



Okeanos Explorer ROV Dive Summary

Dive Information	
General Location	
General Area Descriptor	Blake Escarpment, US Continental Margin
Site Name	Blake Escarpment South
Science Team Leads	Leslie Sautter / Cheryl Morrison
Expedition Coordinator	Kasey Cantwell
ROV Dive Supervisor	Bobby Mohr
Mapping Lead	Derek Sowers
ROV Dive Name	
Cruise	EX1806

	Asako Matsumoto	Planetary Exploration Research Center, Chiba Institute of Technology	amatsu@gorgonian.jp
	Charles Messing	Nova Southeastern University	messagingc@nova.edu
	Christopher Kelley	University of Hawaii	ckelley@hawaii.edu
	Christopher Mah	Dept of Invertebrate Zoology, NMNH Smithsonian	brisinga@gmail.com
	Daniel Wagner	NOAA-OER	daniel.wagner@noaa.gov
	Derek Sowers	OER	derek.sowers@noaa.gov
	Enrique Salgado	NCCOS	enrique.salgado@noaa.gov
	Erik Cordes	Temple University	ecordes@temple.edu
	George Matsumoto	MBARI	mage@mbari.org
	Heather Judkins	University of South Florida St. Petersburg	Judkins@mail.usf.edu
	Jim Masterson	FAU Harbor Branch Oceanographic ECC	jmaster7@fau.edu
	Kate Rose	NOAA NCEI	kate.rose@noaa.gov
	Kevin Jerram	UNH	kjerram@ccom.unh.edu
	Lauren Walling	Univeristy of Louisiana, Lafayette	c00305146@louisiana.edu
	Les Watling	University of Hawaii at Manoa	watling@hawaii.edu
	Leslie Sautter	College of Charleston	Sautterl@cofc.edu
	Mark Benfield	Louisiana State University	mbenfie@lsu.edu
	Matt Dornback	NOAA-NCEI	matt.dornback@noaa.gov
	Megan McCuller	North Carolina Museum of Natural Sciences	mccullermi@gmail.com
	Michael Vecchione	NOAA/NMFS National Systematics Lab	vecchiom@si.edu
	Nicole Morgan	FSU	nbmorgan11@gmail.com
	Nolan Barrett	South Carolina Unisersity	barrettnh@g.cofc.edu
	Robert Carney	Louisiana State Univ	rcarne1@lsu.edu

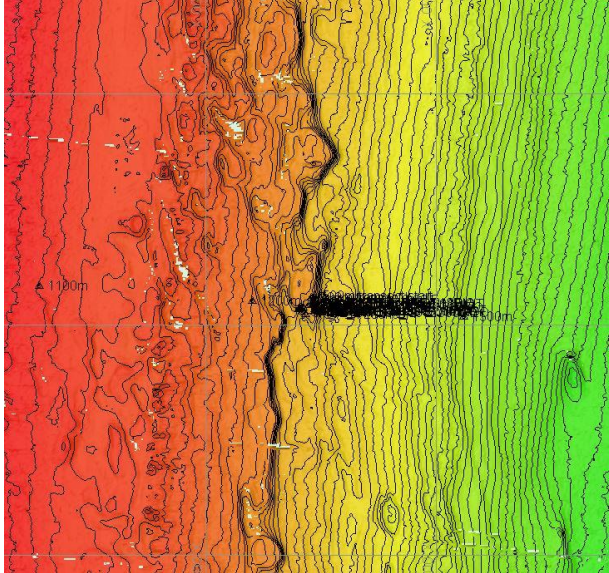
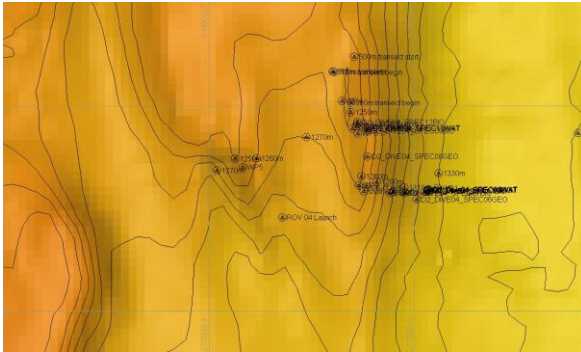


