

# ROV Dive Summary

## EX2304, Dive 02, July 16, 2023

### General Location Map

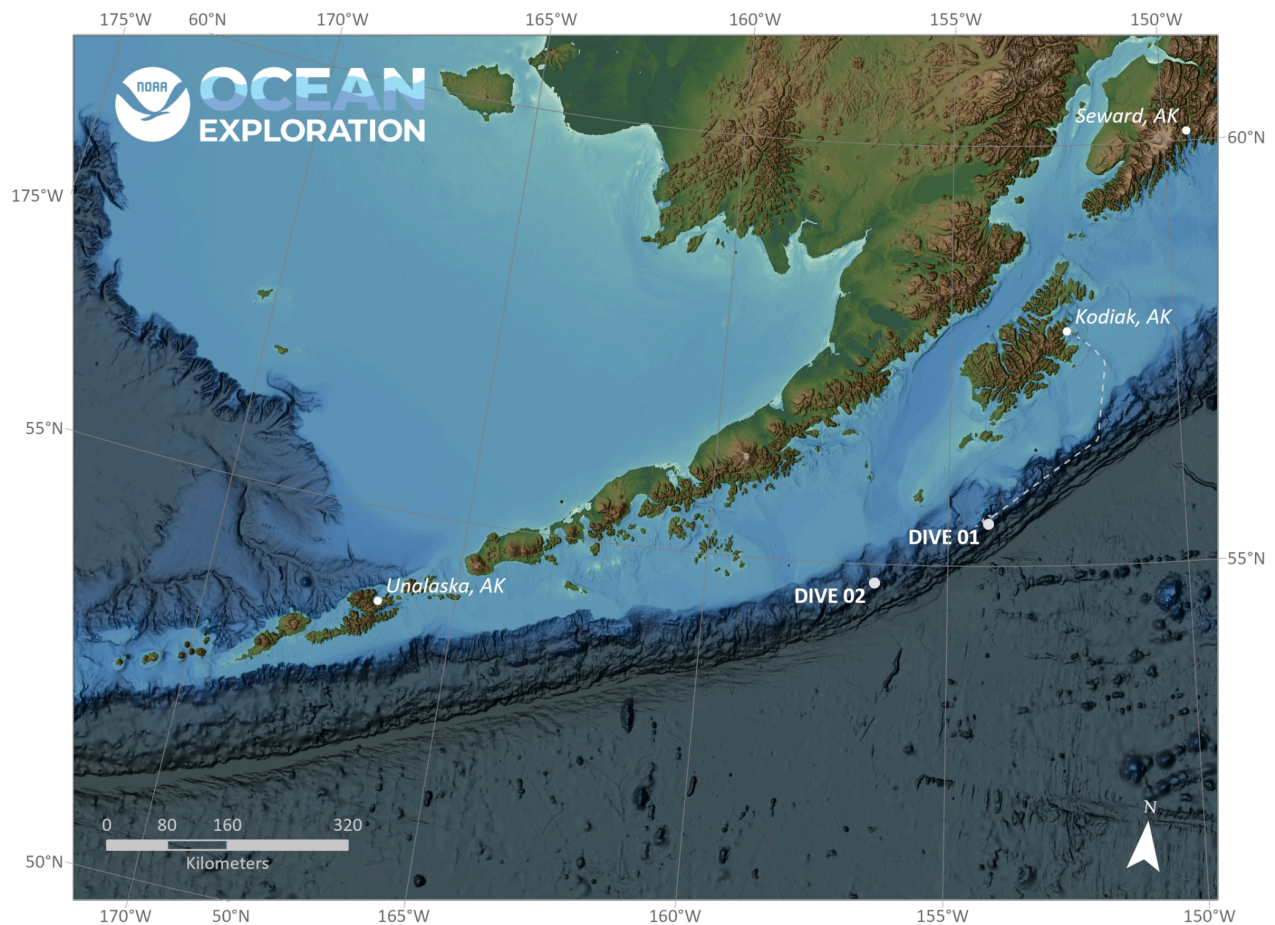


Figure 1. General location of EX2304 Dive 02.

## Dive Information

<b>Site Name</b>	Dive 02: Big Bend Canyon
<b>General Area Descriptor</b>	Big Bend Canyon ~160 km SE offshore from the Semidi Islands
<b>Science Team Leads</b>	Rhian Waller (Bio); Jennifer Aschoff (Geo)
<b>Expedition Coordinator</b>	Shannon Hoy
<b>ROV Dive Supervisor</b>	Christopher Ritter
<b>Sample Data Manager</b>	Anna Lienesch; Jennifer Green
<b>Dive Purpose</b>	Geology, Biology, eDNA
<b>Maritime Heritage Restrictions</b>	No
<b>ROV Dive Summary Data</b>	<p style="text-align: center;">Dive Summary: EX2304_DIVE02            ^^^            Dive Type: Normal            In Water: 2023-07-16T16:25:00.188470                      54.75273559428025 ; -156.51777467792024            On Bottom: 2023-07-16T17:56:17.851532                      54.75286622355976 ; -156.52508959157353            Off Bottom: 2023-07-16T23:14:13.987369                      54.755753417354505 ; -156.52924707099567            Out Water: 2023-07-17T00:39:29.174738                      54.754702 ; -156.567677            Dive Duration: 8:14:28            Bottom Time: 5:17:56            Max Vehicle Depth: 2324.3 m            Min Seafloor Depth: 2139.4 m            Distance Travelled: 525.2 m</p>

Dive  
Description

EX2304 Dive 02 was positioned in a flat area within a broad basin at the base of a steep escarpment ~100m west of Big Bend Canyon, at a water depth of 2335 m. We do not believe this canyon has been previously described. The canyon is located ~160 km SE offshore from the Semidi Islands. The ROV ascended from the base of the escarpment to a water depth of about 2200 m.

