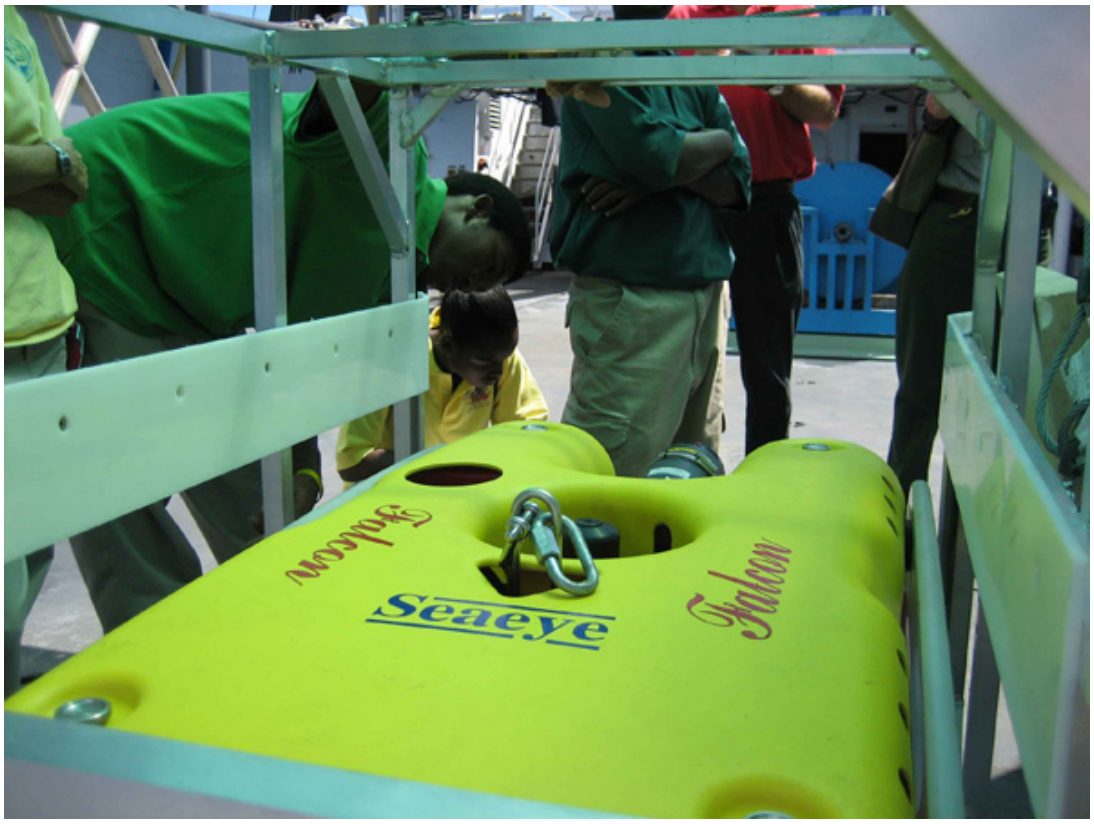
Web Update
Press Briefing and Student Tour:

On Monday 3/20 Joel Tutien (Superintendent of Parks, National Park Service, USVI) Zandy Hillis-Starr (Biological Resource Manager, National Park Service, St. Croix) and Tim Battista (Chief Scientist NOAA's Ocean Service, Silver Spring, MD) provided a mission briefing to students and local St. Croix, USVI radio, newspaper, and television media. The team conveyed the great excitement and anticipation for the opportunity to collect multibeam and imagery of seafloor habitats at water depths never characterized or observed within the Buck Island National Monument.

Seven high school and middle school students and teachers from St. Thomas, USVI attended the scientific briefing. The students were members of the Environmental Rangers club. The scientists onboard the ship gave a full demonstration of the mission objectives, ship multibeam capabilties and mutlibeam products, and the Remotely Operated Vehicle. The ROV operators from SeaVision Marine Services provided details of the ROV capabilities including the camera, video, and geopositioning. The students had many intriguing and insightful questions about the ROV operation and application.

Mathew Snyder explains the details of ROV operations.



St. Thomas students inspect the SeaEye Falcon ROV to be used in the coming days)

The science team will take advantage of another night in Frederiksted before they depart for Buck Island on Tuesday morning.

Web Update
Day 1: 03/21/2006

On Tuesday 3/21 at 9:45 am the NOAA ship Nancy Foster got underway departing from the east end pier at Frederiksted, USVI to Buck Island on the northeast side of St. Croix. Transit time to the study site was approximately 3 hours.

(NOAA ship Nancy Foster at the Frederiksted Pier, St. Croix)

Before getting underway, Hydrographer Jay Lazar conducted a lead line test to verify the lever arm measurements for the multibeam unit. The multibeam team will conduct a patch test and outer beam angle offset calibration at sites located surrounding Buck Island once the ship completes its transit to the study area. Multibeam operations will commence upon satisfactory completion of these tests.

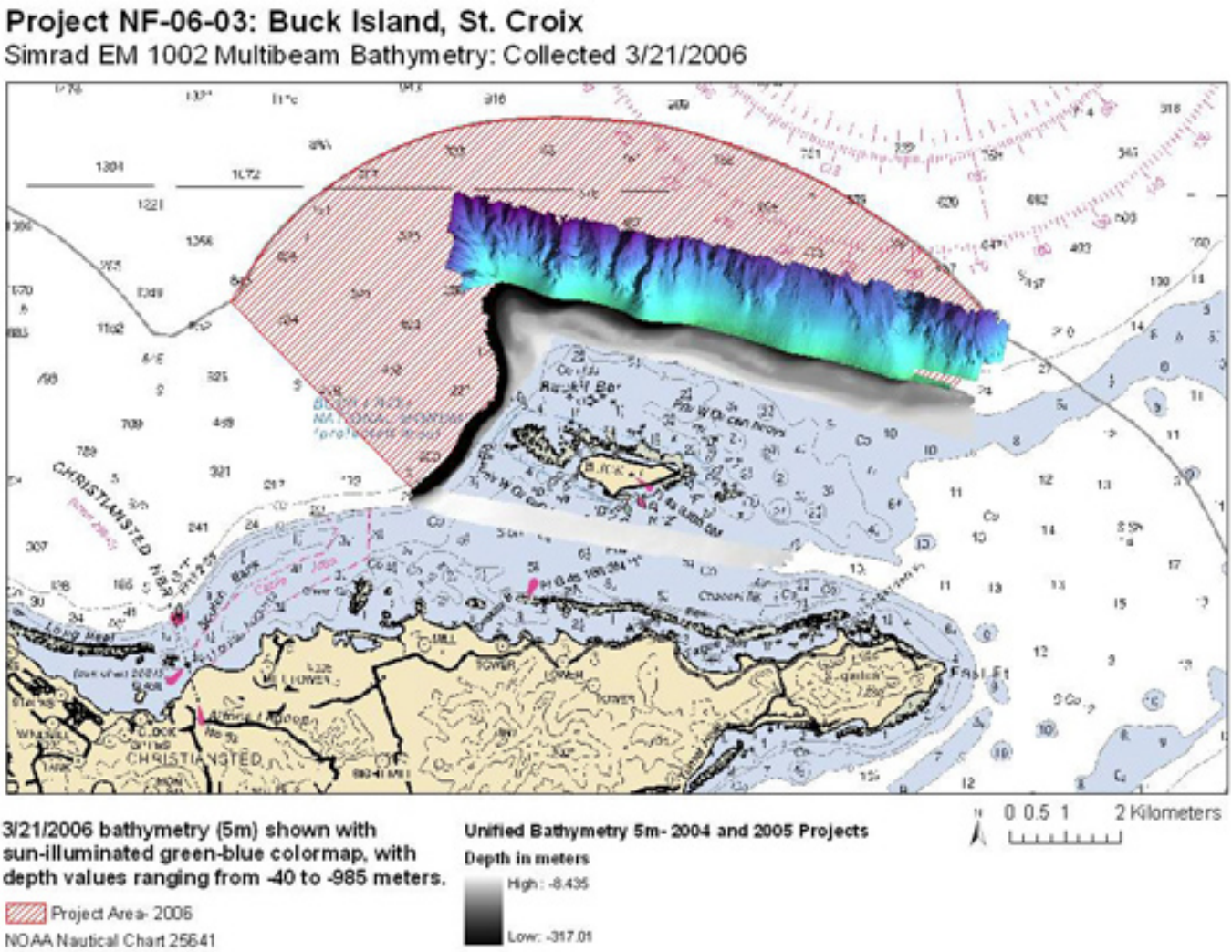
(Scientists conduct lead line test)

ROV Operators made the final preparations of the gear necessary to deploy the ROV. The ship moon pool will be used to lower a pole through the ship with an acoustic transponder attached to allow the ship based equipment to communicate to the ROV deployed in the water column below. This communication will allow the ROV operators to track the position of the ROV on the seafloor.

