


OKEANOS EXPLORER ROV DIVE SUMMARY

Site Name	Pichincho			
ROV Lead/Expedition Coordinator	Brian Bingham/ Brian Kennedy			
Science Team Leads	Andrea Quattrini and Mike Cheadle			
General Area Descriptor	Puerto Rico and US Virgin Islands			
ROV Dive Name	Cruise Season	Leg	Dive Number	
	EX1502	3	DIVE03	
Equipment Deployed	ROV:	Deep Discoverer		
	Camera Platform:	Seirios		
ROV Measurements	<input checked="" type="checkbox"/> D2 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"/> ROV HD 2	<input checked="" type="checkbox"/> Seirios CTD	
	<input checked="" type="checkbox"/> Temperature Probe	<input checked="" type="checkbox"/> D2 DO Sensor	<input type="checkbox"/> Seirios DO sensor	
Equipment Malfunctions	Operating with a secondary DO sensor that was last calibrated in 2013. Port top swing arm was damaged during Dive 03, it was recovered safely and repaired overnight.			
ROV Dive Summary (From processed ROV data)				
Special Notes	After few observations of fish, approximately halfway through the dive, science team asked that Seirios lighting be turned down to see if decreased light would increase fish observations.			
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Purpose of the Dive

- i) To explore possible habitats for deep water snappers and groupers
- ii) To document the biology living on and around the un-named fault scarp from 600m to 300m depth.
- iii) To determine the lithology and stratigraphy of the rocks exposed by the fault.
- iv) To identify structural features that could be related to the fault.

Description of the Dive:

This was a shallow dive located on a 30° dipping slope below Mona Passage. The slope was formed by a weathered and sedimented fault scarp within the Late Oligocene to Early Pliocene platform carbonate sequence. The dive began at 10:48 UTC and D2 descended to 608m and landed on a sub-horizontal valley floor to the south of the fault scarp. The dive consisted of a four short upward transects and three east-southeasterly transects parallel to the scarp. The dive ended at 21:56 UTC at 303m on the scarp. Little to no bottom current was apparent during 10 hours of the dive. However, after an hour spent at 300 m depth, a strong current (~1 knot) swept through the area, disabling pilot control of the ROV. The dive ended 30 min after this occurrence as the ROV could not get back to the scarp.

Geology:

The dive started with D2 landing on a sub horizontal, rippled, sand rich surface at 608m. D2 then proceeded in a north, north easterly direction towards a slope formed by an un-named 30km long normal fault in Mona Passage. Progressively more gravel and rock debris were encountered as D2 traversed towards the slope. The first boulders (608m, 11:50 UTC) were large (metre scale) slabs of bedded, burrowed and honey-combed textured carbonate, surrounded by sediment. The base of the slope was reached at 606m at 12:54 UTC. Near the foot of the slope (594m, 14:08 UTC) large, metre scale, fauna encrusted and sandy coated slabs of carbonate were encountered. These slabs had clearly broken off from higher up the scarp and fallen to the base of the slope. Carbonate rock outcrop was reached at 541m (14:59 UTC) and extended with a staircase geometry of up to 10 metre scale vertical faces separated by gently dipping sediment and boulder covered slopes until 396m (18:40 UTC). The sequence was variably bedded on a 30cm to 1 metre scale (e.g. 533m, 15:40 UTC; see photo below) and showed clear differential erosion, with stronger layers forming resistant layers and ledges and less resistant layers being eroded. In several places the carbonate was clearly exposed and recognizable due to local rock face failures. Burrows were visible in some fresh outcrops, but on the whole most of the section was covered by sediment and encrusting sponges, corals and other biology. There is the possibility that cementation was occurring within the covering sediment forming hard crusts on some of the exposures. At 410m (18:16 UTC), large boulders were encountered sitting on a ledge above a slope scarp.

At about 374m (18:57 UTC), the slope slightly shallowed and the character of the carbonate exposures changed. Above 374m, until at least 303m, the carbonate is very irregularly weathered, displaying a karstic topography, with rounded outcrop with sinkhole-like depressions with the beginnings of limestone pavement development (see photo below). Cave-like features formed by differential erosion of weaker layers were clearly observed (e.g. 309m, 20:04 UTC). At one locality a crack in the carbonate outcrop, provided an example of how the rock face can fail and produce the boulders that were seen lower down the slope (304m 20:00 UTC). The origin of the apparent karstic topography is enigmatic. One possibility is weathering occurred after the sequence had been exposed above sea-level during the Last Glacial Maximum sea-level lowstand, and subsequently, the sequence has subsided below sea-level due to sea level rise and due to crustal extension below the Mona Passage (Chaytor & ten Brink, 2010). Depressions in the surface of the limestone karst contained accumulations of winnowed coral fragments together with less common echinoid spines. At the margins of these accumulations, larger objects, such as gastropod shells, sponge fragments, bivalve shells and limestone pebbles were observed. We speculate that the periodically strong currents in this area may have transported and winnowed these fragments from elsewhere.