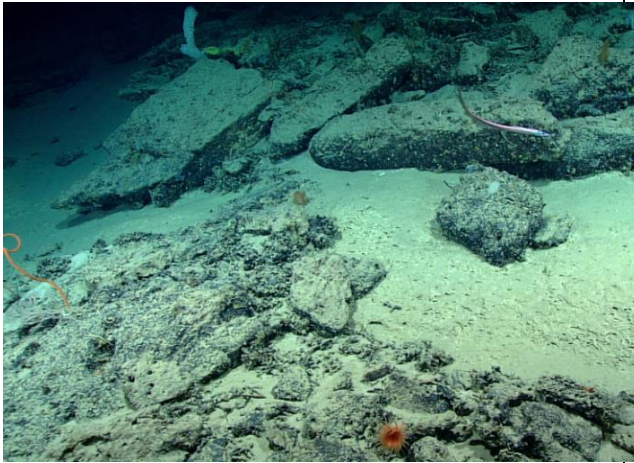
	Sandra Brooke	Florida State University	sbrooke@fsu.edu
	Santiago Herrera	Lehigh University	sherrera@alum.mit.edu, sah516@lehigh.edu
	Scott Allen	NOAA Ship Okeanos Explorer	
	Scott France	University of Louisiana at Lafayette	france@louisiana.edu
	Scott Harris	College of Charleston	harriss@cofc.edu
	Shirley Pomponi	CIOERT - FAU HBOI	SPomponi@fau.edu
	Stephanie Bush	Smithsonian	stephalopod@gmail.com
	Tamara Frank	Nova Southeastern University	tfrank1@nova.edu
	Tara Harmer Luke	Stockton University	luket@stockton.edu
	Thomas Hansknecht	Ret. taxonomist (mobile Alabama)	tjhansk@comcast.net
	Tina Molodtsova	Shirshov Institute of Oceanology RAS	tina@ocean.ru; tina.molodtsova@gmail.com
	Tracey Sutton	Nova Southeastern University	tsutton1@nova.edu
	Treyson Gillespie	College of Charleston	gillespieta@g.cofc.edu
	Upasana Ganguly	University of Louisiana at Lafayette	upasana.ganguly1@louisiana.edu
	Zach Proux	College of Charleston	prouxzs@g.cofc.edu
Purpose of the Dive	<p>This dive is part of a series that will investigate the similarities and differences in community composition between deepwater habitats of the SE US continental margin. During this dive, the ROV <i>Deep Discoverer</i> was proposed to explore a rocky feature on the Blake Escarpment, the outer edge of the Blake Plateau offshore the Georgia coast. The dive's primary objective was to characterize the distribution and abundance of benthic fauna at depths between 1200 and 1400 m. A comparison of the diversity/distribution of coral and sponge communities across the region and to the broader Atlantic is of particular importance to understanding biogeography and connectivity of communities in the Atlantic.</p> <p>This site was proposed by Peter Etnoyer in support of SEDCI objectives, as an unexplored area with potential habitat suitability for corals and sponges. This region was first mapped during EX-18-05 and new information will inform biogeographic patterns in the region.</p>		