(ROV operator and engineer install transponder equipment)

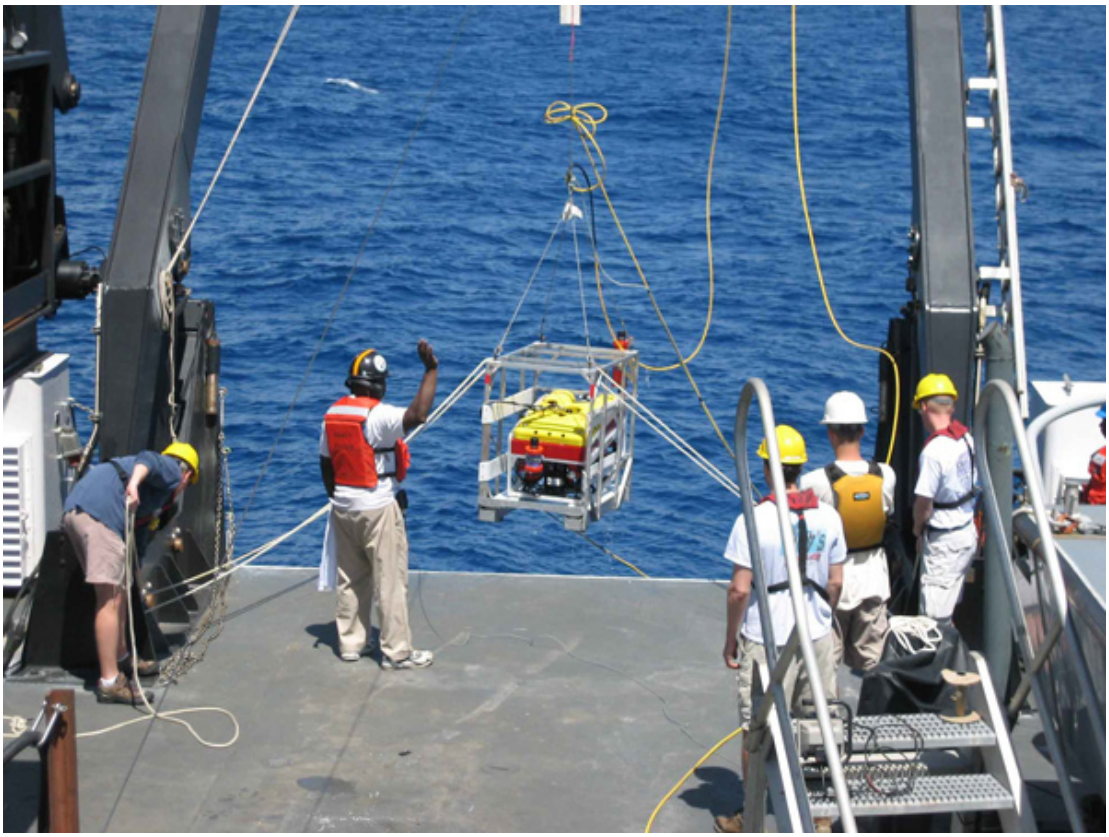
Web Update
Day 2: 03/22/2006:

On Wednesday 3/22 the multibeam team successfully conduct a patch test and outer beam angle offset calibration at sites on the west and east side of Buck Island. Multibeaming commenced at 2400 beginning on the north side of Buck Island and completed approximately 4.5 nm^2 area of seafloor esonification.

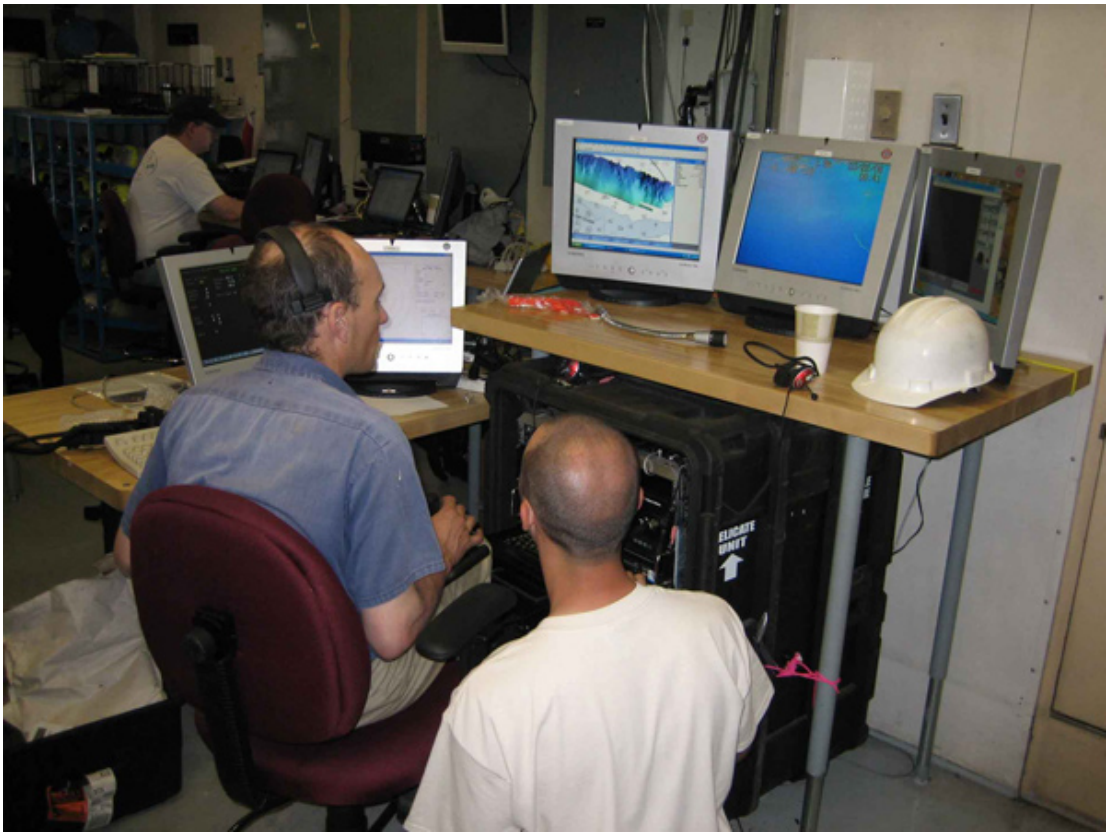


Mulitbeam past and present coverage of Buck Island

ROV Operators continue to trouble-shoot technical issues with the vehicle and dynamic oceanographic conditions. Ocean currents are running strong east to west in the area of deployment. The ship's crew are performing well deploying the ROV off the stern A-frame. Sea state has been excellent with moderate swell and low prevailing winds. Several attempts were made to deploy the vehicle but vehicle communication issues still need to be worked out to get the vehicle tracking on the seafloor.



Deploying the SeaEye Falcon ROV and cage off the stern

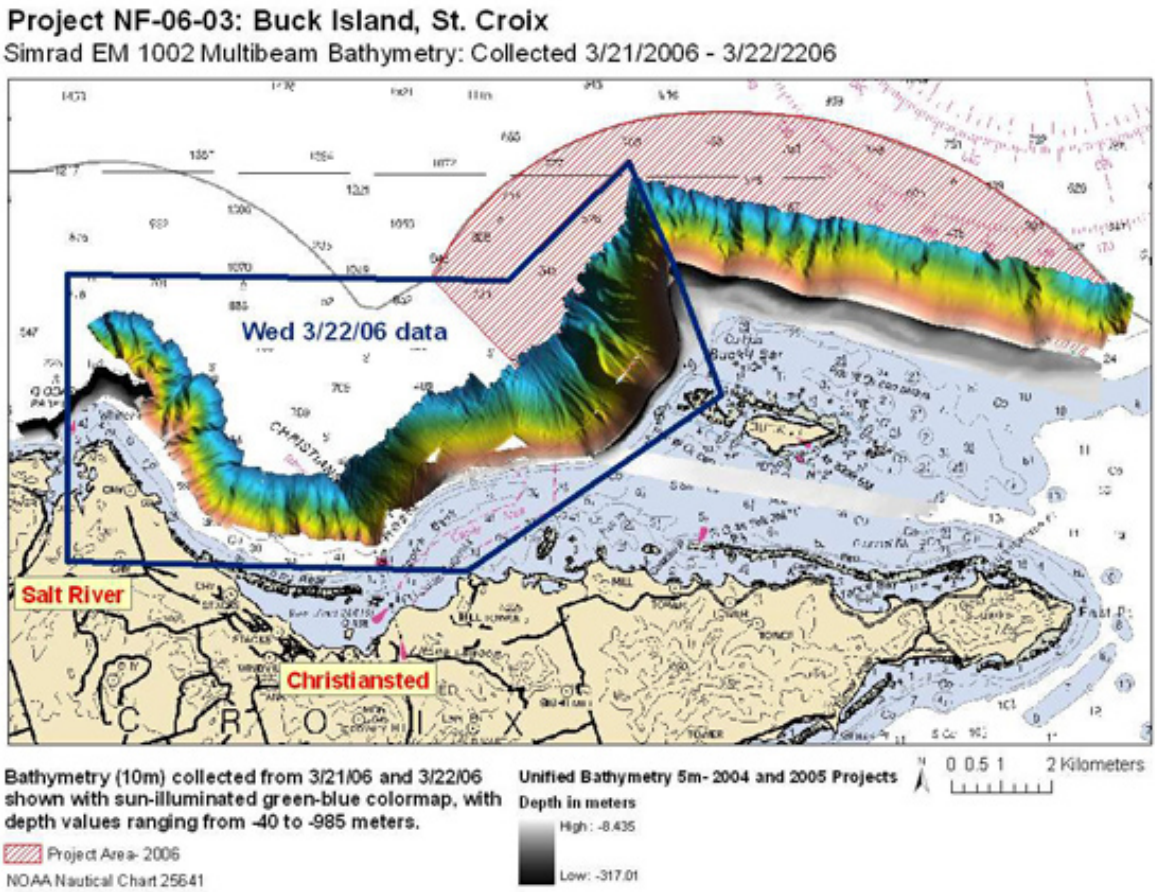


ROV operators Mathew Cook and Jeff Snyder

After several unsuccessful attempts with the ROV, the science team decided to regroup on ROV and commence multibeam operations at 1600.