**Geology:**

New mapping data show that Big Bend Canyon is ~1200 m deep and up to 2 km wide, making a sharp eastward bend near its terminus. The length of the has not been determined, but it appears to extend from the continental shelf edge to the basin floor. Geologically, this was an interesting dive, highlighting some of the exposed rock layers and morphology of the canyon walls. The canyon walls were scoured by deep, straight gullies ~0.5-3 m wide with strong currents funneled through them. In-situ rock layers were observed at several positions along the wall of the canyon. The basin floor was predominantly characterized by mud, with areas of scattered coarse-grained sediment (i.e., gravel) locally. Gravel was almost entirely composed of rounded to well rounded volcanic cobbles, which were favorable hard grounds for coral. The volcanic clasts (basaltic?) varied in size from pebble to cobble (~5-20 cm) and were more abundant on the basin-floor, than closer to the canyon wall. These cobbles appear to have been far-traveled, and experienced grain-to-grain interaction at some point during transport based on the high degree of rounding. One boulder-sized basalt clast was surrounded by a moat, or slight depression, that may suggest it was a glacial dropstone.

The canyon walls showed some poorly cemented, bedded sedimentary (mudstone) and/or volcanoclastic rock that proved challenging to sample. The lowermost rock layers, at about 2300m, appeared to have freshly exposed surfaces with very little modern mud deposited on them. This lower 3-5 meters may be a relatively recent fault scarp based on its linear geometry, orientation parallel to other known faults, and fresh (unweathered) appearance with little mud covering strata. Three geologic samples were taken: 1) a rounded basalt(?) cobble, 2) friable bentonitic mudstone with burrows, and 3) a well cemented, fractured mudstone.

	<p><b>Biology:</b> The dive started in a muddy environment with little larger macrofauna, though a fair abundance of grenadier rat tail fish and isolated rock/stones that were covered with <i>Rididpathes</i> Antipatharians, carnivorous sponges and some cup corals. On the sediments some corallimorphs and cerianthids were observed, and as we ascended and the terrain became harder we began to see dense forests of at least 4 species of carnivorous sponges (<i>Cladorhizidae</i>), <i>Farea</i> sp. sponges (may be a new depth record), mixed among some very large primnoid octocorals (tentatively <i>Parastenella</i>) and mixed species of Antipatharian black corals. Two species of snailfish, multiple grenadier rat tails and at least two species of large red crabs (Triangle Tanner Crabs and King Crabs) were observed during the dive as well. Collections were made of two types of <i>Cladorhizidae</i> (and two more were collected incidentally on rock samples) and the potential <i>Parastenella</i>.</p> <p>Some notable observations include big red jellies on the descent, large corallimorphs with amphipods on its tentacles, a small nudibranch (rarely seen in the deep sea environment); an anemone with eggs within its tentacles; a potentially new range record of a <i>Hemicorallium</i> coral, unknown eggs around the stem of a carnivorous sponge and large king crabs using corals as habitat.</p> <p>A total of 5 Niskin samples for eDNA were taken throughout the transect.</p>
Notable Observations	High density (forest) of <i>Cladorhizidae</i> carnivorous sponges; potentially new species of <i>Cladorhizidae</i> , abundance of large (pebble to boulder sized clasts), rounded volcanic clasts on the seafloor (potential glacial dropstones) at 2300m; outcrop of fractured, bioturbated mudstone
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)	Scarp/Wall; Submarine Canyon
SeaTube Link (science annotations)	<a href="https://data.oceannetworks.ca/app/dive-logs/2863">https://data.oceannetworks.ca/app/dive-logs/2863</a>

## Equipment Deployed

ROV	<i>Deep Discoverer</i>
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Camera Platform	<i>Seirios</i>
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	Port Biobox lid stuck.

