

## Okeanos Explorer ROV Dive Summary

Dive Information			
Dive Map			
Site Name	"Governor Lolo" Seamount (formerly referenced as "Seamount D")		
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	Eastern American Samoa EEZ		
ROV Dive Name			
Cruise	EX1702		
Leg			
Dive Number	11		
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	
Equipment Malfunctions			
ROV Dive Summary (from processed ROV data)	<p>In Water: 2017-02-26T20:12:21.083000 15°, 44.198' S ; 167°, 15.971' W</p> <p>Out Water: 2017-02-27T03:40:42.741000 15°, 44.101' S ; 167°, 15.414' W</p> <p>Off Bottom: 2017-02-27T01:58:15.047000 15°, 44.089' S ; 167°, 15.828' W</p> <p>On Bottom: 2017-02-26T21:51:19.408000 15°, 43.981' S ; 167°, 15.878' W</p> <p>Dive duration: 7:28:21</p> <p>Bottom Time: 4:6:55</p> <p>Max. depth: 3005.3 m</p>		
Special Notes			
Scientists Involved (please provide name, location, affiliation, email)	<p>Asako Matsumoto, PERC, Chiba Institute of Technology, Japan  Christopher Kelley, University of Hawaii  Matthew Jackson, UC Santa Barbara  Santiago Herrera, Lehigh University  Tara Harmer Luke, Stockton University  Timothy Shank, Woods Hole Oceanographic Institution  Tina Molodtsova, P.P. Shirshov Institute of Oceanology RAS  Kevin Kocot, The University of Alabama  Les Watling, University of Hawaii  Matthias Falk, Lehigh University  Scott France, University of Louisiana  Steve Auscavitch, Temple University</p>		



<p>Purpose of the Dive</p>	<p>The goal of this dive was to generate baseline information on geology and geochemistry of this unexplored (and largely unmapped) seamount. There was also significant interest in understanding the deep sea habitats and biological communities on the seamount to better understand their diversity and distribution. American Samoa’s Division of Marine and Wildlife Resources have expressed an interest in the seamounts in this region as long-line fishing activities are conducted in the area.</p> <p>From a geological standpoint, this seamount may be an older seamount linked to the Cook-Austral Islands, not Samoa. Samples from this seamount are key in defining the Cook-Austral hotspot tracks back in time, and as such an age on a volcanic rock is needed from this seamount. Without an age, it is not possible to truly define plate motion for the time frame represented by this volcano.</p> <p>From the biological perspective this dive had the potential to provide new depth records for several species as well the discovery of new species. Very little work has been done in the Central Pacific at these depths on seamounts. We aim to collect information that will inform the biogeographic identity of the communities at abyssal depths in this region.</p>
<p>Description of the Dive</p>	<p><i>NOTE: This dive site was originally termed “Seamount D” and has since been informally named “Governor Lolo” seamount.</i></p> <p>“Governor Lolo” seamount lies in the eastern region of the Samoan EEZ. Seamounts located this far east in the Samoan EEZ have never been sampled prior to this expedition. The first high-resolution bathymetry for this seamount was generated during this expedition. The bathymetry reveals that the seamount has a conical shape with a prominent ridge extending to the northeast. The base of the volcano is composed of “pancake” structures like those observed on “Utu” seamount to the north; however, the pancake structures may relate to a rejuvenated stage of volcanism, and these structures were avoided when creating the dive plan. One hypothesis is that “Governor Lolo” seamount is an ancient volcano that formed by a different, non-Samoan hotspot. This hypothesis can be tested by obtaining basaltic samples to obtain age-dates and geochemical data.</p> <p>The dive track was designed to target the northern side of the volcanic structure. A long, steep feature was chosen to maximize rock exposure to enhance the probability of encountering rocks along the dive track.</p> <p><b>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:</b></p> <p>21:50:00 UTC. The ROV arrived on bottom. A FE (ferromanganese encrusted) flow is visible in the upper right of the field of view; FE boulders and cobbles populate the rest of the field of view, with light-colored sediment filling in the region between the FE rocks. One of these rocks constituted the first geological sample of the expedition (an ~30 cm rock, placed in starboard rockbox):  <b>D2_DIVE11_SPEC01GEO</b></p> <p>22:00:04. FE outcrop coming into view with sponges; the outcrops fill the entire field of view. It may be a large (several meters in diameter) block, not attached to the seafloor, but it is difficult to tell with the perspective provided by the ROV. Sediment cover is &lt;5% on the surface of the outcrop.</p>



22:26:07. There is a steep rock face in front of the ROV. FE cobbles and boulders make up the lithologies at the base of the face; the Seirios view shows an overhanging ledge above the ROV.

