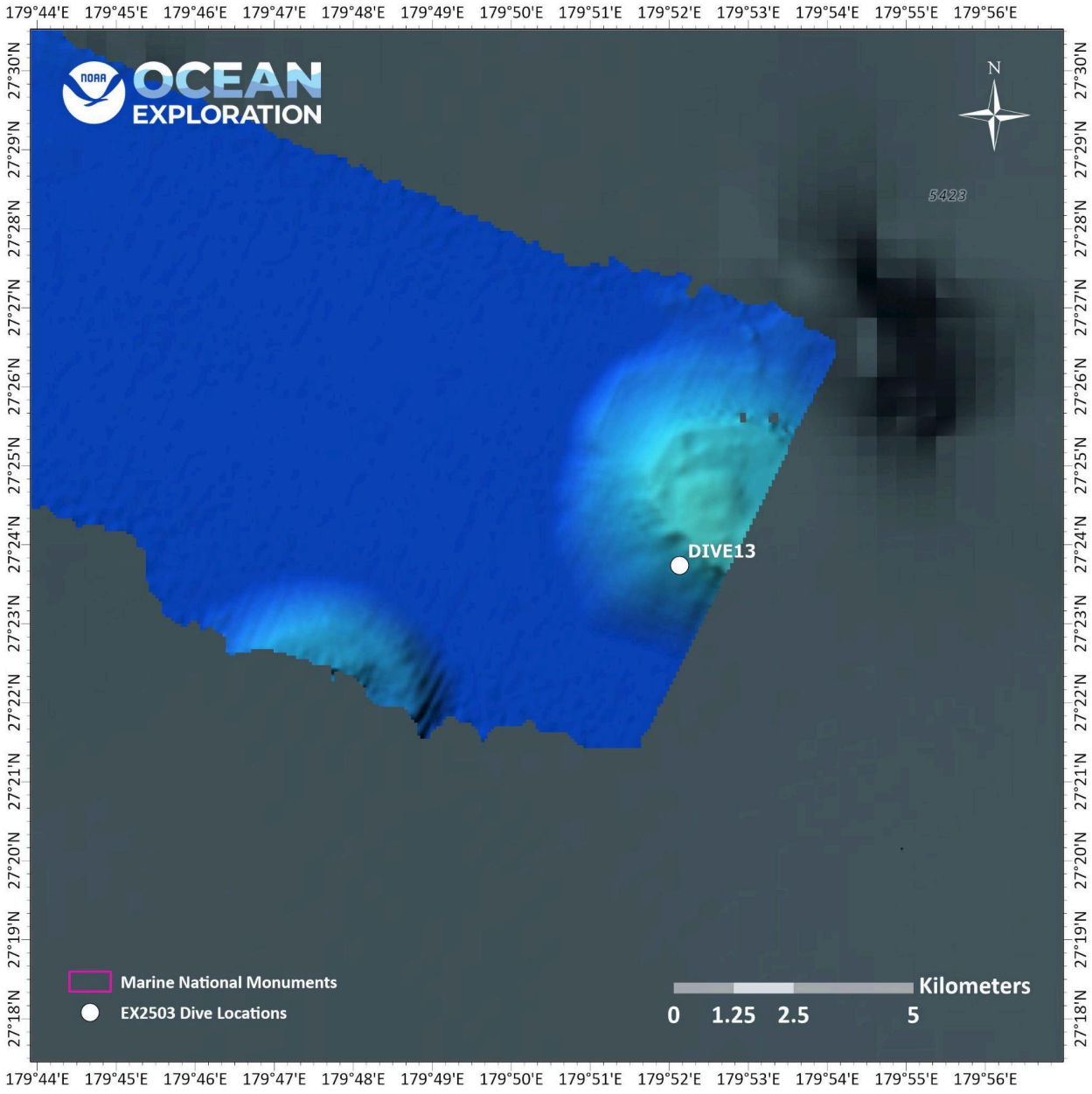
ROV Dive Summary
EX2503, Dive 13, April 26, 2025