## Close-Up Map of Main Dive Site

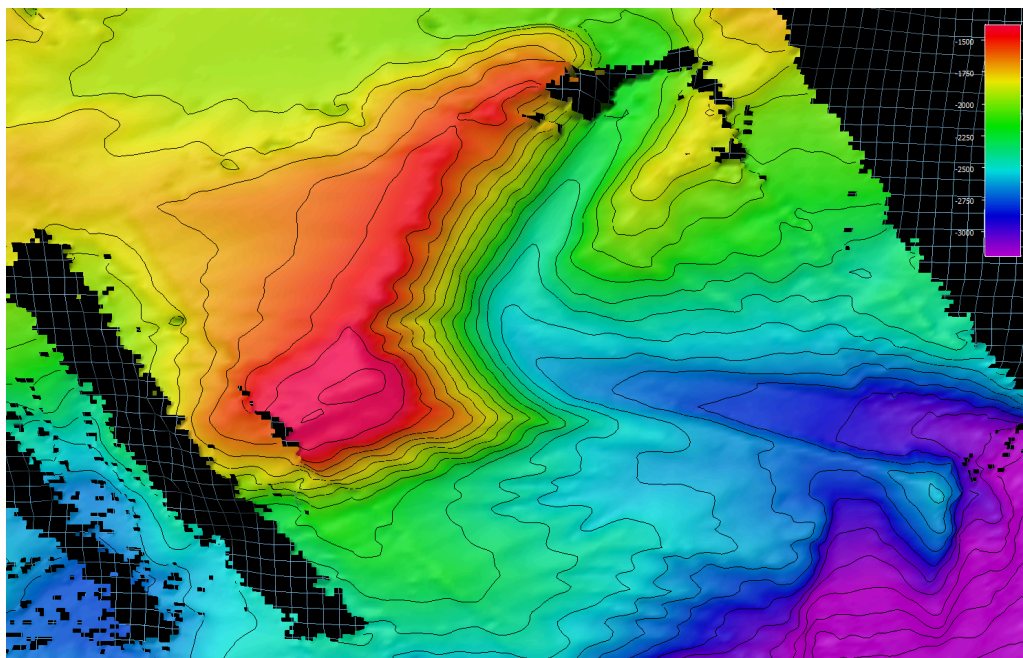


Figure 2: Overview of the “Big Bend Canyon”. North is oriented toward the top of the image. Depths in meters.

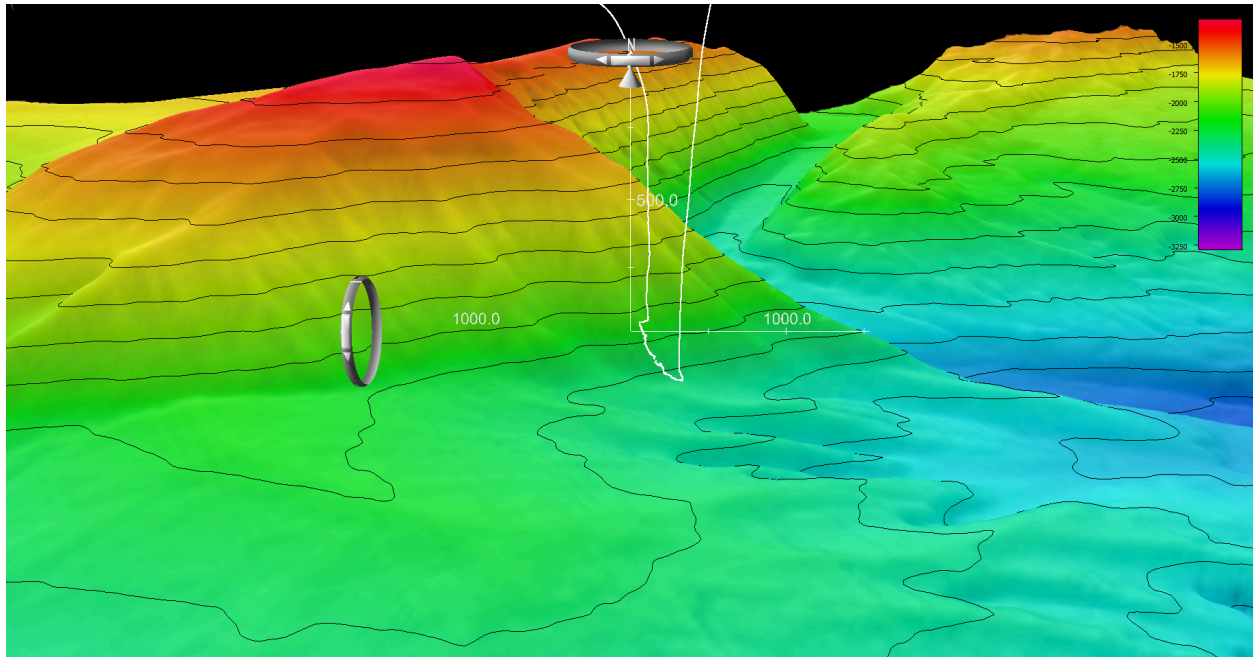


Figure 3: 3D view of the “Big Bend Canyon” ROV track as completed. North is oriented toward the top of the image. Depths in meters.