22:38:48. The ROV is moving up on top of the overhanging outcrop, and with the 'zoomed out' perspective the outcrop appears to be constructed of pillow basalts. The block with the overhang does not seem to be attached to the substrate, and may have rolled down from above.

22:48:26. Large FE boulders (2 to 5 meters) dot the landscape. Sediment covers 60 to 70% of the field of view, and has ripples. A number of cobbles are in the view screen, and one (10 to 15 cm, long axis) has the appearance of being a pillow fragment. This became the second geological specimen of the dive. It fell out of the claw and rolled perhaps 4 or 5 meters, forcing the ROV to retreat and collect the sample again. It was placed in the port rock box: **D2\_DIVE11\_SPEC03GEO**.

23:02:21. The sediment cover on the slope (a slope of perhaps 30 degrees) is extensive, and is visible off to the left for 10's of meters as the ROV pans to the left; this is some of the most extensive sediment cover observed on the dive, with >80% sediment (the sediment is predominantly light colored, and appears to host numerous forams, but the sediment also hosts dark-colored fragments that may be fragments of basalt or FE material that has broken off and rolled downhill from above). The ROV continues to head upslope and encounters talus that includes FE boulders and cobbles.

23:13:44. The sediment cover continues to be extensive (perhaps 80% of surface cover) and is light colored. Large blocks visible as the ROV pans right and left, many of which are not attached to the substrate.

23:15:14. A large outcrop, perhaps 10's of meters long, with a FE overhang that is several meters high; FE cobbles lie scattered in sediment at the base of the overhang, and they likely fell off the overhang. The cobbles are likely to be basaltic in origin (and less likely to be sediment), as the cobbles cluster at the base of the ledge and there are no cobbles far from the ledge. One cobble was sampled, and is the third geological specimen of the dive. The rock is perhaps 15 to 20 cm long and is highly elongate (the rock was placed in the starboard rock box): **D2\_DIVE11\_SPEC04GEO**

23:32:51. A large outcrop several meters high, composed of FE pillows, comes into view. The ferromanganese cover appears to be very thick and developed, a testament to the old age of this seamount.

23:49:17. The ROV is moving up on top of a large FE outcrop. It is difficult to evaluate the composition of the outcrop. The ROV then transited back over the sediment, but the sediment cover is somewhat reduced (60% of field of view) and boulders and cobbles cover the rest of the field of view. One of the cobbles had a coral attached, and was sampled. The cobble is likely a pillow fragment. This rock became the fourth rock sample of the dive (and was placed in the port outboard biobox). **D2\_DIVE11\_SPEC05GEO**

00:13:57. Another FE block (5 or more meters wide) is observed that is not attached to the substrate; it is composed of what appear to be pillows, and cobble debris lies at the base of the boulder. A number of these block are observed as the dive progresses, and is consistent with the dive track going over a debris field that may have resulted from a land slide, or from continuous falling of blocks and boulders from points higher on the seamount.

00:17:48. The sediment cover continues to be extensive on the seafloor, covering >60% of the observed surfaces. The slope appears to be ~30 degrees along this portion of the dive track (and along much of the dive track thus far). FE boulders and cobbles dot the landscape, and likely detached from outcrops above and

rolled down hill and came to rest at their current locations.

00:42:44. A very large (10 meters or more, perhaps) outcrop of FE pillow basalts comes into view. There appears to be a basaltic dike crosscutting the outcrop.

00:52:33. As the ROV continues upslope, the sediment cover is reduced to <10%. A large (10's of meters) outcrop composed of pillow basalts comes into view, and grades into a rough textured surface, perhaps consisting of a volcanic breccia.

00:56:39. The volcanic breccia continues to be prevalent in the outcrops, and the sediment cover has increased to perhaps 50% of the field of view.

01:13:33. FE boulder and cobbles scattered throughout the sediment. The ROV is moving toward a larger outcrop with less sediment cover, but the composition of the outcrop appears to change from FE pillow basalts at the base to FE volcanic breccia near the top.

