

Okeanos Explorer ROV Dive Summary

Dive Information			
Dive Map			
Site Name	Tutuila (Nautilus dive)		
ROV Lead(s)	Karl McLetchie		
Expedition Coordinator(s) / Mapping Lead	Kelley Elliott / Meme Lobecker		
Science Team Lead(s)	Santiago Herrera (Biology) and Matt Jackson (Geology)		
General Area Descriptor	American Samoa (south side of Tutuila, near Pago Pago harbor)		
ROV Dive Name			
Cruise	EX1702		
Leg			
Dive Number	13		
Equipment Deployed			
ROV	Deep Discoverer (D2)		
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 5
	<input checked="" type="checkbox"/> LSS	<input checked="" type="checkbox"/> ORP	

<p>Purpose of the Dive</p>	<p>This dive sought to characterize a population of protected Nautili that has been observed using baited cameras in the Taena Bank area, at depths between 300 and 400 meters, near the harbor of Pago Pago, American Samoa. This is also the depth range for bottomfish and precious corals. From a geologic standpoint, this dive presented an important opportunity to sample the shallow volcanic stratigraphy of Tutuila island.</p>
<p>Description of the Dive</p>	<p>The dive track was designed to target two steep faces, one shallow and one deeper, on the shallow portion of the south side of Tutuila: the upper portion of the deeper wall is separated from the lower portion of a shallower wall by a gently sloping bench. The bench is likely to be a submerged sea terrace. The ROV dive was planned to land midway up on the deeper wall, then move up the deeper wall and transit across the less steep terrain to the base of the shallower face. However due to a potential discrepancy with the bathymetry, the ROV landed on the less steep terrain. Decision was made to continue upslope from here. The ROV moved up the shallower face to a depth of 250 m, and then moved laterally to the east to observe potential nautilus habitats at 250 m water depth.</p> <p>The following geological description provides a chronological summary of the major geological features, or changes in the geology of the ocean floor, over the course of the dive:</p> <p>20:58:00 UTC. The ROV arrived on bottom. It is clear that the steep wall of the first, deeper face was missed completely, and the ROV instead landed on the flat bench that is located just north of the deeper wall. Large (1 or 2 m in diameter) boulders are the first objects in the field view; some are lighter in color (and are likely carbonate in composition) while other boulders are darker in color (and may be basaltic in composition, but may also be carbonates covered with a bit of ferromanganese). Light colored sediment covers the field of view (60%, or so, of the field of view) and dominates the space between boulders. It is notable that very little, if any, ferromanganese is observed to cover the surfaces in the field of view, and this likely relates to the young age (and perhaps the shallow depth) of the outcropping rocks; the lack of ferromanganese coating facilitates observation of the carbonate substrate.</p> <p>21:10:51. Large blocks continue to be visible on an otherwise flat surface that is covered with light-colored sediment; ripples are visible in the sediment. As in the first observation, sediment cover is extensive on the flat surfaces between boulders.</p> <p>21:22:00. A large (several meters in diameter) boulder lies on the light colored sediment; this is notable, as the block does not seem to be attached to the substrate, and was thus transported (rolled) a significant distance (100's of meters) across the flat bench. The boulder may have detached from the nearby (shallower) wall.</p> <p>21:28:55. Carbonate rubble (pebbles and cobbles) is observed around the base of a large (several meters in diameter) block, and may relate to recent breakage. The block (and subsequent blocks observed) is clearly carbonate in origin and it appears to be composed of debris from a former reef. The boulder that the rubble broke from appears to host significant reef-related fossils.</p> <p>21:50:00. Large carbonate blocks continue to dominate the landscape, with light-colored sediments between the carbonate blocks.</p> <p>21:50:00 until 23:18:00. Both science leads participated in an onshore outreach activity, taking questions from Samoan officials regarding the science goals of the</p>



expedition. During this time, the ROV transited across the gently sloping bench—likely a submerged reef—between the deeper and shallower faces.

23:19:00. The onshore scientists found an unidentified coral species and spent ~10 minutes collecting it before moving on.

23:32:00. A vertical wall has come into view, and this appears to be the shallower of the two faces that were targeted for this dive. The wall is composed of carbonate. The ROV began moving up the steep wall.

00:12:13. The ROV is still moving up the steep wall. Carbonate is the dominant (if the only) lithology in the field of view.

00:17:34. Fragments of carbonate, cobbles and carbonate sand, have accumulated in a gully in the face of the steep wall.

00:24:10. A rubble pile is clear at the base of a face. The largest boulder lies on top of a beer can (the paint on the can looks extremely fresh), indicating that a small landslide (which generated the rubble pile) occurred recently (<50 years).

