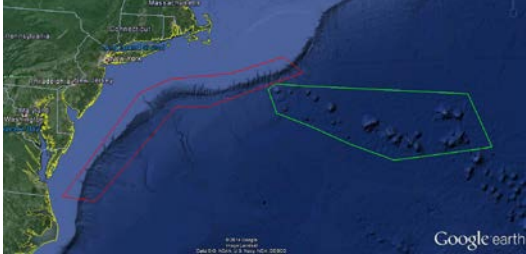


OKEANOS EXPLORER ROV DIVE SUMMARY

Site Name	Norfolk Canyon		
ROV Lead/Expedition Coordinator	David Lovalvo/ Brian Kennedy		
Science Team Leads	Jamie Austin Jesse Ausubel		
General Area Descriptor	Mid Atlantic U.S. Canyons		
ROV Dive Name	Cruise Season	Leg	Dive Number
	EX1404	2	DIVE03
Equipment Deployed	ROV:		Deep Discoverer
	Camera Platform:		Seirios
ROV Measurements	<input checked="" type="checkbox"/> CTD	<input checked="" type="checkbox"/> Depth	<input checked="" type="checkbox"/> Altitude
	<input checked="" type="checkbox"/> Scanning Sonar	<input checked="" type="checkbox"/> USBL Position	<input checked="" type="checkbox"/> Heading
	<input checked="" type="checkbox"/> Pitch	<input checked="" type="checkbox"/> Roll	<input checked="" type="checkbox"/> HD Camera 1
	<input checked="" type="checkbox"/> HD Camera 2	<input checked="" type="checkbox"/> Low Res Cam 1	<input checked="" type="checkbox"/> Low Res Cam 2
	<input checked="" type="checkbox"/> Low Res Cam 3	<input checked="" type="checkbox"/> Low Res Cam 4	<input checked="" type="checkbox"/> Low Res Cam 2
Equipment Malfunctions	None		
ROV Dive Summary (From processed ROV data)	Dive Summary: EX1404L2_DIVE03		
	^-----^		
	In Water at:	2014-09-07T18:15:25.647000 37°, 01.372' N ; 074°, 35.659' W	
	Out Water at:	2014-09-08T01:00:16.879000 37°, 01.566' N ; 074°, 36.031' W	
	Off Bottom at:	2014-09-08T00:22:00.744000 37°, 01.457' N ; 074°, 36.095' W	
	On Bottom at:	2014-09-07T19:09:01.484000 37°, 01.681' N ; 074°, 35.911' W	
	Dive duration:	6:44:51	
	Bottom Time:	5:12:59	
Max. depth:	675.9 m		
Special Notes			
Scientists Involved <i>(please provide name / location / affiliation / email)</i>	James Austin	University of Texas/Austin, Jackson School of Geosciences	jamie@utig.ig.utexas.edu
	Sandra Brooke	FSUCML	sbrooke@fsu.edu
	Kasey Cantwell	NOAA OER	kasey.cantwell@noaa.gov
	Robert Carney	LSU	rcarne1@lsu.edu
	Christopher (Chris) Mah	Invertebrate Zoology, NMNH, Smithsonian	brisinga@gmail.com
	Martha Nizinski	NOAA/NMFS	nizinski@si.edu
	Andrea Quattrini	USGS	andrea.quattrini@temple.edu
	Steve Ross	Univ. of NC at Wilmington	rosss@uncw.edu

	Carolyn Ruppel	USGS	cruppel@usgs.gov
	Tim Shank	WHOI	tshank@whoi.edu
	Brad Stevens	Univ of MD Eastern Shore	bgstevens@umes.edu
	Michael Vecchione	NMFS Syatematics Lab	vecchiom@si.edu
	Jesse Ausubel	Rockfeller university	ausubel@mail.rockefeller.edu
	Scott France	University of Louisiana at Lafayette	france@louisiana.edu

Purpose of the Dive

Explore the biology and geomorphology of Norfolk Canyon

Description of the Dive:

The primary objective of Dive 3 was to transect both up and across part of the south flank of Norfolk Canyon in search of deep-water coral species and other encrusting and nektonic/pelagic biota. Based upon extant Okeanos and Foster multibeam data, the flank was expected to be both a steep initial slope (associated with generally high backscatter) and along-canyon tributary drainages (with variable backscatter) crossing the proposed dive track. Previous dives in the vicinity had encountered spectacular deep-water coral occurrences.

Both vehicles were in the water by 1410 hrs. (This unusual mid-afternoon deployment was occasioned by the presence of a group of distinguished observers to the ship for the dive, Kiley Dancy, Aaron Kornbluth, Cameron Hume, Jay O'Dell, and Eric Schwab.) Seafloor was sighted at 1508 hrs., at a depth of 675 m. The landing site was a small sloping bench mid-way up the steeper flank. This site was sedimented; red crabs and eels were immediately observed. Euphausids/krill/amphipods were not as abundant in the water column as had been observed in similar water depths during earlier dives in both Lindenkohl (Dive 1) and Washington (Dive 2) canyons. It was difficult to identify the small nekton visually; some might have been fry or juvenile fish. Just upslope of the landing site, ripples in the sediment attested to the presence of at least occasional seafloor currents. Such current was encountered periodically throughout the dive.