## ROV CTD Profile

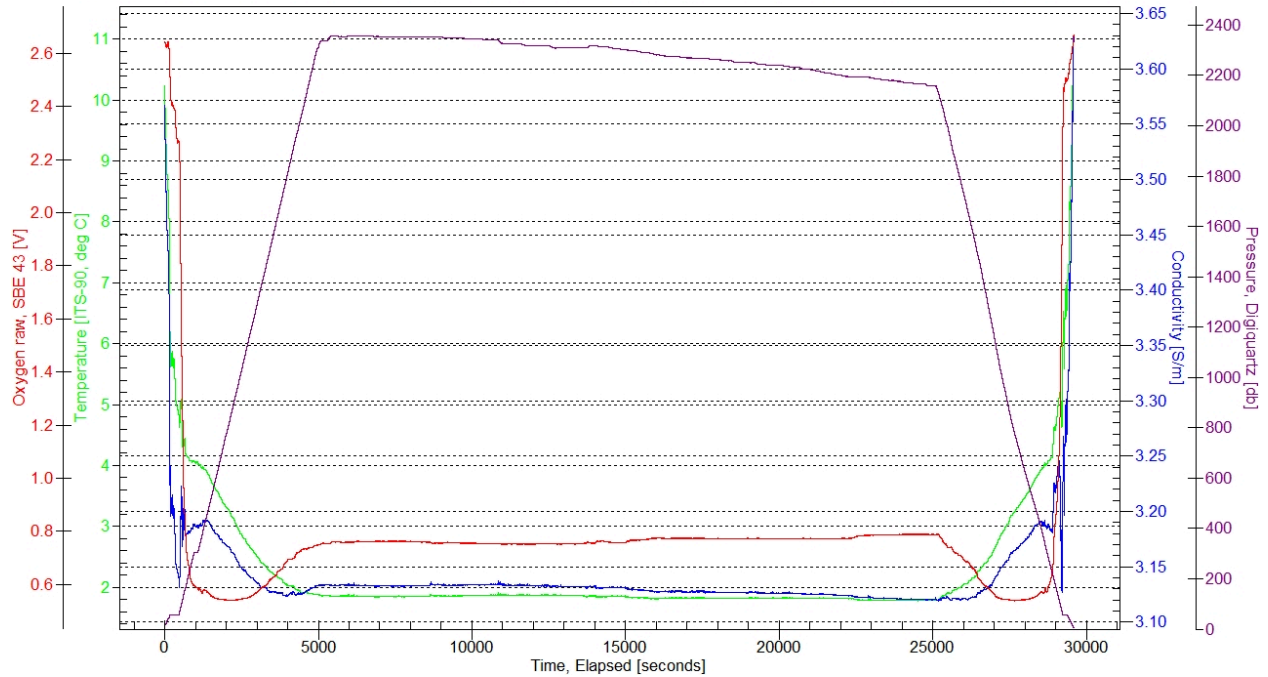


Figure 4. Plot of the ROV CTD profile, showing temperature, conductivity, pressure, and dissolved oxygen over time.

## Representative Photos of the Dive

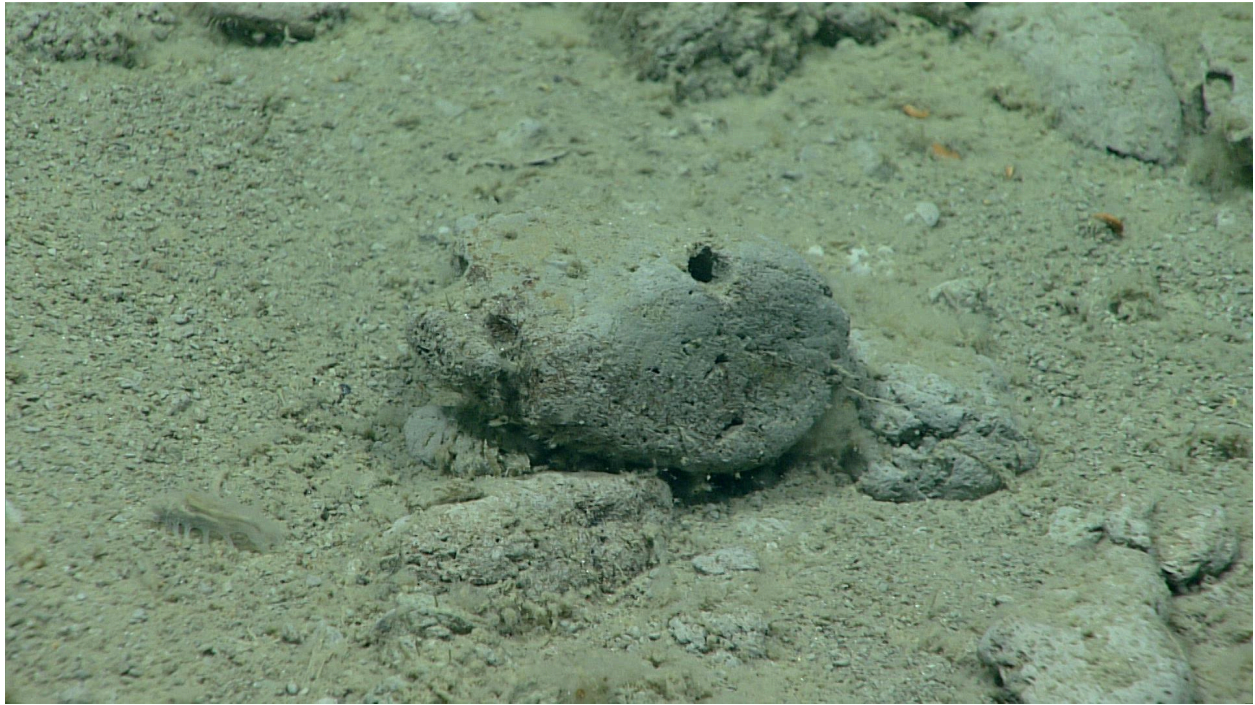


Figure 5: Numerous rounded cobbles and pebbles were present on the seafloor near (~50 m from) the bend of Big Bend Canyon. These rounded clasts suggest transport in turbulent conditions with grain-grain contact at some point in the past. Clast types ranged from hard, igneous clasts to softer mudstone like the one pictured here. It's possible these were transported to the shelf-edge during the last glacial maximum and later delivered to the slope.





Figure 6: Another example of sediment on the basin-floor at a depth of about 2200 m adjacent to the submarine canyon showing well-rounded, volcanic (basaltic?) cobbles and pebbles. These rounded cobbles are possibly glacier-derived.



Figure 7: Characteristic substrate at the bottom of the dive site (2335 m water depth) about 50 m from the canyon. An unusual sighting of an aeolid nudibranch in the foreground.



