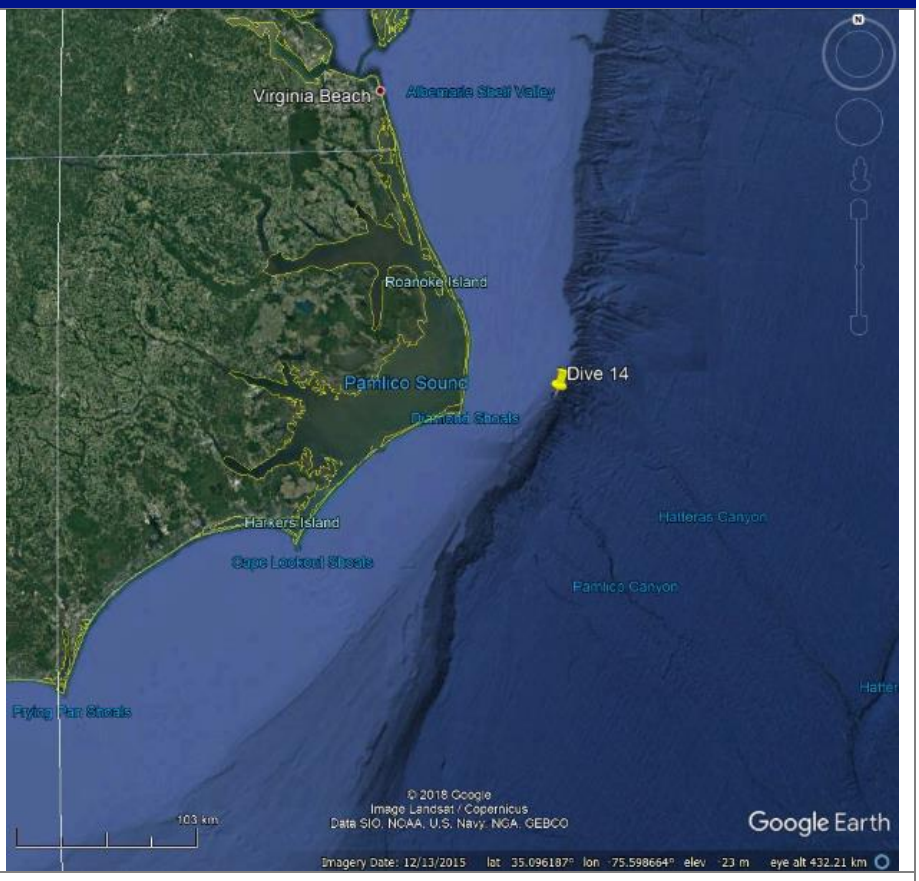
Ocean Exploration and Research

Okeanos Explorer ROV Dive Summary

Dive Information

General Location	
General Area Descriptor	Southeast U.S. Continental Margin - North Carolina Canyons
Site Name	Hatteras Canyon
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
Leg	-
Dive Number	DIVE14

Equipment Deployed

ROV	Deep Discoverer
Camera Platform	Seirios
ROV Measurements	☒CTD ☒Depth ☒Altitude ☒Scanning Sonar ☒USBL Position ☒Heading ☒Pitch ☒Roll ☒HD Camera 1 ☒HD Camera 2 ☒Low Res Cam 1 ☒Low Res Cam 2 ☒Low Res Cam 3 ☒Low Res Cam 4 ☒Low Res Cam 5
Equipment Malfunctions	
ROV Dive Summary (from processed ROV data)	Dive Summary: EX1806_DIVE14 ^^ In Water: 2018-06-28T12:26:33.403318 35°, 17.921' N ; 74°, 56.949' W On Bottom: 2018-06-28T12:57:03.416958 35°, 17.781' N ; 74°, 56.806' W Off Bottom: 2018-06-28T20:14:57.468981 35°, 17.507' N ; 74°, 57.043' W Out Water: 2018-06-28T20:31:56.904397 35°, 17.428' N ; 74°, 57.118' W Dive duration: 8:5:23 Bottom Time: 7:17:54 Max. depth: 510.0 m
Special Notes	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.
Scientists Involved (please provide name, location, affiliation, email)	see below

