

ROV Dive Summary

EX2304, Dive 02, July 16, 2023

General Location Map

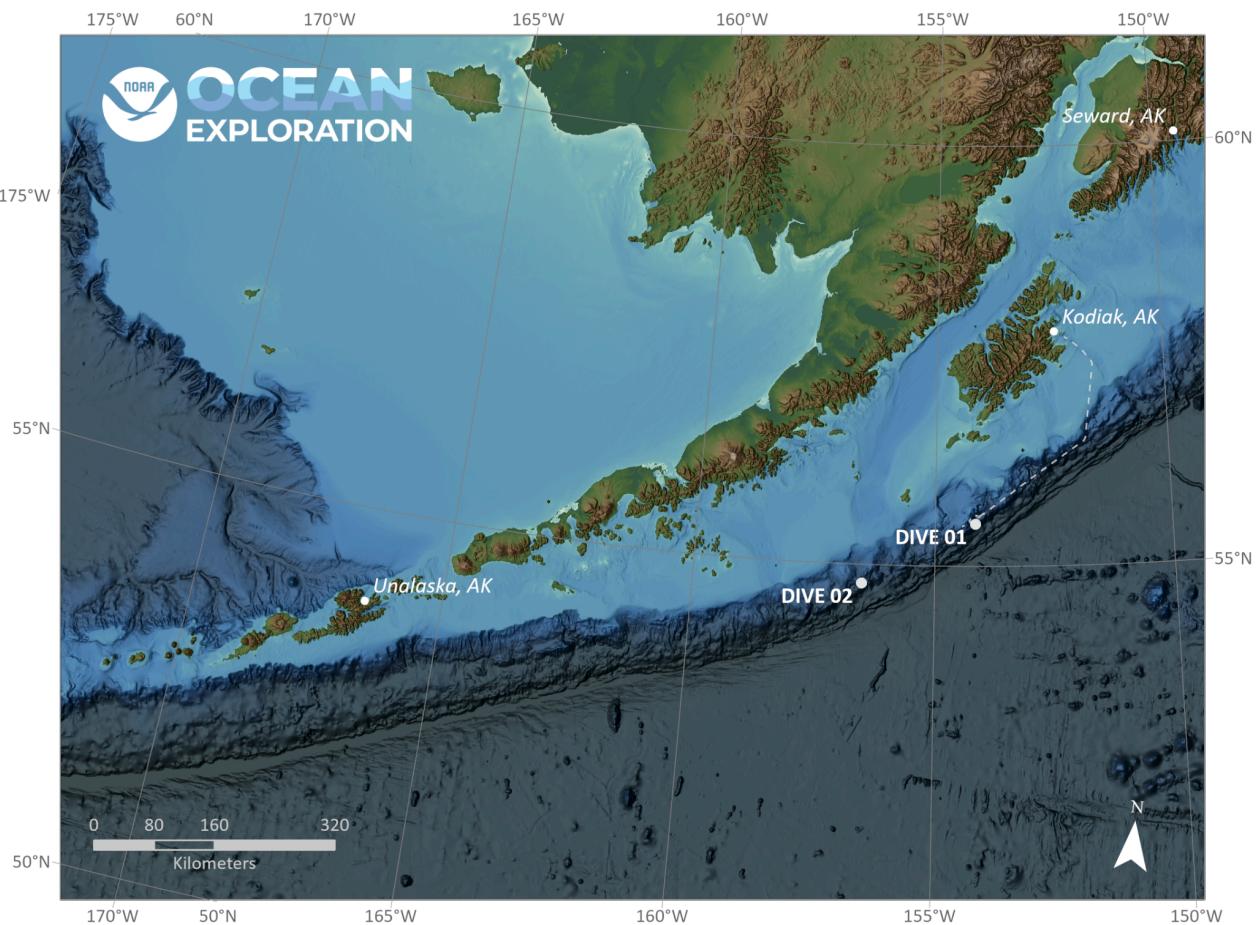


Figure 1. General location of EX2304 Dive 02.

