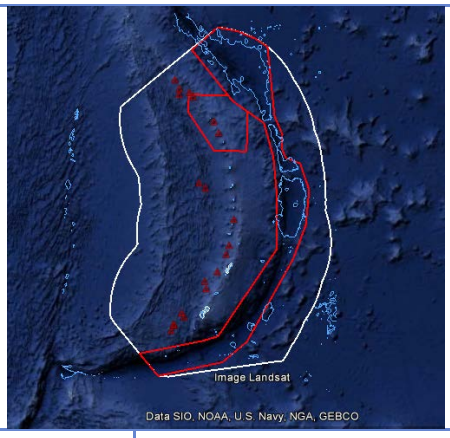
OKEANOS EXPLORER ROV DIVE SUMMARY

Site Name	Maug	
ROV Lead/Expedition Coordinators	Jim Newman/ Kasey Cantwell	
Science Team Leads	Shirley Pomponi (HBOI-FAU, CIOERT) Patty Fryer (UH)	
General Area Descriptor	Areas in and around the Marianas Trench Marine National Monument	

ROV Dive Name	Cruise	Leg	Dive Number
	EX1605	3	DIVE03
Equipment Deployed	ROV:	Deep Discoverer	
	Camera Platform:	Seirios	
ROV Measurements	☒ CTD	☒ Depth	☒ Altitude
	☒ Scanning Sonar	☒ USBL Position	☒ Heading
	☒ Pitch	☒ Roll	☒ HD Camera 1
	☒ HD Camera 2	☒ Low Res Cam 1	☒ Low Res Cam 2
	☒ Low Res Cam 3	☒ Low Res Cam 4	☒ Low Res Cam 2
Equipment Malfunctions			

ROV Dive Summary (From processed ROV data)

Dive Summary: EX1605L3_DIVE03

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In Water:	2016-06-19T22:26:29.910000 20°, 03.169' N ; 145°, 13.639' E
Out Water:	2016-06-20T06:31:02.268000 20°, 03.027' N ; 145°, 14.310' E
Off Bottom:	2016-06-20T04:33:55.945000 20°, 02.894' N ; 145°, 13.992' E
On Bottom:	2016-06-18T00:04:18.832000 15°, 47.677' N ; 146°, 00.785' E
Dive duration:	8:4:32
Bottom Time:	52:29:37
Max. depth:	532.7 m

Special Notes

Scientists Involved

Name	Institution	Email

(please provide name / location / affiliation / email)			
	Diva Amon	University of Hawaii	divaamon@hawaii.edu
	Amy Baco-Taylor	Florida State university	abacotaylor@fsu.edu
	Maryjo Brounce	California Institute of Technology	mbrounce@gps.caltech.edu
	David Burdick	University of Guam Marine Laboratory	burdickdr@hotmail.com
	Robert Carney	Louisiana State Univ	rcarne1@lsu.edu
	William Clancey	HBOI/IHMC	wclancey@ihmc.us
	Mike Ford	NOAA Fisheries	michael.ford@noaa.gov
	Scott France	University of Louisiana at Lafayette	france@louisiana.edu
	Patricia Fryer	Univ. Hawai'i at Mānoa (UHM)	pfryer@hawaii.edu
	Deborah Glickson	FAU-Harbor Branch Oceanographic Institute	dglickson@fau.edu
	Tara Harmer Luke	Stockton University	luket@stockton.edu
	Chris Kelley	University of Hawaii Manoa	ckelley@hawaii.edu
	Christopher Mah	National Museum of Natural History (Smithsonian)	brisinga@gmail.com, mahch@si.edu
	Asako Matsumoto	Chiba Institute of Technology (Chitech)	amatsu@gorgonian.jp
	Tina Molodtsova	P.P.Shirshov Institute of Oceanology RAS	tina@ocean.ru, tina.molodtsova@gmail.com
	Nicole Morgan	Florida State University	nmorgan@fsu.edu
	Bruce Mundy	NOAA NMFS PIFSC	bruce.mundy@noaa.gov
	Shirley Pomponi	FAU	spomponi@fau.edu
	Andrea Quattrini	Harvey Mudd College	aquattrini@g.hmc.edu
	Bob Stern	U TX Dallas	rjstern@utdallas.edu
	Hongpeng Tong	University of Hawaii	hongpeng@hawaii.edu
	Michael Vecchione	NMFS National Systematics Lab	vecchiom@si.edu
	Les Watling	University of Hawaii at Manoa	watling@hawaii.edu
	Chong Chen	JAMSTEC	cchen@jamstec.go.jp
	Amanda Netburn	NOAA OER	amanda.netburn@noaa.gov
	Matt Dornback	NCEI	matt.dornback@noaa.gov
	Charlie Wilkins	OMAO	charles.e.wilkins@noaa.gov
	Jason Meyer	Meyer Hydrographic	jason7seas@gmail.com
	Derek Sowers	OER	derek.sowers@noaa.gov