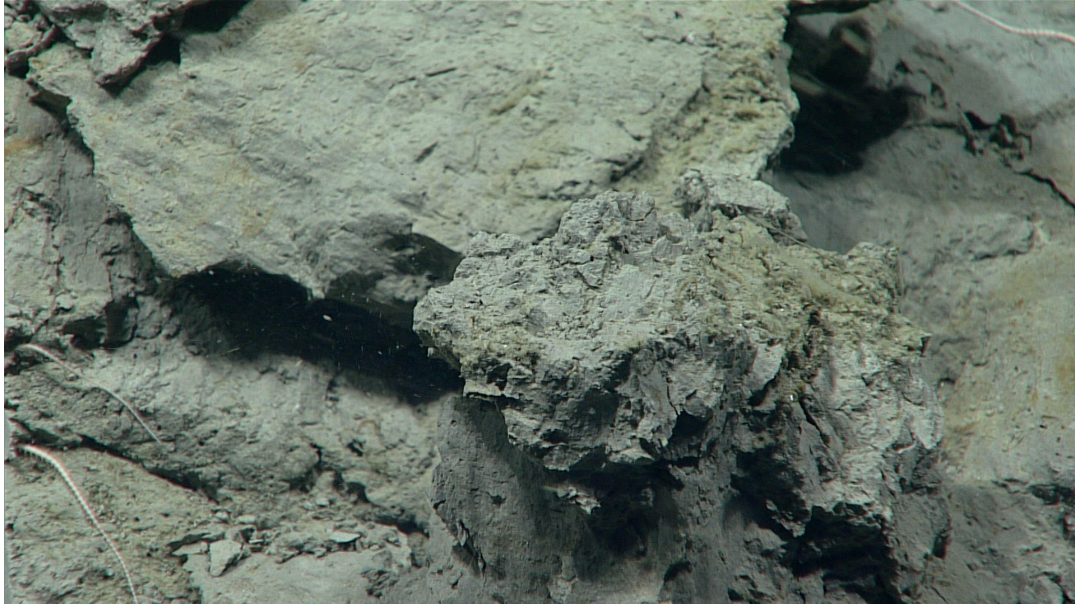


Figure 8: Close-up view of mudstone with possible volcanoclastics. The now-dissolved tephra or feldspar phenocrysts may have been present in the rectangular, angular voids in the mudstone.

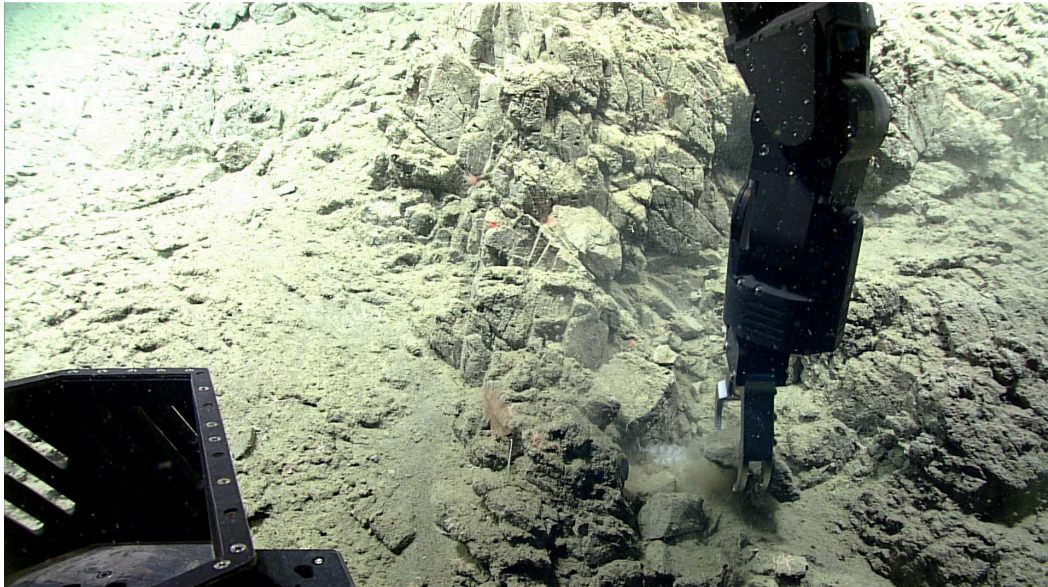


Figure 9: The arm of remotely operated vehicle *Deep Discoverer* sampling fractured, well-cemented mudstone near the top of the ROV transect. This well-cemented, fractured mudstone, collected at a depth of 2,165 meters, was one of three geological samples collected during the dive. Red laser dots (center view) are 10 cm apart for scale.





Figure 10: An actinostola anemone with eggs inside the tentacles. This pre-spawning behavior is rarely seen in the deep sea and is well documented in shallow water species.

