NA128 – The 2021 Expedition on Cascadia Margin

E/V *Nautilus* and ROVs *Hercules* and *Argus* are owned and operated by the Ocean Exploration Trust Inc. (OET). The expedition was a collaborative effort between OET and the NOAA Ocean Exploration Research Program, as well as NOAA Pacific Marine Environmental Laboratory (PMEL).

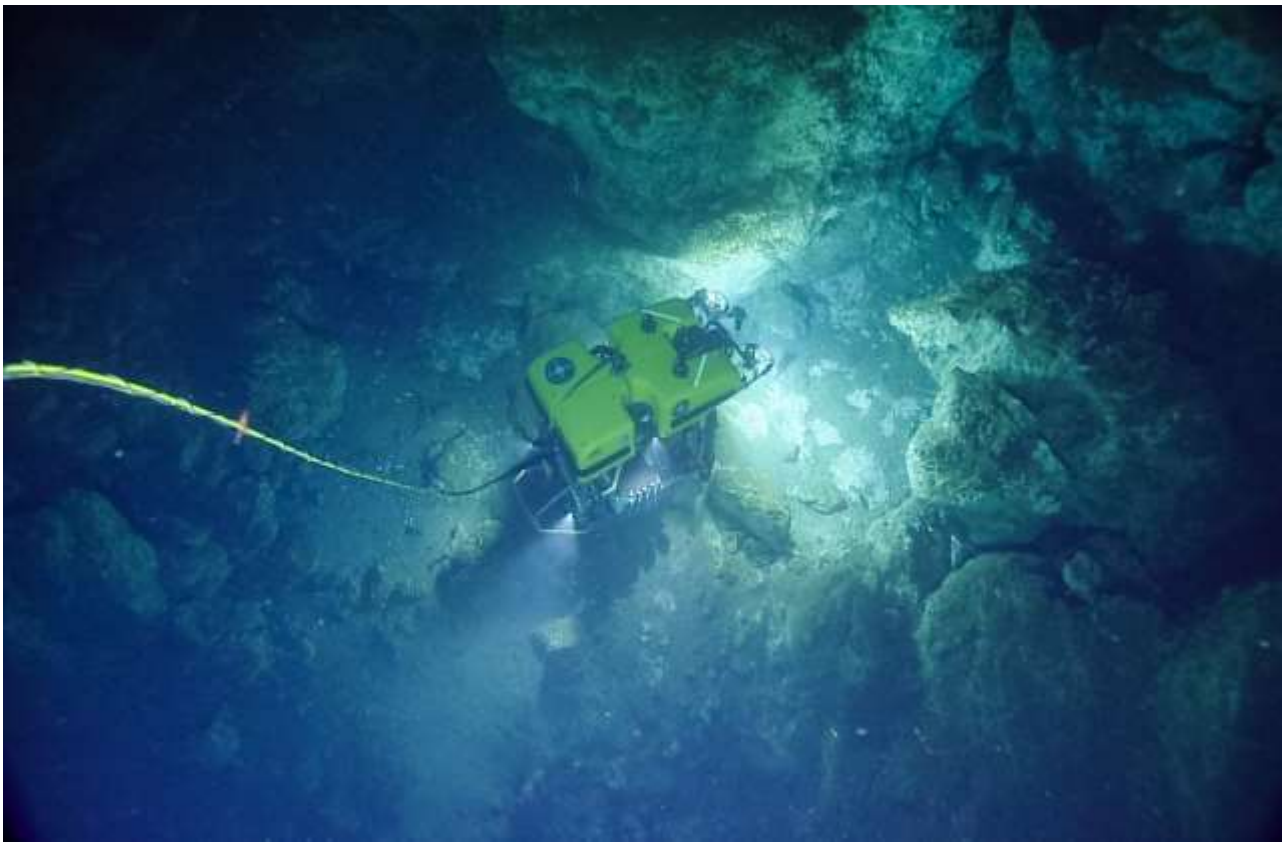
Tamara Baumberger: Lead Scientist (OSU CIMERS / NOAA PMEL)

Nicole Raineault: Expedition Leader (OET)

Robert Waters: OET ROV chief pilot

Neal Myles: OET E/V *Nautilus* Captain

Report compiled by Susan G. Merle (OSU CIMERS / NOAA PMEL)



H1864 Ridge SW of Grays Canyon: Hydrate Site and *Hercules* ROV

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An Overview of E/V *Nautilus* Cruise NA128 on the Cascadia Margin

Tamara Baumberger OSU CIMERS / NOAA PMEL

A multi-disciplinary team of researchers set off to further explore and characterize the Cascadia Margin methane seeps on Ocean Exploration Trust's *E/V Nautilus* with *ROV Hercules* and *ROV Argus on board.* The expedition left Astoria, OR on 22 July 2021 and arrived back on land in Port Angeles, WA on 5 August 2021 after being deferred from expedition season 2020. This project was conducted within the partnership between NOAA Pacific Marine Environmental Laboratory (NOAA PMEL) and NOAA Ocean Exploration. It builds on two previous ROV expeditions to the Cascadia Margin on the *E/V Nautilus*, NA072 in 2016 and NA095 in 2018, respectively. Many classic studies of methane seeps and methane hydrates have been conducted along the Cascadia Margin and bubble streams have been observed by fishermen over several decades, but the overall distribution and number of seeps was largely unexplored. During the E/V *Nautilus* NA072 expedition in 2016, multibeam sonar surveys located over 800 previously unknown bubble streams rising from the Cascadia Margin between the Strait of Juan de Fuca and Cape Mendocino at depths between 104 and 2,073 m, and 10 of these newly located seep sites were characterized during ROV *Hercules* dives. This was a game changer. In the following years, NOAA PMEL and collaborators have conducted several methane seep studies along the Cascadia Margin using a large range of research ships. By early 2020, nearly 3500 methane bubble streams, clustered into more than 1300 methane emission sites, had been identified along the US Cascadia Margin. Hydrophones listened to bubbles being released at the seafloor and the chemical composition of these bubbles has been investigated. Biological studies of the associated ecosystems revealed that microbial communities show high variability in their spatial distribution and community structure and a latitudinal trend was observed in species diversity and richness. Nevertheless, structural influence as well as chemical and biological diversity of these seep sites and their importance to coastal margin ecology remain very poorly known. High-resolution mapping and ROV-based surveys, sampling, and characterization of methane seep sites are essential to evaluate the tectonic influence on seepage, the chemical variations and the resulting biodiversity of these seep habitats.

The 2021 expedition resulted in 11 ROV sampling dives in 13 days at sea. 6956 km^2 of water column and seafloor multibeam mapping was conducted as well as collecting sub-bottom profiling data. Typically, ROV dives were conducted during daytime (8 am to 8 pm PT) and the night was used to transit to the next dive site and map the seafloor and the water column using the ship-mounted EM302 multibeam sonar system. Upon arrival at a new dive site;the E/V Nautilus mapped the dive area to identify locations of active bubble streams, which were the most promising dive targets. ROV dives covered a depth range from 149 m to 1767 m along the Oregon and Washington Cascadia Margin. In addition to the standard operational tools, ROV Hercules was equipped with scientific instruments including up to 3 gastight sampling bottles, a gastight hydrate sampler, 6 Niskin bottles, 5 push core liners, a Norbit multibeam sonar, a miniature autonomous plume recorder (MAPR) and a high-resolution still camera. The team on the E/V Nautilus hosted 14 ship-to-shore interactions throughout the expedition ranging from the Oregon coast to Cyprus as well as provided full ROV dive recordings on Youtube.

A major finding of this expedition was the discovery of a warm seep at the base of the continental slope 15 km east of the Cascadia deformation front offshore southern Oregon. This dive location was selected based on recently collected seismic reflection data indicating the presence of upwelling warm fluid. This is a rare finding and the identification and sampling of such a seep exemplifies the need for further exploration.

An ROV Hercules dive to a previously located hydrate deposit in the Astoria Canyon found that said hydrate deposit was no longer exposed (identified by a physical marker left at the seafloor), but that the area was still actively seeping. However, additional dives at the canyon floor discovered hydrate of about 4 m^3 exposed at a site that had not yet been visited as well as several areas with exposure closer to the canyon wall.

Exploring the benthic habitat and community diversity of previously unexplored methane seeps and hydrate sites led to the collection of numerous biological samples. During the exploration of a carbonate ridge offshore from Newport, OR, the benthic fauna observed in sedimented areas included ophiuroids, crinoids, and sea stars, while dominant fauna on rocky substrates included glass sponges, corals (including mushroom, bubblegum, and bamboo), anemones, buccinid gastropods, and various sea stars. Multiple seep habitat areas were encountered, including active bubbling, characterized primarily by white microbial mats, reduced sediments, medium-sized patches of vesicomyid clams, shell hash, and mushroom corals on adjacent rocks. Demersal fauna included thornyhead rockfish, flatfish, hagfish, eelpouts and large schools of sablefish.

The water column samples collected for dissolved gases, nutrients and trace metals inform about the distribution and fate of methane in the water column above seeps. The data will be added to other datasets for an improved estimate for the air-sea methane flux along the West Coast. Water column chemistry also investigates the mitigation of nutrients and trace metals from the seafloor to the shallow ocean.

The new findings illustrate that we are still only at the beginning of exploring and characterizing the Cascadia Margin methane seeps, including through the coordination and interpretation of existing and new datasets. The collected data represents important new baseline data that can be used to investigate possible methane-related impacts associated with climate, blue economy, marine chemistry, benthic and water column biology and habitat, and the current tectonic state of the Cascadia Margin.

Table 1: NA128 Scientific Participants at Sea

Name	Role	Affiliation
Tamara Baumberger	Lead Scientist	Oregon State Univ/ NOAA PMEL Earth Ocean Interactions Program
Nicole Raineault	Expedition Leader	OET
Anson Antriasian	Science / Data Team	Oregon State Univ/ NOAA PMEL Earth Ocean Interactions Program
Lila Ardor Bellucci	Science / Data Team	OET / Oregon State Univ.
Jeffrey Beeson	Science / Data Team / Navigator	Oregon State Univ/ NOAA PMEL Earth Ocean Interactions Program
Shannon Brown	Science / Data Team	Univ. of Washington /NOAA PMEL Earth Ocean Interactions Program
Nathaniel Buck	Science / Data Team	Univ. of Washington / NOAA PMEL Earth Ocean Interactions Program
Tim Burbank	Data Engineer	OET
Megan Cook	Communications	OET
Dan Cormany	ROV Pilot	OET
Mark DeRoche	Deck Chief	OET
Tammy Gomez	Video Engineer	Mumbian Enterprises, Inc.
Michael Hannaford	Hercules Pilot	OET
Anne Hartwell	Science / Data Team	OET
Renato Kane	Navigator	OET
Kristopher Krasnosky	Navigator / High Resolution Mapper	Univ. of Rhode Island
Ed McNichol	Video Operations Manager	Mumbian Enterprises, Inc.
Susan Merle	Science / Data Team	Oregon State Univ/ NOAA PMEL Earth Ocean Interactions Program
Kylie Pasternak	Argus Pilot	OET
Kevin Roe	Science / Data Team	Univ. of Washington / NOAA PMEL Earth Ocean Interactions Program
Rendhy Sapiie	Argus Pilot	OET
Taylorann Smith	Science Manager-In-Training	OET
Mychal Valle	ROV Engineering Intern	OET
Robert Waters	Hercules Pilot	OET
Nova West	Video Engineer / Documentarian	OET

Fig. 1: Locations of Hercules NA128 ROV Dives and Bubble Streams on Cascadia Margin
Susan Merle

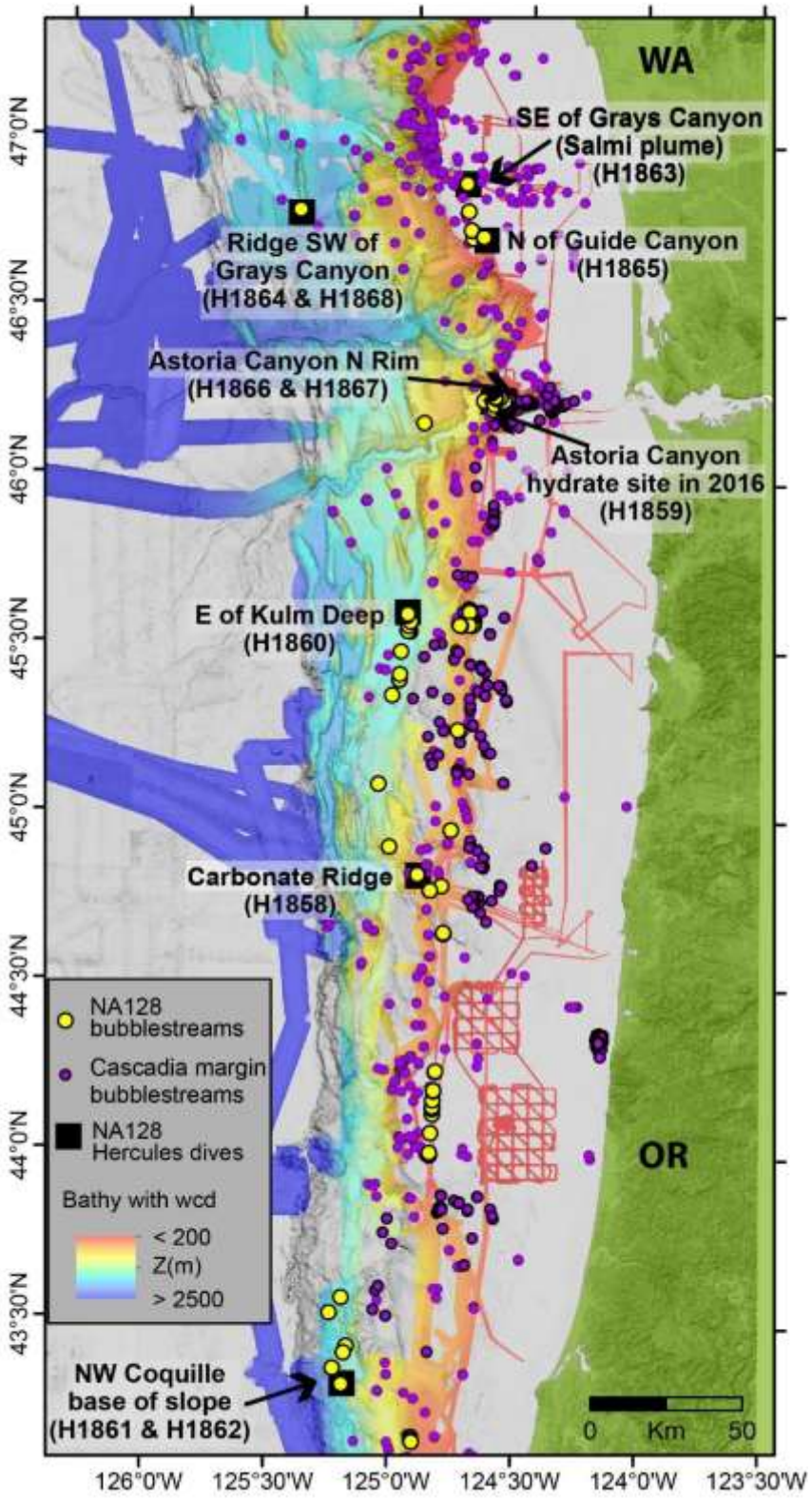


Table 2: NA128 Hercules Dive Locations, Sites and Times

EM302 multibeam seafloor and water column mapping operations were conducted during transits between dive sites. Each site was mapped prior to the ROV dive to assess if bubble streams were active candidates for sampling during the dive.