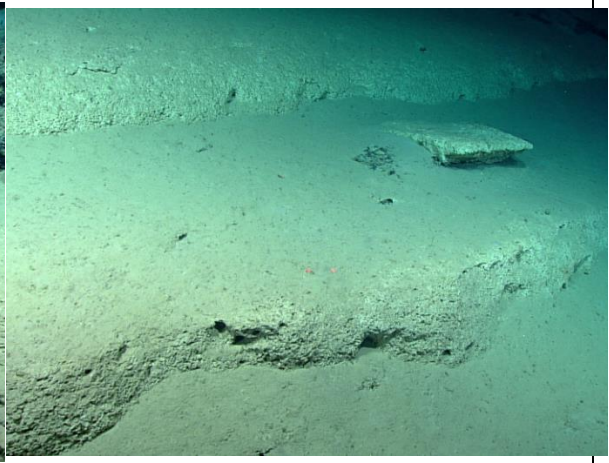
<p style="text-align: center;">Description of the Dive</p>	<p>This site is a relatively low slope area with several small ridges that may be outcropping exposed rock layers, resulting in small, steeper sloped scarps. These ridges form a series of terraces that step down the continental slope from depths of approximately 1200 to 1400 m. We are referring to these features as ‘bathyal steppes’ or ‘intra-slope terraces’ .</p> <p>The ROV ascended the steep slope of a single steppe, then traversed along the edge of the crest. The total relief of this dive was approximately 80 m. Several different layers of rock were encountered, some of which were clearly more erosion-resistant than others (see images, below). Rocks that were friable and easily eroded had few organisms on their surface, whereas all resistant strata had denser biologic communities. These rocks are all comprised of clays and silts, likely of biogenic origin. Varying degrees of induration and encrustation by Fe-Mn oxides determine the rocks’ resistance to erosion, the terracing and the angle of the slope, and the concentrations of organisms.</p> <p>The varied rocky substrate was colonized by a high diversity of black corals, with seven species tentatively identified as <i>Stichopathes</i>, <i>Bathypathes</i>, <i>Stauropathes</i>, <i>Parantipathes</i>, <i>Heteropathes</i>, <i>Alternatipathes</i>, <i>Leiopathes</i>. Octocoral species were also diverse, and included <i>Anthothela</i>, <i>Paramuricea</i>, <i>Chrysogorgia</i>, <i>Metallogorgia</i>, <i>Thourarella</i>, <i>Corallium</i>, <i>Anthomastus</i>, <i>Pseudoanthomastus</i>, <i>Candidella</i>, the stoloniferans <i>Cornulariidae</i> and <i>Clavularia</i>, and several bamboo corals (Isididae), including <i>Isidella</i>, <i>Cladarisis</i>, <i>Keratoisis</i>, <i>Lepidisis</i> and a candelabrum bamboo coral. Chirostyloid squat lobster associates were observed on <i>Parantipathes</i> and <i>Ophiocreas</i> brittle stars occurred on <i>Metallogorgia</i>. Scleractinians included several colonies of <i>Enallopsammia rostrata</i>, <i>Solenosmilia variabilis</i>, and solitary corals including <i>Desmophyllum dianthus</i>. Zooanthids grew over dead bamboo coral and on several sponges. A bobtail squid (Family Sepiolidae) was partially buried in sediment at the base of <i>Enallopsammia rostrata</i>. A dandelion siphonophore was observed in a sedimented area. Crustaceans observed on the dive included shrimps, squat lobsters, large amphipods, isopods, plus the anomurans <i>Neolithodes</i> and hermit crabs. Stalked crinoids, sea urchins, sea cucumbers, brittle stars, <i>Hymenaster</i> sea stars, and Gorgonocephalidae basket stars made up the echinoderms observed. Porifera included both unidentified and <i>Tretopleura</i> hexactinellid glass sponges, a blue encrusting sponge, and a yellow demosponge, possibly <i>Hertwigia</i>. Fishes included Synphobranchid cutthroat eels, <i>Gaidropsaurus</i> and an ophidioid cusk eel <i>Diplacanthapoma</i>, and the anglerfish <i>Chaunax coloratus</i>.</p> <p>MIDWATER: During the midwater portion of the dive, we conducted exploratory transects at 5 different depths - 950, 880, 700, 500, and 300 meters. There was an abrupt decrease in temperature and increase in oxygen around 880 m. This thermocline/oxycline was accompanied by a layer of water with extremely high density of particulate matter (aka “marine snow”). We spent time surveying at these deeper depths to investigate what types of animals are associated with these intriguing water masses. At 950 m, we encountered several oikopleurid larvaceans (a few with yellow-green tails), a bathylagid fish (aka deep sea smelt), <i>Cyclothone</i> (bristlemouth) fish, a jellyfish that was likely <i>Halitrephes</i>, as well as a <i>Solmissus</i> jellyfish. At 880 meters, fish included more <i>Cyclothone</i> and a <i>Sternoptyx</i> hatchetfish. We saw siphonophores, a cydippid ctenophore, and 2 <i>Atolla</i> jellyfish. One <i>Atolla</i> appeared to be oriented upside down. Around 790 meters the marine snow started to thin out, though it remained relatively dense throughout the transects. At 700 m, there were more larvaceans, many chaetognaths, and several siphonophores, including a Prayid and possibly a <i>Bargmannia</i> siphonophores. The peak of the Deep Scattering Layer, as detected by the EK60 echosounder, was at around 500 m, which is also where we saw the most fish, including <i>Cyclothone</i>, <i>Chauliodus</i> (viperfish), and a likely a Gonostomatid, <i>Bonapartia pedaliota</i>. We also saw sergestid shrimp, krill, and an amphipod at this depth. At 300 m, we encountered several <i>Trichodesmium</i></p>
--	--



