

## Okeanos Explorer ROV Dive Summary

Dive Information			
Dive Map			
Site Name	South coast of Ta'u Island, Marine Sanctuary (500 - 350 m water depth)		
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	Samoa region, South coast of Ta'u (Ta'u Unit)		
ROV Dive Name			
Cruise	EX1702		
Leg			
Dive Number	02		
Equipment Deployed			
ROV	Deep Discoverer (D2)		
Camera Platform	Seirios		
ROV Measurements	<input checked="" type="checkbox"/> CTD	<input checked="" type="checkbox"/> LSS	<input checked="" type="checkbox"/> ORP
	<input checked="" type="checkbox"/> Scanning Sonar	<input checked="" type="checkbox"/> Depth	<input checked="" type="checkbox"/> Altitude
	<input checked="" type="checkbox"/> Pitch	<input checked="" type="checkbox"/> USBL Position	<input checked="" type="checkbox"/> Heading
	<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 type="checkbox"/>
Equipment Malfunctions	Port manipulator not onboard		
ROV Dive Summary (from processed ROV data)	In Water:	2017-02-17T19:15:04.058000 14°, 17.736' S ; 169°, 30.056' W	
	Out Water:	2017-02-18T03:38:48.544000 14°, 17.406' S ; 169°, 29.724' W	
	Off Bottom:	2017-02-18T03:23:21.648000 14°, 17.452' S ; 169°, 29.914' W	
	On Bottom:	2017-02-17T19:53:43.320000 14°, 17.686' S ; 169°, 29.924' W	
	Dive duration:	8:23:44	
	Bottom Time:	7:29:38	
	Max. depth:	504.9 m	
Special Notes			
Scientists Involved (please provide name, location, affiliation, email)	Santiago Herrera, Lehigh University Matthew Jackson, UC Santa Barbara Chris Kelley, UH Manoa Natalie Summers, UH Manoa Bruce Mundy, NOAA PIFSC Joe O'Malley, NOAA PIFSC Erik Cordes, Temple University Peter Auster, UConn) Chris Mah, Smithsonian Tina Moldostova, PP SOI/RAS Diva Amon, UH Manoa		
Purpose of the Dive	The goal of this dive is to generate baseline information on deep sea habitats and biological communities to better understand their diversity and distribution and support management needs of the National Marine Sanctuary of American Samoa, and scientific interests. The dive will begin around 500 m on the southern face of the ridge shown in the bathymetry map. We will climb on the ridge and then continue moving upslope along the crest of the ridge reaching the end of the dive. The dive will begin in precious coral depths and at the lower limit of the bottomfish fishery, then move up into more of the prime depths for bottomfish. A submersible dive was made on the north side of the island in 2005. New species/records of organisms and basalt rock samples from a new dive on the south side of the island may be useful to trace the history of the island.		



Description of the Dive

The dive track is on the large ridge (rift zone) extending away from the southwest side of Ta'u. This particular dive track was designed start on the side of the ridge, then move west up the side of the ridge to the ridge crest. Upon reaching the ridge crest, the ROV would turn and head northeast, following the ridge crest. The depth range of the dive was optimized to arrive just outside of the Ta'u Unit of the National Marine Sanctuary and enter the sanctuary from the southeast over the course of the dive.