General Location Map



Dive Information

Site Name	Deep Volcanic Dome - Extreme Western Papahānaumokuākea
General Area Descriptor	Papahānaumokuākea
Science Team Leads	Sara Kahanamoku-Meyer (UH Mānoa/HI Sea Grant) and Brian Kennedy (ODL/BU)
Expedition Coordinator	Sam Cuellar (NOAA Ocean Exploration)
ROV Dive Supervisor	Chris Ritter (GFOE)
Mapping Lead	Neah Baechler (NOAA Ocean Exploration/UCAR)
Sample Data Manager	Anna Lienesch and Jordan Schweizer (NCEI)
Dive Purpose	The goal of EX2503 Dive 13 was to explore a recently discovered submerged volcanic feature at the western edge of Papahānaumokuākea. This is a flat-topped volcano that, given its depth, is unlikely to have been subaerially exposed. This is one of the very few elevated features between Dive 12 (an unnamed seamount at the extreme western edge of Papahānaumokuākea) and the southern edge of the Hawaiian chain. As such, we are interested in exploring what biological communities are present on these deep-submerged mounts. In addition, relatively little is known about the origin of these volcanic domes (or, more colloquially, “pancake volcanoes”), so exploring the geological features along the ridge and towards the summit will be important for improving our understanding of their formation. We prioritized collecting geological samples to determine the geological provenance and age of this feature, as well as sediments to characterize (1) the strength of carbonate dissolution at this depth, which borders the known average CCD depth for the Pacific. In addition, given the relatively limited work at this depth range, we expected that this site may be home to new species and/or unusual morphologies of already-known species.
Maritime Heritage Restrictions	No

ROV Dive Summary Data	Dive Summary: EX2503_DIVE13 ^^ Dive Type: Normal In Water: 2025-04-26T18:24:42.140682 27.39594742187512 ; 179.8691983750001 On Bottom: 2025-04-26T21:01:48.558183 27.398327807258735 ; 179.8698875102887 Off Bottom: 2025-04-27T02:13:03.792505 27.39999997792365 ; 179.87194027080474 Out Water: 2025-04-27T04:44:36.529779 27.403907 ; 179.879384 Dive Duration: 10:19:54 Bottom Time: 5:11:15 Max Vehicle Depth: 4599.0 m Min Seafloor Depth: 4163.8 m Distance Travelled: 554.5 m

Dive Description	EX2503 Dive 13 began with visualization of the slope of the volcanic dome at 1059 HST. Upon reaching the bottom depth, we observed a number of unusual organisms in our field of view alone. During the first hour of the div,e we took 8 samples, including an unusual morphotype of *Remuligorgia* (*R. militaris*); a scleractinian cup coral (living below the CCD); an ophiomyxid brittle star directly associated with its feeding trace; a sponge (likely in the family Corbitellinae); a spiny Hymenaster (slime star); a snail sampled near its feeding trace (likely Margaritidae); and a Porcellanasterid sea star sampled near its feeding trace. Most, if not all, of these specimens represent likely new or undescribed species and range extensions. We observed a number of taxa actively engaging in feeding behavior. This observational data is highly valuable as it sheds light on the trophic ecology of this deepwater community. The snails and stars we observed feeding appear to be voracious detritivores, and the abundance of traces we observed suggests that this region has high levels of feeding activity that sustain the visible biomass we observed during the dive. As we shallowed up towards the summit, the density of organisms remained relatively sparse, and the diversity of the communities we observed remained relatively constant. Notably, a number of large *Caulophacus* sponges (with stalks of 2-3 meters in length) were present along the slope and on the summit flats. During the transit to the summit, we also observed but did not collect a number of unusual mollusks, including an unknown Monoplacophoran (a molluscan “living fossil”). The number of likely new species we observed during the dive highlights the critical need for additional work at these under-observed abyssal depths.

Geologically, this site was extremely interesting. The slope of this dome volcano consists primarily of small pillow basalts, which, upon sampling, we found were both heavily encrusted and readily fragmented. Shoreside scientist Val Finlayson provided volcanology expertise during the dive and suggested that the small pillows we observed may imply that this volcano may have had a lower melt production and/or effusion rate that produced the “dribbly flows” that contributed to the “pancake” shape of this feature. We also observed numerous slump features as we made our way towards the summit, providing an opportunity to collect rock samples that will help to determine the geologic age of this volcano (which is currently unclear given its isolation). Further up, we observed pillow basalts that were cracked and partially drained, suggesting these are located where they were originally emplaced. Across all geologic features, there was a thick overgrowth of Ferromanganese crust, and some fragments showed evidence of heavy geochemical alteration. The dive certainly helped to provide clues to the geologic origin of the feature, but also generated a number of questions that will be investigated by shoreside geologists using the two rock samples collected.