All times are UTC (7 hours ahead of local PST time)

Site	Dive	Area	Longitude	Latitude	On bottom	Off bottom	Z Launch
Carbonate Ridge	H1858	Offshore Newport OR	-124.923579	44.834323	2021-07-23 15:38:49.896Z	2021-07-24 02:18:41.890Z	390
Astoria canyon hydrate	H1859	Original AC hydrate site	-124.648750	46.242595	2021-07-25 15:51:25.661Z	2021-07-26 00:41:34.644Z	843
E of Kulm Deep	H1860	No bubble streams but interesting pit	-124.992000	45.613101	2021-07-26 16:10:04.597Z	2021-07-27 01:45:11.349Z	1650
NW Coquille base of slope	H1861	Warm water and multiple bubble streams. ID'd in former MBES data and on Langseth cruise	-125.187358	43.325654	2021-07-27 17:44:39.213Z	2021-07-27 21:06:03.285Z	1765
NW Coquille base of slope	H1862	Warm water and multiple bubble streams. ID'd in former MBES data and on Langseth cruise	-125.187358	43.325654	2021-07-28 04:35:43.245Z	2021-07-28 09:07:10.804Z	1765
SE of Grays Canyon Salmi Plume	H1863	Lots of bubble streams and biota	-124.776800	46.885400	2021-07-30 16:12:59.834Z	2021-07-30 02:00:41.504Z	154
Ridge SW of Grays Canyon (2 dives)	H1864	Found hydrate on first dive and sampled it.	-125.493133	46.789077	2021-07-30 16:12:59.834Z	2021-07-30 21:50:28.393Z	1600
N of Guide Canyon	H1865	Lots of bubble streams and biota	-124.690080	46.719698	2021-07-31 11:22:05.736Z	2021-07-31 22:42:53.149Z	150
Astoria Canyon S Rim to N Rim	H1866	First dive was exploratory and found hydrate.	-124.611552	46.244794	2021-08-01 15:36:29.058Z	2021-08-02 02:18:33.836Z	783
Astoria Canyon N Rim and up N wall	H1867	Second dive found new hydrate exposure and immense biota on canyon wall.	-124.602503	46.240635	2021-08-03 16:01:19.232Z	2021-08-04 01:59:17.617Z	756
Ridge SW of Grays Canyon (2 dives)	H1868	Not much time on final dive but sampled bubbles and biota	-125.493133	46.789077	2021-08-04 12:02:10.414Z	2021-08-04 17:36:12.508Z	1600

NA128 Dive Summaries

Tamara Baumberger OSU CIMERS / NOAA PMEL

A multi-disciplinary team of researchers participated on this seagoing expedition on Ocean Exploration Trust's *E/V Nautilus* with *ROV Hercules* and *ROV Argus* to further explore and characterize the Cascadia Margin methane seeps from Astoria, OR to Port Angeles, WA from 22/July to 5/August 2021 (cruise deferred from expedition season 2020). This project was coordinated within the partnership between NOAA PMEL and NOAA OE. It builds on two previous ROV expeditions to the Cascadia Margin on the *E/V Nautilus*, NA072 in 2016 and NA095 in 2018. The 2021 expedition resulted in 11 ROV sampling dives in 13 days at sea, and 6956 km^2 of water column and seafloor multibeam mapping and sub-bottom profiling data. Typically, ROV dives were conducted during daytime (8 am to 8 pm PT) and the night was used to transit to the next dive site and map the seafloor and the water column using the ship-mounted multibeam sonar system. Once arrived at a new dive site, E/V Nautilus mapped the dive area to identify locations of the at that time active bubble streams as most promising dive targets. ROV dives covered a depth range from 149 m to 1767 m along the Oregon and Washington Cascadia Margin. In addition to the standard operational tools, ROV Hercules was equipped with scientific instruments including up to 3 gastight sampling bottles, a gastight hydrate sampler, 6 Niskin bottles, 5 push core liners, a Norbit multibeam sonar, a miniature autonomous plume recorder (MAPR) and a high-resolution still camera. Expedition highlight were the discovery of a methane seep with both rising bubble streams and warm fluid flow, at the base of the continental slope 15 km off the Cascadia deformation front, and the discovery of a large hydrate deposit at the Astoria Canyon floor. Both findings are good examples for the need of further exploration of the Cascadia Margin. The team on the E/V Nautilus hosted 14 ship-to-shore interactions throughout the expedition ranging from the Oregon coast to Cyprus as well as provided full ROV dive recordings on YouTube.

The expedition left the port of Astoria, OR on 22. July 2021 and headed to the first dive site called approximately 70 km W/NW of Depoe Bay, OR. The previously submitted dive targets had to be continuously reviewed and adjusted due to weather constraints in Southern Oregon and restricted time windows for dives in Central and Northern Washington. Three dives were lost to the weather (24. July, 28. July, 2. August), due to an unfavorable combination of speed and direction of wind, currents and waves.

The following dive summaries are based on the daily site reports written by the OET expedition leader Nicole Raineault, the dive logs and additional notes taken by science lead Tamara Baumberger.

Dive H1858: Carbonate Ridge. NW/SE trending ridge, 70 km W/NW of Depoe Bay, OR. (Z = 570 to 465 m)

Overnight we mapped Carbonate Ridge to identify plume targets and also mapped an adjacent area to the north. The mapping data showed that the active plume sites on the ridge were toward the north end of the feature compared with previous mapping data. We shifted the dive plan and launched the ROVs on 23. July at 0800 for a 12-hour dive. We have found several seeps among the well-formed carbonate on the seafloor. We collected 6 Niskin bottles (3 at each of two plume sites), 2 gastights, slurps of clams and a crab, a

seastar, two soft coral, and three carbonate samples. The sediment was too thin for coring. The last two hours of the dive featured spectacular schools of sable fish as we transited from the last seep along the ridge.

Dive H1859: Astoria Canyon Hydrate. Purpose was to find hydrate on the canyon floor. (Z = 836 to 851)

We mapped overnight and selected targets for a dive on the Astoria Canyon to look for hydrate. The ROVs were launched on 25. July at 0800 for a 12-hour dive. The first site, where we found hydrate in 2016, had an active seep, microbial mat, but no hydrate exposed. The ROVs traversed across the canyon floor to search for hydrate where hydrate was located during a USGS-led R/V Falkor cruise in 2019. We encountered a very vigorous seep and some microbial mats, but no methane hydrate exposures suitable for sampling. We took all 6 Niskin bottles, 5 pushcores, and 1 gastight (1 failed). No clams were found on this dive. The ROVs moved across the seastar-covered canyon floor to explore the north wall, but the decision was made to recover early due to increasing winds and strong current. The vehicles were on deck by 1900 PDT.

Dive H1860: East of Kulm Ridge Deep. (Z = 1618 to 1600)

We mapped overnight on our way to the deep site east of Kulm Ridge. We remapped the dive site in advance of diving and found that the plume had been quite strong in the morning of 24. July (weather day) was not releasing any bubbles at the time of this second survey. Despite this observation, we launched the ROVs on 26. July at 0800. The ROVs encountered some microbial mats, empty clam shells, and worms. There was also a carbonate structure visible. Some bubbles were reported along the crater rim, but this is unconfirmed. We collected 4 pushcores, 6 Niskin bottles, a basketstar, tubeworms, and clam shells. We conducted a high-resolution mapping survey of the site with the Norbit sonar.

Dive H1861: NW Coquille - base of the slope. (Z = 1770 to 1763 m). Exploratory dive based on seismic data collected on the R/V Marcus Langseth earlier in 2021.

We mapped south to the NW Coquille site at the base of slope and located an active seep for ROV dive H1861. The ROVs were launched on 27, July at 0900. The seep site proved interesting, with a small pit on the seafloor, which was venting warm fluids and gas bubbles. This is a very active seep and the sediments also seem saturated with gas. We collected 2 Niskin bottles, 1 gastight of bubbles and 1 gastight with fluids, and 2 push cores (one has outgassed significantly) and took temperature measurements. The seep area had white microbial mat, ophiuroids, shell hash, and some large live clams. We collected Norbit data of the bubble streams near the seabed. The manipulator jaw stopped working around 1330 and we decided to end the dive at 1400 PDT so we could fix the issue and look into USBL issues, and then return to the site to take more samples. This manipulator control issue was resolved by the team on the ROV ascent.

Dive H1862: NW Coquille - base of the slope. (Z = 1763 m). Second dive to warm seep site.

We re-launched the ROVs on 27. July at 2000 PDT for an 8-hour return dive to the NW Coquille base of slope site. We resampled the pit with warm fluid and bubbles and found more areas with shimmering water and bubble streams. The sampling objectives were met (3 gastight samples, 6 Niskin bottles, ophiuroids,

clams, carbonate rock, 3 push cores). We conducted a Norbit survey in downward-looking/survey mode at this site before recovering the vehicles at 0400. The USBL issue that had been identified on the last dive was resolved. The teams processed samples overnight and we mapped on our way to the next dive site on the shelf, north of Coquille. The wind and currents were very strong at the site—over 25 knot winds and white capping waves. Since the forecast was for increasing winds and seas across the remaining Oregon dive sites, we decided to cancel the dive and head north to southern Washington.

Dive H1863: SE of Grays Canyon. (Z = 153 – 148 m). To pockmark published in Salmi et al. (2011)

We mapped our way north to an area SE of Grays Canyon to visit a known seep site described by Salmi et al. (2011). Over half a dozen plumes were identified in the water column data. The ROVs were deployed on 29, July at 1000 PDT and on the bottom at 152 m depth shortly after. Bubble plumes were quickly discovered, including one with an orange bacterial mat. We have collected carbonate rocks, 6 Niskin bottles, 2 gastights, 3 push cores, 2 sea stars, and slurp samples of some small orange squat lobsters, tubeworms, and clams. Although the site has low visibility there are many interesting features including large carbonate slabs, strong seeps, old piles of shell hash, and sponges. We ended the dive by exploring the seafloor depression which was the subject of the Salmi et al. (2011) publication and found large carbonate slabs, many fish (lingcod and rockfish primarily), and bubble streams. We did not detect these earlier during our sonar mapping. The winds and waves picked up after 1600 PDT, so we recovered the vehicles a little early (~1920 PDT).

Dive H1864: Ridge SW of Grays Canyon. (Z= 1600 m)

We mapped the ridge site west of Grays Canyon early in the morning and identified strong targets in the water column data. The ROVs were launched on 30, July at 0800 PDT for a dive to ~1600 m depth on the ridge. The feature was spectacular—with large carbonate blocks and sheets and strong bubble plumes. Methane hydrate was observed and sampled early in the dive. We also collected 2 gastight samples, 5 Niskin bottles, 2 sediment cores, clams, Acharax shells, tubeworms, and carbonate rock. The dive was cut short due to increasing winds of 25 knots and strong currents. The ROVs were on deck at 1645 PDT.

Dive H1865: N of Guide Canyon - Shelf. (Z = 150 - 143 m). To shelf area - location selected based on seismic profile collected on the R/V Marcus Langseth earlier in 2021.

We mapped over the dive site north of Guide canyon on the shelf overnight and identified over a dozen water column seep targets. The ROVs were launched on 31, July at 0400 PDT to a depth of 150 m. The low-visibility shallow site was largely rock coated in a thin veneer of sediment. We located several seeps, which were very intermittent and weak. Some of the targets we had mapped hours before were not active at the time the ROVs were on the seafloor. There were some small, patchy white and orange bacterial mats, some white clam shell hash, but not a lot of other seep fauna visible. We managed to find one bubble stream that was consistent enough to collect a gastight sample. We also found some clams on carbonate rock to

sample and took carbonate rock samples as well. All 6 Niskin bottles were collected along with 4 sediment cores and a cup coral.

Dive H1866: Astoria Canyon North Rim. (Z = 783 - 756 m). To the Northern rim of the base of the Astoria Canyon. Exploring new bubble streams.

We mapped an east-west line from Astoria Canyon overnight to gather additional water column data and identified several strong plumes in the collected data for a dive along the northern rim of Astoria Canyon floor. The ROVs were launched on 01, August at 0800 PDT to a depth of 783 m. Many strong bubble streams were found along the dive transect, which hugged the junction between the canyon floor and wall. Gastropods and microbial mats were found with many of the bubble streams. A large exposure of methane hydrate was discovered and sampled. Other samples include sea stars, 2 gastights, 6 Niskin bottles, 5 push cores, gastropods, and clams. Marker 209 was left at the hydrate site. The sablefish made visibility a challenge at the end of the dive, but all objectives were met.

Dive H1867: Astoria Canyon North Rim. (Z = 783 - 756 m). To the Northern rim of the base of the Astoria Canyon. Repeat dive of H1866 for more hydrate and bubble sampling.

The ship was on site on 03. August by 0730 PDT for the dive at the Astoria Canyon hydrate site. The ROVs were launched just after 0800. We returned to the hydrate location and took two gastights and a hydrate sample. The ROVs explored a ridge along the canyon wall and found more exposed hydrate along with bacterial mats, corals and sponges. The sablefish made their return, reducing visibility as we explored the area. We collected high-resolution Norbit sonar data with Hercules across the seep sites and up the ridge. Other samples include 6 Niskin bottles, small gastropods, sediment cores, carbonate, and cup coral.

Dive H1868: Ridge SW of Grays Canyon. (Z= 1600 m) Repeat dive of H1864 for further exploration and sampling.