Dive Information

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

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| Dive Description | <p>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.</p> <p>Geology:</p> <p>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.</p> <p>The canyon walls showed some poorly cemented, bedded sedimentary (mudstone) and/or volcaniclastic 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> |
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| | <p>Biology: 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 Rididpathes 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 (Cladorhizidae), Farea sp. sponges (may be a new depth record), mixed among some very large primnoid octocorals (tentatively Parastenella) 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 Cladorhizidae (and two more were collected incidentally on rock samples) and the potential Parastenella.</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 Hemicorallium 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 Cladorhizidae carnivorous sponges; potentially new species of Cladorhizidae, 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 | <p>Corals and Sponges —Present</p> <p>Chemosynthetic Community —Absent</p> <p>High biodiversity Community — Absent</p> <p>Active Seep or Vent —Absent</p> <p>Extinct Seep or Vent — Absent</p> <p>Hydrates — Absent</p> |
| CMECS Feature Type(s) | Scarp/Wall; Submarine Canyon |
| SeaTube Link (science annotations) | https://data.oceannetworks.ca/app/dive-logs/2863 |

Equipment Deployed

ROV

Deep Discoverer

| | |
|------------------------|---|
| 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 <u>were malfunctioning or not operational</u> |
| Equipment Malfunctions | Port Biobox lid stuck. |

Close-Up Map of Main Dive Site

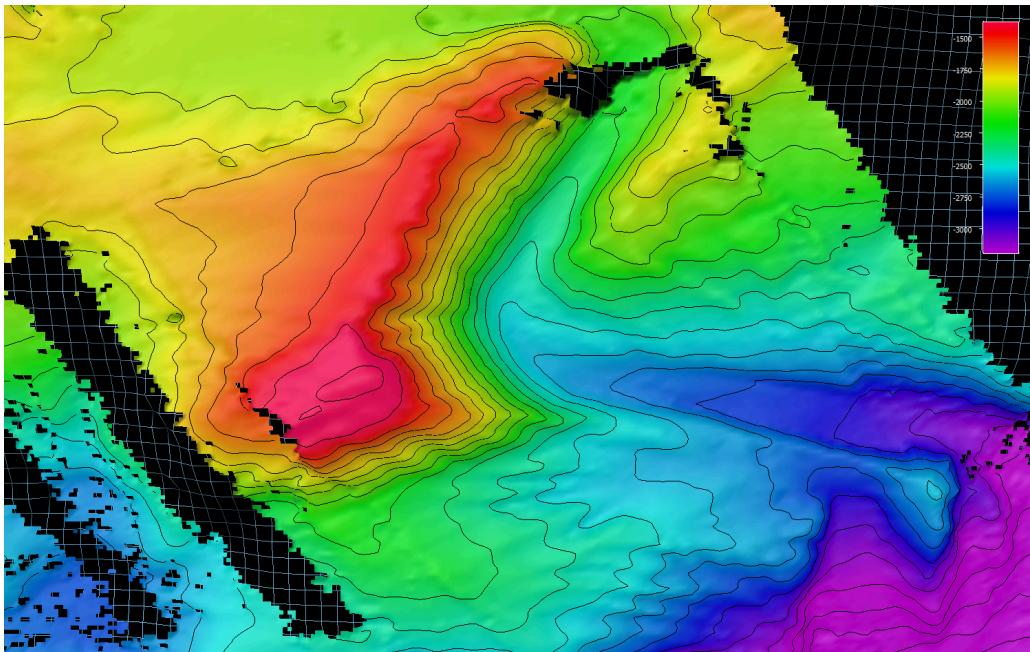


Figure 2: Overview of the “Big Bend Canyon”. North is oriented toward the top of the image.
Depths in meters.