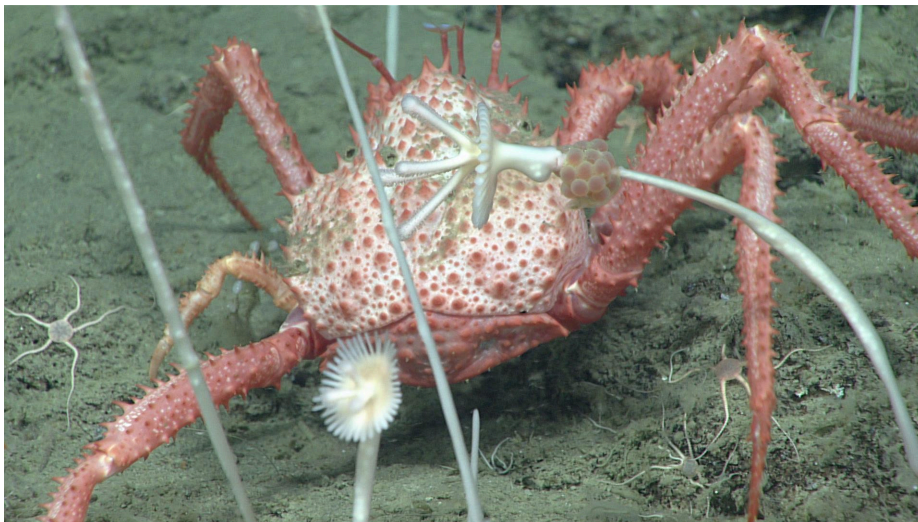


Figure 11: A large king crab in the background with stalked Cladorhizid (carnivorous) sponges of a couple of potentially different species surrounding it. The stalked sponge in the foreground is potentially a *Cladorhiza corona*, though the morphology is slightly different from species descriptions. Around the stalk of the sponge are a set of orange eggs that are of unknown origin.

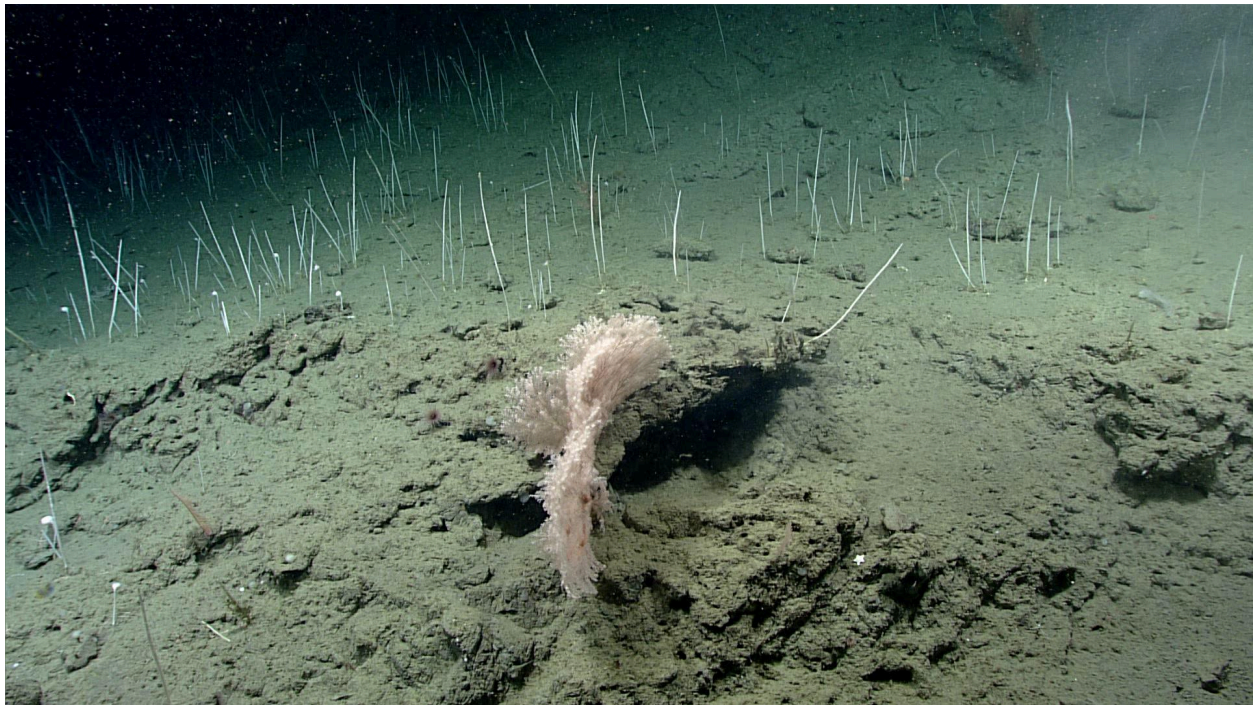


Figure 12: The second half of the dive was dominated by cladorhizid sponges of several species in dense aggregations. In the foreground is a primnoid octocoral, potentially *Parastenella* sp.