**Geology perspective**

The first view of the ocean floor revealed a relatively flat area. The geology in the field of view consisted entirely of small (1-5 cm clasts) of vesicular basalt, possibly scoria or rubble; all of this substrate was lightly dusted with a light-colored sediment. As the ROV moved forward, several larger cobbles appeared, scattered among the small scoria clasts; one of these cobbles (a ~12 cm loose rock) was the first geologic sample (A shrimp kept circling the cobble as we collected it). At a distance of 70 meters Along Dive Track from "On Bottom" Location (ADTOBL), larger basaltic clasts and boulders (up to 20 or 30 cm) became more abundant, all having the appearance of basalt with relatively little weathering (like due to the fact that all dated rocks from Ta'u are <70,000 years in age). At 110 m ADTOBL, the substrate is no longer clearly a scoria. Instead, the substrate may be pillow tops coated with a thin veneer (<1 cm) of sediment, and Chris Kelley even suggested that this might be a carbonate substrate with occasional basalt clasts on the surface. At 160 m ADTOBL, only 10 meters below the ridge crest, we encountered a abundant clasts and small boulders (<40 cm) of basaltic composition covering the entire field of view. All clasts and boulders were angular and dark in color, except for a single light colored, rounded boulder which appeared to be a basaltic rocks partially covered in carbonate (the rounding may have occurred in a shallow environment and the boulder rolled downhill). On the ridge crest at 175 m ADTOBL, rocks with ropy pillow textures appeared in outcrops, and a large boulder (the largest identified thus far, at 2x4x3 m) appear in the field of view, with another even larger ~5 m further on. A loose basaltic clast near these large boulder outcrops was collected (the second geology sample of this dive), and the clast appeared to have been originally attached to the large boulder outcrop. At 250 m ADTOBL, the substrate was quite similar to the location where the ROV first arrived on bottom, and the area was relatively flat and devoid of larger rocks. At this juncture, Jasper Konter suggested that the geology that we had observed over > 200 m was broadly consistent with being an explosive volcanic deposit, with angular basaltic clasts and boulders (mostly highly vesicular) randomly distributed among a rubble consisting of small (<2 cm) sociaceous rubble. To test this hypothesis, the ROV pilot bumped the ROV into the sustrate (which is similar to the substrate that had been observed over much of the divetrack) away from large clasts and boulders; the substrate was soft and comprised largely of reddish clay and hosted abundant pebbles of scoria, reminiscent of altered volcanic tephra in Iceland. Later in the dive (at 00:07:35 UTC), a new substrate was encountered that was relatively common for the rest of the dive: It is comprised of relatively flat and solid material that does not have the appearance of basalt, but instead looks like volcanic sediment that has been welded together with a chemical precipitate "cement" (possibly carbonate); this substrate breaks into large (up to 1 or 2 meters) flat blocks with linear edges, and the blocks are only 5-10 cm thick; some linear features between the blocks have the appearance of gulleys that are perhaps 10 to 20 cm deep and equally wide.



This substrate continues until at least 1:35:00 UTC. At 02:17:00, the substrate is similar to that which was exposed when the ROV intentionally bumped into seafloor, and a thin blank of light-colored sediment partially covers the substrate; basaltic clasts and boulders (and possible outcrops) appear in the field of view. Near the end of the dive, a loose boulder near (and likely originally attached to) a basaltic outcrop was sampled, and this was the third geologic sample of the dive.

### Biology perspective

ROV landed on a relatively flat area at 500m on the south face of the ridge. Bottom covered by cobbled rocks, observed several stripped squat lobsters, several large-claws pagurid crabs with a zoanthid symbionts, and a few cup corals. Also observed robin fish, a few shrimp with large eyes, and a snake eel. Red/purple urchins were abundant. Also observed a chrysogorgid coral (*Chrysogorgia*), and a toad fish (*Chaunax*) with unusual coloration (green dorsal red ventral). Collected a basalt rock sample.

As we moved north to begin climbing on top of the ridge we began observing larger basalt boulders, many sponges, ophiuroids, different fish species, sea stars (including Goniasterids [cookie cutter], and *Cermimaster*). We observed a small *Paragorgia* bubblegum coral, cup corals, a *Bathypates* black coral, and 3 morphospecies of comatulid crinoids: a pale crinoid, stripped crinoid, and a white (curly crinoid). Also a stripped ophiuroid with red oral disk with with dots (reminiscent of the mushroom *Amanita muscaria*).

As we reached WP2 on top of the ridge we observed and collected a samples from a Primnoid octocoral with a peculiar folded-fan shape (had snapping shrimp and tiny yellow squat lobster as associates). Also observed a pencil urchin potentially feeding on spider crab. Here we observed a fourth kind of crinoid purple/white. There was a great abundance of crevices in the rocks, with MANY ophiuroids living in them. Great abundance of the Red/purple urchins as a well. ECHINODERM WONDERLAND. Observed larger outcrops on top of ridge. 428m

Moved along the top of the ridge. Met stronger currents moving from NW. Collected second basalt. Many demosponges found growing in ribbon patterns. Observed green eyed fishes, a *Chaunax* specimen (same morphospecies as earlier). Observed a yellow stalked crinoid at 420m. The red/violet urchins were abundant in this area. Also observed cardinal fishes living in cracks. Much less abundance of suspension feeders than at shallower depths.

