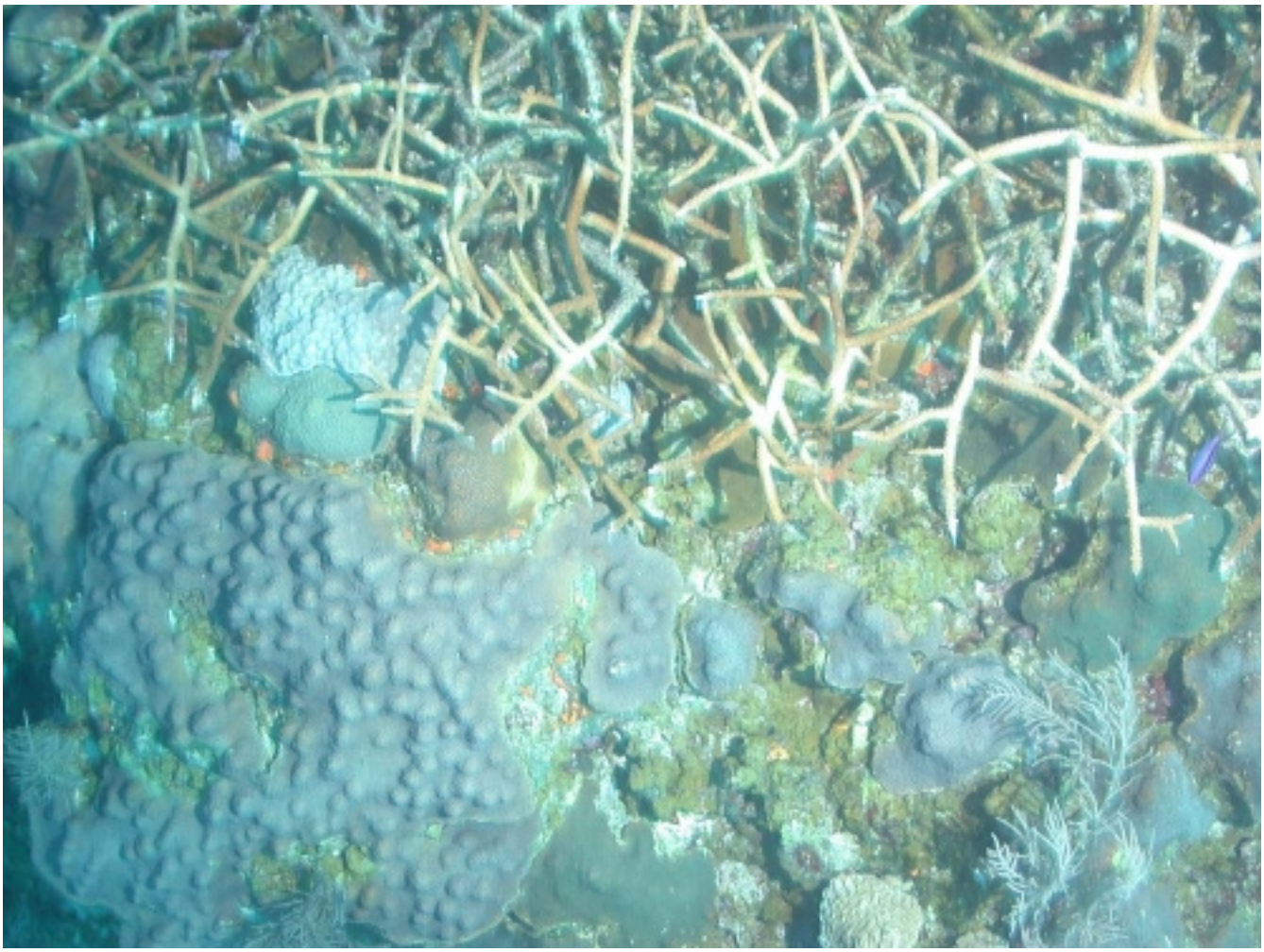


Figure 2: Staghorn coral (Acropora cevicornis) appears as a thicket of brambles along the upper margin and towards the center of this picture. Staghorn coral is excruciatingly rare among the transects of our expedition. The ROV video has revealed plenty of coral rubble with the distinctive outlines of Staghorn coral, indicating it once thrived.