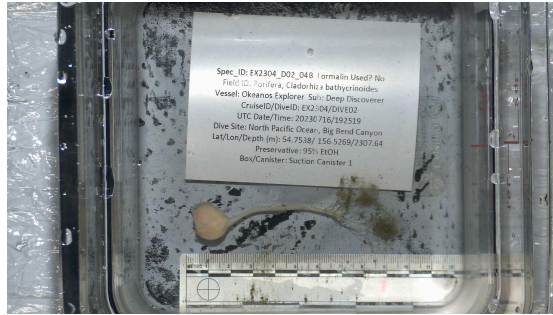


## Samples Collected



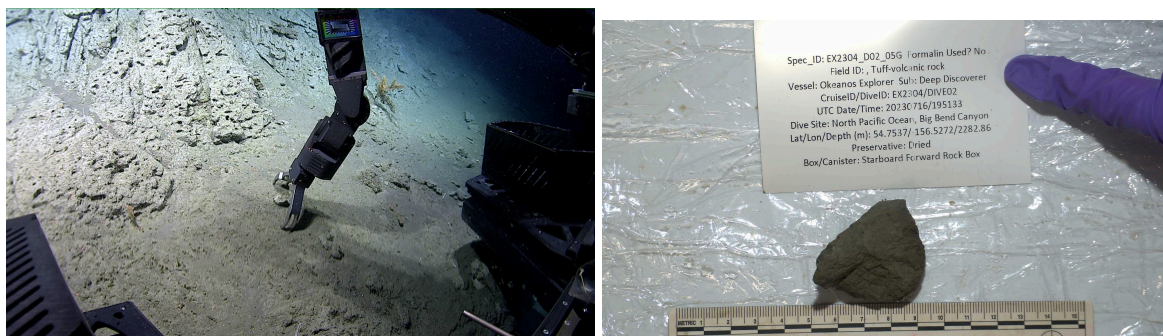
Sample ID	EX2304_D02_03G
Date (UTC)	20230716
Time (UTC)	184831
Depth (m)	2318.9645
Latitude (decimal degrees)	54.753107
Longitude (decimal degrees)	-156.52589
Temp. (°C)	1.85401
Field ID(s)	Rounded basalt cobble
Comments	8 cm, well rounded basaltic cobble with potentially zoned feldspar

Associates Sample ID	Field Identification	Count
EX2304_D02_03G_A01B	Cladorhiza	1



Sample ID	EX2304_D02_04B
Date (UTC)	20230716
Time (UTC)	192519
Depth (m)	2307.6358
Latitude (decimal degrees)	54.753761
Longitude (decimal degrees)	-156.526897
Temp. (°C)	1.86441
Field ID(s)	Cladorhiza bathyrynoides
Comments	has a stalk system, looks like roots, white coloration, has small bulbs in it and bulbous head

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



Sample ID	EX2304_D02_05G
Date (UTC)	20230716
Time (UTC)	195133
Depth (m)	2282.8584
Latitude (decimal degrees)	54.753665
Longitude (decimal degrees)	-156.527228
Temp. (°C)	1.86518
Field ID(s)	Tuff-volcanic rock
Comments	silty mudstone, massive/structureless 4.5 cm

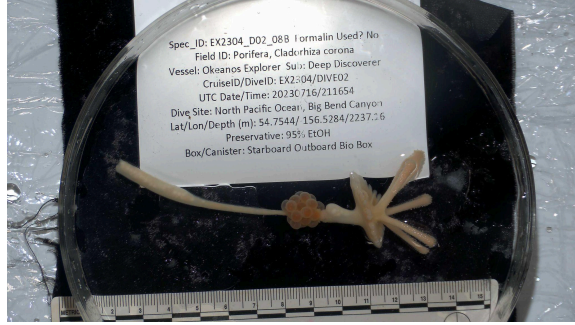
Associates Sample ID	Field Identification	Count
N/A	N/A	N/A



Sample ID	EX2304_D02_06B
Date (UTC)	20230716
Time (UTC)	210408
Depth (m)	2243.0982
Latitude (decimal degrees)	54.754371
Longitude (decimal degrees)	-156.528252
Temp. ( °C)	1.8159
Field ID(s)	Porifera
Comments	Carnivorous Sponge stalked, maybe Abestostoma- best guess; measures approx. 30 cm. Maybe has eggs that are white

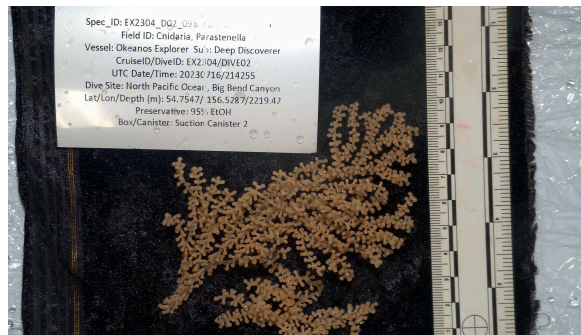
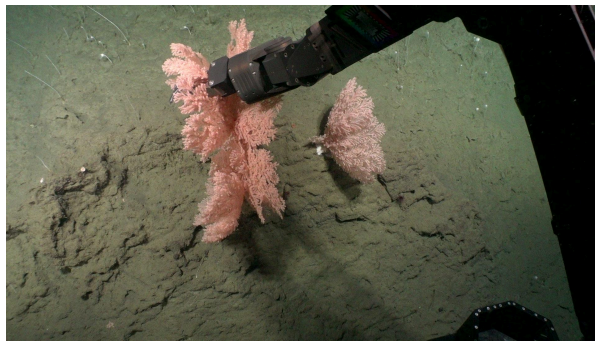
Associates Sample ID	Field Identification	Count
N/A	N/A	N/A





Sample ID	EX2304_D02_08B
Date (UTC)	20230716
Time (UTC)	211654
Depth (m)	2237.1625
Latitude (decimal degrees)	54.754425
Longitude (decimal degrees)	-156.528431
Temp. (°C)	1.82564
Field ID(s)	Cladorhiza corona
Comments	uncertain of species; best guess. Associate stored with primary because difficult to remove.