The sedimentary environment at this site was also very interesting. We collected two sediment samples, one at bottom depth (-4360 m) and top depth (-4160 m). The deeper sample was composed nearly entirely of fine-grained reddish clay, while the top sample was composed of heavily fragmented carbonate grains likely of foraminiferal origin and intact planktonic and benthic foraminifera, and occasional pteropod shells. The preservational differences between sediments from these two depths suggest that this volcanic dome spans the CCD “snowline” beyond which no carbonate is preserved, with a summit that reaches into the lysocline (i.e., the region that extends between carbonate saturation depth and carbonate compensation depth).

Notable Observations	Several likely new or undescribed echinoderms (Ophiomyxidae, Porcellanasteridae, and *Benthaster*), a Scleractinian coral, a Corbitellinae sponge, a Margaritidae gastropod, and an unusual *Remuligorgia* coral. Multiple observations of organisms feeding on detritus and small benthic fauna (including a potential observation of a Margaritidae snail consuming a benthic foraminifer) and high-resolution imagery of feeding traces co-located with their associated taxon. Small pillow basalt flows suggest this volcanic dome feature may have been produced by slow, "dribbly" basalt flows. Sedimentary evidence that this feature spans the carbonate compensation boundary, with the summit region of this feature extending into the lysocline.
Community and Habitat Observations	Corals and Sponges — Present Chemosynthetic Community — Absent High biodiversity Community — Absent Active Seep or Vent — Absent Extinct Seep or Vent — Absent Hydrates — Absent
CMECS Feature Type(s)	Seamount > Slope > Wall
SeaTube Link (science annotations)	https://data.oceannetworks.ca/app/dive-logs/2105

Equipment Deployed

ROV	*Deep Discoverer*
Camera Platform	*Seirios*
ROV Measurements	The following ROV measurements, data streams, and equipment are used on each ROV deployment: CTD, depth, scanning sonar, USBL position, altitude, heading, attitude, high-resolution cameras, low-resolution cameras, manipulator arms, suction sampler, sample drawers and thrusters. The following row notes if any of these sensors were malfunctioning or not operational.
Equipment Malfunctions	

Close-Up Map of Main Dive Site

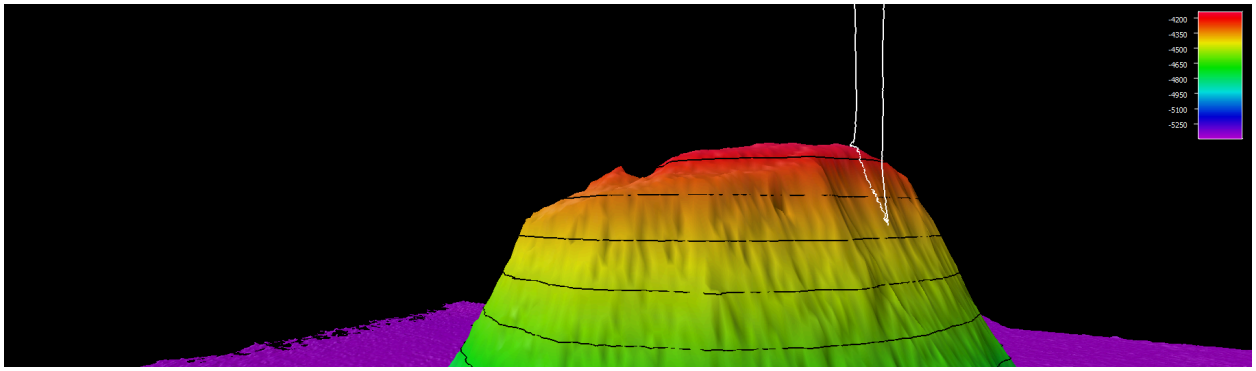


Figure 1: Dive 13 dive site. Shown in 1.5x vertical exaggeration; smoothed ROV dive track shown in white on 50x50 (interpolated) cell size bathymetry. Depth shown in meters; coloration based on depths with 100-meter contours overlain.