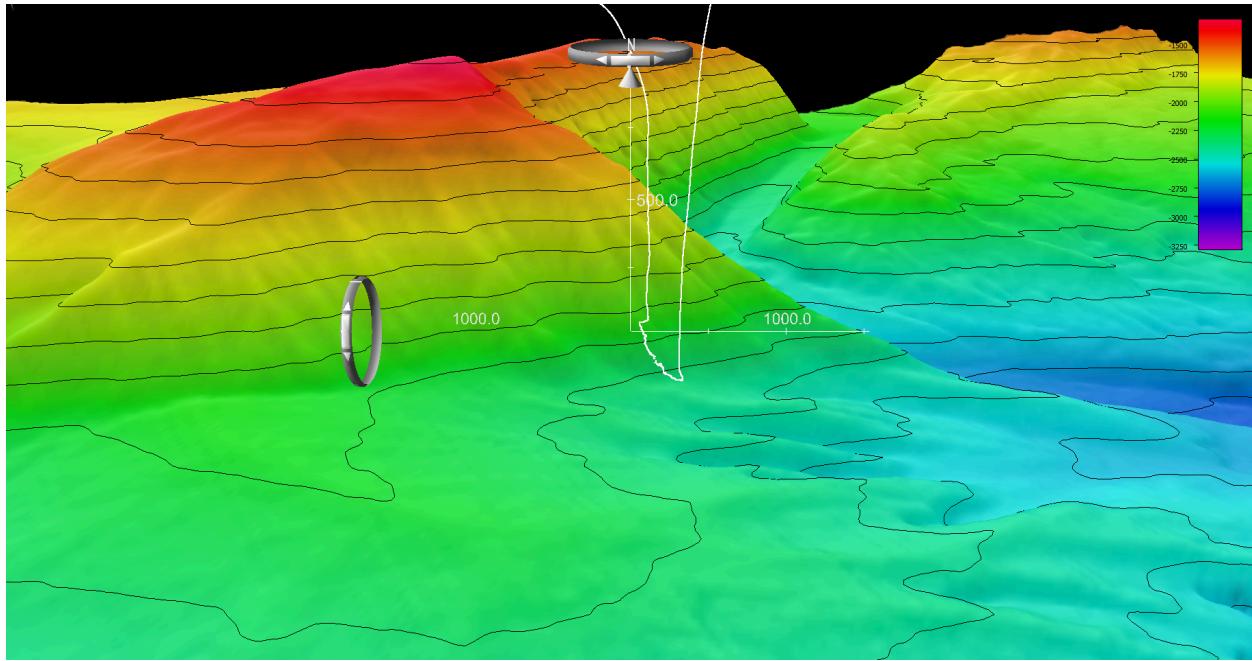


Figure 3: 3D view of the “Big Bend Canyon” ROV track as completed. North is oriented toward the top of the image. Depths in meters.

ROV CTD Profile

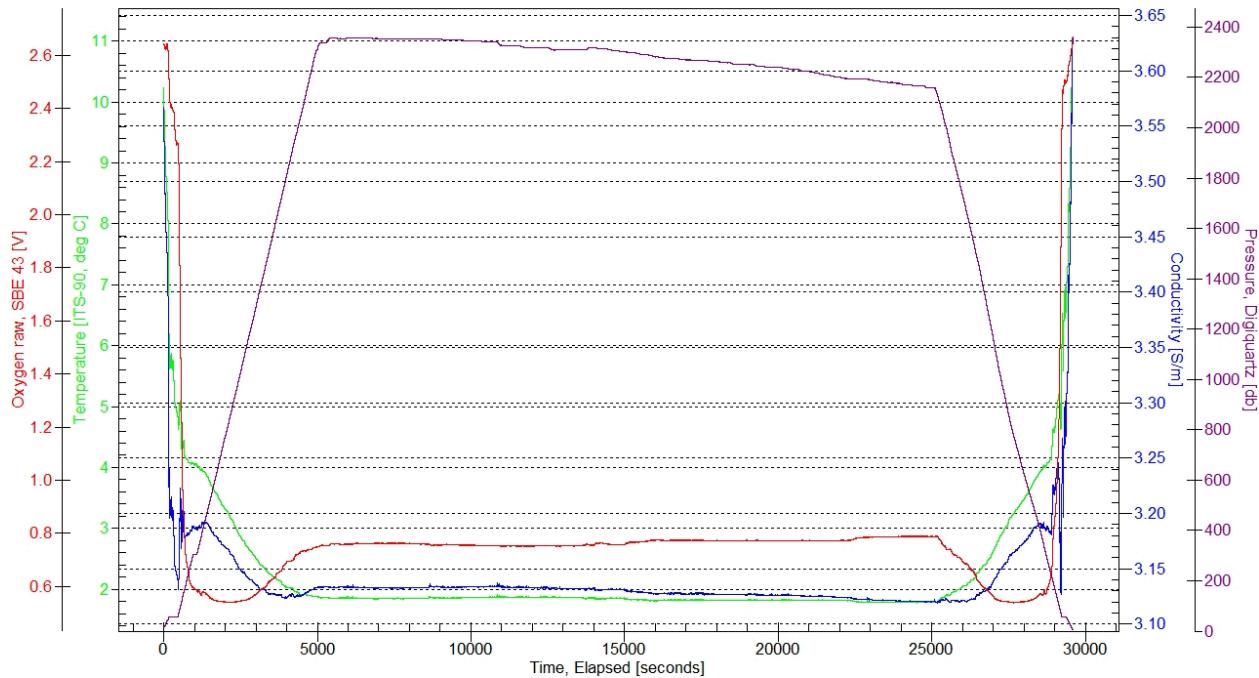


Figure 4. Plot of the ROV CTD profile, showing temperature, conductivity, pressure, and dissolved oxygen over time.

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 volcanic clastics. The now-dissolved tephra or feldspar phenocrysts may have been present in the rectangular, angular voids in the mudstone.