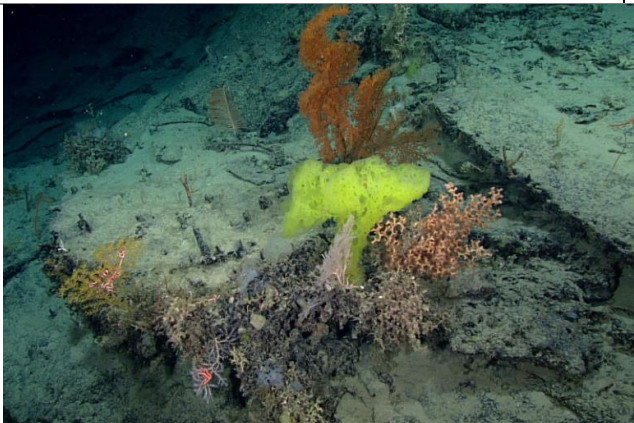
	<p>(cyanobacteria) colonies, several Prayid siphonophores (including <i>Rosacea</i> and also <i>Desmophyes annectens</i>) siphonophores, and an unidentified organism that may have been a phyllosoma (lobster larva). The high number and diversity of animals encountered suggest that this was a high productivity site, and the high density of organisms and particulate matter in the water column likely support the density and biodiversity of the benthic organisms as well.</p>	
<p>Notable Observations</p>	<ul style="list-style-type: none"> • <i>The bathyal steppes (intra-slope terraces) that occur at the escarpment in this region create diverse habitat for sessile organisms.</i> • <i>This site had high coral diversity and medium coral densities. There was a change in dominant coral taxa from Antipatharians (black corals) towards the base of the scarp to Isidids (bamboo corals) towards the crest.</i> • <i>The escarpment depth and species observed suggest influence by the Deep Western Boundary Undercurrent.</i> 	
<p>Community Presence/Absence <i>(community is defined as more than two species)</i></p>	<p><input checked="" type="checkbox"/> Corals and Sponges Present</p> <hr/> <p><input type="checkbox"/> Chemosynthetic Community Present</p> <hr/> <p><input checked="" type="checkbox"/> High biodiversity Community Present</p>	<p><input type="checkbox"/> Active Seep or Vent</p> <hr/> <p><input type="checkbox"/> Extinct Seep or Vent</p> <hr/> <p><input type="checkbox"/> Hydrates Present</p>
<p>Overall Map of the ROV Dive Area</p>		<p>Close-up Map of Main Dive Site</p>
		
<p>Representative Photos of the Dive</p>		



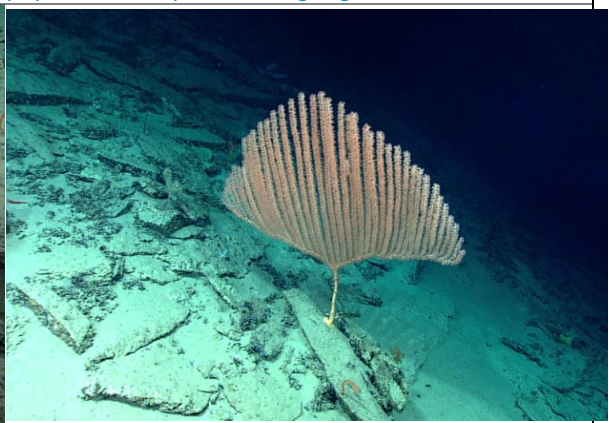
Near to the base of the scarp, outcrops of tabular indurated mudstones were found.



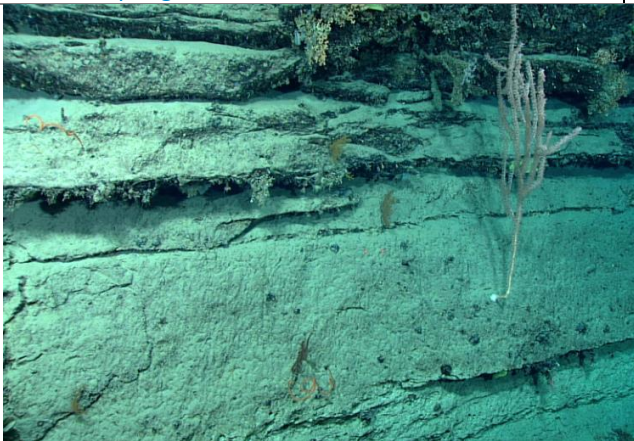
Above the mudstones, less consolidated mudstones generated broader terracing. These rocks crumbled during a collection attempt. They are sparsely populated except for boring organism.