Cobble-sized debris was encountered soon after beginning the upslope transect. These cobbles were heavily encrusted. Acanthogorgia colonies were part of this encrustation. Starting at a depth of 664 m., outcrops of thinly-bedded (likely fine-

grained) were also observed. Many of these layers were broken, creating debris of various sizes that characterized the otherwise sedimented slope. Periodic avalanches of soft sediment were observed to be caused by the ambient biology - especially movement of crabs and the actions of swimming squid. However, burrows were much less common than in the areas explored in Washington Canyon.

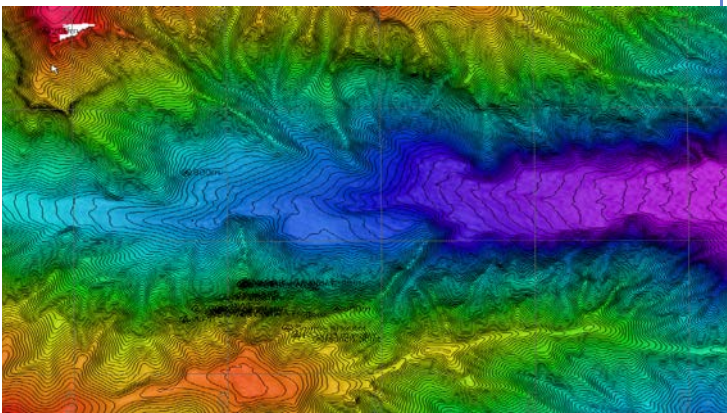
Throughout the dive, seafloor life was common; red crabs were ubiquitous, as were a number of fish varieties - hake, black-bellied rosefish, eels, halosaurs, monkfish, and one cusk eel. Squids dominated the cephalopods but included some small octopods. Galatheids (squat lobsters) were present from time to time. Siphonophores and salps drifted past, though less frequently than in Washington Canyon. Encrusting organisms includes a variety of echinoderms (brittle stars in the sediment (ophiuroids), and three or more species of starfish), sponges, small bivalves, bryozoa, zoanthids, and (occasional) crinoids higher on the slope. Sea spiders (pycnogonids) clambered over some of the corals. Communities offered a rich visual palette: red, rose, pink, peach, orange, white. A highlight was a monkfish predating a squid; schools of these squid (likely the northern shortfin squid, common to these canyons) were everywhere. We also sighted egg cases of sharks or rays.

More extensive layered outcrops began at 644 m. Evidence for downslope sediment movement around these outcrops was prevalent - erosional chutes, occasional amphitheaters, and debris aprons/talus piles. Such scattered outcrop/benches occurred upward to the base of a near-vertical wall exposure at 534 m. A geologic highlight en route to this wall was an exposure of folded, layered rock - clear evidence for soft-sediment (semi-lithified) deformation of whatever siltstone/mudstone forming the thinly layered outcrops.

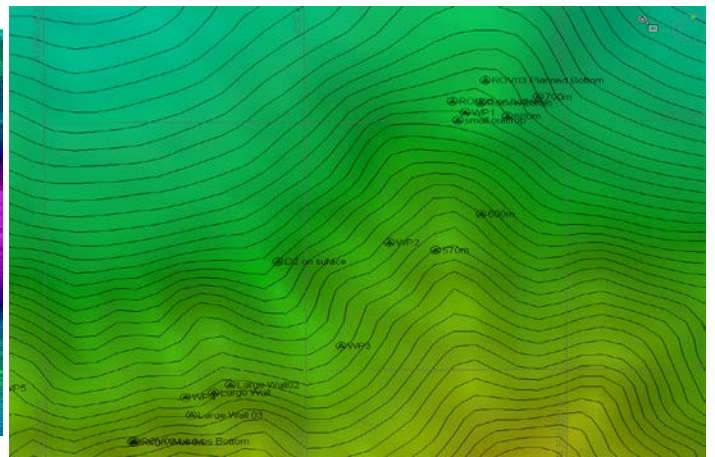
The wall exposure, spectacular and composed of more massively bedded rock, continued to the end of the dive at 495 m. There was clear evidence of vertical joints/cracks affecting these rocks; spalling of jointed rock chimneys is likely responsible for maintenance of the near verticality observed. This wall was unevenly colonized by beautiful colonies of *Paragorgia* ("bubblegum") coral, some as large as a

meter across; *Acanthogorgia* and *Anthothela* coral colonies were also observed. Many other organisms, including hydroids, also encrusted this wall. *Lophelia pertusa* was not sighted.

Overall Map of ROV Dive Area

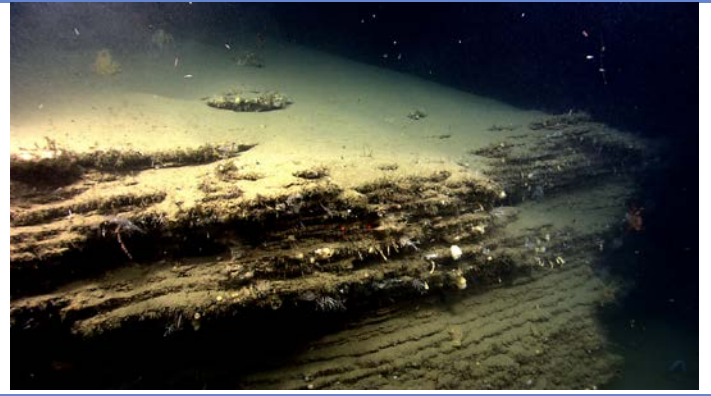


Close-up Map of Main Dive Site



Representative Photos of the Dive





Please direct inquiries to:

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