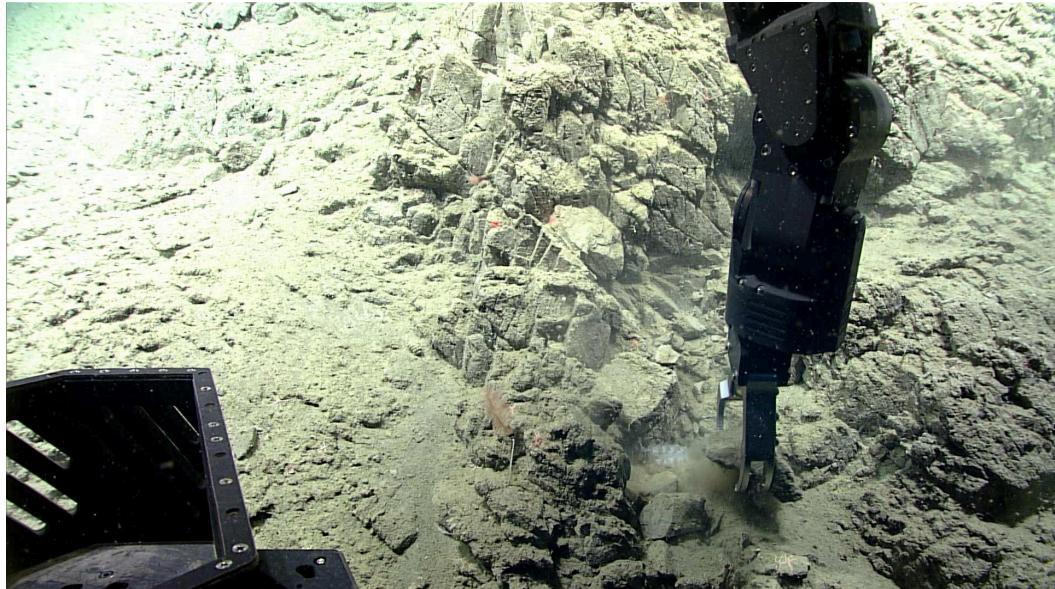


Figure 9: The arm of remotely operated vehicle *Deep Discoverer* sampling fractured, well-cemented mudstone near the top of the ROV transect. This well-cemented, fractured mudstone, collected at a depth of 2,165 meters, was one of three geological samples collected during the dive. Red laser dots (center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