00:46:51. As the ROV moves upslope, a pile of rubble, including pebbles and clasts, lies at the base of a steep face. All lithologies are carbonate, and likely to be the remains of a submarine reef.

00:50:48. The ROV continues moving up the steep face, and is likely composed of carbonate.

01:02:26. A scleractinia “cup coral” is observed to be attached to the steep wall. A few meters above, a shallow ledge comes into view that is host to carbonate rubble, which likely fell from the steep face above. The ledge provides a natural habitat for fish and coral. As the dive continues, these narrow ledges are found along the steep face and host sediment, pebbles, cobbles and boulders that have fallen from above.

01:28:39. A spectacular overhanging ledge composed of reef debris has come into view.

01:35:52. A small cave feature was observed in the vertical carbonate wall. This is likely a dissolution feature, and is an ideal location for sessile organisms (as evidenced by the abundance of corals in the small cave). Moving laterally, a number of these concave features are observed along the steep wall.

01:41:38. The ROV has been at the target depth of 250 meters for the past 10 or 15 meters, and the decision was made to move east along the 250 meter contour. This is because the slope on the face is less steep toward the east than to the west.

02:03:26. The ROV is still moving eastward along the 250 m contour. The ROV just finished collecting a strange and completely unknown soft-bodied organism (the classification of which generated significant debate).

02:06:16. A scleractinia coral is observed to be hanging on the edge of the near-vertical carbonate wall. Zooming out, the entire field of view is a sheer face composed of carbonate.

02:20:58. The ROV continues to move laterally (to the east) along a steep rock face. A small rubble pile serves as the habitat for a community. On the cliff face there is frequent sediment on narrow (cm lengthscale) ledges.

02:42:04. The ROV continues the lateral traverse of the steep wall,

02:44:18. The steep carbonate face shows some larger overhangs that are host to large (1 to 2 m) carbonate boulders.

03:09:40. A live scleractinia coral (perhaps a second one is visible as well) comes into view.

03:10:00 to end of dive. The ROV moved laterally along the 250 meter contour until the ascent. The ROV then began to ascend up the steep wall to the surface: the wall became more distant, and then disappeared from the field of view, as the



ROV ascended. The steep wall continues to near the surface.

The biological perspective is as follows:

Reached seafloor at 21:01 454 m depth. Large outcropping boulders, heavy sedimentation, few sessile organisms on rocks, heaving particle load in water. Observed a couple of fishes near the landed site. Encountered significant current coming from N-NE.

Observed an *Enallopsamia* scleractinian (~10cm wide) on outcrop, also an anemone, squat lobster, urchins on sediment. Saw fishes in the family Acropomatidae, a flat fish, squat lobsters (likely making burrows), and a sea robin. Encountered some outcrops with *Acanthogorgia* octocorals, cup corals, and parapagurid hermit crabs 21:23 441m. Moved over sediment, observed an urchin, encountered a large outcrop with vertical wall at 21:25 435m. Encountered a couple of different species of small scleractinian corals *Madrepora?* (white), *Enallopsamia?* (yellow), 21:29 430m. Saw a large, and several small, cup corals with yellow base.

Observed squat lobsters in holes, a couple of colonies of *Dendrophyllia?* with squat lobster associates on large carbonate outcrop, a group cardinal fishes, and a handful of cup corals (same morph as Rose and Ta'u) 21:33 426m. Observed a stalked crinoid at 21:41 417 m, as well as cup corals and a goniasterid seastar, and a yellow small urchin (same morph as Ta'U). Continued over a gentle slope terrain that was heavily sedimented, where we observed some urchins as well as beer cans. Found a large outcrop with cup corals, squat lobsters small *Enallopsamia?* and *Madrepora?* colonies 21:53 412m. Commencing live event.

Live event over, collected *Helicoprino* at 23:20 End
EX1702_DIVE13_SPEC01BIO. Encountered vertical wall at 330m 23:27, cup coral. Collected *Helicoprino* at 23:20. Observing a Nautilus egg?, several black single octocoral/crinoid polyps. Several *Stichopathes* whip red colonies 00:16 305m. Amberjack following the ROV 00:25 295m. *Bolocera* bottom fish at 00:31 292 m. Several small fan colonies and smaller yellow colonies of scleractinians at 00:42 286m. Observed a Goniasterid seastar.