Web Update
Day 3: 03/23/2006:

On Thursday 3/23 the multibeam team continues to collect data with high productivity. Today the team completed approximately 30km^2 of data collection on the west side of Buck Island and continuing west to Salt River Marine Park. These data are merging nicely with imagery collected in previous years. Multibeam data was collected from approximately 40 meters water depths to as deep as 980 meters. The bathymetry and backscatter data from the Simrad EM 1002 have been impressive. The science team is excited to begin exploring and ground-truthing the deep canyons and tremendous slopes found along the slopes of Buck Island.



Mulitbeam past and present coverage of Buck Island to Salt River

ROV Operators successfully deployed the vehicle to depths of 400 meters along the northern section of Buck Island. The initial portion of the transect covered a sloping plane (20 degrees) with little biological cover. The region was predominantly comprised of fine sediment with a fish sightings, urchins, crinoids, sea-whips, and what appeared to be occasional sparse algae, . As the ROV reached depths of 400 meters large uncolonized outcroppings were sighted followed by sharply sloping walls. It was euphoric.

Park Service scientists observe ROV video

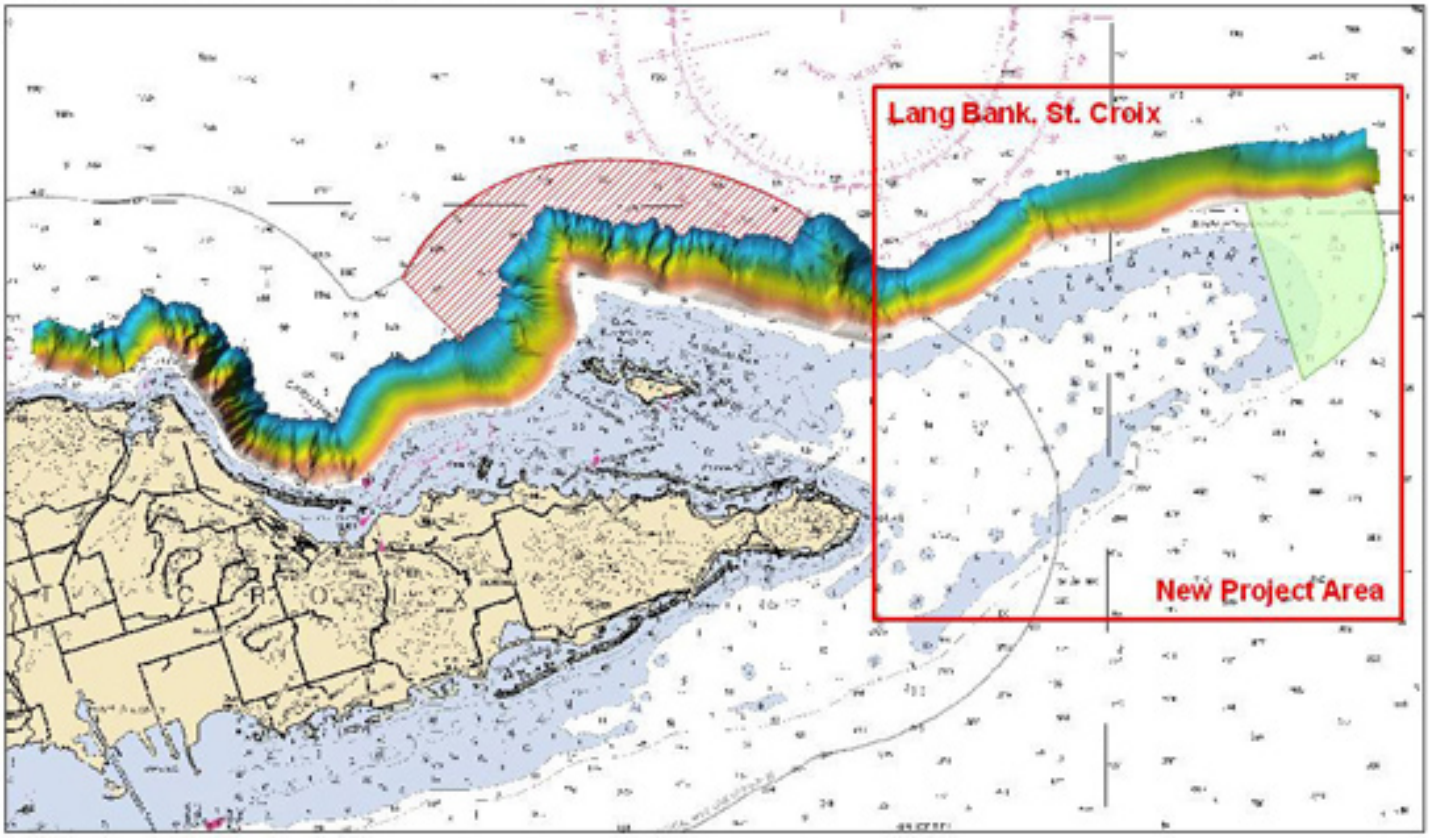
The ship is conducting scientific investigations 24 hours a day. Generally, multibeam is occurring overnight from 6 pm to 8 am the next morning and ROV during daylight from 8 am to 6 pm. Fortunately there is time for downtime for some of the scientists to enjoy the fine weather and seas we have been experiencing here in St. Croix.

Hyrdographer enjoys some downtime while perusing NOAA's hydrographic specs and deliverables manual

Web Update
Day 4: 03/24/2006:

On Friday 3/24 the multibeam team continues to make excellent progress mapping the 40m to 1000 m depth regime along the northside of St. Croix. The chief scientist made the decision to extend mapping activities to Monday (3/26) to provide additional time to conduct ROV activities. Given that the multibeam team has mapped well beyond what was anticipated, NOAA made inquiries with St. Croix resource management officials to determine other high priority areas that could be mapped. Given the nigh time multibeam operations and thus the need to work in water greater then 30 m, the decision was made to begin mapping the area of Lang Bank extending due east from the Buck Island National Monument.

Project NF-06-03: Lang Bank, St. Croix
Original and Expanded Project Areas



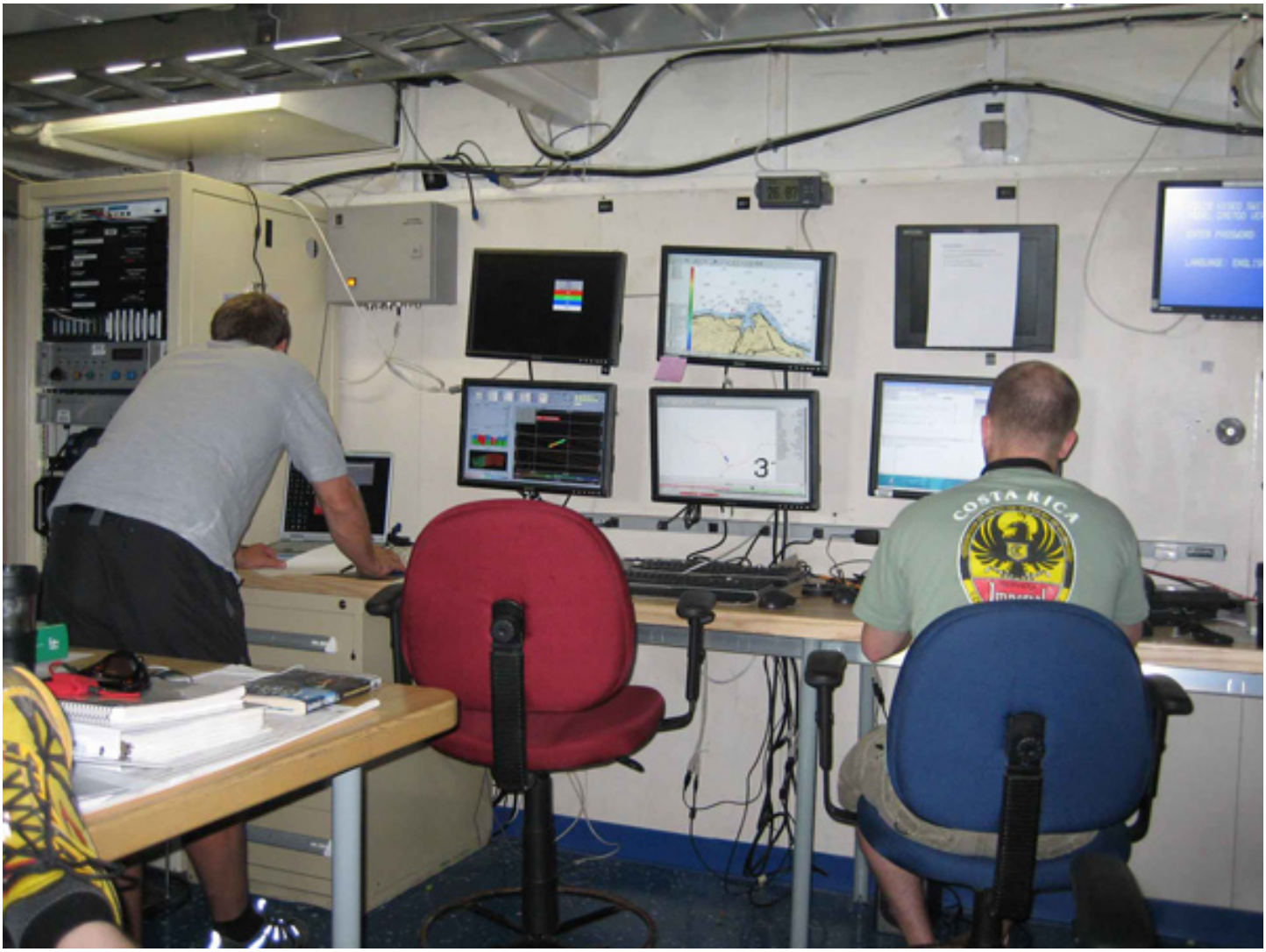
Bathymetry (10m) collected over five days from 3/21/06 to 3/25/06 shown with sun-illuminated red-blue colormap, with depth values ranging from -40 to -985 meters.