Sound Speed Manager Image of ROV CTD Profile

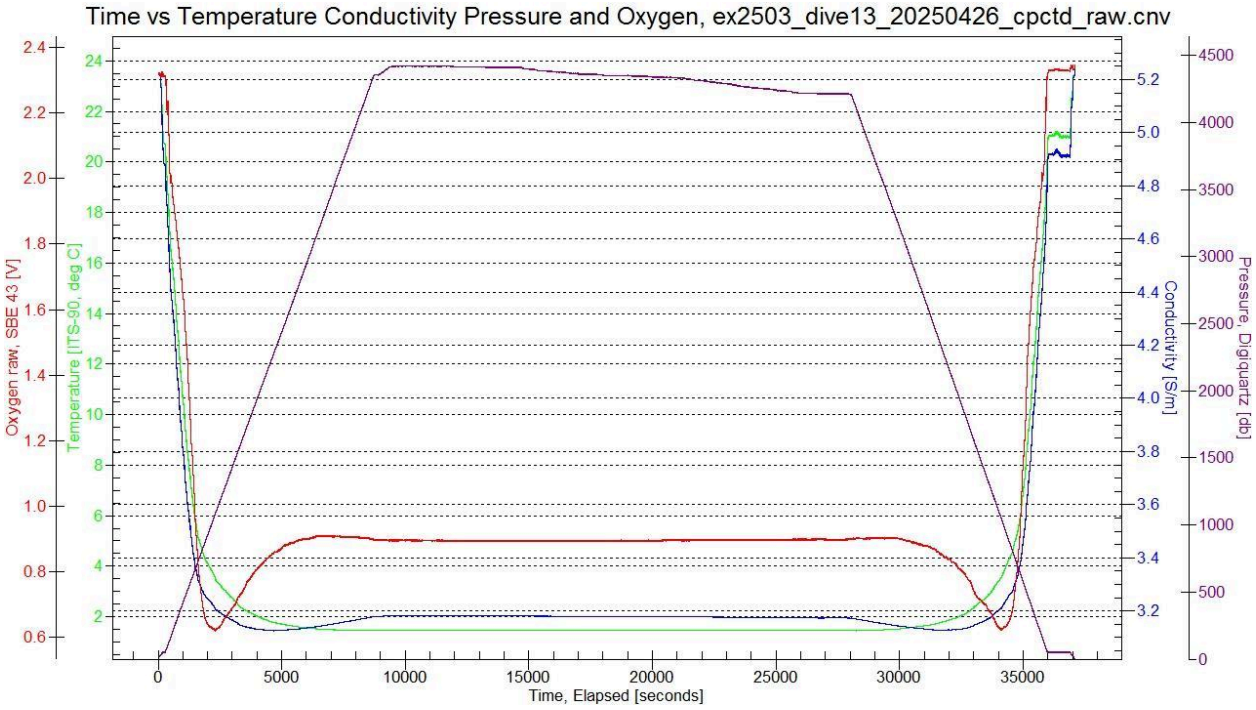
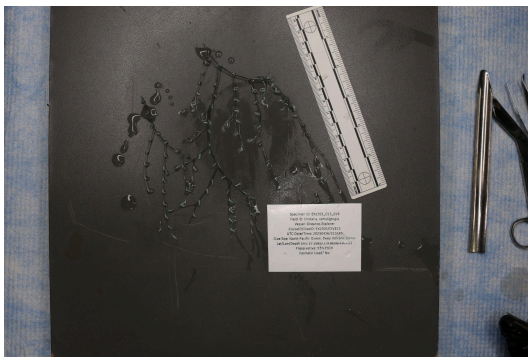


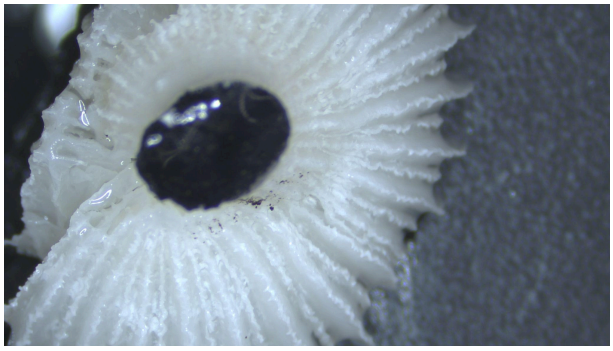
Figure 2. Ambient conditions during Dive 13. Plot shows Temperature (˚C), Conductivity (S/m), Pressure (db), and Oxygen (V; as measured by SBE43).