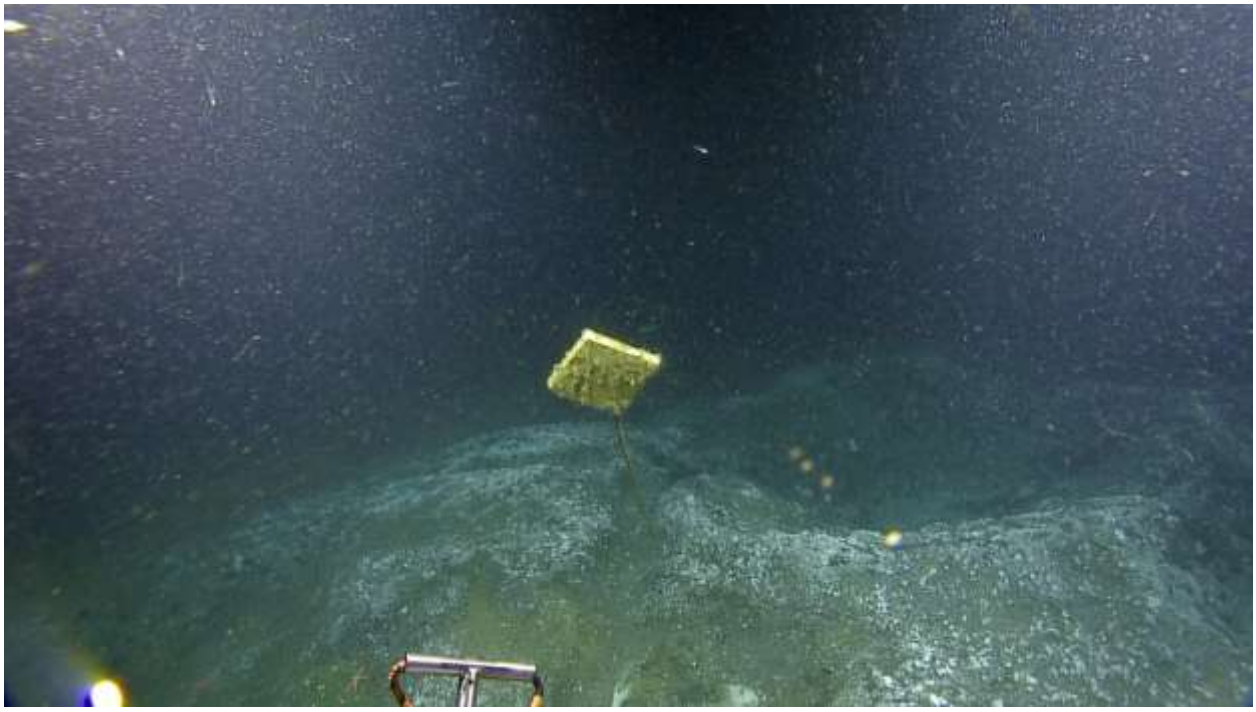
We launched the ROVs on 04. August at 0400 PDT for the last dive of the cruise for further exploring the ridge SW of Grays Canyon. We collected a gastight at the site near the methane hydrate before exploring other targets identified in the mapping data overnight. We could not locate active seeps at any of those targets. The ROVs traversed the ridge to complete the exploration targets from the previous dive plan and found more large slabs of carbonate with fractures filled with sediment and patches of tubeworms, gastropods, bivalves, and occasional microbial mat. We returned to the active bubbling site, near the exposed hydrate, to collect a final gastight and a series of 6 Niskin bottles on ascent. This dive ended by 1200 PDT to start the transit to Port Angeles, WA.

Hercules and Argus Images from the Seafloor

H1858 Carbonate Ridge: gastropods, shell hash, bacterial mat

H1858 Carbonate Ridge: fishing gear and sable fish

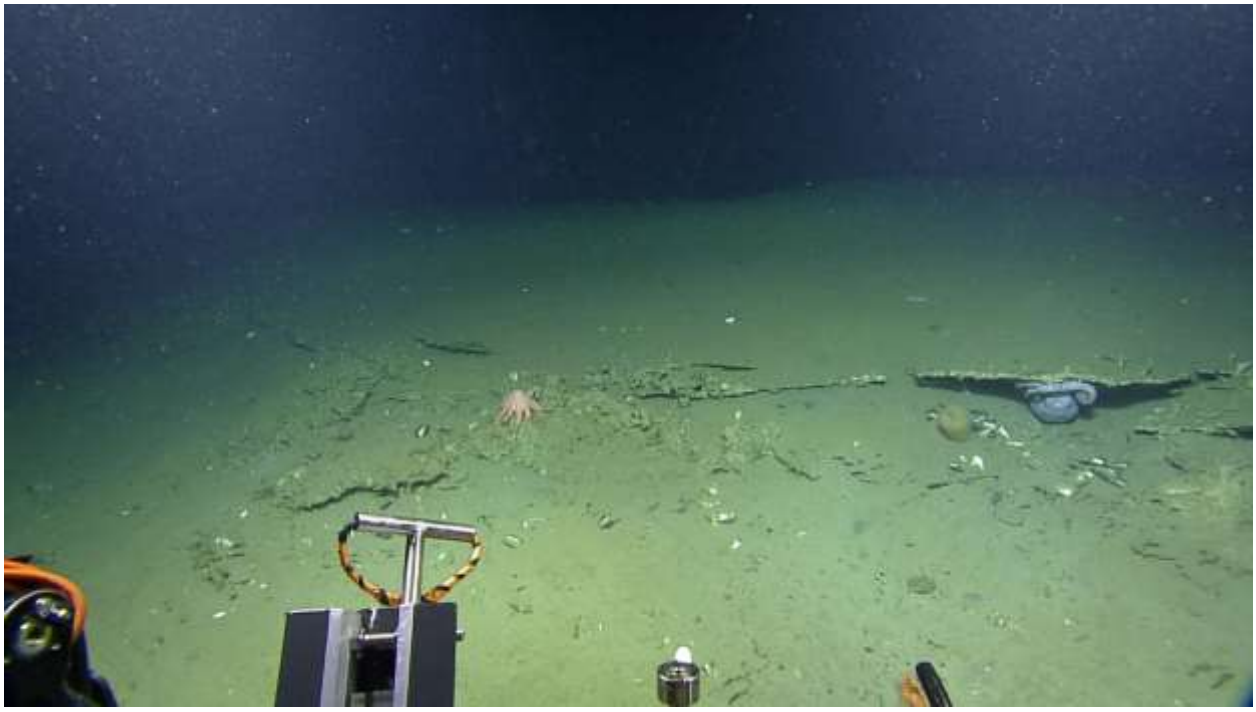
H1859 Astoria Canyon 2016 hydrate site: revisited in 2021. Seafloor marker from 2016. No hydrate found.



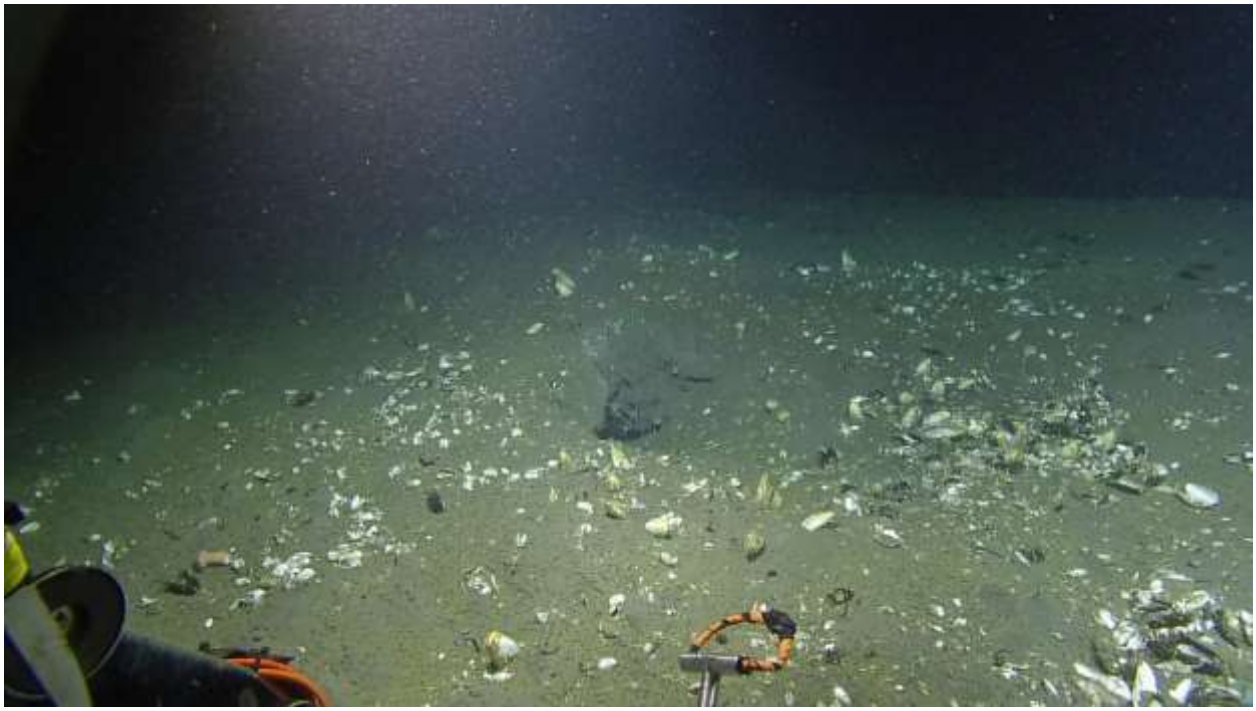
H1859 Astoria Canyon 2016 hydrate site: Core sample

H1860 E of Kulm Deep: Tubeworm bush with associated biota

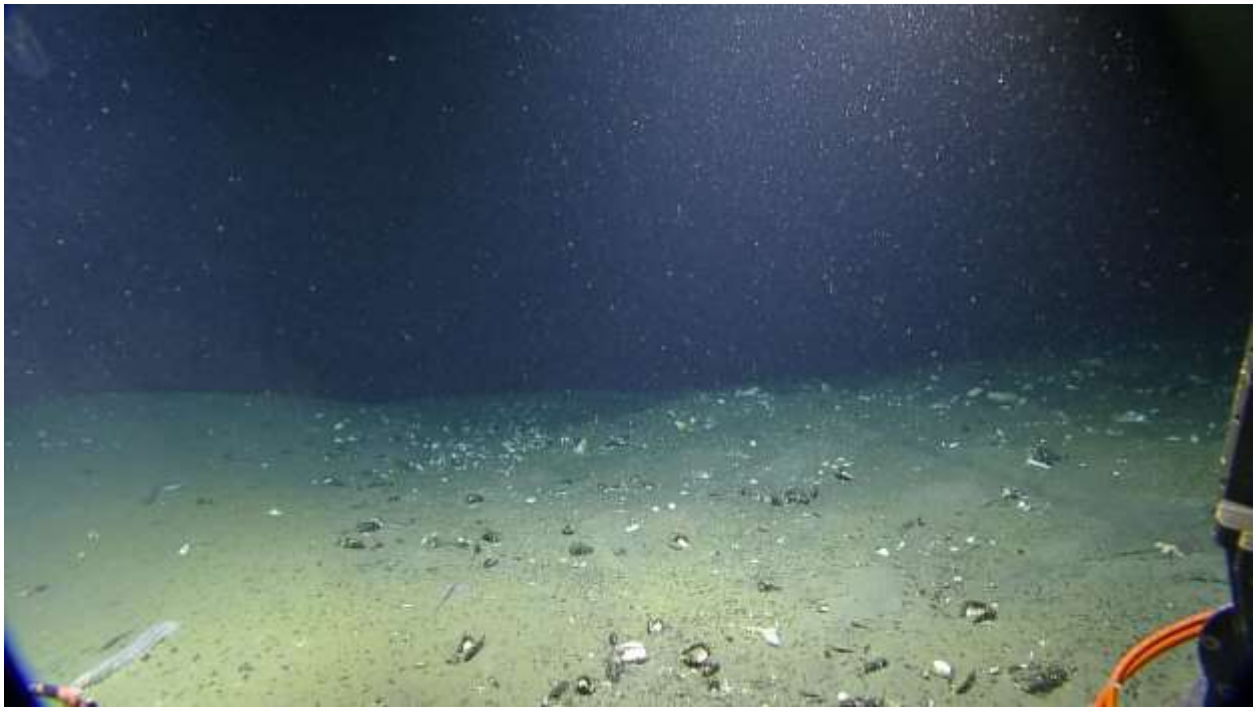
H1860 E of Kulm Deep: Octopus under ledge (right) sea star (center-left) and shell hash



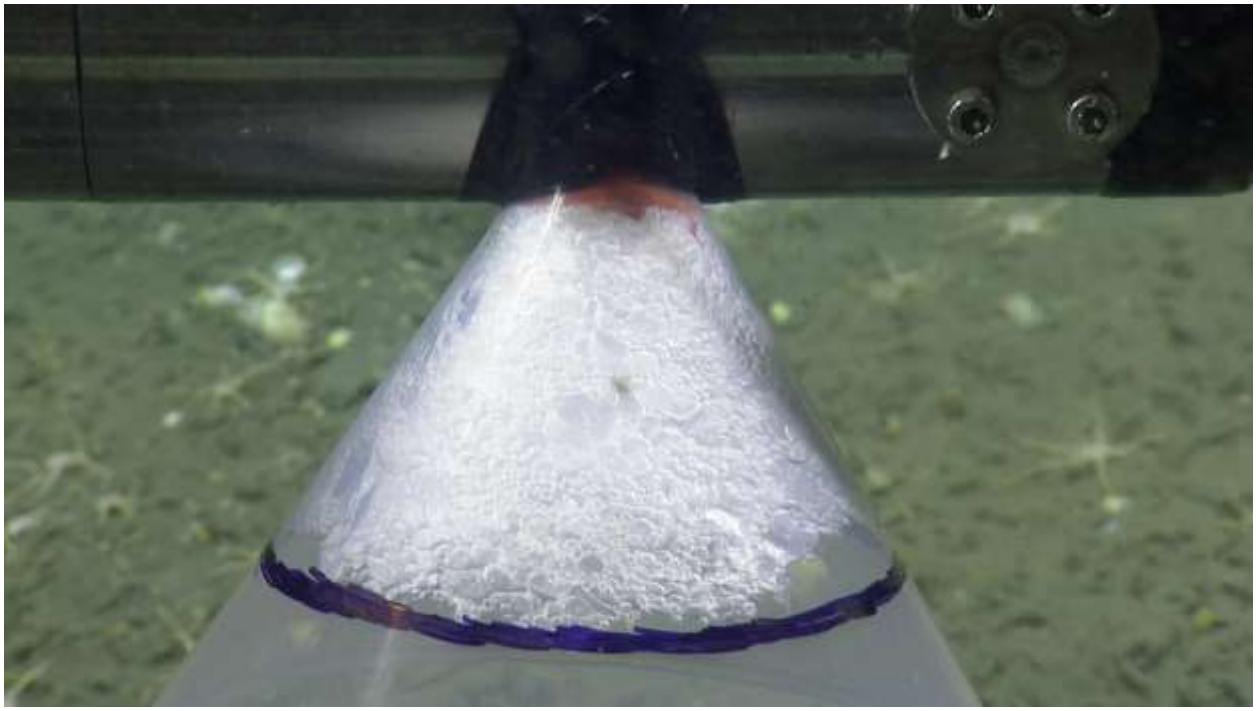
H1861 NW Coquille base of slope: shell hash, bivalves and diffuse venting