Purpose of the Dive

This dive explored a small ridge feature along the north side of the outer slopes of Maug crater. The dive addresses the CAPSTONE priority of exploring for high-density communities of deep-sea corals, in this case precious corals that are under the management of NOAA Fisheries. While the precious coral fishery is listed as a managed fishery in Guam and CNMI, no precious coral beds had been identified prior to EX1605L1 and only anecdotal accounts have been published of their presence in this region of the Pacific. This particular site was chosen to also survey bottom fish fishery habitat, which has also not been characterized in Guam/CNMI and determine if there is a depth and site overlap between the two fisheries.

The water column surrounding this island is protected, but we have not explored its volume. Previous shallow water surveys of this island chain by the Pacific Islands Fisheries Science Center (NOAA NMFS) suggested this island (along with Pagan to the south) had high levels of biological activity. We strive to discover what lives in the water column surrounding this island. The midwater of the oceans (500 m to our vehicle maximum of 6000 m) is the largest biome on Earth and unexplored. The quality of video obtained through *Deep Discoverer* II and the onboard instrumentation represent a unique capability to explore this part of the ocean.

Description of the Dive:

Today we dove on a ridge on the northwest flank of the Maug Islands. The overnight mapping showed that it was a short, curved ridge concave to the southwest. We landed on the side of a steep wall of what appeared to be massive lava. For most of the dive, however, it was difficult to tell what the ridge face was made of due to the high density of fauna. At one point we thought it could be composed of limestone, i.e., a ridge built by a reef, because on a close zoom the surface seemed to be weathered with holes in it. The cliff face looked more like a moss garden than a rock wall! Many of the rounded pits in the face of the wall were likely made by detachment of the bases of the abundant large fans of corals. We saw much the same type of rock throughout the dive. In some areas the rock was fractured or the surfaces of the ridge were irregular, with pockmarks and the edge of the ridge had some vertical faults creating ledges 2 or 3 m down-dropped to the southwest. Along the latter part of the ridge we did see some thin layers of fine volcaniclastics (ash or lapilli). At the end of the dive we saw ash layers with larger rounded boulders resting on them and pebble- to cobble-sized volcaniclastics. The ROV maneuvered over the southwest edge of the ridge at the end of the dive and examined the steep wall. It was made of layered volcaniclastics. The entire dive was dominated by biology, not geology, as this feature was on the slope of a volcano that has not erupted in historic time and has had plenty of time to be colonized by critters.

The biggest challenge of this dive was deciding which biological samples to collect as there were so many new and different organisms! At the beginning of the dive, we observed different species of bamboo corals, as well as the "gold coral" *Kulamanamana haumeaae*. There were deepwater cardinalfish, as well as *Coronaster* sp. sea stars. At 400 m, there was a different assemblage of organisms along the ledge of the ridge: bamboo and other octocorals were replaced by stalked crinoids. Several scorpaenids were observed, but the most obvious feature was the dead skeletons of the pseudocolonial coral, *Eguchipsammia* sp. We observed and collected a sponge that has never been reported from the Pacific (S*pongosorites ?siliquaria*); the sponge was common at this depth. There were abundant basketstars, crinoids, and unusual sea stars. In addition, there were numerous live slit shells and thousands of small knobby lithistid sponges. By far the most common invertebrate at 400 m and shallower was the bright yellow, pseudocolonial coral, *Eguchipsammia* sp. A "pregnant" female deepwater sand tiger shark spent a few minutes checking out D2 at 315 m.