Samples Collected



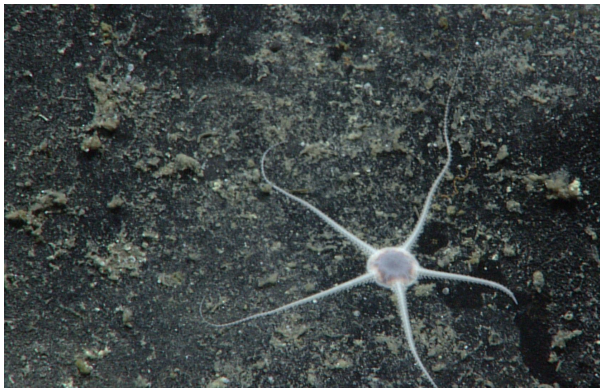
Sample ID	EX2503_D13_01B
Date (UTC)	20250426
Time (UTC)	211645
Depth (m)	4365.208984375
Latitude (decimal degrees)	27.3982925415039
Longitude (decimal degrees)	179.869781494141
Temp. (°C)	1.46700000762939
Field ID(s)	ramuligorgia
Comments	Small sclerites in the tissue visible through tissue, large polyps

Associates Sample ID:	N/A
Field Identification:	N/A
Count:	N/A



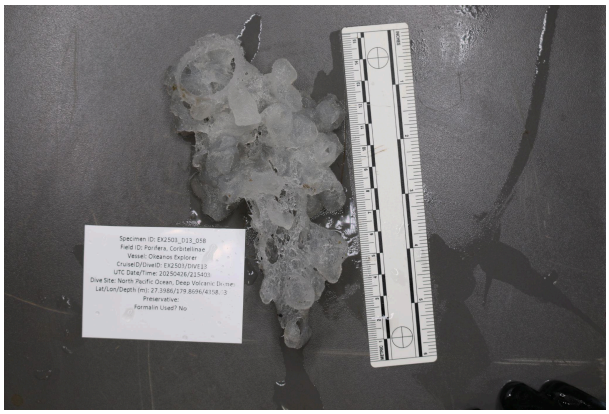
Sample ID	EX2503_D13_02B
Date (UTC)	20250426
Time (UTC)	213249
Depth (m)	4365.1181640625
Latitude (decimal degrees)	27.3983974456787
Longitude (decimal degrees)	179.869857788086
Temp. (°C)	1.46800005435944
Field ID(s)	Scleractinia
Comments	Slightly broken, squat body form wider than other similar scleractinians, some mucus present.

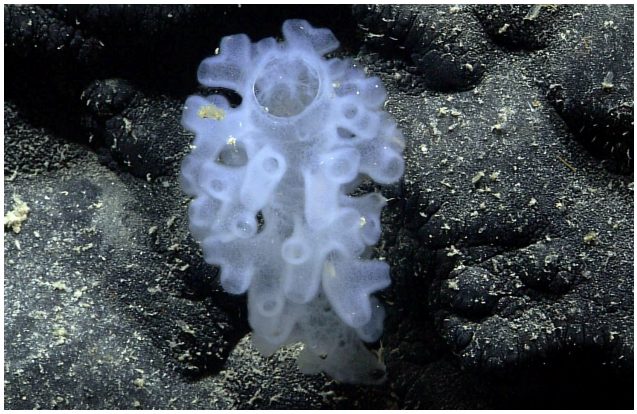
Associates Sample ID:	N/A
Field Identification:	N/A
Count:	N/A



Sample ID	EX2503_D13_04B
Date (UTC)	20250426
Time (UTC)	214136
Depth (m)	4364.90576171875
Latitude (decimal degrees)	27.3982582092285
Longitude (decimal degrees)	179.869705200195
Temp. (°C)	1.46800005435944
Field ID(s)	Ophiomyxidae
Comments	Sediments stuck to specimen, grey brown coloration center on disk