H1861 NW Coquille base of slope: bubbles and the bottom



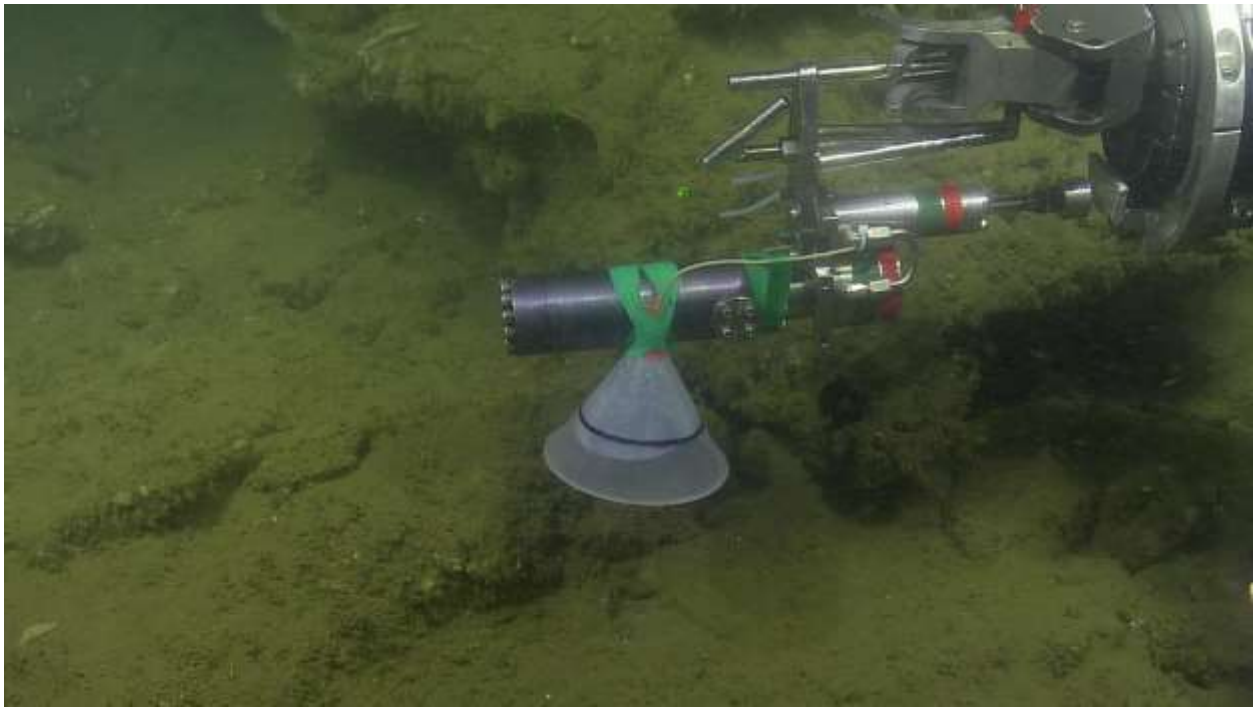
H1862 NW Coquille base of slope: gas tight sample with hydrate in funnel



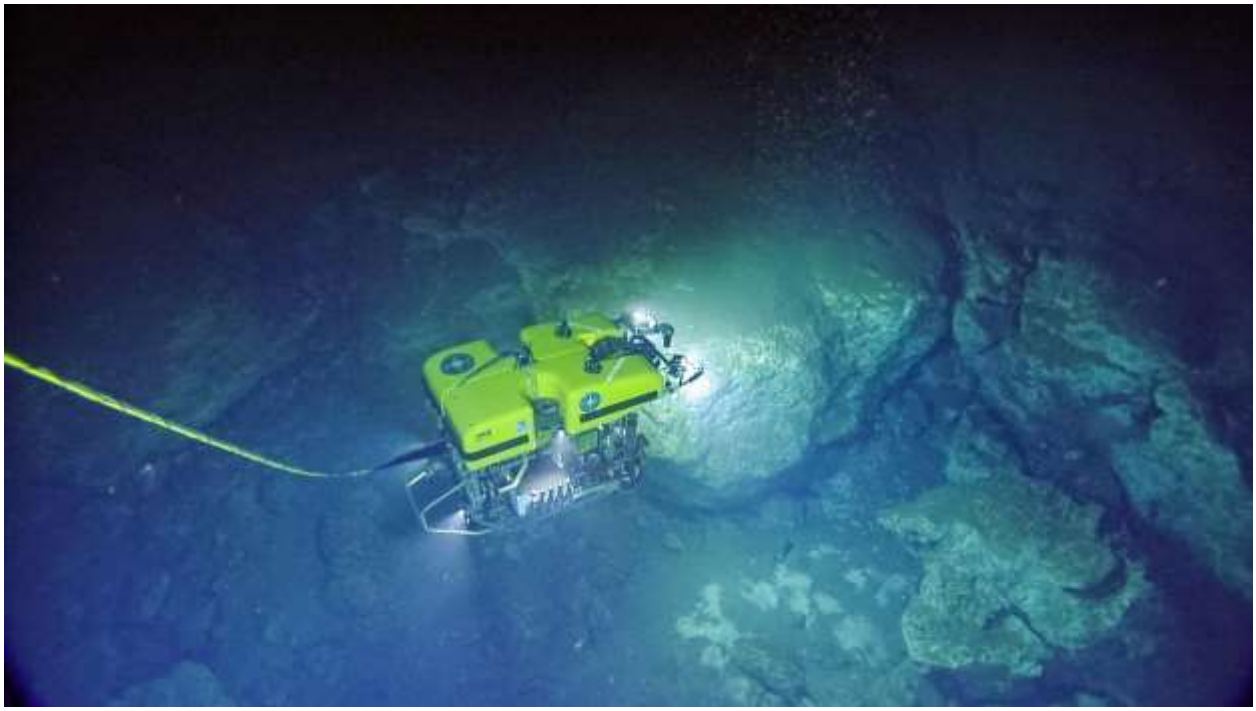
H1862 NW Coquille base of slope: suction sample of bacterial mat, shells and brittle stars

H1863 SE of Grays Canyon: rockfish and carbonates

H1863 SE of Grays Canyon: gas tight sample



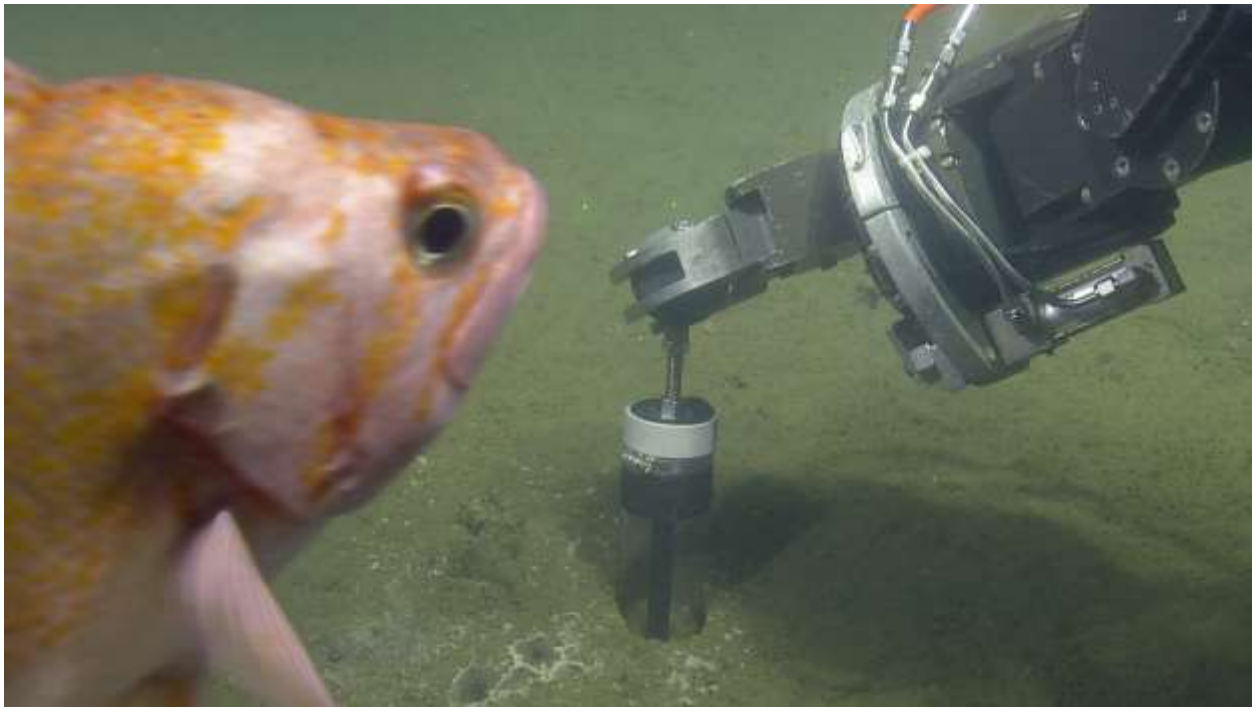
H1864 Ridge SW of Grays Canyon: hydrate site and Hercules ROV



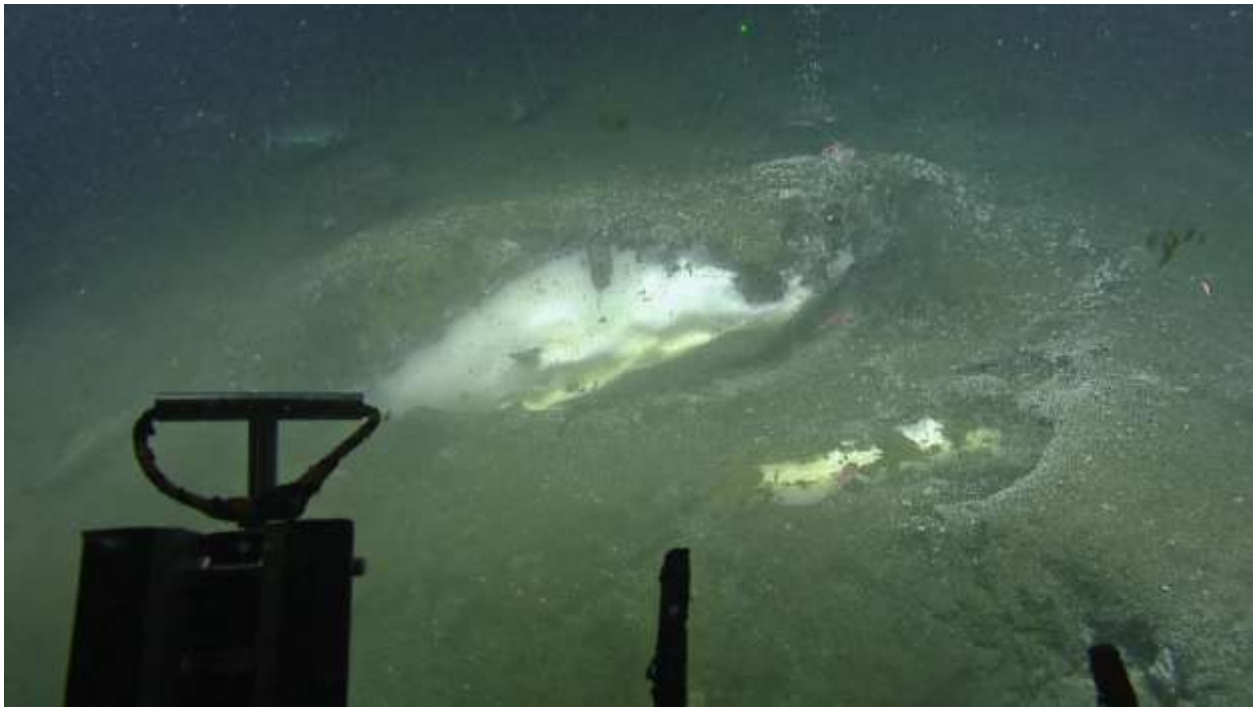
H1864 Ridge SW of Grays Canyon: hydrate sampling

H1865 N of Guide Canyon: various and dense biota

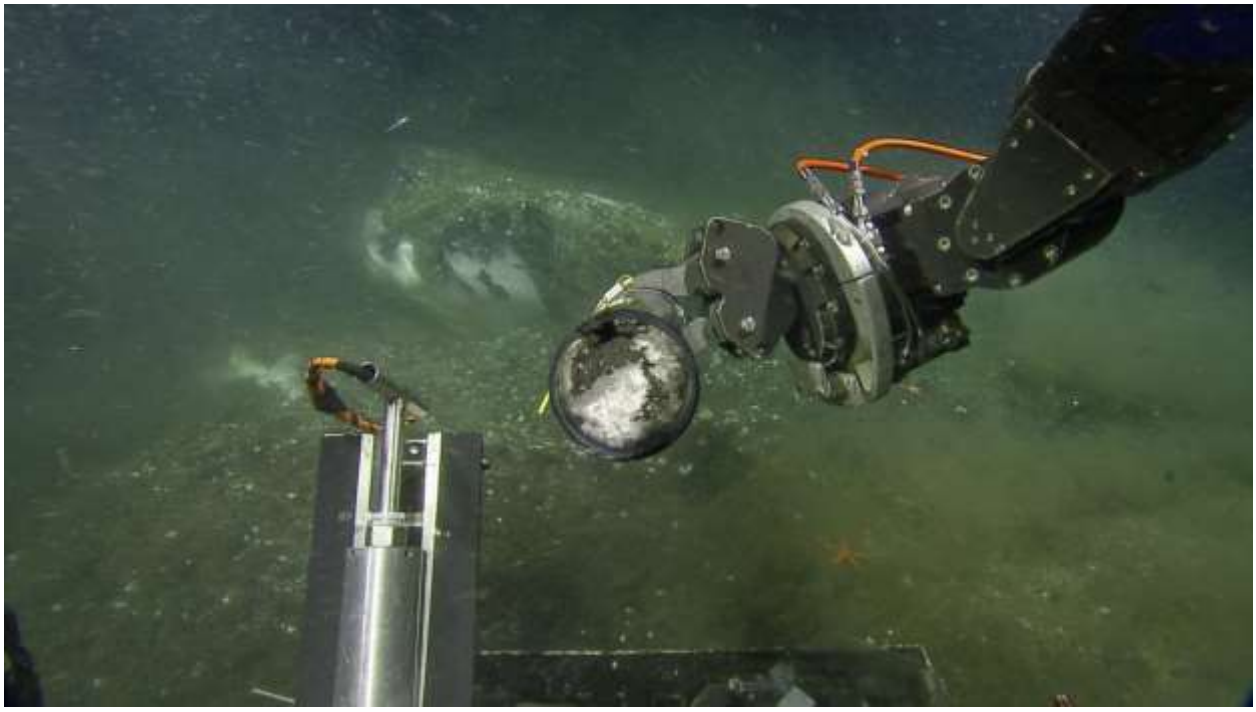
H1865 N of Guide Canyon: core and rockfish



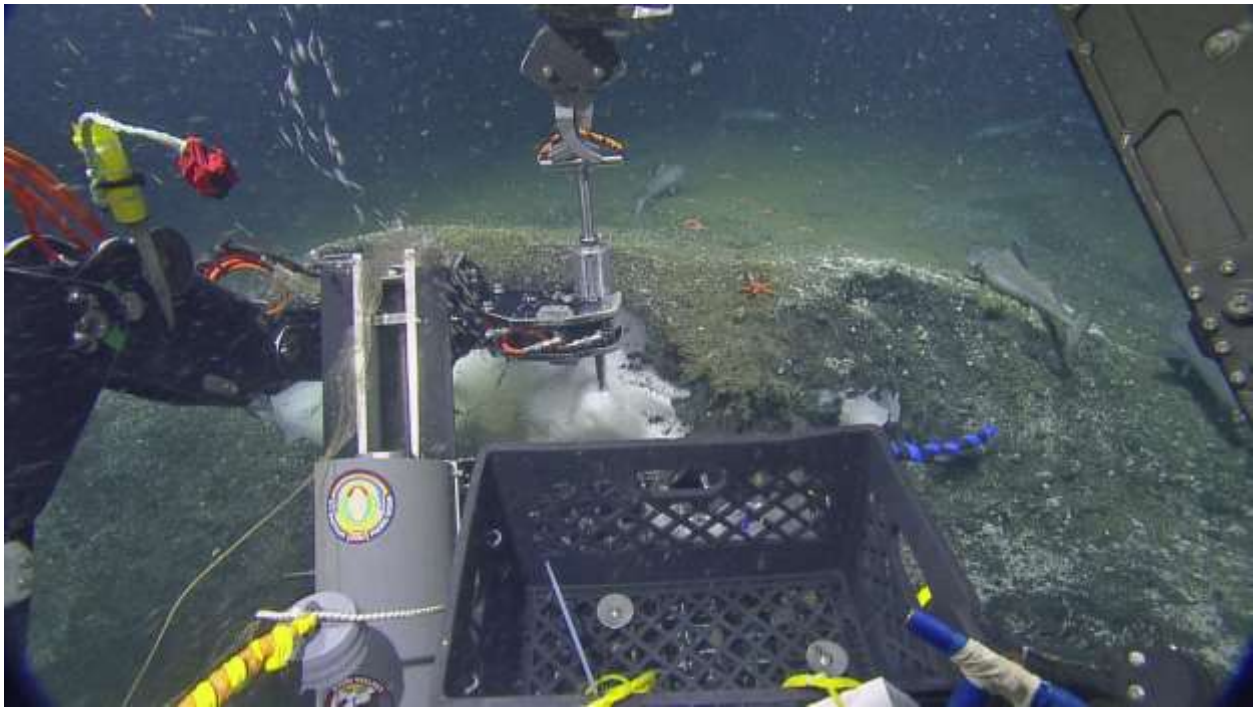
H1866 N rim of Astoria Canyon: hydrate outcrop