Original Project Area- 2006
Lang Bank Conservation District

N 0 1 2 4 Kilometers

NOAA Nautical Chart 25641

Multibeam St. Croix coverage



Mulitbeam acquisition and navigation computers

We are planning a busy ROV day tomorrow. Two transects at are planned for 800 meter water depth and on at 500 meter.

Web Update
Day 5: 03/25/2006:

The ROV team began the day before sunrise in order to get an early start. They were eager to see if the work performed on the ROV overnight would solve the problems from the days before. Of particular interest was a rotating collar which would allow a ROV power/data cable to rotate around a load bearing metal cable. A lack of rotation had caused giant knots consisting of upwards of 100 meters of intertwined cable. The knots required two hours to untangle.

Three transects over covering over 4.5 kilometers of habitat were completed. Two transects ran along the 800 m isobath and 500 m isobath to the north of Buck Island and one ran along the 800 meter isobath west of Buck Island. The transects were set to parallel their respective bathymetric contours so that the ROV rigging would not have to change once a transect was started – a technique to reduce transect time.

As the ROV passed 60 meters depth during the first transect, the ROV crew let out a sigh of relief. Over the past

five days the ROV passed the 60 meter mark only twice. As the distance between the ROV and the baneful mark increased the probability of a successful mission increased as well. The ROV's decent was slow, but at last after 40 minutes the bottom finally became visible.

At the two transects north of Buck Island a steep imposing slope, set at about 60 degrees from horizontal was revealed (sometimes the slope was completely vertical). It would have been perfect for rock climbing if it were 1 km higher. The slope was characterized by a dark rock face which carried a burden of fine grayish sediment above every ledge and jutting jagged rock. Fissures crossed the rock face and several times they ran parallel like glacial striations. Several overhangs were found and the ROV attempted to peer underneath, but the possibility of sharp rocks cutting the umbilical cord prevented a complete examination. Some shrimp were seen underneath, but the ROV team wondered what types of mysterious creatures could be hiding in deeper recesses. During the shallower 500 meter deep transect fish, sponges, black coral, whips, sea cucumbers, crinoids, eels, isopods and countless trails etched into the fine sediment were observed. The 800 meter transect showed a relatively more barren seascape with fewer, but some of the most interesting organisms, including a large red cardinal fish cowering next to a rock, pastel colored sea cucumbers and a ghostly white completely still lobster.

An inquisitive cardinal fish approached the ROV at 800 meters below sea level. It remained stationary hovering just in front of the camera lens for ten seconds before darting off

The third transect required a three kilometer long trek to the west of Buck Island. The transit was slow because the ROV remained in the water, because bringing the ROV completely out of the water is a costly time investment. On the transect the bottom was less steep (30 degrees from hosizontal) and had more sediment than what was observed north of Buck Island. Many small planktonic creatures approached the ROV's lights as it glided 1 meter above the sea floor, but generally as in the previous deep transect few organisms were seen.

The exciting and productive day ended after midnight. The ROV team was exhausted.

Web Update
Day 6: 03/26/2006:

The ROV team woke up still drained from Saturday's long day. At 0800 the ROV entered the water and began a slow descent. Its target was the start of a 1.5 km transect along the 500 m isobath west of Buck Island.

On the bottom the ROV recorded scenes of a gentle slope covered with a fine grey sediment was marked by small holes, mounds and thin short protrusions – definite signs of life. Most of the transect was characterized by this type of habitat, but a small bustling oasis teeming with life was found about halfway into the transect. The oasis was comprised of numerous isolated hard structures sticking out of the sediment. They appeared as if strewn across a desert. Crinoids, sponges and an aggregation of 30 large red Cardinal fish lived among the hard structures. A large white fish (similar to a lizardfish, lounged on top of a sponge. As the ROV approached it appeared undisturbed and continued to gaze into the dark void.

Sponges and crinoids attached to a rock surface feed on particles in the water column. The bare substratum is typical of the benthic habitat found north of Buck Island. Occasionally organisms such as these are attached.

The second transect, a section of the 500 m isobath north-east of Buck Island, was started in the early afternoon. The habitat was predominantly sediment infrequently interrupted by small low (50cm X 50cm) rock outcroppings. Occasionally, especially when several rock outcroppings were grouped together and sponges were attached, small cardinal fish and fish that shared many characteristics with Bonnetmouths were seen darting about. To the teams surprise the habitat changed dramatically during the last few hundred meters of the transect and appeared much more like the habitat of steep rock seen north of Buck Island. Several small fish darted among the crevices before they could be identified.

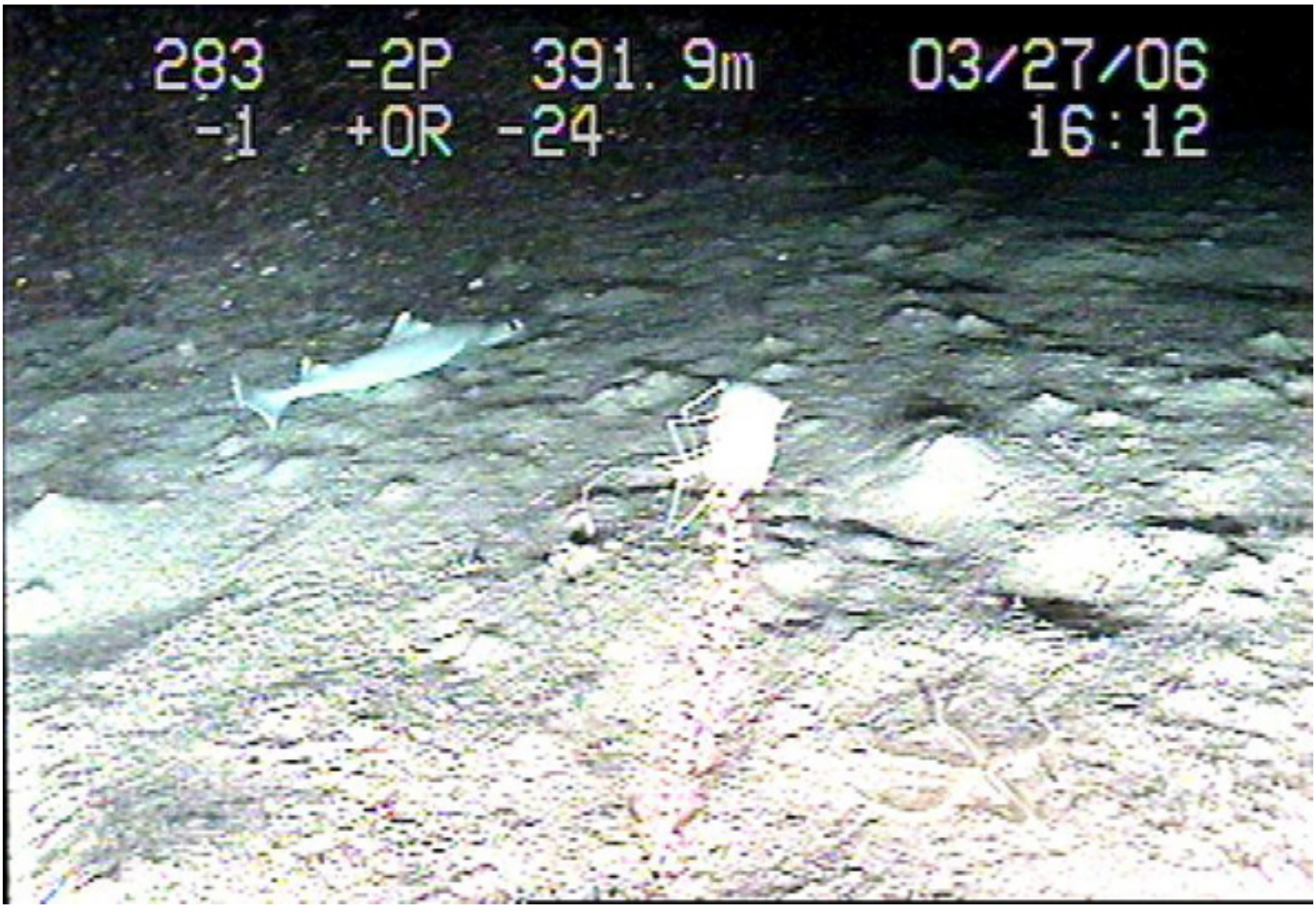
Web Update
Day 7: 03/27/2006:

Several kilometers offshore of Buck Island the shelf edge gives way to a slope that drops precipitously from 100 m to 1000 m in little over 2 kilometers. The majority of the shelf slope runs parallel to Buck Island's shoreline, but there is an anomalous elevated spur connected to the slope that extends northward toward the eastern edge of the Buck Island National Monument. The two surveys performed today were chosen to characterize this spur. One transect ran along the eastern slope of the spur at the 800 m bathymetric contour and a second transect ran up the spur from the 800 m contour to the spur's apex at 600 m.