At 400-389m we observed very low abundance of megafauna. Substrate appeared subdivided into planar pieces.

Found an increase in megafaunal abundance at 388m. Several yellow stalked crinoids. Collected *Anthomastus* mushroom octocoral. During collection we observed shimmering water from thermocline fluctuations (plus or minus 1C). Observed more stalked crinoids and a new (for the dive) morph white cup corals. Encountered several yellow comatulid crinoids (new morphotype) and greater abundance of *Anthomastus*.

Very abundant *Anthomastus*, yellow crinoids at 353m, as well as several half living *Enallopsamia/Dendrophyllia* stony corals. Made first observation of snapper. A



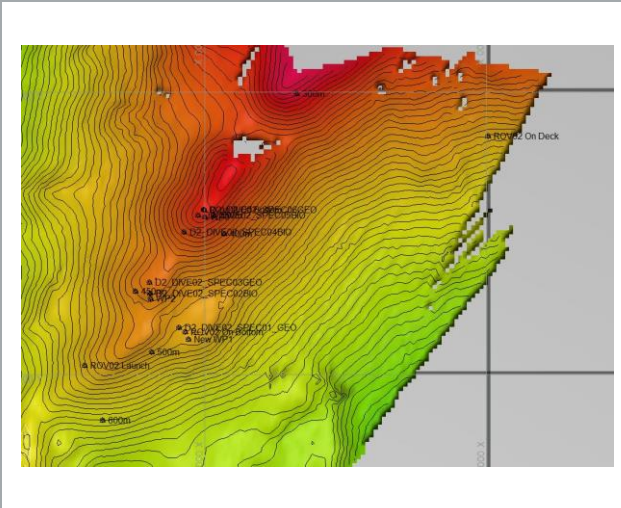
couple of *Chrysogorgia*, many brown cones sponges? (resembling earlier decay stages of 'spiderwebs' we observed earlier). Several seabass, and many commercially important fishes.

Reached the top of flat terrace on WP3. Observed a new kind of stalked crinoid (sunflower morph, with 'legs'). Observed many 'fried egg' anemones. Also an abundance of *Enallopsamia/Dendrophyllia* half living colonies, with colonization from zoanths. Collected specimen at DEPTH: 346 m TEMP : 13.15784C, DO : 3.76798 mg/L.

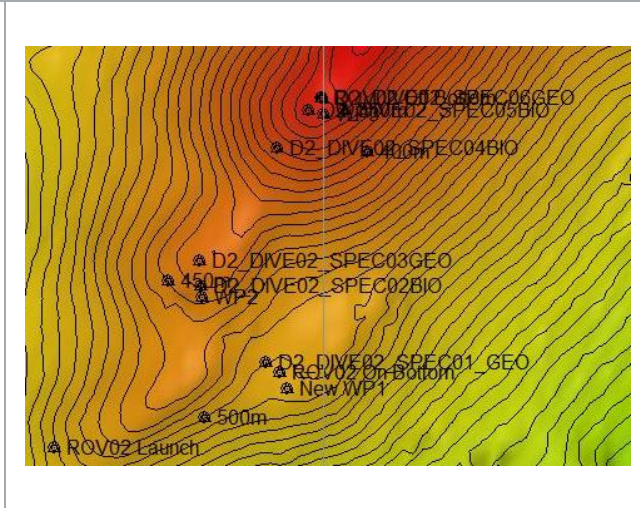
Incredible abundance of dead skeletons of '*Chrysogorgia*'? black corals? overgrown by what seemed to be hydrozoans (After on-board examination we did not find inner '*Chrysogorgia*'? skeletons). Also several stalks overgrown with Zoanths. These two biological species were carpeting seafloor at DEPTH : 343.9526m, TEMP : 13.31684C, DO : 3.80297 mg/L.

Sampled a basalt clast at the end of the dive. Also observe an abundance of anemones and mushroom corals *Anthomastus*.

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



Screen grab of hypack display providing an overview of the actual dive track and targets from dive.