01:36:34. The ROV has been moving through scattered boulders and cobbles with sediment (covering perhaps 50 to 60% of the field of view) as the ROV heads upslope.

01:38:48. A large block (perhaps 5 to 10 meters long) has the appearance of having rolled downhill, and is composed of pillow basalts. As the ROV continues uphill, large FE blocks, boulders and cobble-sized rocks come into view, again with light-colored sediment between the rocks.

**The biological perspective is as follows:**

Observed many small fish at 350 m during descent. Arrived on seafloor at 21:49 2988m. Substrate was a mix of loose cobbles and sediment. Collected rock (20170226 21:58:11, D2\_DIVE11\_SPEC01GEO, 3003 m)

Observed several stalked demosponges as well as non-stalked glass sponges on large outcrops. Encountered slender isidid bamboo coral about 1 foot tall. Observed *Pleurogorgia* (black skeleton) with mysid shrimp and clear ophiuroid. Collected V shaped primnoid with venus flytrap associate (20170226 22:21:53; D2\_DIVE11\_SPEC02BIO; 2994 m). All these corals look similar to the ones at Utu shallow.

At 22:29 2994m observed stalked glass sponge (Bolosominae). Also observed whip primnoid (V branching at the base), small 'chrysogorgiid' (Phil Aldersdale thinks this may be a *Riisea* [Family Ellisellidae]) octocoral with sparse branching (perhaps a juvenile, not *Pleurogorgia*). Also an *Iridogorgia* with attached benthic ctenophore. Observed abundant small sponges on the edges of large detached boulders here. Also several small *Pleurogorgia*.

Collected rock at 22:57 2991m (20170226 22:58:04; D2\_DIVE10\_SPEC03GEO; 298 m). Collected another rock (20170226 23:28:44; D2\_DIVE11\_SPEC04GEO; 2971 m).

Observed couple of whip isidids and a sail holothurian feeding at 2984m 23:05. Another sparse-branching chrysogorgiid or *Riisea*, as well as a *Calophacus* glass sponge and an *Halosaur* fish (23:00 2975m).

Imaged an *Iridogorgia*, different bushy chrysogorgiid octocorals and stalked sponges at 2956m 23:50. Observed another whip bamboo at 00:01 2954m on a loose cobble. Collected whip bamboo with cobble attachment at 00:05 2954m (20170227 00:09:23; D2\_DIVE11\_SPEC05GEO; 2951 m).



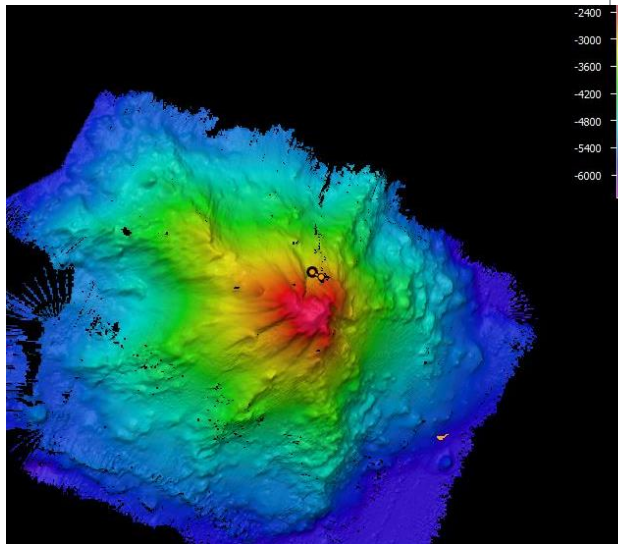
Encountered a diversity of terrain, sedimented slopes, large detached boulders, broken pillow basalts, angular cobbles. *Calophacus* glass sponge at 2944m 00:15. Found sediment area with ripples at 00:18 2944m, followed by larger boulder.

Observed and collected 'chrysogorgiid' octocoral with sparse branching. Phil Aldersdale thought *Riisea* (F. Ellisellidae Family), was very brittle when sampled, very unexpected. At this point it is unclear what this coral is (20170227 00:38:17; D2\_DIVE11\_SPEC06BIO; 2924 m).