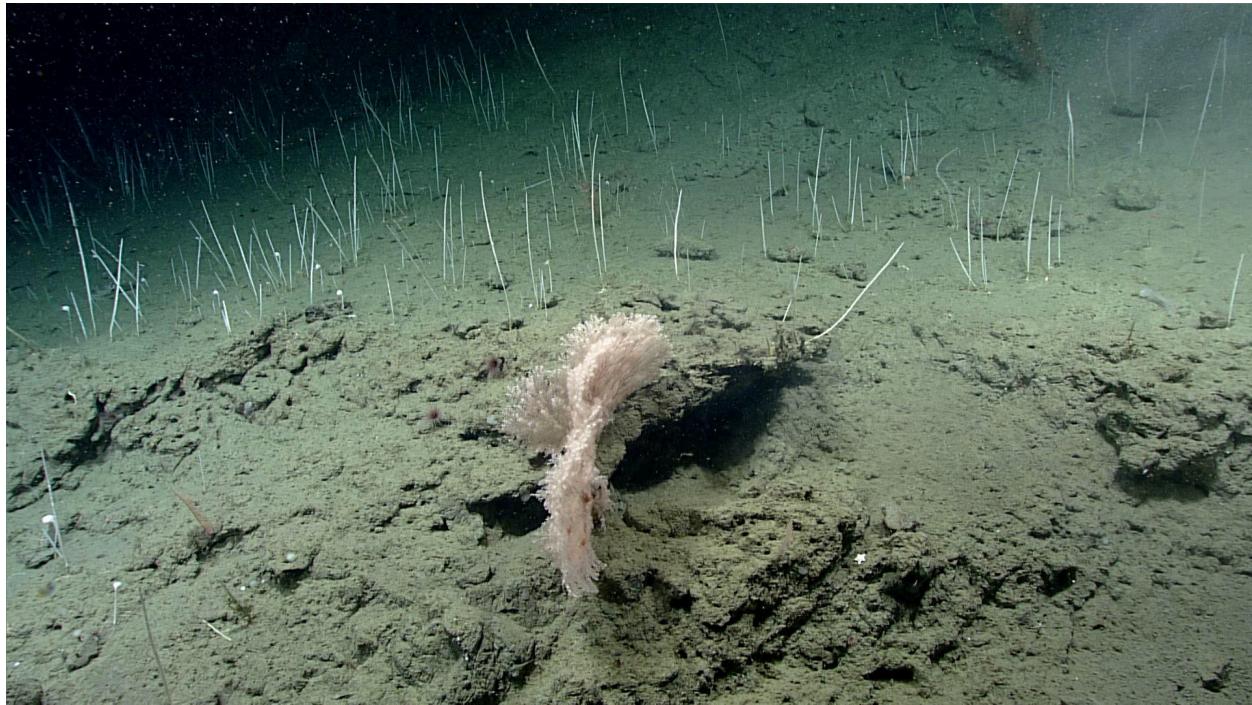


Figure 12: The second half of the dive was dominated by cladorhizid sponges of several species in dense aggregations. In the foreground is a primnoid octocoral, potentially *Parastenella* sp.

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 bathycrinoides |
| 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 |



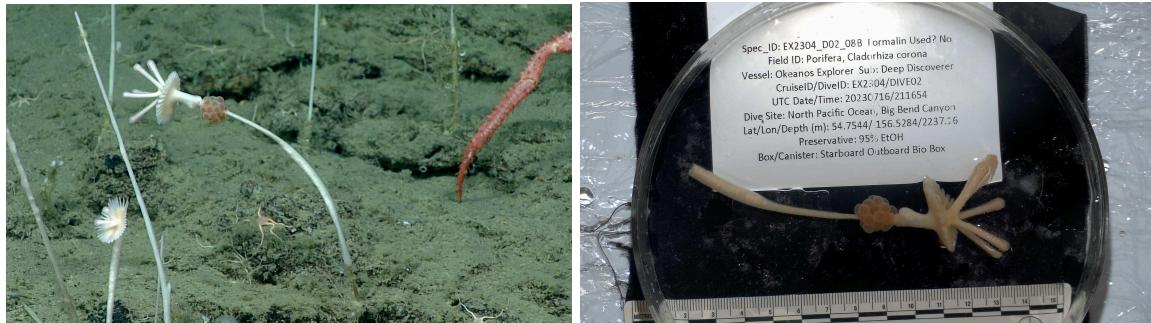
| | |
|-----------------------------|--|
| Sample ID | EX2304_D02_05G |
| Date (UTC) | 20230716 |
| Time (UTC) | 195133 |
| Depth (m) | 2282.8584 |
| Latitude (decimal degrees) | 54.753665 |
| Longitude (decimal degrees) | -156.527228 |
| Temp. (°C) | 1.86518 |
| Field ID(s) | Tuff-volcanic rock |
|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

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



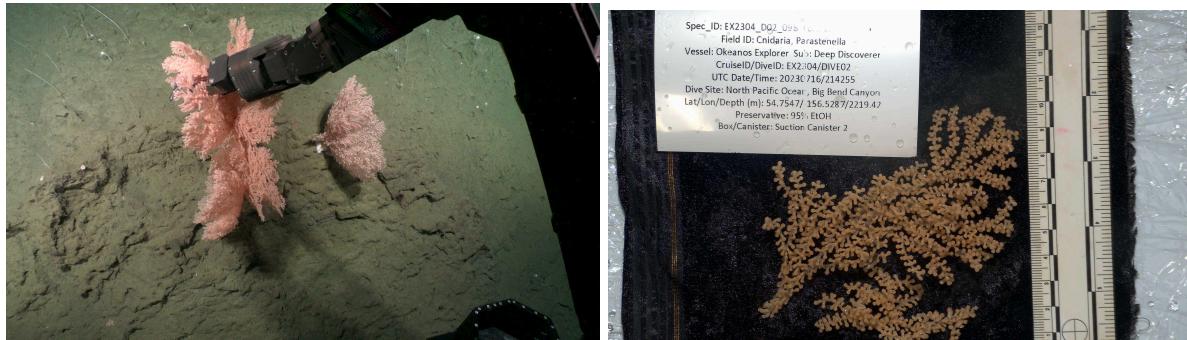
| | |
|-----------------------------|--|
| Sample ID | EX2304_D02_06B |
| Date (UTC) | 20230716 |
| Time (UTC) | 210408 |
| Depth (m) | 2243.0982 |
| Latitude (decimal degrees) | 54.754371 |
| Longitude (decimal degrees) | -156.528252 |
| Temp. (°C) | 1.8159 |
| Field ID(s) | Porifera |
| Comments | 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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