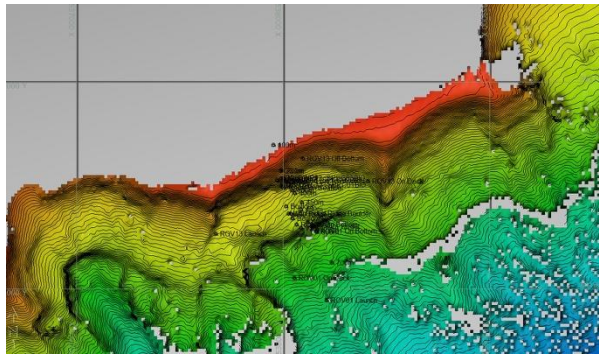
At 00:48 281m ROV encountered a fishing line. Further upslope, encountered yellow comatulid crinoid with curling arms. Saw a white whip black coral with curling distal end attached to the vertical wall at 01:02 264m. Observed a few more white whip black corals further upslope. Collected shallow water brisingid on whip coral from the family elliselidae (20170301 01:22:56; D2_DIVE13_SPEC02BIO; 257 m).

Observed several white plexaurid seafans with associate squat lobsters, as well as more whip elliseids. Started moving laterally to the east, encountered and collected unusual *Alicia* anemone (20170301 02:01:17; D2_DIVE13_SPEC03BIO; 258 m).

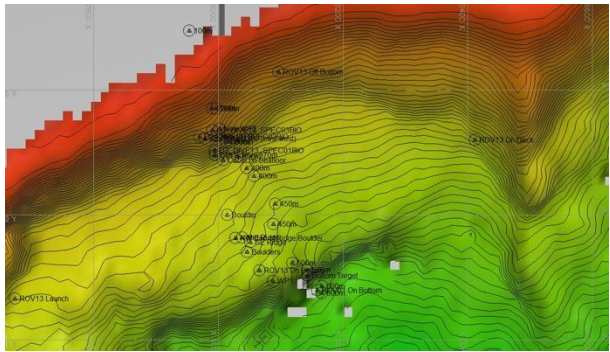
Found more white plexaurid seafans as well as an Elliselidae (the same morph collected with the brisingid) at 02:06 255m. Imaged a sponge crab 02:24 256m. Saw a hammerhead shark on Serios cam at 02:28 253m. Found more long line and

several pieces of cloth perhaps palu (bait bags), in addition to beer cans (260m 02:51). Encountered barren carbonate walls of higher rugosity. Observed another white whip black coral and whip ellisid octocoral with ophiuroid associate 03:15 250m. Commenced recovery ascent facing the wall at 03:19.

Overall Map of the ROV Dive Area



Close-up Map of Main Dive Site

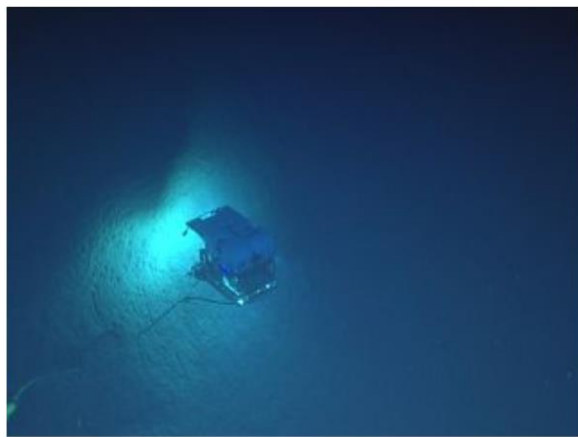


Representative Photos of the Dive



EX1702_IMG_20170228T214624Z_ROVHD.jpg

Urchin on gently sloping bench with heavy sediment cover.




EX1702_IMG_20170301T020521Z_CPHD.jpg


D2 facing the near vertical carbonate wall at the 260-250 m depth contour.

Samples Collected

Sample

Sample ID	D2_DIVE13_SPEC01BIO	 <p>EX1702_IMG_20170228T232219Z_ROVHD.jpg</p>
Date (UTC)	20170228	
Time (UTC)	23:24:10	
Depth (m)	345.0267	
Temperature (°C)	13.67640	
Field ID(s)	Primnoid Coral	
Comments		

Sample

Sample ID	D2_DIVE13_SPEC02BIO	 <p>EX1702_IMG_20170301T012030Z_ROVHD.jpg</p>
Date (UTC)	20170301	
Time (UTC)	01:22:56	
Depth (m)	256.8743	
Temperature (°C)	18.38179	
Field ID(s)	Brisingid on octocoral	
Comments		

Sample	
Sample ID	D2_DIVE13_SPEC03BIO
Date (UTC)	20170301
Time (UTC)	02:01:17
Depth (m)	257.9701
Temperature (° C)	18.67550
Field ID(s)	<i>Alicia</i>
Comments	

EX1702_IMG_20170301T020016Z_ROVHD.jpg

Please direct inquiries to:

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