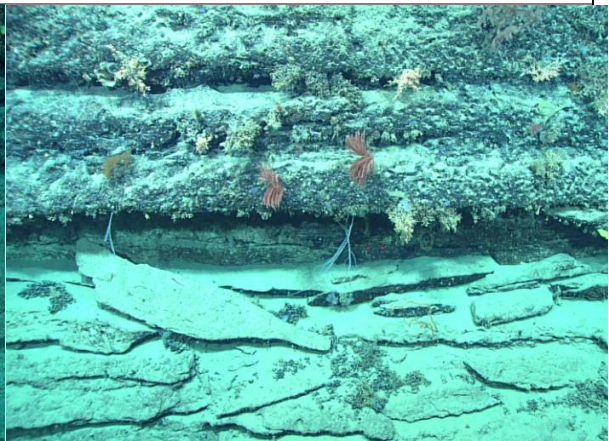
Farther upslope, more indurated mudstones occur. A rock ledge inhabited by several species of black corals, octocorals, live and dead scleractinian corals, brittle stars and sponges.



Several of the candelabrum morphology of a bamboo coral (*Isididae*) were observed at shallower areas of the scarp. This area was dominated by thin, broken slabs of mudstone.



Nearly vertical walls were found near to the top of the scarp. Layers of more erosion-resistant rock form balcony-like ledges and provide habitat for a high diversity of organisms, including *Keratoisis* bamboo



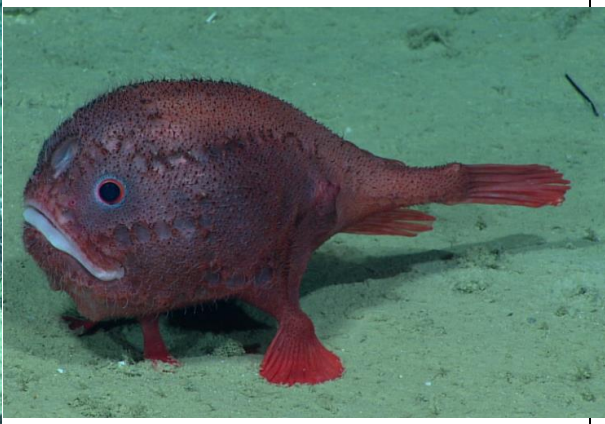
The contact between tabular mudstones and erosion resistant mudstones provides excellent habitat for *Bathypathes* black corals and *Solenosmilia* stony corals..

corals and *Solenosmilia* stony corals..



At the crest of the scarp, large *Antipathes* black corals, bamboo corals (above) and *Solenosmilia* stony coral were abundant, living at the edge as well as on the flat-lying pavement of rock. A *Gaidropsaurus* fish was seen.

Example of fauna (bamboo corals and *Farrea* glass sponges) inhabiting an outcrop of rock.



A golden crab, *Chaceon fenneri*, was observed above a ledge at the top of the scarp.

An anglerfish, *Chaunax coloratus*, was observed on soft sediment.

Samples Collected


Sample

Sample ID	EX1806_DIVE04_SPEC01BIO
Date (UTC)	20180617
Time (UTC)	135702
Depth (m)	1321.15
Temperature (°C)	4.09
Field ID(s)	<i>Stauropathes</i> sp.
Reason for Collection	<i>Characteristic of site</i>




Notes			
Associates	Associate ID	Field Identification	Notes
	None		


Sample

Sample ID	EX1806_DIVE04_SPEC02BIO		
Date (UTC)	20180617		
Time (UTC)	140638		
Depth (m)	1321.04		
Temperature (°C)	4.09		
Field ID(s)	<i>Bathypathes</i> sp.		
Reason for Collection	<i>To be included in ASPIRE connectivity study</i>		
Notes	Very mucousy when removed from BIOBOX, as well as the formalin in which a subsample was preserved		
Associates	Associate ID	Field Identification	Notes
	A01	Polychaeta	Polynoidea (scale worm)