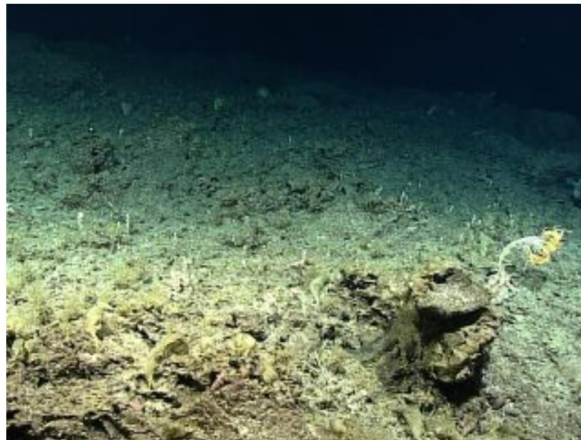


Zoomed in view of hypack screen grab showing dive track, waypoints and targets dropped during the dive.

Representative Photos of the Dive



EX1702\_IMG\_20170217T205247Z\_ROVHD.jpg



EX1702\_IMG\_20170218T022813Z\_ROVHD.jpg

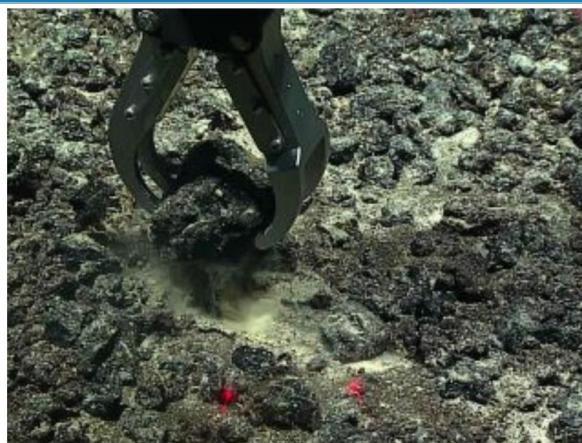
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**Samples Collected**

**Sample**

Sample ID	D2_DIVE02_SPEC01GEO
Date (UTC)	20170217
Time (UTC)	20:20:29
Depth (m)	503.6627
Temperature (°C)	8.40650
Field ID(s)	Basalt clast



EX1702\_IMG\_20170217T201834Z\_ROVHD.jpg

Comments Two barnacles and a cup coral were found associated with this rock.



**Sample**



Sample ID	D2_DIVE02_SPEC02BIO
Date (UTC)	20170217
Time (UTC)	22:04:41
Depth (m)	448.1645
Temperature (°C)	10.06324
Field ID(s)	Primnoidae



EX1702\_IMG\_20170217T220351Z\_PTMAN\_CORO.jpg



Comments	A squat lobster was found associated with the coral	
<b>Sample</b>		
Sample ID	D2_DIVE02_SPEC03GEO	 <p>EX1702_IMG_20170217T224723Z_ROVHD.jpg</p>
Date (UTC)	20170217	
Time (UTC)	22:47:23	
Depth (m)	433.9793	
Temperature ( ° C)	10.35211	
Field ID(s)	Basalt sample	
Comments	A shrimp, squat lobster, ophiuroids, a snail, and a sponge were found associated with the rock	
<b>Sample</b>		
Sample ID	D2_DIVE02_SPEC04BIO	 <p>EX1702_IMG_20170218T003418Z_ROVHD.jpg</p>
Date (UTC)	20170218	
Time (UTC)	00:54:52	
Depth (m)	388.9632	
Temperature ( ° C)	11.48788	
Field ID(s)	<i>Anthomastus</i>	
Comments		

Sample	
Sample ID	D2_DIVE02_SPEC05BIO
Date (UTC)	20170218
Time (UTC)	02:54:31
Depth (m)	345.3540
Temperature ( ° C)	13.22594
Field ID(s)	<i>Dendrophyllia</i>
Comments	Hydroids, zooantids, a comatulid crinoid, two squat lobsters, barnacles and an ophiuroid were found associated with the coral
	
EX1702_IMG_20170218T024816Z_ROVHD.jpg	
Sample	
Sample ID	D2_DIVE02_SPEC06GEO
Date (UTC)	20170218
Time (UTC)	03:16:08
Depth (m)	343.9248
Temperature ( ° C)	13.15128
Field ID(s)	Basalt clast
Comments	Hydroids, zooantids, cup coral, aplacophorans, ophiuroids were found associated with the rock
	
EX1702_IMG_20170218T031347Z_ROVHD.jpg	

**Please direct inquiries to:**

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