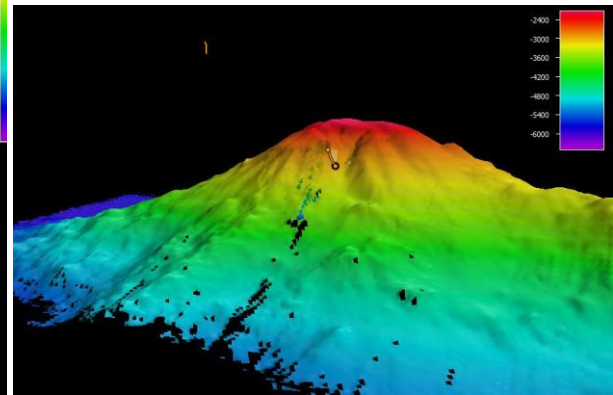
Observed a juvenile *Iridogorgia*, a *Callophacus* sponge, and a larger mystery octocoral at 00:53 2914m. Observed more small *Callophacus*, bamboo whips followed by sediment and breccia areas. Encountered large outcrops with stalked anemones, some alive, some dead. Found dead sponge skeletons with crinoids (including stalked developing stages), hydroids, barnacles, zoanths, sabellid worms, hydroids (~01:20, 2880m).

Observed a small isidid whip 2868m 01:35. Again at 01:39 2863 m, and also *Callophacus*. Not much fauna at 2857m 01:45. Collected demosponge (20170227 01:56:22; D2\_DIVE11\_SPEC07BIO; 2853m), ended dive immediately afterwards.

Overall Map of the ROV Dive Area



Close-up Map of Main Dive Site



Representative Photos of the Dive



EX1702\_IMG\_20170227T001224Z\_ROVHD.jpg

**Manganese nodules and broken off basalt cobbles among pockets of sediment**



EX1702\_IMG\_20170226T234322Z\_ROVHD.jpg

**Boulder outcrop colonized by small golden octocorals and glass sponges**

**Samples Collected**

**Sample**

Sample ID	D2_DIVE11_SPEC01GEO
Date (UTC)	20170226
Time (UTC)	21:58:11
Depth (m)	3002.9135
Temperature ( ° C)	1.73237
Field ID(s)	rock
Comments	



EX1702\_IMG\_20170226T215644Z\_ROVHD.jpg

**Sample**

Sample ID	D2_DIVE11_SPEC02BIO
Date (UTC)	20170226
Time (UTC)	22:21:53
Depth (m)	2994.3977
Temperature ( ° C)	1.78234



Field ID(s)	Primnoidae with venus flytrap anemone	
Comments		

### Sample

Sample ID	D2_DIVE10_SPEC03GEO	
Date (UTC)	20170226	
Time (UTC)	22:58:04	
Depth (m)	2989.0247	
Temperature ( ° C)	1.73864	
Field ID(s)	rock	
Comments		

EX1702\_IMG\_20170226T225659Z\_ROVHD.jpg

### Sample

Sample ID	D2_DIVE11_SPEC04GEO	
Date (UTC)	20170226	
Time (UTC)	23:28:44	
Depth (m)	2971.0581	
Temperature ( ° C)	1.73955	
Field ID(s)	Rock	

EX1702\_IMG\_20170226T232723Z\_ROVHD.jpg



Comments	
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**Sample**

Sample ID	D2_DIVE11_SPEC05GEO
Date (UTC)	20170227
Time (UTC)	00:09:23
Depth (m)	2951.4718
Temperature ( ° C)	1.73801
Field ID(s)	Rock with associate bamboo



EX1702\_IMG\_20170227T000056Z\_D2\_DIVE11\_SPEC05GEO\_04.j...


Comments	
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**Sample**

Sample ID	D2_DIVE11_SPEC06BIO
Date (UTC)	20170227
Time (UTC)	00:38:17
Depth (m)	2924.8879
Temperature ( ° C)	1.74656



EX1702\_IMG\_20170227T002648Z\_ROVHD.jpg

Comments		
<b>Sample</b>		
Sample ID	D2_DIVE11_SPEC07BIO	
Date (UTC)	20170227	
Time (UTC)	01:56:22	
Depth (m)	2852.6506	
Temperature ( ° C)	1.72205	
Field ID(s)	Demosponge	<small>EX1702_IMG_20170227T015323Z_ROVHD.jpg</small>
Comments		

**Please direct inquiries to:**

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