Associates Sample ID:	N/A
Field Identification:	N/A
Count:	N/A

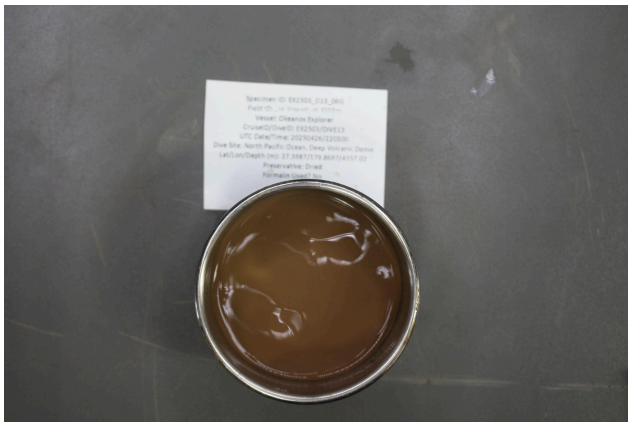




Sample ID	EX2503_D13_05B
Date (UTC)	20250426
Time (UTC)	215403
Depth (m)	4358.02978515625
Latitude (decimal degrees)	27.3985500335693
Longitude (decimal degrees)	179.869598388672
Temp. (°C)	1.46899998188019
Field ID(s)	Corbitellinae
Comments	Spicules partially enclosing operculum

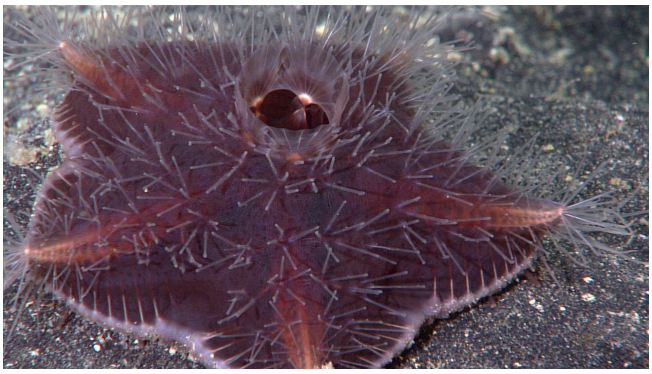
Associates Sample ID:	EX2503_D13_05B_A01B
Field Identification:	Polychaeta

Count:	2

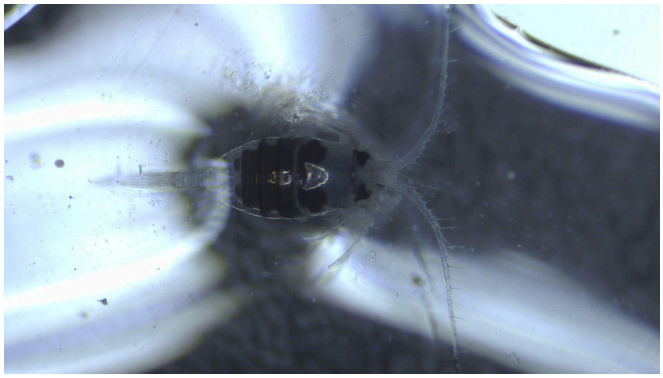


Sample ID	EX2503_D13_06G
Date (UTC)	20250426
Time (UTC)	220300
Depth (m)	4357.01806640625
Latitude (decimal degrees)	27.3986644744873
Longitude (decimal degrees)	179.869659423828
Temp. (°C)	1.46800005435944
Field ID(s)	sediments at 4355m
Comments	Pelagic clay

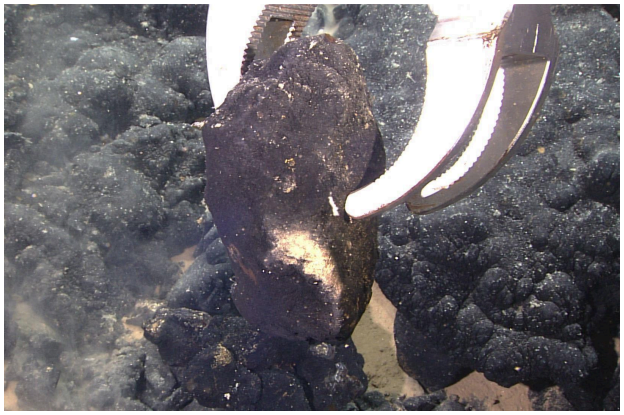
Associates Sample ID:	N/A
Field Identification:	N/A
Count:	N/A



Sample ID	EX2503_D13_07B
Date (UTC)	20250426
Time (UTC)	222238
Depth (m)	4353.77294921875
Latitude (decimal degrees)	27.3984661102295
Longitude (decimal degrees)	179.869720458984
Temp. (°C)	1.46700000762939
Field ID(s)	Hymenaster
Comments	Minimal slime, some apparent slime in canister but less than expected for slime stars, dead upon recovery, deep red in color, multiple approximately 1cm spines protruding through super dorsal membrane, operculum appears covered with slime as well, single row of spines ventrally on either side of tube feet row