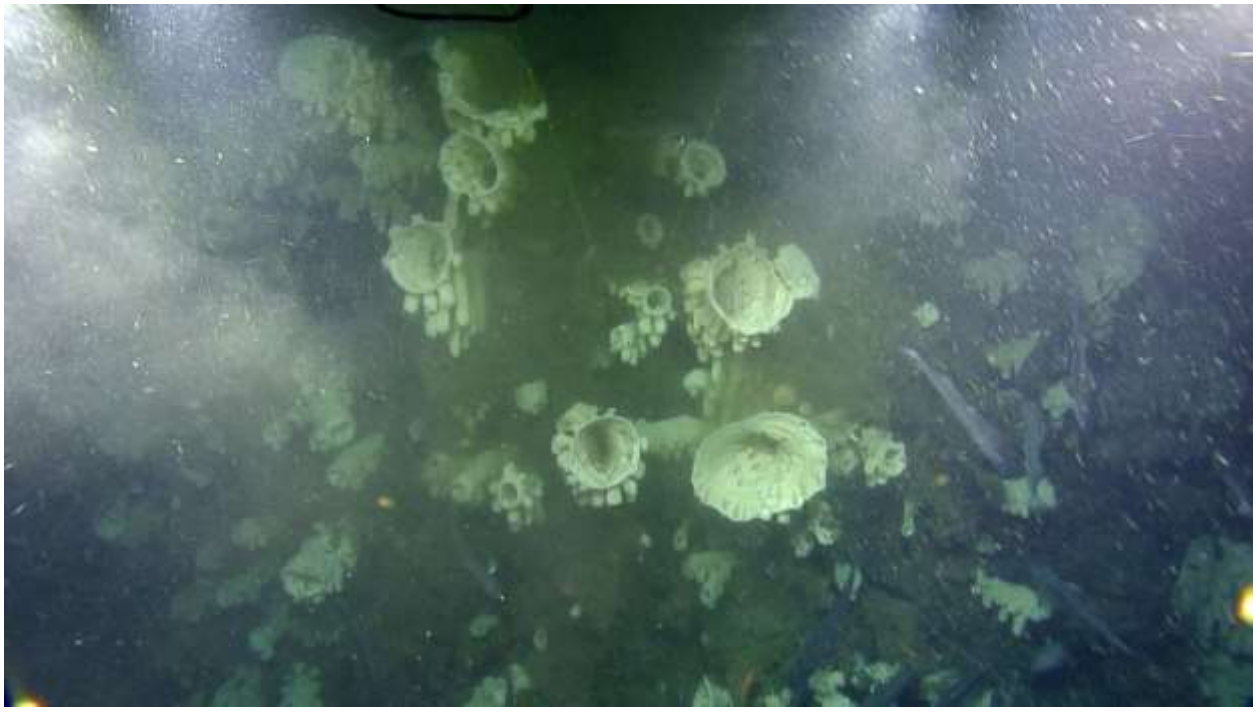
H1866 N rim of Astoria Canyon: core near hydrate



H1867 N rim of Astoria Canyon: hydrate sampling



H1867 N rim of Astoria Canyon: sponge community



H1868 Ridge SW of Grays Canyon: geology

H1868 Ridge SW of Grays Canyon: biology (sculpin)

Data Archiving and Dissemination, Sample Information, Scientists Ashore, Multibeam Bathymetric Collection and Data Processing

Nicole Raineault, OET

Data Archiving and Dissemination

The Ocean Exploration Trust partnered with the Pacific Marine Environmental Lab on a NOAA OER-funded expedition. As an Applied Exploration cruise, OET meets the Public Access to Research Results (PARR) requirements by making cruise data publically accessible through inclusion in national databases. We strive to collect data in a way that will be useful to scientists decades after a cruise. Digital, video, and sample data (including oceanographic sensor data, HD video and images, observational notes, mapping and navigation data) collected aboard *Nautilus* are essential to a successful expedition and are collected to fit widely accepted standards for archival purposes.

Data are logged, aggregated, processed, and quadruplicated by automated scripts. These data types are categorized as primary (raw) and secondary (processed), or video. A subset of the raw primary data types is streamed home live for monitoring and processing. A mirror copy of the software that produces secondary products on the ship is simultaneously running on shore to reproduce some secondary products for off-ship consumption with low bandwidth requirements. A critical component of our exploration is sharing the data with others for use in research and education and to aid in scientific grant writing. The dataset-of-record is carried home from the ship at the end of each cruise, and ingested into the shore-side fileserver and video Quality Control queue. Data subsets are shared offsite on request via webserver or physical hard drives for large packages. Video is delivered digitally to clients on via a webserver or by custom-built RAIDs by request. Low-resolution satellite recordings of the ROV video is also available on the NautilusLive YouTube channel: ROV Hercules Dive NA128 H1867 2021 08 04 01 04 10 207 UTC 0.

Cruise and data request information is available on the NautilusLive webpage. An expedition page for the cruise will remain available at: https://nautiluslive.org/cruise/NA128. This is a public-facing page that contains highlight videos, photo albums, and information from the cruise. Please send science@oet.org any updates (e.g. publications) to have them added to this webpage.

The cruise data is catalogued and archived in the Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/NA128 and is available within 60 days of the end of the cruise. R2R routinely catalogs and deposits data in long-term public archives, including the NOAA National Centers for Environmental Information (NCEI) for seafloor mapping data and (MGDS) for ROV-related sensor, imagery, navigation and sample data. Scientists may also request data and video via an electronic request form linked on the NautilusLive webpage: https://nautiluslive.org/science/data-management. Video delivery typically takes up to two months and request for delivery of a RAID has a nominal cost associated with it. In addition, two complete copies of the data were provided to lead scientist, Dr. Tamara Baumberger and Dr. Jeff Beeson.

Table 3: OET Location of Cruise Data

Type	Examples	Format(s)	Current Archives
Environmental	CTD, O_2, air temp, SST, wind speed	ASCII	OET, R2R, MGDS
Navigation	Lat/lon, heading, depth, altitude	ASCII, NMEA	OET, R2R, MGDS
Acoustic	Multibeam, sub-bottom	.all, .SEGY, various products	OET, R2R, NCEI
Observations	EventLog	ASCII	OET, MGDS
Documentation	SitReps, Dive Plans & Reports, dive and sample logs	pdf, doc, html, odf, ASCII	OET, MGDS
Still Imagery	ROV captures, Sexton still cam, topside	png, tif	OET, MGDS
Video	ROV HD	mov, mp4	OET, ISC, YouTube
Geo samples	Rocks, push cores	Physical samples	MGSL & lead scientist labs
Bio samples	Whole specimens, tissue	Physical samples, images (in situ and lab)	Lead scientist & associated labs
Other samples	Water (eDNA filtrate), gas, hydrate	Physical samples	Lead scientist & associated labs

Sample Information

The science team collected representative samples of biology and geology primarily as specimens and samples for their own research. OET made any additional physical samples available to all researchers through archival institutions that provide access to samples. We currently send all biological samples to Harvard University's Museum of Comparative Zoology and all geological samples to the Marine Geological Samples Lab at the University of Rhode Island. As a result of this cruise, 10 carbonate rock sub-samples were sent to the Geological Samples Lab. For more information about our repositories, to view the collections, or make a request please visit the web pages of the repositories:

Geological Samples: https://www.geosamples.org/catalogsearch

Biological Samples: http://mczbase.mcz.harvard.edu/SpecimenSearch.cfm

152 individual samples were taken on this cruise. Many were subsampled for a total of 558 samples. 155 are biological specimens, 21 are rocks, 19 are gas tights, 3 hydrate, 61 niskins, and 50 sediment cores.

Scientists Ashore

The Scientist Ashore Program is a network of scientists around the world who are interested in participating in our exploration live from home. Since 2013, *Nautilus* has formally recruited shoreside scientists in cruises via a sign-up on the Ocean Exploration Trust Scientists Ashore webpage.100 scientists signed up as shoreside participants for this expedition. Many scientists actively participated from shore during this cruise through our web-based SciChat system, which allows shoreside scientists to communicate with the watchstanding scientists. The Science Portal will continue to house the dive plans and situation reports from the expedition. To register and request access for the expedition, please visit: https://scip.oceanexplorationtrust.org/.

To improve the ability of scientists to follow along on shore the Inner Space Center posted archives of each dive on YouTube to allow post-dive viewing.

Gas-Tight Bottle Sampling

Tamara Baumberger and Anson Antriasian OSU CIMERS / NOAA PMEL

Gas Tight Bottle (GTB) samplers were used to capture gas from bubble streams encountered by ROV Hercules during the E/V Nautilus NA128 cruise. The sampling apparatus consisted of an evacuated gas-tight titanium bottle, a funnel, and PEEK tubing. The titanium bottle came in two classes of volume: ~10 ml, and ~ 150-165 ml. When possible, the smaller volume GTBs were used to collect gas samples at depths greater than 600m. In total, 22 GTB samples were collected from 8 dive sites between 23 June and 4 August 2021.

Up to 3 GTB samplers were deployed to each dive site, holstered in a milk crate type basket on the front porch of ROV Hercules. To collect a gas sample, the ROV manipulator arm selected a GTB sampler and positioned it above a bubble stream until 200ml of gas accumulated within the funnel. The ROV operator triggered the GTB to replace its internal vacuum with gas from the funnel, and then re-seal the GTB.

Once onboard E/V Nautilus, the gas recovered from each GTB was processed through an extraction line and subsampled into splits of aluminosilicate ampoules (3 ml each) for later helium and neon isotope analysis, and also into Pyrex ampoules (35 ml each) for later total gas concentration and carbon/hydrogen isotope analysis. The fluid portion of GTB samples (if any existed) was collected in Nalgene bottles and kept for later analysis. Before redeployment, each GTB was evacuated and sealed, and the volume between the GTB vacuum and the funnel was pre-filled with seawater to prevent dead sampling volume and contamination by laboratory air.

For sample NA128-56, a titanium snorkel was used in place of a funnel to collect a fluid sample directly from the source vent and capture into the GTB. Once brought on-board E/V Nautilus, the gas portion of the recovered sample was processed in the extraction line and subsampled into splits in the same manner as funnel-equipped GTBs.

Samples of gas hydrate were collected in a newly-developed instrument that removes a small sample of hydrate (a cylinder approximately 10mm in diameter, and several mm in length) from its outcrop and seals it in a gas-tight volume while at the outcrop location, which avoids sample contamination and fractionation that may otherwise occur if the gas hydrate sample is exposed to ocean during recovery. The solid gas hydrate samples dissociated within the gas tight volume during return to E/V Nautilus, and were processed through the extraction line and subsampled into splits for later analysis in the same manner as other GTB samples. In total, three hydrate samples from two outcrops were collected in this way.

Table 4: Summary GT and Hydrate Samples Collected during NA128

Dive	Site Name	Marker #	Sample #	GTB #	Latitude	Longitude	Z (m)	Tape Color
H1558	Carbonate Ridge	262	NA128-4	7	44.834604	-124.924750	494	red green
H1558	Carbonate Ridge	263	NA128-11	2	44.832463	-124.922935	495	white blue
H1859	Astoria Canyon	3	NA128-17	18-2	46.253642	-124.639324	831	orange white black
H1859	Astoria conyon	3	NA128-18	17-1	46.253636	-124.639341	831	white
H1861	Coquille Base	235	NA128-47	17-1	43.325758	-125.187484	1767	white
H1861	Coquille Base	235	NA128-48	18-2	43.325758	-125.187508	1767	orange white black
H1862	Coquille Base Repeat	235	NA128-55	17-1	43.325697	-125.187531	1766	white
H1862	Coquille Base Repeat	235	NA128-56	7	43.325704	-125.187542	1766	red green
H1862	Coquille Base Repeat	235	NA128-57	5	43.325754	-125.187509	1766	black
H1863	SE of Gray's Canyon (Salmi Plume)	215	NA128-69	7	46.885002	-124.779033	152	red green
H1863	SE of Gray's Canyon (Salmi Plume)	215	NA128-77	10	46.883849	-124.778706	151	blue orange
H1864	Ridge SW of GFray's Canyon	256	NA128-83	Hydrate -10	46.789422	-125.492843	1603	blue orange
H1864	Ridge SW of GFray's Canyon	256	NA128-84	17-1	46.789431	-125.492854	1603	white
H1864	Ridge SW of GFray's Canyon	256	NA128-85	18-2	46.789430	-125.492861	1603	orange white black
H1865	N of Guide Canyon Shelf	None	NA128-101	2	46.718843	-124.690185	149	blue white
H1866	Astoria Canyon	209	NA128-113	Hydrate	46.240647	-124.602514	757	
H1866	Astoria Canyon	209	NA128-114	5	46.240649	-124.602513	757	black
H1867	Astoria Conyon	209	NA128-127	Hydrate -2	46.240648	-124.602524	757	blue white
H1867	Astoria Canyon	209	NA128-129	17-1	46.240632	-124.602475	757	white
H1867	Astoria Canyon	209	NA128-128	10	46.240640	-124.602515	757	blue orange
H1868	Ridge SW of Gray’s Canyon	256	NA128-145	17-1	46.789409	-125.492885	1603	white
H1868	Ridge SW of Gray’s Canyon	256	NA128-146	18-2	46.789039	-125.493133	1599	orange white black

Water Column Sampling and Methane Analysis

Nathan Buck UW CICOES / NOAA PMEL

Discrete water column sampling was conducted during the Cascadia 2021 research cruise aboard the E/V Nautilus (**NA128**) to broaden the understanding that methane seeps found on the continental margin play on the biogeochemistry of seawater. Samples were collected using six 5 L Ocean Test Equipment (OTE) water sampling bottles that were attached to the ROV Hercules and rigged with Silastic tubing springs. OTE bottles were subsampled for CH_4, dissolved inorganic carbon (DIC), nutrients and total dissolvable Mn and Fe (TDMn and TDFe, respectively). CH_4 concentrations were sampled and characterized moments after the recovery of the ROV where 100ml of bubble-free sample was drawn directly into 140 ml syringes followed by the addition of 40 ml headspace of ultrapure helium. The sample was vigorously shaken then warmed to room temperature allowing for equilibrium between the water and gas phase to be reached. After equilibration, the headspace gas was injected into a SRI 8610C gas chromatograph (provided by D. Butterfield, NOAA PMEL). The separation of CH_4 from the other gases was accomplished with a 15 m long molecular sieve 5 A column and concentrations were measured with a flame ionization detector (Kelley et al. 1998). TDFe and TDMn samples were collected in 125 ml I-Chem polyethylene bottles and acidified with 0.5 ml subboiled quartz distilled 6 N HCl for a period of longer than 4 weeks before laboratory analysis. Mn was determined by modifying the direct injection method of Resing and Mottl (1992) with the addition of nitrile-triacetic acid to each liter of buffer and was determined to a precision of 1 nM. Fe was determined to a precision of 1.5 nM using methods described in Measures et al. (1995). DIC samples were collected in well rinsed 500 ml borosilicate glass bottles; poisoned with 100 ul of saturated mercuric chloride; sealed with ground glass stoppers greased with Apiezon L; and stored in a cool dry place. DIC samples will be determined using standard methods (Dickson et al, 2007). Lastly, around 40 ml of filtered (0.4 um) seawater was collected in 60 ml bottles and immediately frozen for future nutrient analysis. A total of eleven dives were conducted resulting in 62 bottle samples. Dive locations, sample depths and sample inventories are summarized **Table X**.