Most of the habitat was steep and covered in sediment with occasional rock outcroppings. At several of the rock outcroppings coral and sponges were attached, but it could not be determined why they grew at some outcroppings and not at others. Whenever coral was present sharks, fish, isopods, sea cucumbers, crabs, jellyfish and salps were observed in the area. In between outcroppings, a covering of grayish sediment predominated, but it was not devoid of life. Haphazardly etched tracks, holes and mounds were abundant.

Several organisms worth special mention were a fish (taxa unknown) with elongated pelvic fins, a cluster of coral whips which resembled tulips and a white lobster. The fish's fins were almost as long as its length and were splayed out forward to form a tripod with its caudal fin. The fish rested motionless on its tripod at a 45 degree angle. The tripod provided clearance from the soft sediments underneath. Perhaps it was waiting in the semi-erect position for unwary prey. The coral whips eerily emerged from the sediment, clustered in a 20 sq. m plot as if deliberately planted. Each coral resembled a tulip, because of a gelatinous "bloom" in the shape of a tulip bloom at its end. The ROV observed white crabs on several blooms. Could they be eating plankton and particles which were caught? A white lobster as seen in a previous dive was spotted. It retreated into a hole in the sediment, allowing the ROV team a glimpse of at least one of the types of animals which inhabited the ubiquitous holes. The ROV team had considerable diving and surveying experience in shallow waters, but they had never seen any of the species seen at these depths before.

A fish rests on a tripod formed by elongated pelvic and casual fins. The tripod increased the distance between the fish and sediment and gave the fish a 45 degree angle posture. The image was taken at 800 m below surface NE of Buck Island.



A coral whip with a white crab clinging to what may be a gelatinous bloom at the whip's apex. A small shark with large eyes swims away from the ROV in the background. The image was taken at about 700 m below surface NE of Buck Island.

Web Update
Day 8: 03/28/2006:

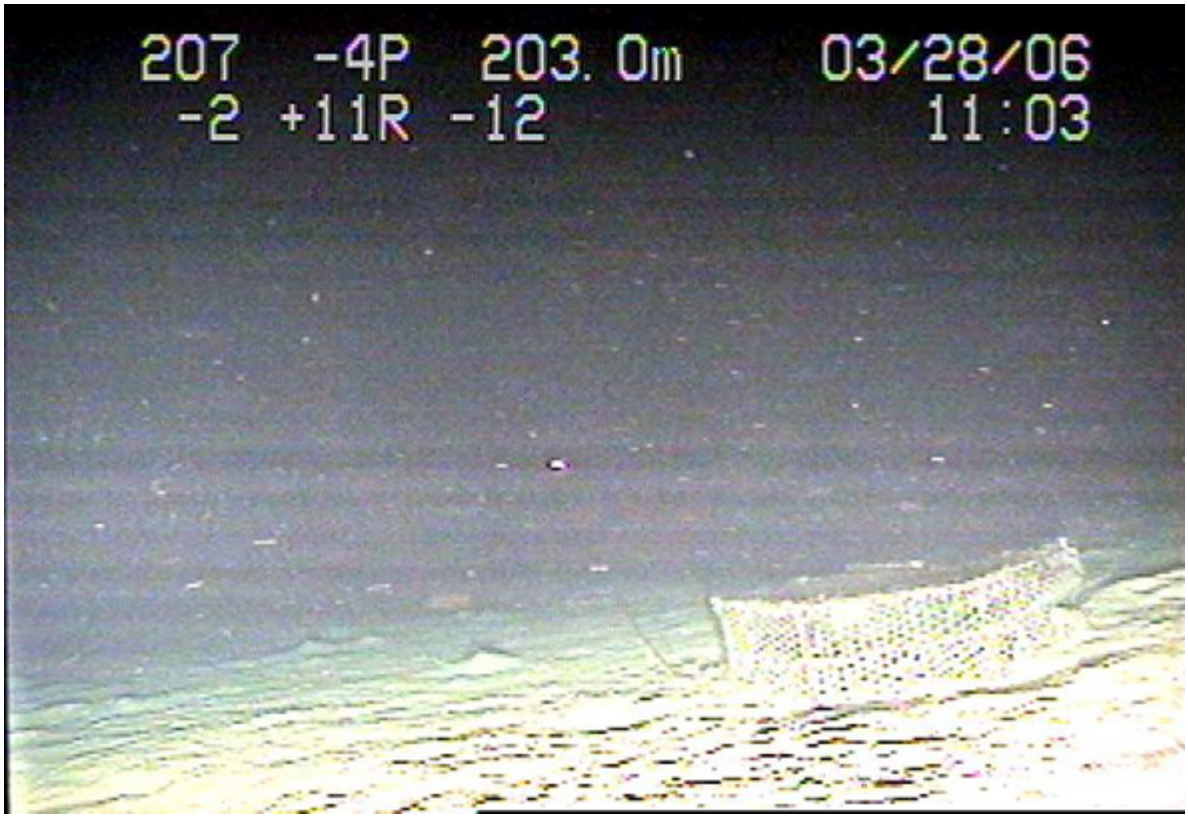
The Nancy Foster traveled 12 hours west to Puerto Rico overnight. The new study area was a 150 sq. km area off the southwest shore of Puerto Rico near La Parguera. The ROV ran two transects positioned along the 200 m and 500 m bathymetric contours in the easternmost portion of the study area.

The vast majority of the surveyed area was loose sediment, but along the 200 m deep transect there were sporadic rock outcroppings with attached hard coral. In general there was much fewer rock outcroppings in these transects than around Buck Island.

Although the habitat was relatively monotonous there were many fish, more than around Buck Island. Most of the fish belonged to five species (taxa unknown) including: a fish with barbs under its chin which it used to compulsively feel the ground, a very long and slender fish which had an elongated tail similar to an eel, a deep squirrelfish, a chimera and a motionless stout blue fish with leopard spots.

There was a moment of excitement in the middle of the day. Towards the end of the 200 m deep transect several ominous abandoned traps - "ghost traps" - were seen strewn along the seafloor. About ten minutes later the

ROV caught sight of fishing line extending from the bottom into the water column directly in front of it. It was too late. Before the ROV or ship could stop the ROV was entangled. Everyone watching nervously held their breath, but luckily within minutes the ROV operator deftly maneuvered the ROV free and order was restored.



A ghost trap at 200 m.

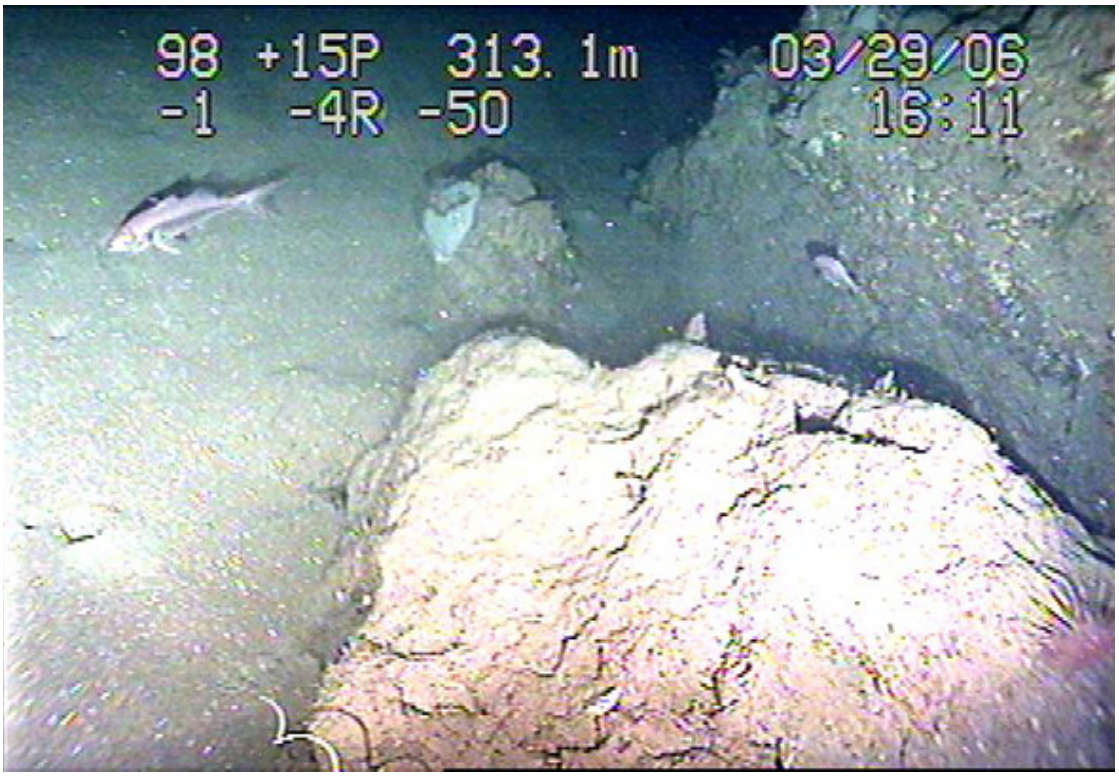
The typical soft sediment benthic habitat found at 200 m. A crinoid is attached to a small outcropping to the right and a sea whip floats in the background to the left.