At the conclusion of benthic exploration, ROV *Deep Discoverer* (D2) conducted a midwater transect to better understand life in the water column in this area. Our midwater transect was 210 m in length and lasted 1 hour with vehicle stops at each pelagic animal we found. It was thought that we might find deep pelagic fauna close to the deep scattering layer (DSL). Using the EK60 sonar at 18 kHz and 70 kHz we were able to identify a DSL and move the vehicles to that depth level (340 m). The bottom depth was approximately 452 m where we began our midwater transect, just 369 m south and west of the liftoff point from our benthic explorations described above.

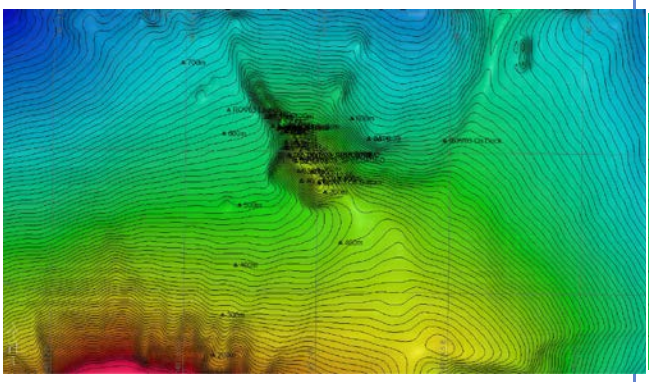
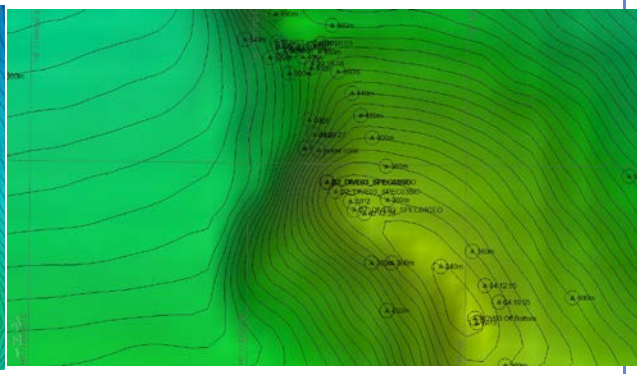
During our transect we documented numerous deep pelagic fauna of interest that takes a first step to characterize this unexplored realm. We found many chaetognaths (Phylum Chaetognatha). We saw several copepods, which are a primary prey for chaetognaths. The fact that we saw these copepods in great detail is a testament to excellent camera systems on *D2*. We observed three of the same type of Cestid ctenophores (Ctenophora: Tentaculata: Cestida) which have the common name 'Venus Girdle.' These unique ctenophores appear as a wide and transparent ribbon. We are hopeful that review of the dive video will allow species-level identification. We saw a solitary salp (most likely Tethys), a polychaete (Tomopteridae) and physonect and calycophoran siphonophores. Except for the copepod, the animals observed were transparent and with very little coloration.

We tested the use of the side arm lighting arrangement on *D2*, but found the light field when these lights were off to be more conducive to imaging nearly transparent animals. The 70 kHz frequency for the EK60 was excellent for finding the DSL, but the return was masked by the signal from Seirios and *D2* when they were positioned in the DSL. This masking makes it difficult to detect if the DSL dissipated from the presence of the ROV or if it remained, but was undetectable.