Dickson, A.G., C.L. Sabine, and J.R. Christian, editors. 2007. Guide to Best Practices for Ocean CO2 Measurements. PICES Special Publication 3, 191 pp.

Kelley, D. S., M. D. Lilley, J. E. Lupton, and E. J. Olson. 1998. Enriched H2, CH4, and 3He concentrations in hydrpthermal plumes associated with the 1996 Gorda Ridge eruptive event. Deep-Sea Research Part II 45: 2665-2682.

Measures, C. I., et al. (1995). "Determination of Iron in Seawater by Flow Injection-Analysis Using in-Line Preconcentration and Spectrophotometric Detection." Marine Chemistry **50**(1-4): 3-12.

Resing, J. A. and M. J. Mottl (1992). "Determination of Manganese in Seawater Using Flow Injection Analysis with Online Preconcentration and Spectrophotometric Detection." Analytical Chemistry **64**(22): 2682-2687.

Table 5: Water Column and Methane Sample Information

Dive	Site Name	Date (UTC)	Time (UTC)	Event Log ID	Lat	Long	*Z (m)*	ALT (m)	Nis-kin #	CH4 / H2 syringe #	DIC #	Nuts #	TDM #	Notes
H1858	Carb Rdge	2021-07-23	23:36	NA128-015	44.832447	-124.922617	493	1	1	K268	1	1	1	First dive so niskins were sloppy; most were leaking out of the bottom
H1858	Carb Rdge	2021-07-23	23:25	NA128-014	44.8324327	-124.922983	486	10	2	K291	2	2	2	
H1858	Carb Rdge	2021-07-23	23:14	NA128-012	44.8324683	-124.922933	494	1	3	K280	3	3	3	
H1858	Carb Rdge	2021-07-23	20:16	NA128-008	44.835116	-124.924753	496	1	4	K295	4	4	4	
H1858	Carb Rdge	2021-07-23	18:40	NA128-003	44.8345691	-124.92479	484	10	5	K360	5	5	5	failed leak test
H1858	Carb Rdge	2021-07-23	18:35	NA128-002	44.8345676	-124.92479	493	1	6	K322	6	6	6	failed leak test
H1859	AC Hydrate	2021-07-25	21:05	NA128-019	46.2536475	-124.639341	830	1	1	K268	7	7	7	
H1859	AC Hydrate	2021-07-25	21:09	NA128-020	46.253647	-124.639339	828	4	2	K291	8	8	8	
H1859	AC Hydrate	2021-07-25	21:20	NA128-021	46.253646	-124.639336	825	10	3	K280	9	9	9	
H1859	AC Hydrate	2021-07-25	21:47	NA128-025	46.2534764	-124.639501	837	1	4	K295	10	10	10	
H1859	AC Hydrate	2021-07-25	22:08	NA128-026	46.2518525	-124.638381	838	1	5	K360	11	11	11	
H1859	AC Hydrate	2021-07-25	22:40	NA128-027	46.2501595	-124.637226	837	1	6	K322	12	12	12	leaker
H1860	East of Kulm Rdge	2021-07-26	20:48	NA128-036	45.6131445	-124.992238	1597	1	1	K268	14	13	13	
H1860	East of Kulm Rdge	2021-07-26	20:49	NA128-037	45.6131624	-124.992214	1597	10	2	K291	15	14	14	
H1860	East of Kulm Rdge	2021-07-26	21:22	NA128-040	45.613222	-124.991724	1598	1	3	K280	13	15	15	
H1860	East of Kulm Rdge	2021-07-26	1:33	NA128-042	45.616263	-124.994447	1595	20	4	K295	16	16	16	
H1860	East of Kulm Rdge	2021-07-26	1:35	NA128-043	45.616396	-124.994705	1585	30	5	K360	17	17	17	
H1860	East of Kulm Rdge	2021-07-26	1:37	NA128-044	45.616455	-124.994849	1575	40	6	K322	18	18	18	
H1861	NW Coq base of slope	2021-07-27	18:48	NA128-045	43.325748	-125.187508	1765	1	6	K268	19	19	19	
H1861	NW Coq base of slope	2021-07-27	18:52	NA128-046	43.325744	-125.187526	1757	10	5	K291	20	20	20	
H1862	NW Coq base of slope	2021-07-28	5:11	NA128-051	43.3257342	-125.187544	1763	4	6	K322	21	21	21	
H1862	NW Coq base of slope	2021-07-28	7:57	NA128-061	43.3257305	-125.187809	1770	1	5	K360	22	22	22	leaker
H1862	NW Coq base of slope	2021-07-28	9:08	NA128-062	43.3257395	-125.18754	1749	20	4	K295	23	23	23	
H1862	NW Coq base of slope	2021-07-28	9:09	NA128-063	43.3257175	-125.187565	1727	44	3	K280	24	24	24	

Dive	Site Name	Date (UTC)	Time (UTC)	Event Log ID	Lat	Long	*Z (m)*	ALT (m)	Nis-kin #	CH4 / H2 syringe #	DIC #	Nuts #	TDM #	Notes
H1862	NW Coq base of slope	2021-07-28	9:10	NA128-064	43.325726	-125.187575	1720	50	2	K291	25	25	25	
H1862	NW Coq base of slope	2021-07-28	9:10	NA128-065	43.325726	-125.187575	1720	50	1	K268	26	26	26	
H1863	SE of Grays C	2021-07-29	18:37	NA128-067	46.8849968	-124.779058	151	1	6	K322	32	27	32	
H1863	SE of Grays C	2021-07-29	18:47	NA128-068	46.8850025	-124.779073	143	10	5	K360	28	28	31	
H1863	SE of Grays C	2021-07-29	19:46	NA128-070	46.8850125	-124.779032	149	4	4	K295	29	29	30	Leaker
H1863	SE of Grays C	2021-07-29	19:52	NA128-071	46.8851735	-124.779278	151	1	3	K280	30	30	29	
H1863	SE of Grays C	2021-07-29	22:09	NA128-076	46.8838485	-124.778706	152		2	K291	31	31	28	
H1863	SE of Grays C	2021-07-29	23:39	NA128-081	46.883861	-124.77874	143	10	1	K268	27	32	27	
H1864	Rdg SW of Grays C	2021-07-30	19:40	NA128-086	46.789384	-125.492817	1601	1	1	K268	33	33	33	
H1864	Rdg SW of Grays C	2021-07-30							2	K291	34	34	34	accidental trip no recording of time or location
H1864	Rdg SW of Grays C	2021-07-30	21:15	NA128-093	46.789374	-125.492836	1598	4	3	K280	35	35	35	
H1864	Rdg SW of Grays C	2021-07-30	21:19	NA128-094	46.789374	-125.492821	1593	10	4	K295	36	36	36	
H1864	Rdg SW of Grays C	2021-07-30	21:45	NA128-095	46.789562	-125.492614	1602	1	5	K360	37	37	37	Leaker
H1864	Rdg SW of Grays C	2021-07-30	21:50	NA128-096	46.7895505	-125.492608	1593	10	6	K322	38	38	38	
H1865	N of Guide C	2021-07-31	18:09	NA128-097	46.720039	-124.690254	147	1	6	K322	39	39	39	
H1865	N of Guide C	2021-07-31	18:11	NA128-098	46.7200385	-124.690255	138	10	5	K360	40	40	40	
H1865	N of Guide C	2021-07-31	18:31	NA128-100	46.7200605	-124.690544	147	1	4	K295	41	41	41	
H1865	N of Guide C	2021-07-31	20:21	NA128-102	46.7188425	-124.690185	149	1	3	K280	42	42	42	
H1865	N of Guide C	2021-07-31	20:23	NA128-103	46.718843	-124.690187	139	10	2	K291	43	43	43	
H1865	N of Guide C	2021-07-31	21:20	NA128-109	46.718994	-124.690529	148	1	1	K268	44	44	44	
H1866	AC S Rim to N Rim	2021-08-01	22:32	NA128-115	46.240686	-124.602498	756	1	6	K322	45	45	45	
H1866	AC S Rim to N Rim	2021-08-01	23:53	NA128-117	46.240651	-124.602489	755	4	5	K360	46	46	46	Failed leak test
H1866	AC S Rim to N Rim	2021-08-01	23:56	NA128-118	46.2406495	-124.602486	749	10	4	K295	47	47	47	
H1866	AC S Rim to N Rim	2021-08-01	0:06	NA128-119	46.2405	-124.602281	762	1	3	K280	48	48	48	
H1866	AC S Rim to N Rim	2021-08-01	2:08	NA128-125	46.241713	-124.604521	782	1	2	K291	49	49	49	
H1866	AC S Rim to N Rim	2021-08-01	2:09	NA128-126	46.24171	-124.604526	773	10	1	K268	50	50	50	Failed leak test

Dive	Site Name	Date (UTC)	Time (UTC)	Event Log ID	Lat	Long	*Z (m)*	ALT (m)	Nis-kin #	CH4 / H2 syringe #	DIC #	Nuts #	TDM #	Notes
H1867	AC N Rim and up N wall	2021-08-03	21:02	NA128-132	46.243241	-124.606653	778	1	1	K268	51	51	51	
H1867	AC N Rim and up N wall	2021-08-03	21:26	NA128-134	46.2432795	-124.606765	766	10	2	K291	52	52	52	
H1867	AC N Rim and up N wall	2021-08-03	21:46	NA128-135	46.2441485	-124.609916	774	1	3	K280	53	53	53	
H1867	AC N Rim and up N wall	2021-08-03	22:10	NA128-140	46.244154	-124.609913	770	4	4	K295	54	54	54	
H1867	AC N Rim and up N wall	2021-08-03	22:11	NA128-141	46.244172	-124.609918	765	10	5	K360	55	55	55	
H1867	AC N Rim and up N wall	2021-08-03	22:19	NA128-142	46.2443755	-124.609803	775	1	6	K322	56	56	56	
H1868	Rdg SW of Grays C	2021-08-04	17:28	NA128-147	46.7890825	-125.493128	1599	1	6	K322	57	57	57	
H1868	Rdg SW of Grays C	2021-08-04	17:30	NA128-148	46.789079	-125.493137	1593	4	5	K360	58	58	58	
H1868	Rdg SW of Grays C	2021-08-04	17:31	NA128-149	46.7890663	-125.493155	1590	10	4	K295	59	59	59	
H1868	Rdg SW of Grays C	2021-08-04	17:32	NA128-150	46.789079	-125.493162	1579	20	3	K280	60	60	60	
H1868	Rdg SW of Grays C	2021-08-04	17:33	NA128-151	46.7890835	-125.493146	1569	30	2	K291	61	61	61	failed leak test
H1868	Rdg SW of Grays C	2021-08-04	17:35	NA128-152	46.7890765	-125.493189	1559	40	1	K268	62	62	62	

Pore Fluid Chemistry

Composed by Tamara Baumberger,
with measurements performed by Kevin Roe and GC analysis by Nathan Buck

Pore fluids were extracted from sediment push cores by using Rhizon samplers. In total, pore water was sampled from 17 push cores leading to 111 pore water subsamples (Table 6). Rhizon samplers were attached to 5 ml syringes and spacers were used to hold the vacuum until pore water extraction was complete. Generally, pore fluids were extracted every 2 cm through holes drilled in the core liner before deployment. Rhizon samplers were cleaned with HCl, tap water and distilled water. Priorities for pore water chemistry were: 1. Methane concentrations, 2. sulfide concentrations, 3. major elements, 4. pH/alkalinity, 5. trace metals, 6. nutrients. Methane concentration, pH and alkalinity measurements were performed at sea. For shipboard methane analysis, pore water volumes of 0.6 to 3 ml were collected in syringes and mixed with helium head space gas. Subsequently, the headspace gas was injected into a seagoing SRI gas chromatograph equipped with a flame ionization detector. Alkalinity was determined on sub-samples diluted with de-ionized water by using the automated “Alkalin” acid titration method on the Metrohm Titrino. pH was determined with the Metrohm pH electrode, but this was only possible for core

top samples (there was insufficient pore water volume extracted from down-core sampling). Subsamples for sulfide concentrations (preserved in vials with zinc acetate) and major element compositions were collected and will be analyzed on shore in the NOAA PMEL laboratories in Seattle, WA.

Pore water extractions, subsampling and pH/alkalinity measurements were performed by Kevin Roe from UW and NOAA PMEL and GC analysis by Nathan Buck from UW and NOAA PMEL.