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Purpose of the Dive	This dive was part of a series that investigates the similarities and differences in community composition between deepwater habitats of the SE US continental margin. Submarine canyon sites in the past have been shown to be deep sea coral habitats, particularly in areas of rock/hard-bottom exposure. This site was proposed by Deep Search to represent canyon features that have yet to be explored in detail. The autonomous vehicle *Sentry* has surveyed a handful of locations in the canyons off North Carolina, however visual information about the presence and ID of corals and other benthic fauna have not been possible. An ROV/HOV is required to visually examine these rugged, high profile features.		
Description of the Dive	This dive explored the north-facing slope of an intra-canyon ridge. The dive began at a depth of 508 m and ascended the steeply sloped muddy substrate. Bacterial mats indicative of methane seeps were first observed at 456 m, and at 450 m the first of three gently bubbling methane gas seeps was encountered. Small leakages of gas were also seen at 389 and 333 m. Throughout most of the dive, small bacterial mats with black, reduced sediments were observed across the muddy substrate, yet no extensive chemosynthetic		

communities were encountered. Numerous large holes were encountered, possibly the burrows of midshipman fish (*Porichthys plectrodon*). Small-scale slumping was observed occurring as a result of bioturbation, but otherwise the steep environment appeared quite stable.

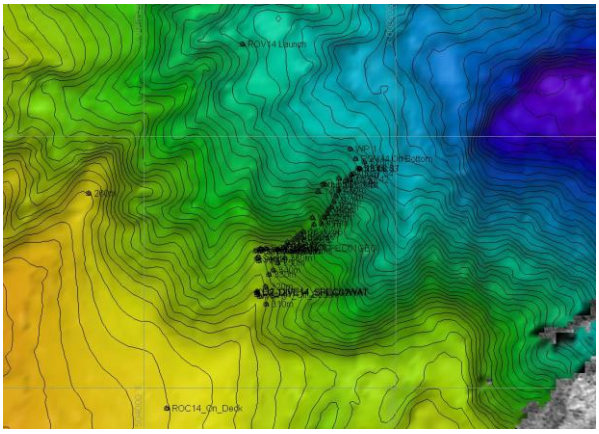
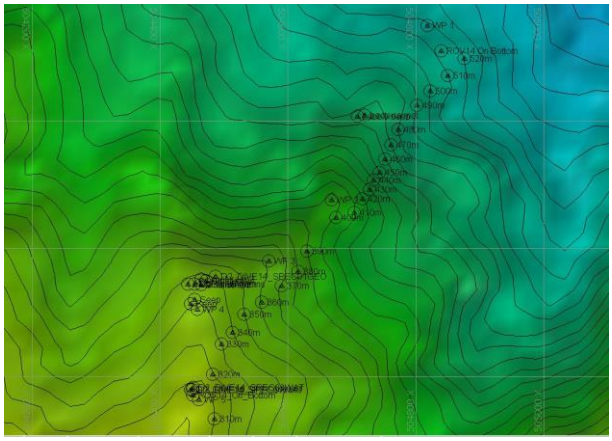
During this dive, the water column was very active, with mid-water organisms such as sergestid shrimps, snipe eels, salps, ctenophores, barracudina (Peralipididae), snipe eels (trichiurids), viper fish (*Chauliodus*), myctophids and squid (*Illex* sp.) close to the benthos. The school of squid followed the ROV for most of the dive and were likely feeding on mid-water organisms, and myctophid fish heads that were partially consumed by squid were observed often on the sea floor. Blackbelly rosefish (*Helicolenus dactylopterus*), which were small (possibly juveniles) and abundant were observed consuming the fish heads. Small eelpouts (*Lycenchelys verrillii*) were also common. Other fishes observed included hake (*Phycis chesteri*, *Urophycis regia* and *Merluccius albidus*), armored sea robins (*Peristedion*), tonguefish (*Symphurus marginatus*), herring smelt (*Argentina* sp.), plus several hagfish (*Eptatretus lopheliae*) burying head first into the sediment. Several fish were observed in holes in the sediment with only their heads visible. These were tentatively identified as the Atlantic midshipman (*Porichthys plectrodon*), though these were deeper than the depth range for the species (1-100 m).