Biology:

In the beginning of the dive, the ROV traversed over mostly a mud bottom with scattered gravel. This area was also covered with dead demosponges, few live demosponges, and scattered dead, bivalve shells. As the ROV continued, larger boulders and carbonate blocks were present and then large, carbonate outcrops were present at 541 m (14:59 UTC). Numerous species of demosponges, encrusting sponges, and hexactinellid glass sponges (cf. *Lefroyella decora*) colonized these hard substrates, with demosponges (Corallistidae) and encrusting sponges dominating, particularly the shallower depths (~450-300 m). In some places along the scarp, no sessile fauna were present whereas in other areas, sessile fauna were highly dense. Branching sponges (*Dictoplax sp.?*) were common throughout the dive as well, and at least visually, appeared morphologically similar to stylasterid corals. Stylasterids and other deepwater corals were present, however, relatively few were observed. A few individual cup corals, likely *Javania sp.*, were seen throughout the course of the dive. An unknown octocoral (?Chrysogorgiidae), plexaurids, and whip-like and feather-like antipatharians were observed attached to rock boulders and outcrops. Notably, at 16:33 UTC (493 m depth), several colonies of gold coral (Zoanthidae) were observed and at 20:05 UTC (307 m depth) several scleractinian corals (?*Madrepora sp.*) were observed colonizing an undercut in a large carbonate outcrop.

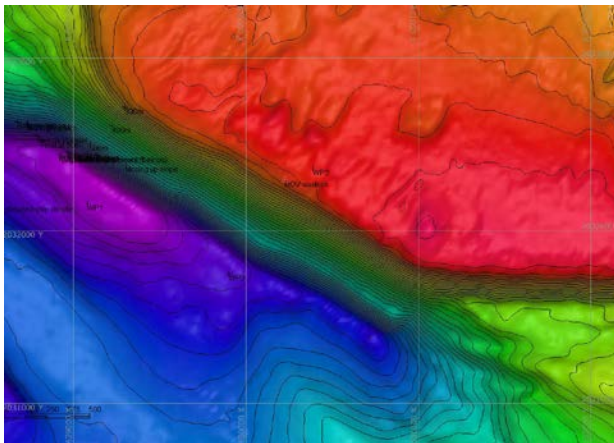
Fishes

Thirteen fish species were seen during the dive. At 11:44 UTC, depth 606 m, an unidentified fish with mottling coloration (Ophidiidae?) was hiding under a live sponge. At the base of the large carbonate outcrops, other fishes observed included the beardfish *Polymixia nobilis*, ocean bass ?*Synagrops sp.*, scorpionfish cf. *Phenacoscorpius nebris*, greeneye *Chlorophthalmus agassizi*, and deepwater cardinalfish *Epigonus spp.* Along the portion of the dive that traversed high-relief, carbonate outcrops, the D2 observed numerous *Epigonus spp.*, as well as a dogfish shark *Squalus cubensis* and the gaper *Chaunax pictus*. Notably, it appeared that the gaper changed color (from orange to more yellow) as it was disturbed by the ROV. At a depth of approximately 400 m, the fish assemblage appeared to shift. From 400-300 m depth, the D2 observed a soldierfish *Ostichthys trachypoma*, temperate slopebasses *Symphysanodon ?berryi*, a yet to be described species of wrasse *Polylepion sp.* A moray eel *Gymnothorax maderensis*, and the longfin bulleye *Cookeolus japonicus*.

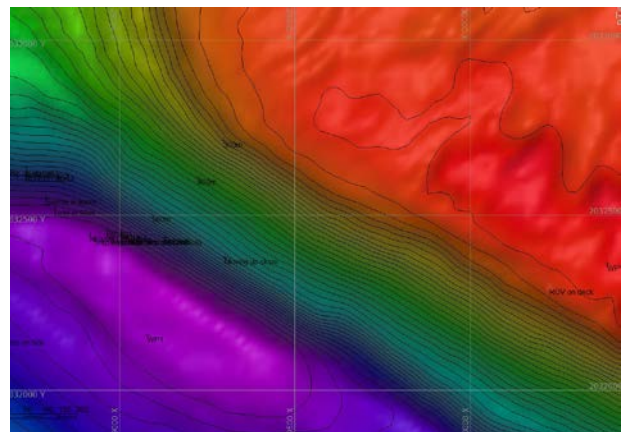
Other notable observations:

Barnacle crinoids (*Holopus sp.*) were common throughout the dive. On the unknown ?Chrysogorgiidae octocoral, an unknown chirostylid squat lobster was observed. A ~10 cm nemertine (ribbon worm) was seen moving along the seafloor at 13:23 UTC. Numerous species of asteroid sea stars were observed, with two notable feeding observations: *Henricia sp.* (14:26:57 UTC, 587 m) and *Plinthaster dentatus* (15:54 UTC, 524 m) feeding on a sponge.

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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