Sample

Sample ID	EX1806_DIVE04_SPEC06GEO		
Date (UTC)	20180617		
Time (UTC)	142929		
Depth (m)	1315.47		
Temperature (°C)	4.09		
Field ID(s)	Mudstone with Fe-Mn crust		
Reason for Collection	<i>To characterize the rocks observed at the dive site</i>		
Notes	Similar to other mudstones collected in Dives 01 and 02.		
Associates	Associate ID	Field Identification	Notes
	None		


Sample

Sample ID	EX1806_DIVE04_SPEC07BIO		
Date (UTC)	20180617		
Time (UTC)	145642		




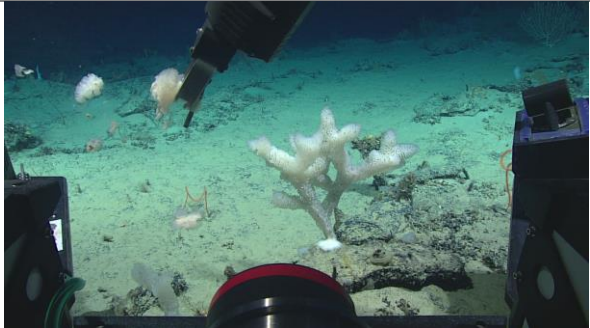
Depth (m)	1308.84		
Temperature (°C)	4.09		
Field ID(s)	<i>Thouarella</i> sp.		
Reason for Collection	<i>Rare fauna</i>		
Notes			
Associates	Associate ID	Field Identification	Notes
	None		

Sample

Sample ID	EX1806_DIVE04_SPEC08GEO		
Date (UTC)	20180617		
Time (UTC)	175620		
Depth (m)	1249.63		
Temperature (°C)	4.12		
Field ID(s)	Mudstone with Fe-Mn crust		
Reason for Collection			
Notes			
Associates	Associate ID	Field Identification	Notes
	A01	Hexactinellida	
	A02	hydroids (Hydrozoa)	

Sample

Sample ID	EX1806_DIVE04_SPEC09BIO		
Date (UTC)	20180617		
Time (UTC)	190108		
Depth (m)	1247.23		
Temperature (°C)	4.12		
Field ID(s)	<i>Leiopathes</i> sp.		
Reason for Collection	<i>For inclusion in ASPIRE connectivity studies</i>		
Notes	Not as mucousy as predicted		
Associates	Associate ID	Field Identification	Notes

	None														
Sample															
Sample ID	EX1806_DIVE04_SPEC12BIO														
Date (UTC)	20180617														
Time (UTC)	191936														
Depth (m)	1247.65														
Temperature (°C)	4.12														
Field ID(s)	Hexactinellida														
Reason for Collection															
Notes	Overall branching structure comprised of convoluted ruffles														
	<i>[Notes section here can include number of organisms, condition of organism(s) upon retrieval or photos as needed]</i>														
Associates	<table border="1"> <thead> <tr> <th>Associate ID</th> <th>Field Identification</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td>A01</td> <td>Ophiuroidea</td> <td></td> </tr> <tr> <td>A02</td> <td>Amphipoda</td> <td></td> </tr> <tr> <td>A03</td> <td>Polychaeta</td> <td>Polynoidae (scale worm)</td> </tr> </tbody> </table>			Associate ID	Field Identification	Notes	A01	Ophiuroidea		A02	Amphipoda		A03	Polychaeta	Polynoidae (scale worm)
	Associate ID	Field Identification	Notes												
	A01	Ophiuroidea													
	A02	Amphipoda													
A03	Polychaeta	Polynoidae (scale worm)													
Water Samples Collected															
<p>Though water samples were collected on this dive, there were issues with sample storage and preservation, therefore no water samples were retained nor archived. Sample numbering and data remains the same, as if water sampling did occur.</p> <p>EX1806_DIVE04_SPEC03WAT, EX1806_DIVE04_SPEC04WAT, EX1806_DIVE04_SPEC05WAT, EX1806_DIVE04_SPEC10WAT, and EX1806_DIVE04_SPEC11WAT have no physical specimen associated with them.</p>															

Please direct inquiries to:

NOAA Office of Ocean Exploration & Research
 1315 East-West Highway (SSMC3 10th Floor)
 Silver Spring, MD 20910
 (301) 734-1014