Web Update
Day 9: 03/29/2006:

The surveys began late today even though everyone was ready early in the morning. We had used electronic navigation charts to position transects at predefined depths, but this morning in an attempt to reach a deep target we found them to be highly inaccurate. The ROV was supposed to survey an 800 m bathymetric contour, but by 0800 we had reached 900 m and the seafloor was not in sight. Quickly the multibeam data collected overnight was checked and it was found that the depth under the ROV was closer to 950 m – well below the safe operational depth. Instead of cancelling the dive, the ROV headed upslope to meet the seafloor at a shallower depth. Once in sight the ROV swung perpendicular to the slope and began a 1 kilometer transect.

The bottom was characterized predominantly by soft sediment, similar to what was seen at shallower depths (200 m and 500 m) yesterday. No rock outcroppings, which have been small oases of diversity, were found, but numerous fish including a type of frogfish were seen amongst the monotonous terrain. Infrequently, the ROV glided past red pulsating jellyfish, tripod fish silently waiting on the seafloor and utterly motionless sea cucumbers. Tracks in the sediment had been seen on every dive so far, but for some reason there were more and they were more prominent than ever before. The tracks were made up of two rows of lines that ran perpendicular to the direction of the track, very similar to tank tracks. Unfortunately, we did not see their makers. Either there was a lot of life crawling around the seafloor or they been accumulating for a long time.

A second transect performed in the early afternoon was positioned using the multibeam data in an area with wide shallow channels and over a small elevated protuberance. The channels ran down slope and widened as they descended. We expected to see differences between the ridges and depressions, but none were seen. The protuberance was a cluster of several rocks. AS we approached several large fish were seen fleeing the area. We remained for a few minutes to inspect the biotic cover and a very large Queen Snapper appeared. Several smaller ones were seen in the background but they never came close. Queen Snapper are a deep water fish. They are exploited by the deep water snapper fishery and a delicacy in Puerto Rico.



A large rock in the middle of kilometers of soft, flat sediment attracts large fish. A Queen Snapper approaches the ROV from the left.

After a hard days work the ROV peers above the sea surface as it approaches the NOAA ship Nancy Foster.

Web Update
Day 10: 03/30/2006:

The first transect of the day followed a 650 m bathymetric contour 11 km south of La Parguera. The section of contour and depth were chosen so that the transect would go over several ridges and a large protrusion in the valley of two ridges. In addition to multibeam bathymetric data, multibeam backscatter data were used for transect positioning. The backscatter data added another dimension to the selection process, because it differentiates areas which reflect sound differently.

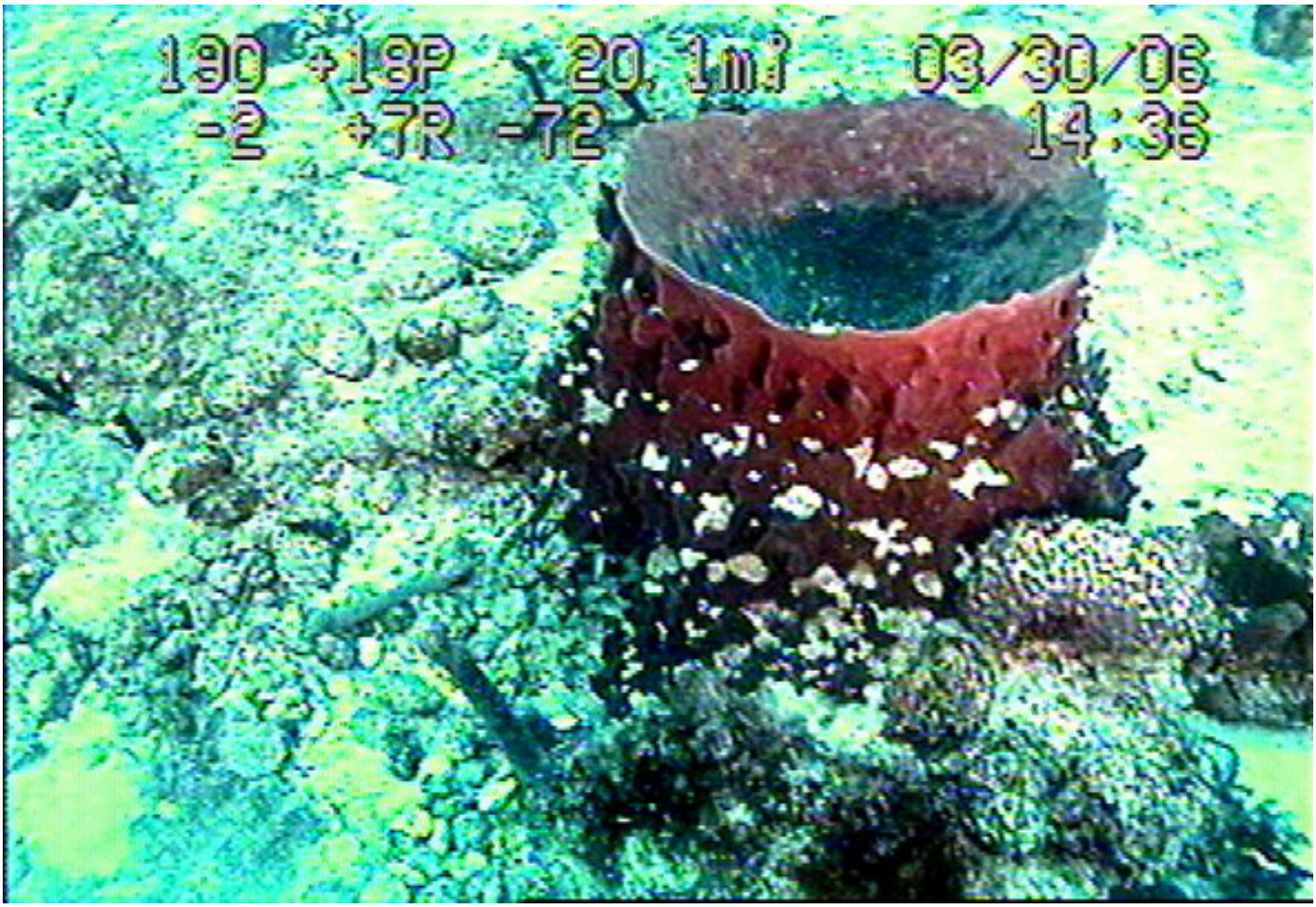
The ROV glided over soft loose sediment along the entire transect, except for where the protrusion was mapped by the multibeam data. The protrusion ended up being two large bare rocks (each 5 X 5m). They seemed out of place amongst the flat expanses of sediment. The ROV team had high expectations for the large protrusion, but when we finally reached the rocks they did not have the amount of life around them that was expected. The ROV inspected the bare rocks for 15 minutes. Several sponges and crinoids were seen, but that was it until a lonely fish was sighted in the distance just as the ROV was leaving.

The second transect of the day was positioned to target “El Hoyo” [the hole], a redhind spawning aggregation site, and an adjacent steep descent. El Hoyo is a 1.5 km basin-like feature at the top of the shelf slope. It is distinguished by a depressed center, 30 m deep, and an elevated ridge along its perimeter. The majority of the area within El Hoyo is colonized hard bottom with some loose sediment from the breakdown of corals. The hard bot-

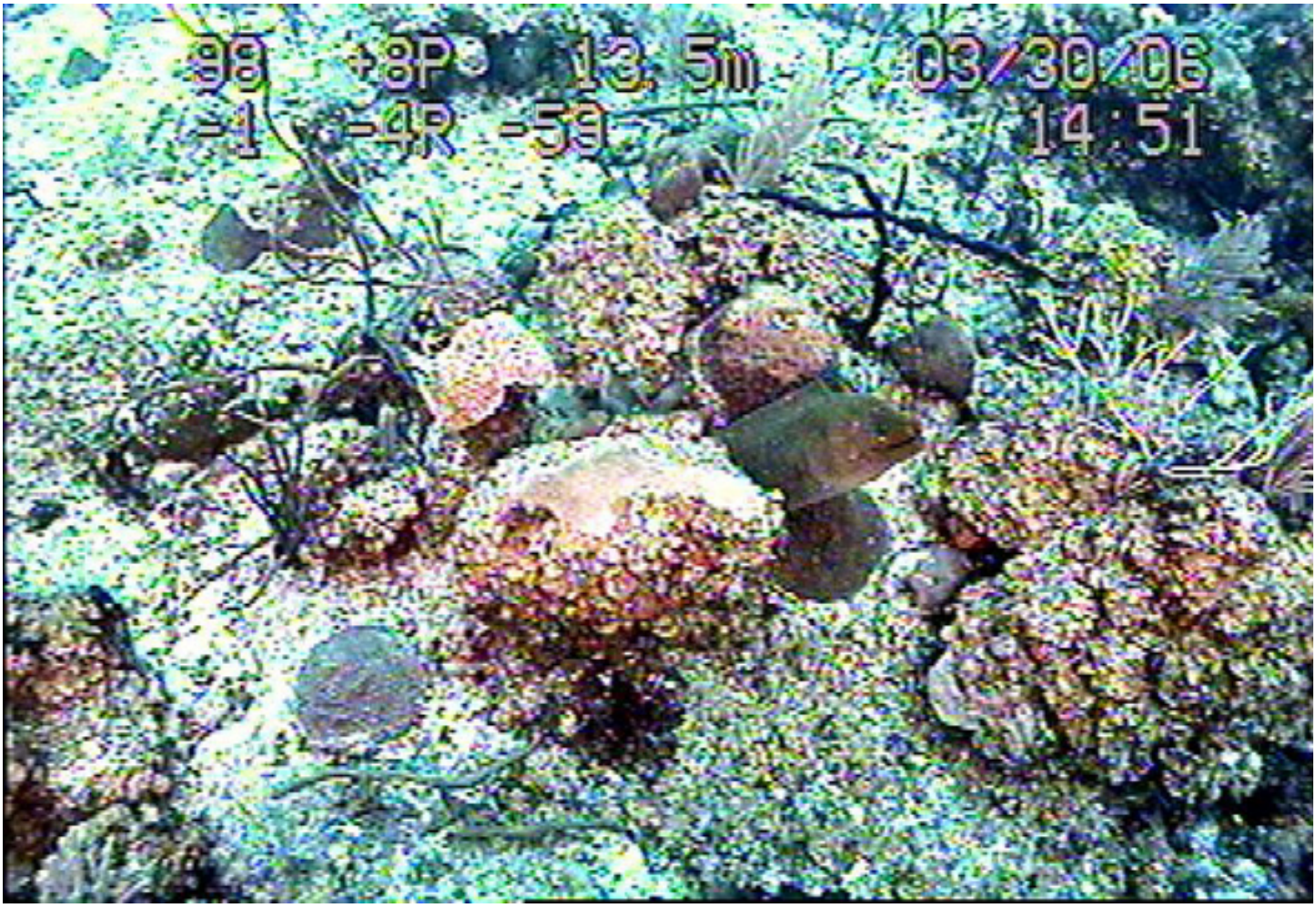
tom is covered by a great diversity of organisms including: gorgonians, hard corals, sponges, and fleshy algae. Any loose sediment is covered by a thin film of brownish cyanobacteria. At one point the ROV's thrusters produced a small eddy which peeled away a small flap of cyanobacteria and stirred the loose sediment underneath.