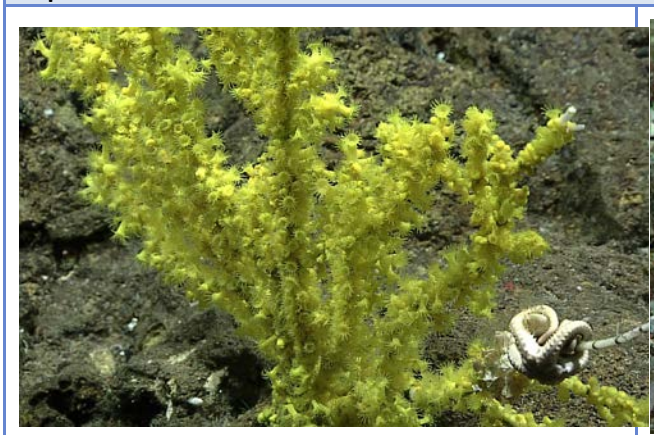
Liftoff from benthic exploration prior to positioning for the Midwater Transect:
LAT :20.04812, LON : 145.23339, DEPTH : 326.4930m, TEMP : 15.71200C, SAL : 34.61575 PSU, DO : 6.39446 mg/L

Start of the Midwater Transect:
LAT :20.05038, LON : 145.23597, DEPTH : 452.0728m, TEMP : 11.99670C, SAL : 34.31996 PSU, DO : 5.81680 mg/L

End of the Midwater Transect:
LAT :20.05045, LON : 145.23798, DEPTH : 339.1610m, TEMP : 15.45892C, SAL : 34.59055 PSU, DO : 6.34711 mg/L

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

Representative Photos of the Dive



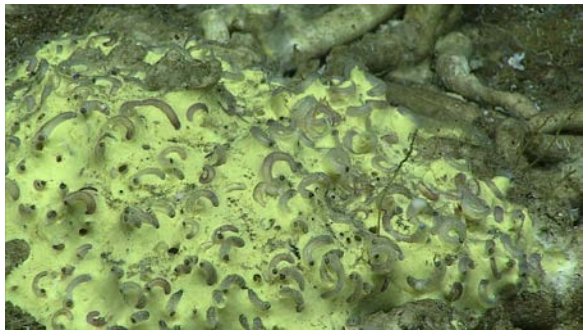
The “gold coral”, *Kulamanamana haumeaae*, is actually a zoanthid. Although it doesn’t produce a hard skeleton, the matrix is ground down and use for jewelry. This is a slow-growing coral; colonies are very long-lived.caption here]

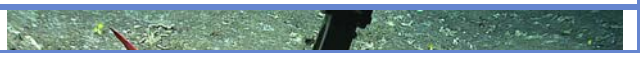
Slit shells are living fossils. Several were observed during the Maug dive. North of the Mariana region, 5 species of slit shell have been reported. Only *Perotrochus diluculum* has been collected in the depth range of the Maug dive, and experts believe this is a new species.

A layer of indurated volcaniclastic sediment (on the left side of the image) makes a nice ledge for an octopus to hide under.

Samples Collected

Sample ID	SPEC01BIO
Date (UTC)	20160620
Time (UTC)	021914
Depth (m)	358.64
Temperature (ºC)	15.08
Field ID(s)	SPONGOSORITES ?SILIQUARIA WITH VERMETID GASTROPODS
Comments	New record of occurrence for the genus (*Spongosorites*) in the Pacific. It will be interesting to learn if this is the same as *S. siliquaria*, from the tropical western Atlantic.
Sample ID	SPEC02GEO





Date (UTC)	20160620	
Time (UTC)	022118	
Depth (m)	358.57	
Temperature (ºC)	15.1	
Field ID(s)	ROCK	
Comments	Rock turns out to be a coral skeleton.	

Sample ID	SPEC03BIO	
Date (UTC)	20160620	
Time (UTC)	023355	
Depth (m)	354.24	
Temperature (ºC)	15.13	
Field ID(s)	CORAL	
Comments	Dominant fauna collection	

Sample ID	SPEC04GEO	
Date (UTC)	20160620	
Time (UTC)	025314	
Depth (m)	345.99	
Temperature (ºC)	15.14	
Field ID(s)	ROCK	
Comments	16x10x6cm, Substrate was volcanoclastic. The sample is a subangular lava fragment.	

Please direct inquiries to:	NOAA Office of Ocean Exploration & Research 1315 East-West Highway (SSMC3 10th Floor) Silver Spring, MD 20910 (301) 734-1014