Associates Sample ID:	EX2503_D13_07B_A01B
Field Identification:	Copepoda
Count:	1



Sample ID	EX2503_D13_08G
Date (UTC)	20250426
Time (UTC)	223026
Depth (m)	4353.8017578125
Latitude (decimal degrees)	27.3985214233398
Longitude (decimal degrees)	179.869567871094
Temp. (°C)	1.4650000333786
Field ID(s)	fragmented pillow? from slope failure at

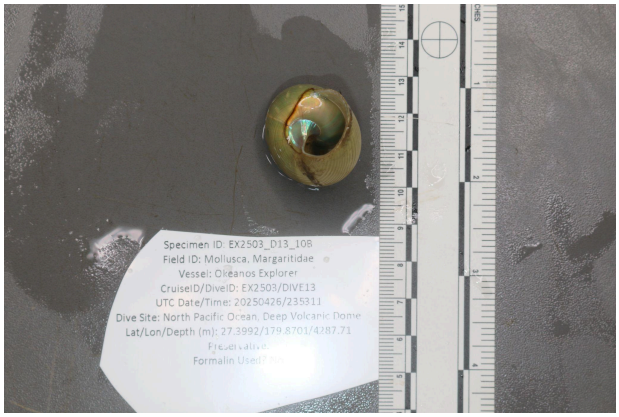
	4352m
Comments	Heavily encrusted with very fine FeMn crust, limited biological encrustations, angular in shape

Associates Sample ID:	N/A
Field Identification:	N/A
Count:	N/A

Sample ID	EX2503_D13_09G
Date (UTC)	20250426
Time (UTC)	233333
Depth (m)	4294.5849609375
Latitude (decimal degrees)	27.3990936279297
Longitude (decimal degrees)	179.870269775391
Temp. (°C)	1.45899999141693
Field ID(s)	basalt pillow from tallus at 4295m
Comments	Heavily encrusted with fine FeMn, several light reddish-brown areas exposed under

	crust - can't tell if it's crust or not.

Associates Sample ID:	N/A
Field Identification:	N/A
Count:	N/A



Sample ID	EX2503_D13_10B
Date (UTC)	20250426
Time (UTC)	235311
Depth (m)	4287.7080078125
Latitude (decimal degrees)	27.3992118835449
Longitude (decimal degrees)	179.870132446289
Temp. (°C)	1.45899999141693
Field ID(s)	Margaritidae
Comments	Iridescent colored, shell in light is iridescent, snail body retracted approximately 3 cm into shell

Associates Sample ID:	N/A

Field Identification:	N/A
Count:	N/A

Sample ID	EX2503_D13_11B
Date (UTC)	20250427
Time (UTC)	001036
Depth (m)	4284.759765625
Latitude (decimal degrees)	27.3989810943604
Longitude (decimal degrees)	179.870254516602
Temp. (°C)	1.45700001716614
Field ID(s)	Porcellanasteridae
Comments	Very small, very rigid with no flex, very white and shiny

Associates Sample ID:	N/A
Field Identification:	N/A
Count:	N/A

Sample ID	EX2503_D13_13G
Date (UTC)	20250427
Time (UTC)	020244
Depth (m)	4161.2119140625
Latitude (decimal degrees)	27.4004306793213
Longitude (decimal degrees)	179.872131347656
Temp. (°C)	1.44799995422363
Field ID(s)	clay seds?
Comments	Pelagic clay rich with visible carbonate grains and small FeMn nodules

Niskin Sampling Summary

Sample ID	EX2503_D13_03W
Date (UTC)	20250426
Time (UTC)	213618
Depth (m)	4363.0048828125
Latitude (decimal degrees)	27.3983764648438

Longitude (decimal degrees)	179.869781494141
Bottle Number	Niskin Bottle 1
Temperature	1.46800005435944
Dissolved Oxygen (mg/L)	4.86299991607666
Treatment	DNA/RNA Shield

Sample ID	EX2503_D13_12W
Date (UTC)	20250427
Time (UTC)	011708
Depth (m)	4191.13916015625
Latitude (decimal degrees)	27.3998565673828
Longitude (decimal degrees)	179.871170043945
Bottle Number	Niskin Bottle 2
Temperature	1.45200002193451
Dissolved Oxygen (mg/L)	4.71199989318848
Treatment	DNA/RNA Shield

Scientists Involved

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