The ROV began in the center of El Hoyo, passed some internal raised hard bottom features and then went over the perimeter ridge. A variety of fish swam in front of the camera, including angelfish, barracuda, damselfish, filefish, grouper, grunts, jacks, mackerel, morays, parrotfish, snappers, squirrelfish, tilefish and wrasses. It was a cornucopia of fish! It was a real treat to finally be able to identify the fish, after encountering so many unknown taxa in deeper waters. Two relatively large barracuda were very curious and kept swimming in front of the camera.

The ROV descended from El Hoyo's ridge in an almost vertical trajectory. The trek downwards began at 20 m below the surface and ended at 250 m in less then 80 horizontal meters. The top third of the descent had many sponges and coral, but around 80 m they began to thin and were ultimately replaced by bare rock. At the bottom of the steep wall the ROV found the soft sediment the ROV team has become very familiar with and the transect was terminated.

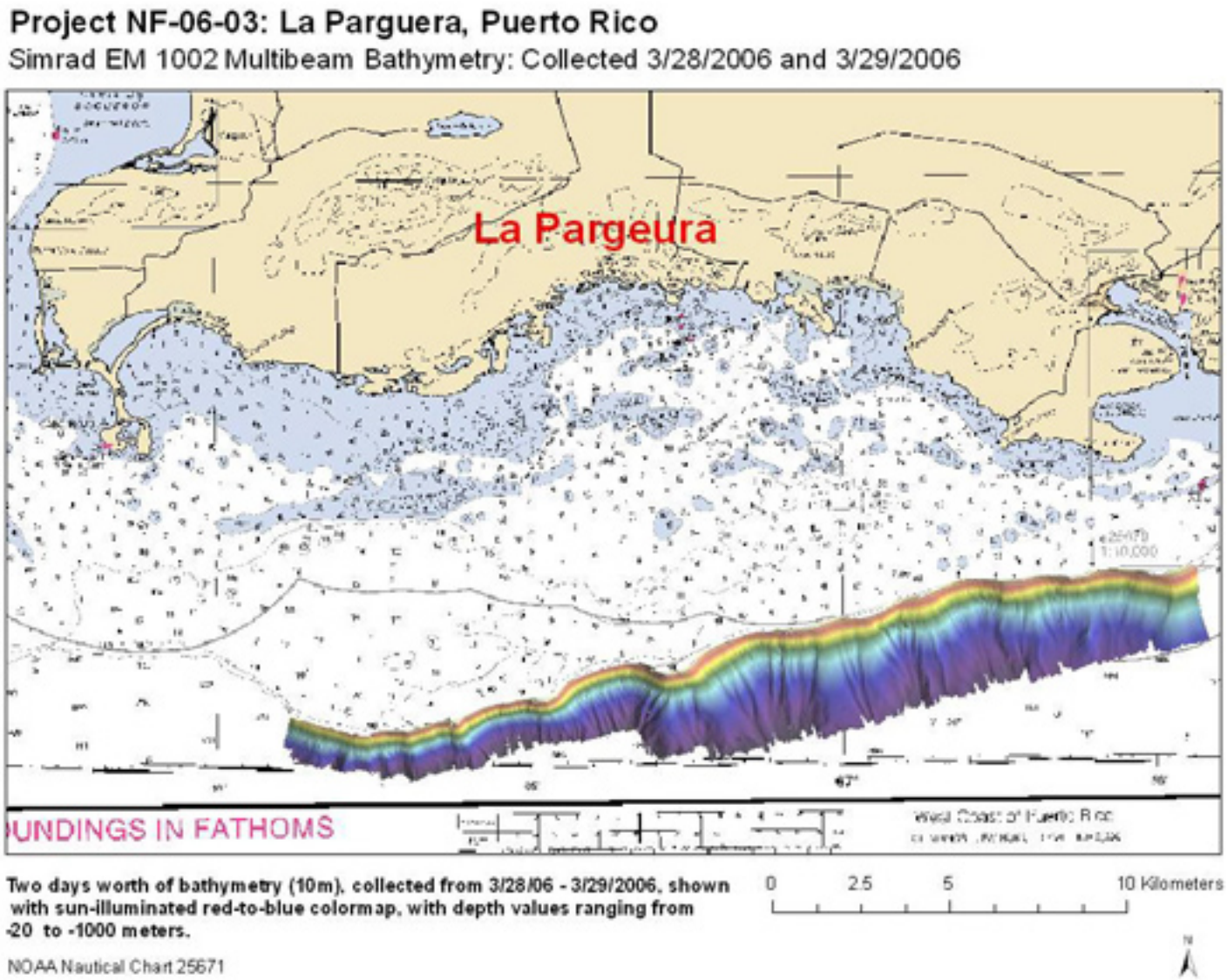


Colonized hard bottom habitat in El Hoyo.



A green moray (gymnothorax funebris) poking its head out from between coral colonies.

By night the science team has been working beyond the shelf edge to map the features, ridges, drop-offs and topography of the seafloor off Parguera, Puerta Rico, we have multibeamed 6.2 km^2. The shelf edge occurs approximately 10 km parallel from the shoreline. Depths drop rapidly along the shelf edge, sloping from about 50 feet water depth to 1,800 feet in little over 1.3 km. See the attached image for details of coverage in Puerto Rico.



(Multibeam of Parguera, Puerto Rico).

Web Update
Day 11: 03/31/2006:

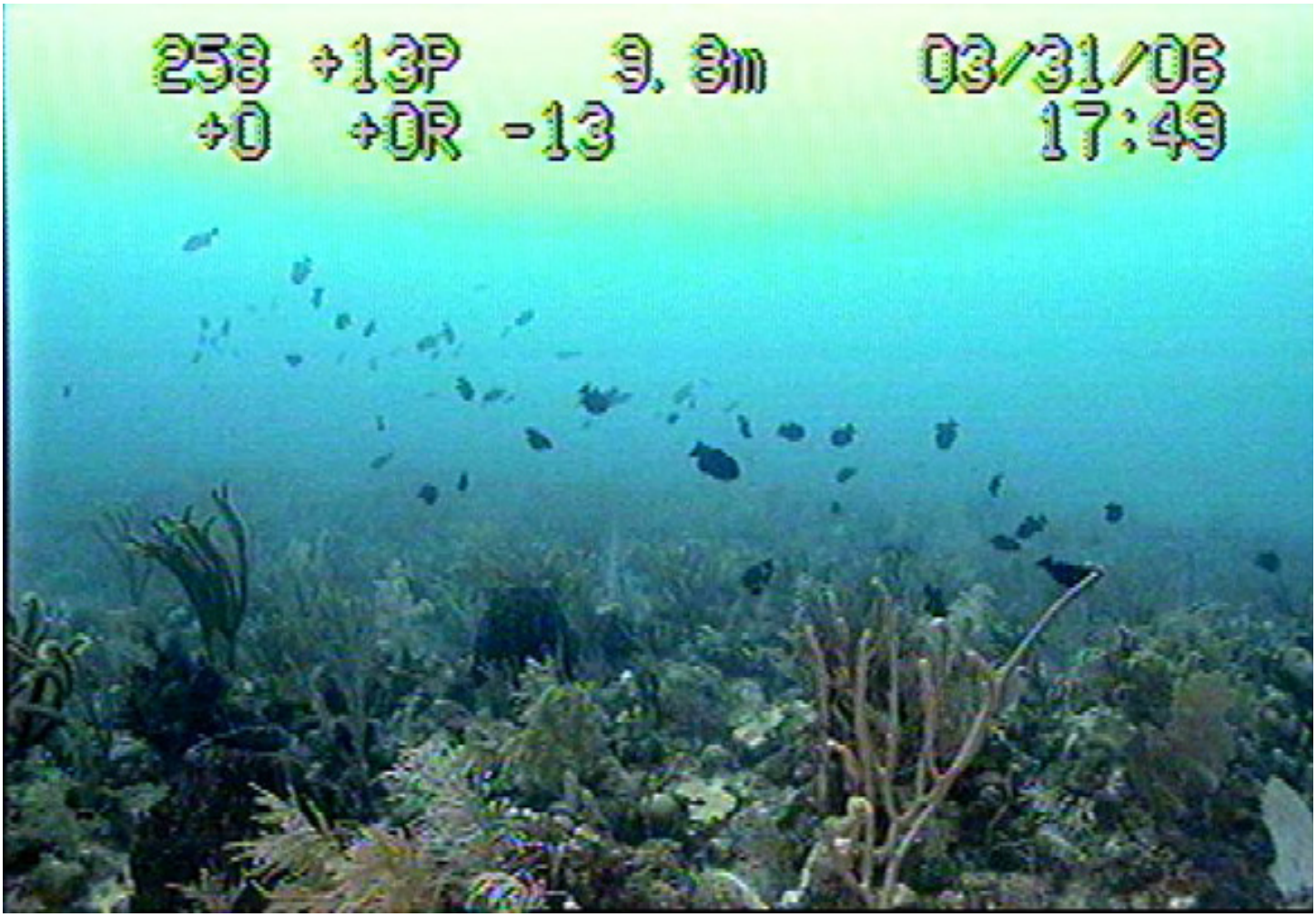
Three transects were preformed today: two deep transects over mud and a shallow transect down a rock precipice. The first transect targeted a steep slope with high-frequency downslope-upslope oriented channels. From the bathymetric data they appeared to be caused by mass slumping at a very steep grade. The second transect targeted deeply carved wide channels. The third transect, was very similar to the last transect completed on day 10. It began at 20 m over colonized hard bottom, descended down a 200 m vertical precipice, and ended at the precipice's bottom on a 45 degree slope.

Although the first dive was relatively deep (500 m) several sharks and large snappers were seen in a relatively small area. Before the ROV began recording data a hammerhead shark appeared, minutes later another shark (taxa unknown) with large dark eyes was spotted and minutes after that three snappers huddled next to a large boulder. For some reason, the location where the ROV touched down had a large amount of biomass. The only distinguishing feature was the boulder. Interestingly, although some boulders were sites for many corals and sponges this boulder was relatively barren. Why were there fish and sharks but no coral or sponges?

The second transect was relatively uneventful, except for some peculiar crabs that looked like spiders. The ROV had spotted the spider-crabs before, but they were on the solid surfaces and this time one was hovering in the water above the seafloor. The hovering crab seemed to be dangling from threads, just like a spider would from its web. We had not ever heard of this phenomenon before so we deduced that the unfortunate crab had probably been taken by jellyfish tentacles.

A third transect over colonized hard bottom was performed during the crepuscular period when fish and invertebrates are most active on the reef. Hundreds of fish swam around sponges and coral on the colonized hard bottom, but their numbers dwindled as the ROV descended the precipice. Only a few sporadic sightings of fish were seen below 40 m, but sponges and coral were still prevalent. At approximately 80 m the sponges and coral sightings faded too. Near the bottom of the precipice, at a depth of 200 m, a school of squid swam around the ROV. They were probably attracted by the ROV's lights thinking it was the moon. The ROV was swarmed by about twenty of them and they constantly squirted ink into the water reducing visibility. Soon after the squids retreated the transect was terminated and the ROV ascended.

A white lobster, Acanthacaris ceaca, pokes its head from a hole - its home. Many similar holes were seen during every ROV transect, but only rarely did we capture images of the lobsters too. According to Mary Wicksten, a professor of invertebrate zoology at Texas A&M University, A. ceaca is one of the largest varieties of blind lobster in the Atlantic.



Many black durgon (Melichthys niger) swim above colonized hard bottom in front of a transect at 20 m. The bottom is covered in waving gorgonians, rough sponges and colorful stony corals.

Web Update
Day 12: 04/01/2006:

For the first survey of the day the ROV targeted a submarine ridge protruding from the shelf slope at 650 m. The ROV began on the eastside of the north-south oriented ridge, ascended to the ridge's peak and then followed the contour on top of the ridge several hundred meters. On its ascent the ROV encountered a solitary fish the team had not seen before. It looked like a hybrid between a filefish and jack. It had sleek reflective silvery scales, a laterally compressed oval-shaped body, and a filefishes' broom like tail. It did not move its position when closely approached, but kept its dorsal and anal fins undulating in a sculling motion. The bottom was typically mud, but several large rocks were scattered about. Large stands of coral, the most dense we had seen at this depth, were on top of several rocks, but for the most part very little biotic cover was observed over the different types of substrate.

The second transect of the day and last of the mission was to survey an area characterized by jagged contour lines at 440 m. It was hypothesized that the area would have a large amount of boulders and deep crevices in contrast to the typical flat expanses of mud seen at these depths. This hypothesis was confirmed after only a few minutes on the bottom when a large 5 m high boulder was sighted. The majority of the benthic habitat was mud, but large rocks were seen wherever the bathymetric data showed a bumb. The bathymetry quickly became more complex. Deep crevices and irregular protrusions were spotted frequently. The ROV moved slowly so that it could navigate among the profuse pinnacles, ledges and overhangs. These features were extremely dangerous

for navigation because the ROV or downweight could easily get stuck between rocks. At one point the terrain became so dangerous the ROV had to leave the transect and restart it 100 m away at a safer place. The last transect ended without incident, except for a poor squid who got so scared and lost all its ink.

The ROV team was happy they had completed their requirements, but would miss the interesting fish and habitats they had become accustomed to during their daily routine. It was an exciting unique experience the team would always remember. Now, the team is packing and getting ready to leave the tantalizing deep underwater world so that they may venture back to their normal lives on terra firma. Maybe next year they will travel deeper.

A cloud of sediment stirred up by the ROV and the red ink emitted by a frightened squid. The squid's outline and reflective eyes can be seen through the obscuring particles in the water towards the center-right of the image.

Two crabs (taxa unknown) rest on the surface of the seafloor. The crab on the left had jumped one meter into the water column from its hiding place in the mud.

Web Update
Day 13: 04/02/2006:

On the last day of the mission, the NOAA ship Nancy Foster transited to San Juan Puerto Rico to offload the science team.

Summary information from the cruise include the collection of 143.3 km^2 of multibeam coverage from 14.7 m water depth to 1000.10 m. Total ROV data for the mission included 22 linear km of video transects from 20 to 830 m water depth.

For St. Croix, Approximately, 81 km^2 of multibeam bathymetry and backscatter data was collected for St. Croix, USVI from Salt River to the northeast end of Lang Bank. Depth range for St. Croix extended from 15.87 to 1000.10 m water depth. Four training/ground truthing ROV transects 5 km in length were collected at a depth range of 490 to 810 m. Three validation/accuracy assessment ROV transects 4 km in length at a depth range of 490 to 810 m

Approximately, 62.3 km^2 of multibeam bathymetry and backscatter data was collected for La Parguera, Puerto Rico. Mutltibeam depth range for La Parguera extended from 14.67 to 984.54 m water depth. Six training/ground truthing ROV transects were collected 7 km in length at a depth range of 20 to 830 m water depth. Five validation/accuracy assessment transects were collected 6 km in length at a depth range from 20 to 830 m water depth.

A wide diversity of habitat types were characterized from multibeam and ROV data. Seafloor features included rock precipices, ledges, limestone caves, boulders, rock outcroppings, flat mud, wide (>1 km) deep channels in mud, thin (< 1 m) shallow channels in mud.

The biota below 200 m never visually characterized before included Lophelia coral, black coral sea whips, feather stars, sea pens, sea anemones, starfish, brittlestars, urchins, sponges, isopods, sea cucumbers, lobsters, shrimps, crabs, conch, Orange Roughys, roundnose grenadiers, tripod fish and several types of snappers.

We'd like to take this opportunity to thank all of the scientific crew who worked tirelessly to collect all of this exciting and important data. We'd particulary like to thank the US National Park Service, NOAA's Office of Coast Survey, SeaVision Marine, University of Hawaii's Hawaii Mapping Research Group, NOAA's Chesapeake Bay Office Habitat Characterization and Mapping Program, Solmar Hydro, and the University of Puerto Rico Mayaguez Island for all of the field support. Lastly, we would like to thank NOAA's Marine Operations Center for their outstanding support to the mission. The Foster's officers and crew were incredibly flexible and responsive to our many requests and performed superior service assisting in the multibeam and ROV collection. The picture below shows the bulk of the science team including Charlie Menza, Jeff Snyder Mike Stetcher, Jay Lazar, Ken Buja, Tim Battista, Matthew Cook, Bryan Costa, Akel Sterling, anda Ada Otter. Not pictured from the science team included Zandy Hills-Starr, Hank Tonnemacher, Michael Nemeth, and Hector Ruiz..

Thank you all for a safe and successful mission.

We'd also like to thank all of you who have visited this website to track our progress over the past several weeks. We hope to see you, and many more, next year.

Sincerely,
Tim Battista - Chief Scientist

NOAA