Table 6: Pore Water Samples Information

Nautilus ID#	Dive #	Depth (cm)	pH	Alkalinity	Methane	Sulphide	Majors
			Shipboard			On shore	
NA128-22	H1859	0	no	yes	yes	no	yes
		1	no	no	yes	no	no
		3	no	no	yes	no	no
		9	no	no	yes	no	no
		11	no	no	yes	no	no
NA128-28	H1859	0	no	no	yes	yes	yes
		4	no	no	yes	yes	no
		6	no	no	yes	yes	yes
NA128-33	H1860	0	yes	no	yes	yes	yes
		1	no	no	yes	yes	yes
		3	no	no	yes	yes	yes
		5	no	no	yes	yes	yes
		7	no	no	yes	no	yes
NA128-39	H1860	0	no	yes	yes	yes	yes
		1	no	no	yes	yes	yes
		3	no	no	yes	yes	yes
		5	no	no	yes	no	yes
		7	no	no	yes	yes	yes
		9	no	no	yes	yes	yes
		11	no	no	yes	yes	no
		13	no	no	yes	yes	yes
NA128-50	H1861	0	yes	no	yes	yes	yes
		2	no	no	yes	yes	yes
		4	no	no	yes	yes	yes
		6	no	no	yes	yes	yes
		8	no	no	yes	yes	yes
		10	no	no	yes	yes	yes

Nautilus ID#	Dive #	Depth (cm)	pH	Alkalinity	Methane	Sulphide	Majors
NA128-59	H1862	0	yes	no	yes	yes	yes
		2	no	no	yes	yes	yes
		4	no	no	yes	yes	yes
		6	no	yes	yes	yes	yes
		8	no	no	yes	yes	yes
		10	no	no	yes	yes	yes
		12	no	no	yes	yes	yes
NA128-73	H1863	0	no	yes	yes	yes	yes
		3	no	no	yes	yes	yes
		5	no	yes	yes	yes	yes
		7	no	yes	yes	yes	yes
		9	no	yes	yes	yes	yes
		11	no	no	yes	yes	yes
		13	no	yes	yes	yes	yes
		15	no	yes	yes	yes	yes
NA128-87	H1864	0	yes	yes	yes	yes	yes
		2	no	yes	yes	yes	yes
		4	no	yes	yes	yes	yes
		6	no	yes	yes	yes	yes
		8	no	yes	yes	yes	yes
		10	no	yes	yes	yes	yes
		12	no	yes	yes	yes	yes
NA128-88	H1864	0	yes	yes	yes	yes	yes
		1	no	yes	yes	yes	yes
		3	no	yes	yes	yes	yes
		5	no	yes	yes	yes	yes
		7	no	yes	yes	yes	yes
		9	no	no	yes	no	yes
		11	no	yes	yes	yes	yes
		13	no	no	yes	yes	yes
NA128-107	H1865	0	yes	yes	yes	yes	yes
		2	no	yes	yes	yes	yes
		4	no	yes	yes	yes	yes
		6	no	yes	yes	yes	yes
		8	no	yes	yes	yes	yes

Nautilus ID#	Dive #	Depth (cm)	pH	Alkalinity	Methane	Sulphide	Majors
		10	no	yes	yes	yes	yes
NA128-111	H1865	0	yes	yes	yes	yes	yes
		2	no	yes	yes	yes	yes
		4	no	yes	yes	yes	yes
		6	no	yes	yes	yes	yes
		8	no	yes	yes	yes	yes
		10	no	yes	yes	yes	yes
		12	no	yes	yes	yes	yes
NA128-121	H1866	0	yes	yes	yes	yes	yes
		1	no	yes	yes	yes	yes
		3	no	yes	yes	yes	yes
		5	no	yes	yes	yes	yes
		7	no	yes	yes	yes	yes
		9	no	yes	yes	yes	yes
		11	no	yes	yes	yes	yes
		13	no	yes	yes	yes	yes
NA128-122	H1866	0	yes	yes	yes	yes	yes
		2	no	yes	yes	yes	yes
		4	no	yes	yes	yes	yes
		6	no	yes	yes	yes	yes
		8	no	yes	yes	yes	yes
		10	no	yes	yes	yes	yes
		12	no	yes	yes	yes	yes
NA128-124	H1866	0	yes	yes	yes	yes	yes
		3	no	yes	yes	yes	yes
		5	no	yes	yes	yes	yes
		7	no	yes	yes	yes	yes
		9	no	yes	yes	yes	yes
		11	no	yes	yes	yes	yes
		13	no	yes	yes	yes	yes
		15	no	no	yes	yes	yes
NA128-133	H1867	0	yes	yes	yes	yes	yes
		3	no	yes	yes	yes	yes
		5	no	yes	yes	yes	yes
		7	no	yes	yes	yes	yes

Nautilus ID#	Dive #	Depth (cm)	pH	Alkalinity	Methane	Sulphide	Majors
		9	no	yes	yes	yes	yes
		11	no	yes	yes	yes	yes
		13	no	yes	no	yes	yes
NA128-138	H1867	0	yes	yes	yes	yes	yes
		2	no	yes	yes	yes	yes
		4	no	yes	yes	yes	yes
		6	no	yes	yes	yes	yes
		8	no	yes	yes	yes	yes
		10	no	yes	yes	yes	yes
		12	no	yes	yes	yes	yes
NA128-143	H1867	0	yes	yes	yes	yes	yes
		1	no	yes	yes	yes	yes
		3	no	yes	yes	yes	yes
		5	no	yes	yes	yes	yes
		7	no	yes	yes	yes	yes
		9	no	yes	yes	yes	yes
		11	no	yes	yes	yes	yes
		13	no	yes	no	yes	yes

Benthic Observations and Sampling

Lila Ardor Bellucci, Oregon State University, OET
Shannon Brown, University of Washington, NOAA PMEL

We aimed to explore the benthic habitat and community diversity of previously unexplored methane seeps and hydrate sites along the U. S. Cascadia Margin. The sites visited were discovered during mid-water surveys on previous expeditions (including E/V *Nautilus* cruises NA072, NA078, NA080, NA088, NA095), and active seepage was confirmed during NA128 acoustic surveys, but their benthic community had not previously been explored with an ROV (*Embley et al., 2017; Seabrook et al., 2017; Baumberger et al., 2018; Merle et al., 2021*). In addition, we returned to a few ROV sites previously visited during NA072, allowing us to expand on previous benthic observations both spatially and temporally.

The main objectives of the benthic team for the NA128 cruise were to: (1) conduct visual surveys of seeps and adjacent habitats, documenting the substrate and community makeup of each site (i.e., clam bed, tubeworm bush, microbial mat, carbonate formations, hydrate), as well as the extent of the different features observed; (2) collect sediment cores from within seep habitats, ecotones, and background sediments at all sites were possible; (3) collect organismal samples of seep-endemic species and their associates; (4) opportunistically sample carbonate rocks for mineralogical and microbial community analysis. Cores from each site were processed at depth intervals in preparation for analysis of microbial (bacterial, archaeal, fungal) and infaunal community diversity via genetic sequencing (preserved at -80 °C) and visual analysis (preserved in formalin), respectively. Core porewaters were also extracted (rhizons, 2 cm intervals) to quantify methane, sulfide, and major ions, in part to help inform community drivers. Megafauna was subsampled for species identification and population genomic analyses (preserved in EtOH, RNAlater, and at -80 °C), as well as for microbial, stable isotope, fatty acid, and gut content analyses (preserved at -80 °C). When possible, this suite of benthic samples was taken in conjunction with Niskin, hydrate, and gas samples, which enabled a comprehensive characterization of the given seep site.

Dive H1858, Carbonate Ridge:
This dive followed a ridge feature characterized by shallow sediment and rocky features varying in size throughout the dive, from small cobbles to large slabs. Benthic fauna observed in sedimented areas included ophiuroids, crinoids, and sea stars, while dominant fauna on rocky substrates included glass sponges, corals (including mushroom, bubblegum, and bamboo), anemones, buccinid gastropods, and various sea stars (especially *Rathbunaster*). Multiple seep habitat areas were encountered (including active bubbling), characterized primarily by white microbial mats, reduced sediments, medium-sized patches of vesicomyid clams, shell hash, and mushroom corals on adjacent rocks. Demersal fauna included thornyhead rockfish, flatfish, hagfish, eelpouts. During the last few hours of the dive, hundreds of sablefish were observed schooling near the seafloor, visible up to 50 m water depth upon recovery.

Dive H1859, Astoria Canyon Hydrate:
This dive was to a marked site where hydrate had previously been observed; although none was seen here, the marker was found near a large seep depression, and the surrounding area was further explored. This site was characterized by soft sediments with multiple areas of active seepage surrounded by large swaths of reduced sediments, microbial mat (being grazed by abundant small white gastropods), and occasional clam hash. Areas between and along the periphery of seep habitat were dominated by soft sediment and abundant sea stars. Other occasionally observed benthic fauna included sea pens, sea cucumbers, and crabs. Demersal fauna included thornyheads, flatfish, eelpouts, hagfish, poralia jellies, and ctenophores.

Dive H1860, Deep Side of E. Kulm Ridge:
This site was characterized by soft sediment with scattered authigenic carbonates and little benthic fauna. While tubeworm bushes, patches of shell hash, and small orange/white bacterial mats were observed, no active seepage was seen. The occasional fauna observed included anemones, holothurians, sea stars, crabs, ophiuroids, euryalid basket stars, sea pens, buccinid gastropods, flatfish, grenadier, sablefish, and hagfish.

Dive H1861, NW of Coquille:
This seep site consisted of one main area of intermittent but strong bubbling from a hole in the seafloor, surrounded by white microbial mat, vesicomyid clams (including some substantial individuals), clamshell hash, and ophiuroids. Shimmering water emitted from this seepage site was measured to be ~7 °C, compared to the ambient temperature of ~2 °C. Adjacent non-seep areas had soft sediments with abundant sea pens, sea stars, and holothurians.

Dive H1862, NW of Coquille:
This dive was to the same site as previously described, revisited to complete sampling after acoustic transponder and manipulator ROV issues. Emissions from the previously described seepage site were measured to be ~11 °C on this dive.

Dive H1863, SE of Grays Canyon:
Several bubble streams (one measured to be ~7 °C) were located at this turbid, shallow site, surrounded by small patches of bacterial mat and sometimes shell hash, but otherwise lacking in endemic seep species. The site was generally composed of soft sediment with interspersed large rock or carbonate slabs and boulders. Fauna on hard substrate included various large anemones, glass (primarily barrel) sponges, abundant small brachiopods, small tubeworms, holothurians, and sea stars. Benthic and demersal fauna included large lingcod, various rockfish, flatfish, hagfish, skates, abundant small shrimp, sea pens, squat lobsters, and holothurians.

Dive H1864, Ridge SW of Gray's Canyon:
This seep site was characterized by a large area of massive carbonate boulders and canyons settled by extensive large tubeworm bushes covered in anemones and other associates. Multiple active bubble

streams were observed, and a hydrate formation was found on a carbonate wall adjacent to bubbling. The thin sediment layer between carbonate formations housed multiple medium-sized, white bacterial mat patches and small-medium-sized patches of large vesicomyid clams (living and hash). Abundant Acarax shells were also seen, although no live Acarax were seen or collected.

Dive H1865, N of Guide Canyon Shelf:
This shallow seep site was mostly soft sediment (very shallow over hard bottom layer in most areas) with medium-large carbonate/rock boulders interspersed. Some shell hash and small white or orange bacterial mats were observed in various site areas, and two small intermittent bubble streams were found, but no large seep communities were seen. Dominant fauna observed on hard substrate included large plumose (and other) anemones, sea stars, sponges, brachiopods, and small tube worms. Demersal and soft-sediment benthic fauna included various rockfish species (some larger schools), flatfish, lingcod, crab, sea stars.

Dive H1866, Astoria Canyon North Rim:
This site consisted of multiple actively seeping areas dominated by large patches of grazed microbial mat/reduced sediment with thousands of tiny white gastropods and pink sea stars on the periphery. One of these seep areas contained a large crater-like depression, and a large hydrate formation surrounded by some vesicomyid clams was found at another seep area along a ridge to the eastern edge of the dive site. These seep regions were separated by swaths of soft muddy bottom dominated by small pink sea stars, crabs (mainly Tanner), rockfish, flatfish, and many sablefish, as well as occasional holothurians, hagfish, neptunia gastropods, and eelpouts.

Dive H1867, Astoria Canyon North Rim:
This dive revisited the previously described hydrate outcropping and further explored the ridge feature upon which it was found. Rocky features and a very large rock wall were found along the ridge with large heterchone sponges on top and the wall itself densely settled by microbial mat patches (orange, bright yellow, white), cup coral, delectopecten-like bivalves, ophiuroids, squat lobsters, mushroom corals, and other encrusting fauna. This wall feature also had multiple areas of exposed hydrate. Previously described microbial mat seep regions were further explored on this dive, and previously mentioned benthic fauna were again observed.

Dive H1868, Ridge SW Grays Canyon:
This dive revisited the previously described site visited during dive H1864 and expanded observations in the surrounding area. Beyond the site's carbonate canyon/mound region was primarily composed of soft sediment with interspersed carbonate rock boulders. These were sometimes settled by tubeworms and surrounded by shell hash and/or small bacterial mat patches. Fauna in this general region included sea stars, crabs, anemones, buccinid gastropods, and egg towers, sea pens, grenadier, blob sculpin, skates, and occasional black coral.

Table 7: Benthic Sampling Conducted during NA128, by Dive Number

Dive #	Depth (m)	Samples
H1858	498	Carbonate rocks: three intact rocks from various locations, one with white bacterial mat Fauna: vesicomyid clams, crabs, mushroom coral, sea stars, and associated meiofauna
H1859	833	Push cores: two near bacterial mat and bubble stream; three in bacterial mat near depression Fauna: sea stars
H1860	1598	Push cores: two near tube worm assemblage; two from patchy white bacterial mat Carbonate rock: authigenic carbonate rock near bundle of tubeworms Fauna: siboglinid tube worms, acharax shells, and a euryalid basket star
H1861	1768	Push cores: one adjacent to bubble stream
H1862	1767	Push cores: one near bubble stream, two near large clam bead Carbonate rock: crumbly rock covered in white bacterial mat Fauna: vesicomyid clams, ophiuroids, and associated meiofauna
H1863	151	Push cores: two from patchy white bacterial mat, one background core Carbonate rock: two flat carbonate slab pieces Fauna: squat lobsters, sea stars, tubeworms, brachiopods, and associated meiofauna
H1864	1601	Push cores: two from patchy bacterial mat near interspersed clams Carbonate rock: one from carbonate wall Fauna: vesicomyid clams, acharax shells, tubeworms, and associated meiofauna
H1865	148	Push cores: two shallow cores near bubble steam, two cores from white bacterial mat Carbonate rocks: two rock fragments from large slab, two other solid fragments Fauna: cup coral, brachiopods, and associated meiofauna
H1866	762	Push cores: two from patchy bacterial mat, two from black/gray mat, one background core Fauna: sea stars and bivalves
H1867	750	Push cores: two from dense white bacterial mat, one background core Carbonate rock: large sediment-covered rock with bacterial mat Fauna: cup coral, bivalves, vesicomyid clams, and associated meiofauna
H1868	1586	N/A

NA128 MAPR data

Sharon Walker

A PMEL Miniature Autonomous Plume Recorder (MAPR) instrument was mounted on the ROV *Hercules* light bar for every dive. The MAPR is a battery powered, self-contained instrument with integrated sensors for measuring temperature, pressure, turbidity (optical backscatter), and oxidation - reduction potential (ORP). Sample interval was set to 5-seconds for all dives. For a few dives, instrument and/or operator error caused no data to be acquired or saved (contact Sharon Walker or Susan Merle for MAPR log sheets, which include summaries of MAPR data files and deployments).