Molluscs included two squid species, *Brachioteuthis beanii* and *Illex* sp. At least two gastropods species were observed, including a larger species that was mostly buried in sediment and a smaller species, possibly *Gemmula periscelida* (Family Turridae). No corals were seen, though cerianthid tube anemones were fairly common. One cerianthid had a Themisto-type hyperiid amphipod caught in it's tentacles, but dropped the amphipod to an awaiting *Bathynectes* crab below. Unlike the previous dive, no brittle stars were observed during this dive, though several *Plutonaster* sp. mud stars were seen. Benthic crustaceans included *Heterocarpus* sp. shrimp, hermit crabs, *Munida valida* squat lobsters, and *Cancer* sp. crabs. An *Enteropneusta* worm was observed out of its burrow and the proboscis of an echiuran spoon worm was seen.

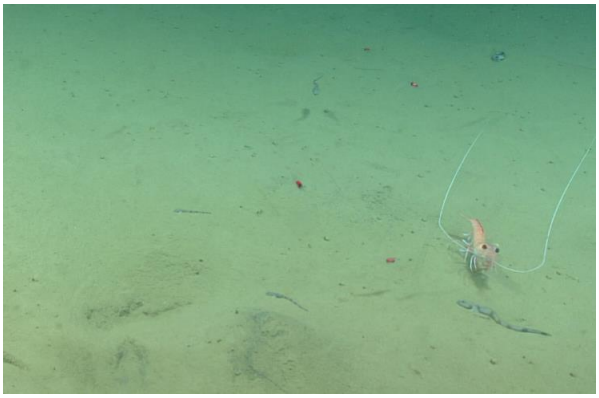
Upon examination of the sediment sample taken in an area with

	many small holes visible at the sediment surface, polychaete worms were found that had a retractable body and compact, fleshy hood.
Notable Observations	*This dive included an active water column and bentho-pelagic coupling, with benthic organisms observed consuming mid-water organisms. Many fish species were observed, including small (juvenile?) blackbelly rosefish and eelpouts.* *Biology was characteristic of soft sediment habitat, with no hard substrate for coral or sponge attachment and growth. The dominant cnidarians were cerianthid tube anemones.* *Bacterial mats, reduced sediments and bubbles indicative of methane seepage were observed.*

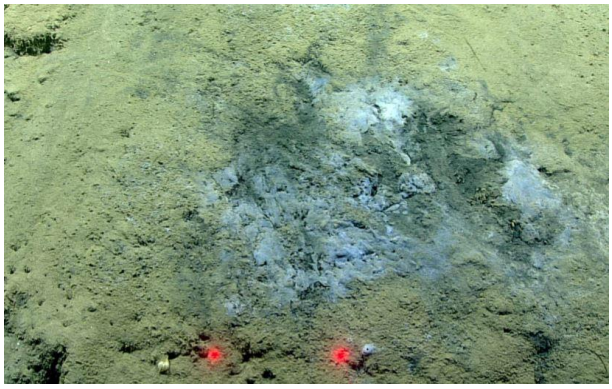
Community Presence/ Absence (*community is defined as more than two species*)		
	☐Corals and Sponges Present	X Active Seep or Vent
	☐Chemosynthetic Community Present	☐Extinct Seep or Vent
	☐High biodiversity Community Present	☐Hydrates Present

Overall Map of the ROV Dive Area	Close-up Map of Main Dive Site
	

Representative Photos of the Dive

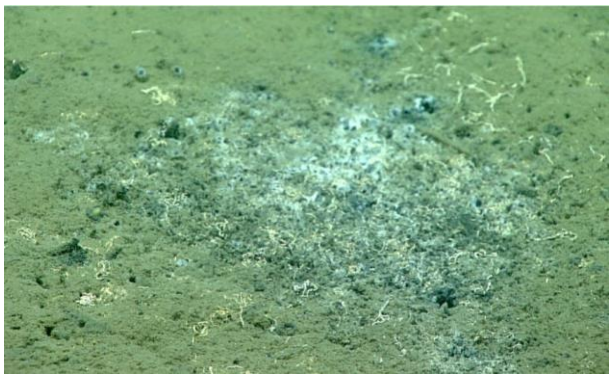


The dive commenced on thick, featureless muddy substrate.



Several areas with bacterial mats and reduced sediments indicative of methane seepage were observed.

The crest of the intra-canyon ridge sloped steeply to each side and was pock-marked by pits.



Bubbles were emerging from one of the pits.