Associates Sample ID	Field Identification	Count
EX2304_D02_08B_A01B	fish eggs	1



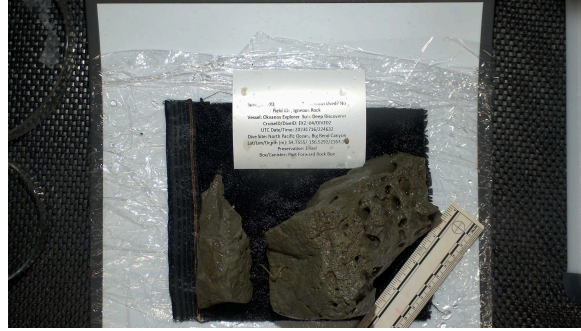
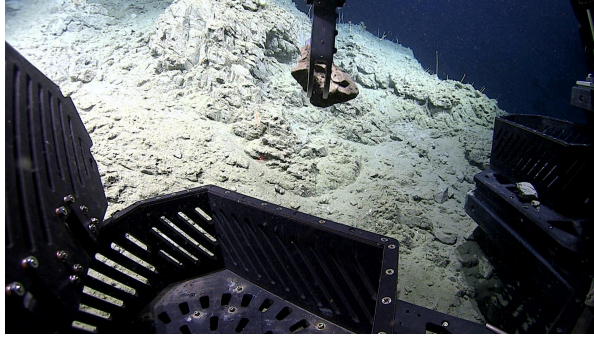
Sample ID	EX2304_D02_09B
Date (UTC)	20230716
Time (UTC)	214255
Depth (m)	2219.4205
Latitude (decimal degrees)	54.754652
Longitude (decimal degrees)	-156.528665
Temp. (°C)	1.81667
Field ID(s)	Parastenella
Comments	pink coloration

Associates Sample ID	Field Identification	Count
EX2304_D02_09B_A01B	Amphipoda	12



Sample ID	EX2304_D02_10G
Date (UTC)	20230716
Time (UTC)	220133
Depth (m)	2208.4033
Latitude (decimal degrees)	54.754748
Longitude (decimal degrees)	-156.528868
Temp. ( ° C)	1.82175
Field ID(s)	Tuff- volcanic Rock
Comments	mudstone/bentonite, 12 cm

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



Sample ID	EX2304_D02_12G
Date (UTC)	20230716
Time (UTC)	224632
Depth (m)	2163.1493
Latitude (decimal degrees)	54.755536
Longitude (decimal degrees)	-156.529171
Temp. ( ° C)	1.79234
Field ID(s)	Igneous Rock
Comments	burrowed massive/structureless, silty, feldspathic mudstone with relict lamination, maximum length is 16cm, numerous vertical burrows present, 1 to 2 cm in diameter.

Associates Sample ID	Field Identification	Count
EX2304_D02_12G_A01B	Cladorhiza	1
EX2304_D02_12G_A02B	Porifera	1

## Niskin Sampling Summary

Sample ID	EX2304_D02_01W
Date (UTC)	20230716
Time (UTC)	164337
Depth (m)	300.8841
Latitude (decimal degrees)	54.752499
Longitude (decimal degrees)	-156.520617
Bottle Number	NISKIN 1
Temperature (°C)	4.05592
Dissolved Oxygen (mg/L)	0.643999994
Treatment	DNA/RNA Shield

Sample ID	EX2304_D02_02W
Date (UTC)	20230716
Time (UTC)	180416
Depth (m)	2320.9128
Latitude (decimal degrees)	54.752771
Longitude (decimal degrees)	-156.525092
Bottle Number	NISKIN 2
Temperature (°C)	1.85449
Dissolved Oxygen (mg/L)	2.173000097
Treatment	DNA/RNA Shield

Sample ID	EX2304_D02_07W
Date (UTC)	20230716
Time (UTC)	210503
Depth (m)	2241.5237
Latitude (decimal degrees)	54.75435
Longitude (decimal degrees)	-156.528172
Bottle Number	NISKIN 3



Temperature (°C)	1.82402
Dissolved Oxygen (mg/L)	2.210999966
Treatment	DNA/RNA Shield

Sample ID	EX2304_D02_11W
Date (UTC)	20230716
Time (UTC)	222107
Depth (m)	2185.5145
Latitude (decimal degrees)	54.75534
Longitude (decimal degrees)	-156.528494
Bottle Number	NISKIN 4
Temperature (°C)	1.82074
Dissolved Oxygen (mg/L)	2.184999943
Treatment	DNA/RNA Shield

Sample ID	EX2304_D02_13W
Date (UTC)	20230716
Time (UTC)	230942
Depth (m)	2140.0546
Latitude (decimal degrees)	54.755765
Longitude (decimal degrees)	-156.529341
Bottle Number	NISKIN 5
Temperature (°C)	1.78451
Dissolved Oxygen (mg/L)	2.308000088
Treatment	DNA/RNA Shield



## Scientists Involved

First Name	Last Name	Affiliation
Christopher	Mah	Smithsonian-National Museum of Natural History (Invertebrate Zoology)
Kelly	Markello	California Academy of Sciences
Asako	Matsumoto	
George	Matsumoto	MBARI
Gord	Rees	Ocean Networks Canada
Carolyn	Ruppel	U.S. Geological Survey
Kenneth	Sulak	U.S. Geological Survey
Steve	Auscavitch	Boston University
Lara	Beckmann	University of Gothenburg
Emily	Crum	NOAA Ocean Exploration
Ervan	Garrison	University of Georgia
Elaina	Jorgensen	NOAA
Sean	Rooney	NOAA Alaska Fisheries Science Center
Michael	Vecchione	NOAA and Smithsonian

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