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Purpose of the Dive

In December 2014, NOAA PMEL discovered evidence for active hydrothermal venting near the summit of Eifuku based on CTD tows and casts. To the best of our knowledge, no ROV dives have ever been made on Eifuku Seamount. The goals of the dive were to explore for hydrothermal vents and characterize any local chemosynthetic animal communities as well as characterizing the geology.

Description of the Dive:

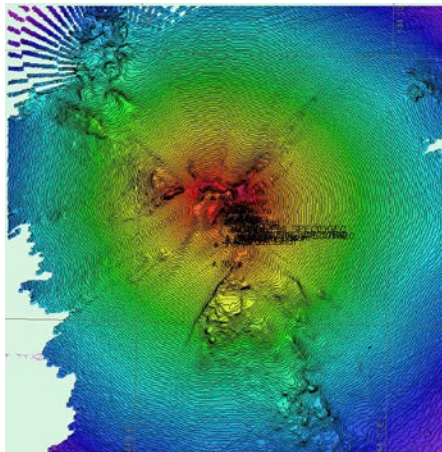
The dive started in a crater on the southeast side of Eifuku Seamount. The fish fauna were unexpectedly diverse—both on the bottom and in the water column. Several Randall’s snappers were observed as deep as 476 m—a depth range extension! This is a commercially important species, but not currently one of the CNMI managed species. There was also a very diverse octocoral fauna, including bamboo coral; it appeared to be different from any described genera, so a sample was collected (SPEC02GEO).

ROV *Deep Discoverer* (D2) rose up a central lava dome and saw many large jagged boulders with striated (grooved) surfaces. Near the top of the dome was a tall, striated lava spine leaning like the Tower of Pisa. On the northwest side of the crater D2 followed a ridge, likely centered on a dike exposed in the wall of the crater. Where exposed, it showed marked columnar jointing. Much of the ridge also had diffuse low-level hydrothermal activity with temperatures reaching about 16°C. Barnacles (typically the early settlers) were the dominant fauna. At least 2 species were observed; one was beautifully transparent. Nudibranchs, although rare, were also seen: *Kaloplacum* had yellow dots that might be bioluminescent—a feature that has never been seen before in this genus. At 424 m, the scientists were stumped over an unknown organism—was it an anemone or a mollusk? Upon closer inspection, we could see the feathery gills, inflated cerata, and two sensory rhinophores: another nudibranch.

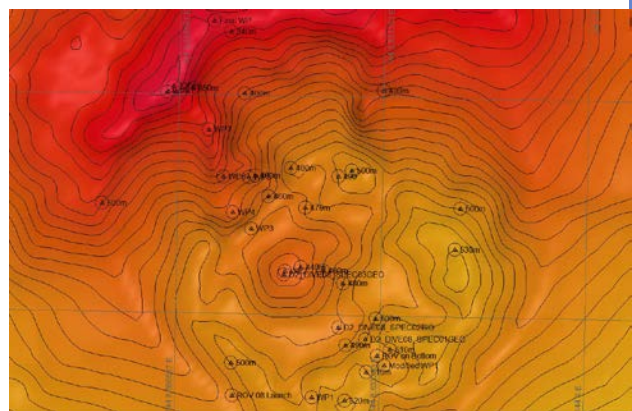
One region, about midway along the ridge, had an old hydrothermal chimney structure on it that was still producing some shimmering water, but no obvious active growth of chimney structures, and no characteristic vent fauna. Along the ridge, above this point, there were two small chimney structures about the size of wasp nests. Above these areas we saw outcrops of columnar jointed rock, and talus piles of blocks broken from the dike walls.

The echinoderms continued to fascinate as we observed that the many *Coronaster* seastars encountered had their arms piled in a clump. At one point, however, we saw some interesting behavior – there were two *Coronaster* individuals next to each other. We speculated if they were different species: one had its pedicellaria batteries extended; in the other, they may have been more relaxed. There were also beautiful long-spined urchins which had the tips of their spines flattened so that they can walk on the tips, and a unique anal sac so they don’t excrete from their test as other urchins do. The second biological sample (SPEC04BIO) was a sponge, the most dominant organism toward the top of the outcrop. At the top of the cone there were pillow lava fragments, and we ended the dive at a steep scarp, concave to the southeast and festoned with basket stars, accompanied by two large groupers.

Overall Map of ROV Dive Area



Close-up Map of Main Dive Site



Representative Photos of the Dive



This is the bottom of the tall lava structure, called a "spine" that formed as very viscous lava was squeezed out of the top of the lava "dome" in the center of the crater. The grooves in the surface of the spine form as the hot magma oozes out of sea floor at the top of the dome and gets "scratched" by the jagged and cooler, thus harder, rock around it.

Two *Coronaster* sea stars, one (on the left) with its pedicellaria batteries extended, and the other (on the right) with them relaxed.

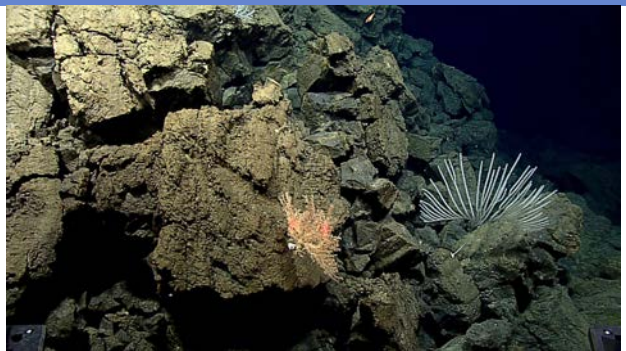
Samples Collected

Sample ID	SPEC01GEO
Date (UTC)	20160624
Time (UTC)	222448
Depth (m)	478.29
Temperature (°C)	10.82
Field ID(s)	ROCK





Comments: 16x9x9cm, glass groundmass, porphyritic with irregular vesicles.

Sample ID	SPEC02BIO
Date (UTC)	20160624
Time (UTC)	222714
Depth (m)	478.29
Temperature (°C)	10.6
Field ID(s)	BAMBOO CORAL



Comments

Sample ID	SPEC03GEO	
Date (UTC)	20160624	
Time (UTC)	232724	
Depth (m)	435.26	
Temperature (°C)	11.38	
Field ID(s)	ROCK/ IGNEOUS	
Comments	20x18x16cm, around the lava dome in the center of the crater. Massive lava with irregular vesicles, glassy groundmass.	
Sample ID	SPEC04BIO	
Date (UTC)	20160625	
Time (UTC)	035213	
Depth (m)	319.24	
Temperature (°C)	16.33	
Field ID(s)	DEMOSPONGE	
Comments	Preserved in 70% ethanol. Subsample preserved in 95% ethanol.	
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