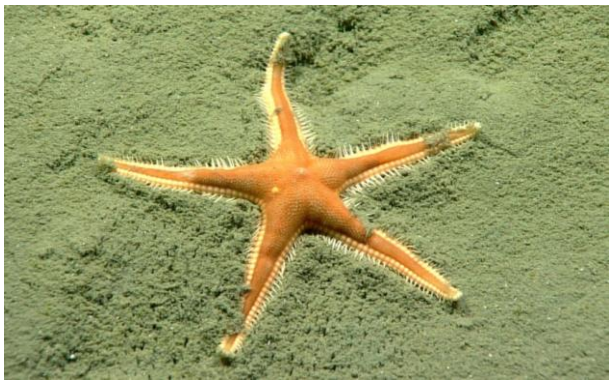
Note the small bubble plume on the right side of the image, seen at 389 m.

Several species of crab were observed, including *Cancer* sp.

Bathynectes portunid crabs were also observed.

A galatheoid squat lobster, possibly *Munida valida*, was seen in burrows.

A *Heterocarpus* shrimp was observed swimming close to the benthos.

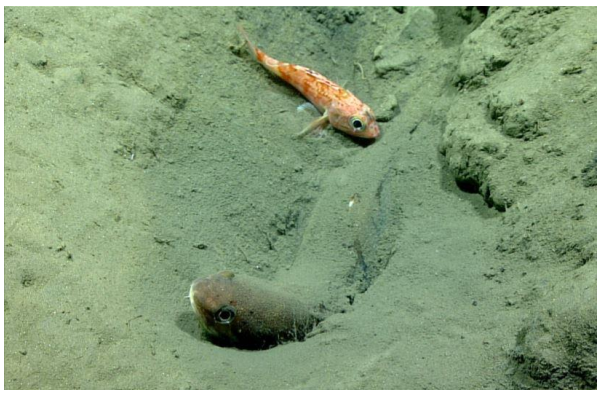


Mudstars (*Plutinaster* sp.) were common.

Two large unknown gastropods were seen buried in the mud.

Smaller gastropods, possibly *Gemmula periscelida* (Family Turridae), were common.

Cerianthid tube anemones were common.



Small (possibly juvenile) blackbelly rosefish (*Helicolenus dactylopterus*) were very common, and the southern hake (*Urophycis regia*) seen here blanketed by sediment were also observed.

Numerous burrows were observed, likely made by the Atlantic midshipman (*Porichthys plectrodon*).

Small eelpouts (*Lycodes terraenovae*) were very common.

An armored sea robin (*Peristedion* sp.).

Hagfish (*Eptatretus lopheliae*) were common and were observed burrowing head-first into the mud.

A long fin hake (*Phycis chesteri)* was observed.

Both male (shown) and female (more uniform in color) tonguefish (*Symphurus marginatus*) were seen on the sediment surface.

Samples Collected

Sample

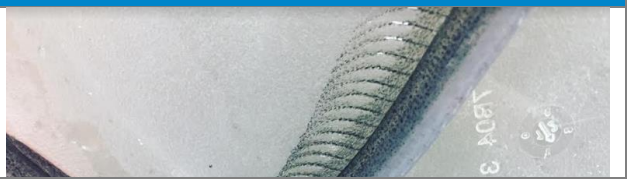
Sample ID	SPEC01GEO
Date (UTC)	2018 06 28
Time (UTC)	17:32:35
Depth (m)	338.48
Temperature (°C)	8.51
Field ID(s)	Mud - a mixture of calcareous microfossils and terrigenous clays.

Reason for Collection	*Characterize sediment and determine source of small holes/burrows*
Notes	Acorn worms were found in abundance and likely produced the holes.
Associates	*[Notes section here can include number of organisms, condition of organism(s) upon retrieval or photos as needed]*

Associate ID	Field Identification	Notes
SPEC01GEO_A01	Enteropneusta	

Sample

Sample ID	EX1806__D2_DIVE14_SPEC05BIO
Date (UTC)	6/28/2018
Time (UTC)	n/a



Depth (m)	n/a
Temperature (°C)	n/a
Field ID(s)	Paralepididae
Reason for Collection	Opportunistic sample - came up with ROV.
Notes	Preserved in formalin with subsamples taken for DNA. No known location or depth.
Associates	*[Notes section here can include number of organisms, condition of organism(s) upon retrieval or photos as needed]*

Associate ID	Field Identification	Notes

Water Samples Collected

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. EX1806_DIVE14_SPEC02WAT, EX1806_DIVE14_SPEC03WAT, and EX1806_DIVE14_SPEC04WAT have no physical specimen associated with them.

Please direct inquiries to:

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