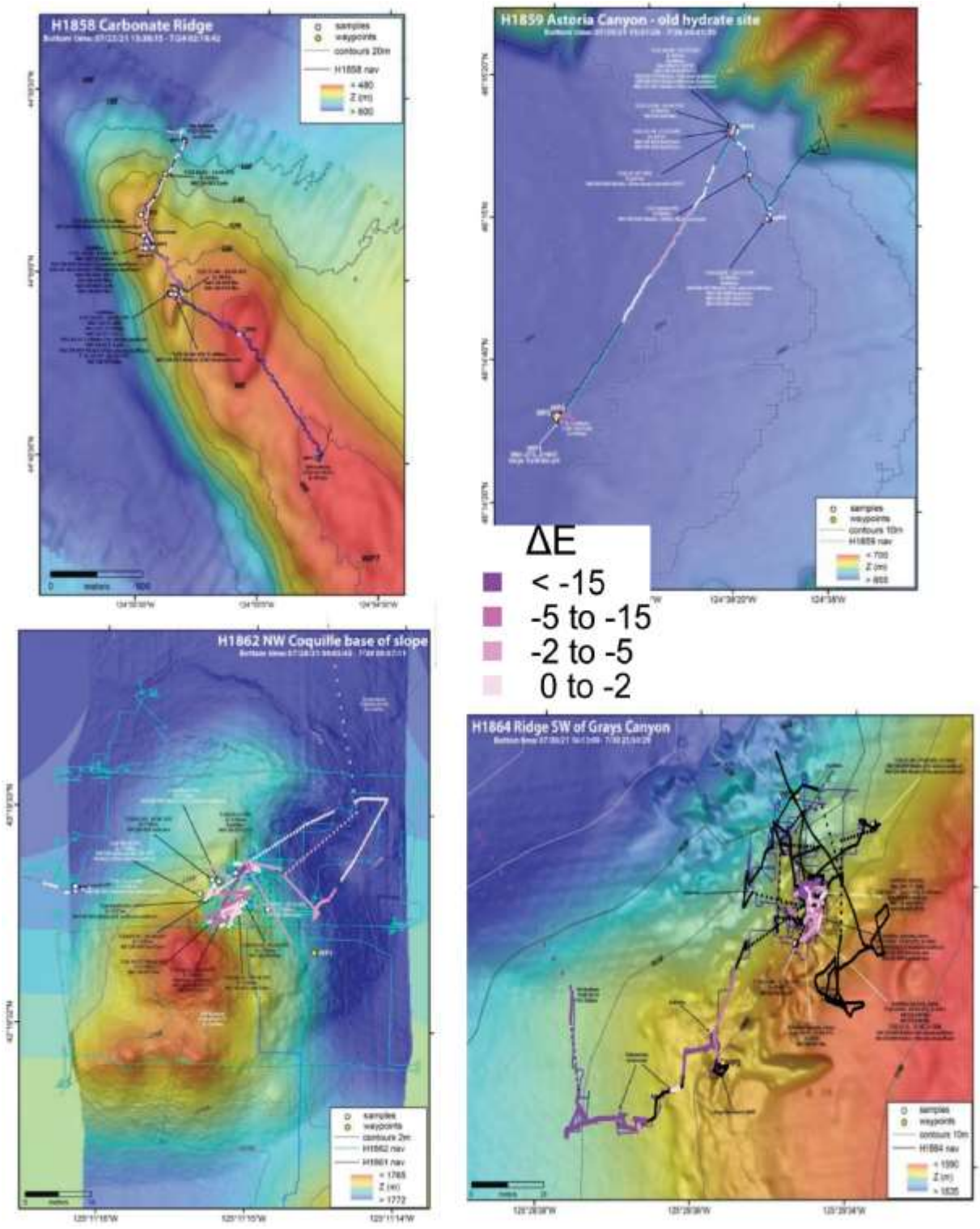
The ORP sensor responds with sharply decreasing values to the presence of dissolved reduced chemical species (e.g., H_2, H_2S, Fe^{2+}). Signals are often correlated with observations of seep-related biota, bacterial mat, or stained sediments and can confirm active fluid flow even where bubbles or shimmering fluid are absent.

Table 8: NA128 MAPR Deployments and Information

MAPR Data File Name	MAPR s/n	Dive#	Date	General Location	Comments
NA128-H1858-MAPR.DATX	67	H1858	23-Jul-2021	Carbonate Ridge (570-465 m depth)	
NA128-H1859-aborted.DATX	67	H1859-postponed	24-Jul-2021	Kulm Ridge - weather prevented dive - did not go in water	dive did not occur - data is all "on deck" data
NA128-H1859-MAPR.DATX	67	H1859	25-Jul-2021	Astoria Canyon hydrate (836-851 m depth)	
no data file	67	H1860	26-Jul-2021	East of Kulm Ridge Deep (1618-1600 m depth)	MAPR log shows data was recorded and file name NA128-H1860-MAPR.DATX, but no data file was in *.zip file
no data file	67	H1861	27-Jul-2021	NW Coquille - base of slope (1700-1763? m depth)	MAPR log shows file name NA128-H1861-MAPR.DATX, but no data file was in *.zip file
NA128-H1862-MAPR.DATX	67	H1862	28-Jul-2021	NW Coquille - base of slope (1763 m depth) - bubble stream sampling	
NA128-H1863-MAPR.DATX	67	H1863	29-Jul-2021	Salmi Plume (SE of Gray's Canyon) ~152 m depth	data is all "on deck" data (from cancelled dive the previous day) - no new data from dive
NA128-H1864-MAPR.DATX	67	H1864	30-Jul-2021	Ridge SW of Grey's Canyon (1490 m depth)	
NA128-H1865-MAPR.DATX	67	H1865	31-Jul-2021	N of Guide Canyon shelf	
NA128-H1866-MAPR.DATX	67	H1866	1-Aug-2021	Astoria Canyon N rim	batteries died mid-dive
no data file		H1867	3-Aug-2021	Astoria Canyon N rim	MAPR did not record data
NA128-H1868-MAPR.DATX	67	H1868	4-Aug-2021	Ridge SW Gray's canyon	LSS obstructed; data from other sensors is good

Fig. 2 (next page): MAPR Dive Maps: Locations and intensity of ORP anomalies (Δ.E) along the tracklines. ORP anomaliesoccur when the sensor encounters reduced chemical species (e.g., Fe(II), H_2S,

and H_2) that are common in seep and hydrothermal fluids. ORP anomalies are highly correlated with observations of bacterial mat, dark anoxic sediments, and indicate active flow, with or without direct observations of bubble streams



Outreach Overview: NA128 | Cascadia Margin

Meghan Cook and OET outreach team

July 22 - August 5, 2021

Funder acknowledgment: NOAA OECI

Partners: Oregon State University, NOAA PMEL, University of Washington

Throughout this expedition various methods of outreach were employed to engage with our Nautilus audiences including students and the wider public including the 24/7 live stream from the ROVs and ship via NautilusLive.org; a live virtual event with onboard and remote team streaming on social media; blogs, photo albums, and a highlight video posted to NautilusLive.org; and development of press materials for media coverage.

ONLINE CONTENT & METRICS

Live Stream Stats During Expedition
Views: 308,000 views

Time watched: 49,000 hours

Imagery assets generated during the expedition

- Full ROV dive recordings on YouTube
- Underwater images Zeus captures & Still_camera selects
- Topside images (Please create a folder with your name when you upload images here)

New content created on NautilusLive.org

- NA128 Expedition Page including:
  - Team member profiles for onsite and remote participants
  - Pinned social media posts from OET and science participants
- Videos: Swarmed by Sablefish, Sampling Methane Seeps of Carbonate Ridge
- Blog: Exploring and Characterizing Cascadia Margin's Methane Seeps
- ESRI StoryMap: Hunting Bubbles
- Photo Album: New Tech on Nautilus - Norbit Sonar

LIVE EVENT

In order to connect viewers around the world with the professionals of the expedition team and the excitement of exploration, OET hosted a live event to kick off the expedition streaming live on YouTube and Facebook. Views included audiences in 26 countries and American Samoa.

- *Next on Nautilus: Sailing Over Subduction Seeps* event was hosted on July 19, 2021 featuring Dr. Tamara Baumberger and Susan Merle. This live program now has over 7590 views on Nautilus Live channels (Youtube: 5790; Facebook: 1800) as of August 6, 2021.

SHIP-TO-SHORE LIVE INTERACTIONS

During NA128, the team on board conducted 14 ship-to-shore interactions with schools, camps, and public audiences reaching over 640 learners. The support team on shore also conducted 2 interactions reaching an additional 18 students.

- Oregon State University Environmental Leadership for Youth - Corvallis, OR
- Inspiring Girls Expeditions: Exploration at Home - USA
- NH 4-H and Conway School District - Conway, NH
- Inner Space Center camp at URI - Narragansett, RI (X2)
- Linn-Benton Community College ROV Camp - Albany, OR
- Cuyahoga Community College - Parma, OH
- Curious Minds Dive Foundation - Summerland Key, FL
- Hatfield Marine Science Center camp - Newport, OR
- Holyoke Public Schools - Holyoke, MA
- Mt. San Antonio College - Walnut, CA
- Primus Language Learning Center - Paphos, Cyprus
- LTK Academy - Centennial, CO
- Boothbay Sea and Science Center camp - East Boothbay, ME
- San Juan Island School District summer STEM enrichment course - Friday Harbor, WA
- Empowering Your Energy Future camp - RI

PRESS & MEDIA

OET team provided materials for media usage including

- Media Plan
- 2021 Expedition Press Release
- 2021 General Nautilus Press Kit

Fig. 3: NA128 EM302 Multibeam Mapping (area enclosed in black polygon)

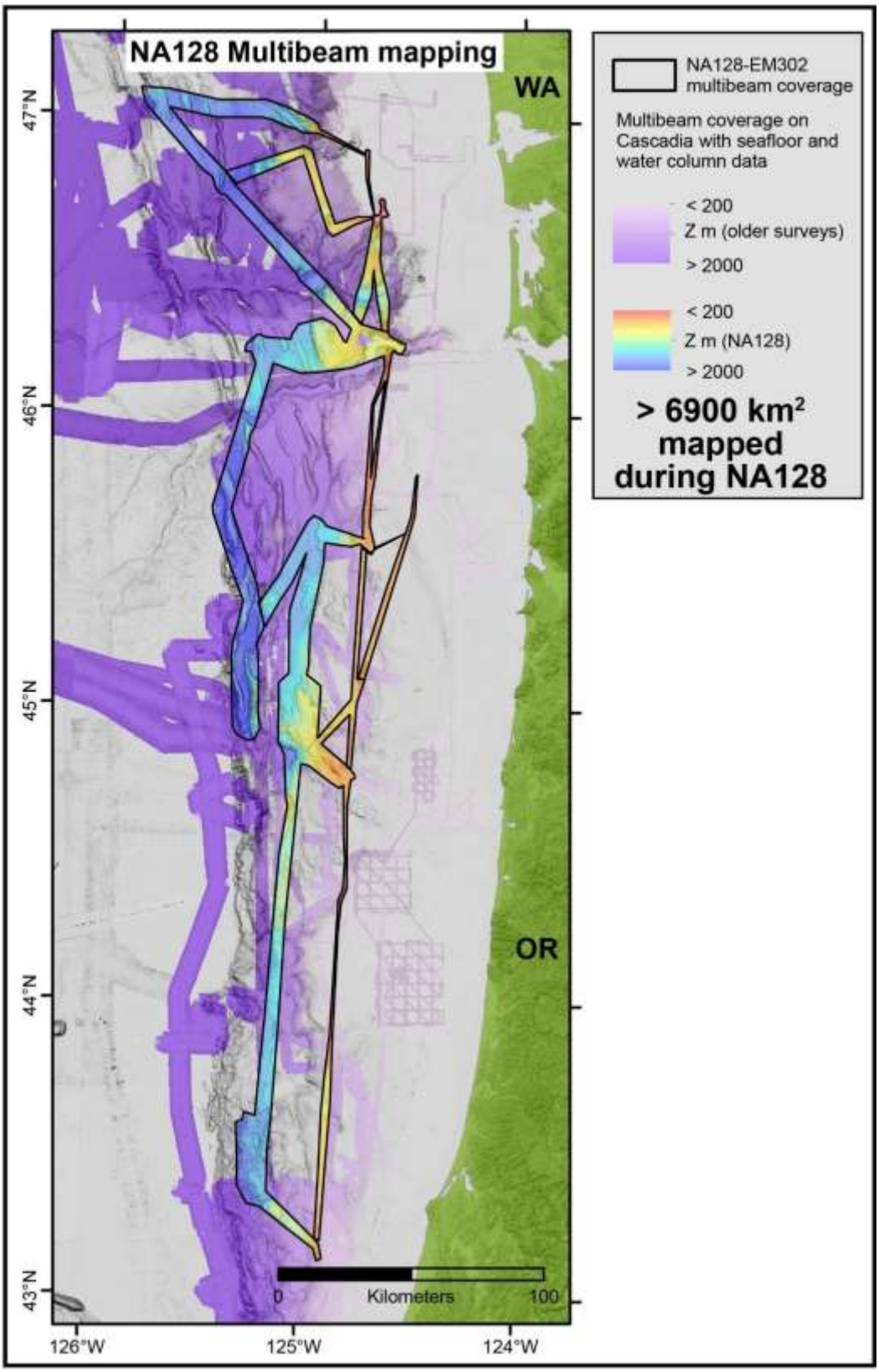


Table 9: NA128 EM302 Multibeam Water Column Data Bubble Stream Flares Identified in the Data

See figure 1 map for locations of NA128 bubble streams (yellow dots)

#	Longitude	Latitude	Depth (m)	Rise Height (m)	Date Time UTC
1	-125.048885	45.366283	-1613.8	-835	07/24/2021 09:06:07
2	-125.019879	45.410945	-1393.4	-930	07/24/2021 09:29:07
3	-125.019076	45.412315	-1381.6	-731	07/24/2021 09:29:52
4	-125.017988	45.428366	-1457.4	-817	07/24/2021 09:37:09
5	-124.686922	46.243004	-891.6	-583	07/25/2021 10:03:51
6	-124.639455	46.253729	-828.2	-450	07/25/2021 10:24:08
7	-124.638807	46.250650	-835.2	-531	07/25/2021 10:24:45
8	-124.615615	46.245636	-789.8	-589	07/25/2021 10:32:34
9	-124.610383	46.244232	-771.0	-572	07/25/2021 10:34:26
10	-124.607283	46.242466	-779.0	-557	07/25/2021 10:35:40
11	-124.603151	46.239895	-762.9	-388	07/25/2021 10:37:18
12	-124.596867	46.232981	-778.2	-505	07/25/2021 10:48:49
13	-124.597518	46.232616	-774.0	-527	07/25/2021 10:49:24
14	-124.619669	46.234015	-809.6	-551	07/25/2021 10:57:32
15	-124.645642	46.241005	-846.2	-728	07/25/2021 11:07:35
16	-124.649281	46.242270	-846.8	-617	07/25/2021 11:09:05
17	-124.639255	46.253631	-813.5	-664	07/25/2021 11:42:08
18	-124.637269	46.250098	-833.2	-621	7/25/21 11:43 AM
19	-124.608754	46.242651	-774.9	-522	7/25/21 11:54 AM
20	-124.604265	46.240214	-782.9	-257	07/25/2021 11:56:51
21	-124.597156	46.232829	-778.7	-607	07/25/2021 12:02:23
22	-124.611909	46.226776	-789.0	-581	07/25/2021 12:11:31
23	-124.643776	46.231272	-725.1	-548	07/25/2021 12:22:51
24	-124.648693	46.239798	-846.6	-720	07/25/2021 12:31:59
25	-124.649532	46.242616	-849.0	-584	07/25/2021 12:50:25
26	-124.649386	46.242624	-845.8	-595	07/25/2021 13:07:13
27	-124.643058	46.230959	-716.0	-467	07/26/2021 06:57:44
28	-124.645241	46.217783	-495.6	-376	07/26/2021 07:03:07
29	-125.015567	45.495826	-1631.8	-1025	07/27/2021 05:15:23
30	-125.172826	43.435613	-1478.3	-675	07/27/2021 15:08:59
31	-125.182630	43.415880	-1562.3	-870	07/27/2021 15:14:07
32	-125.189163	43.321886	-1775.5	-1008	07/27/2021 15:42:01
33	-124.851247	44.005594	-92.8	-42	07/29/2021 00:05:57
34	-124.851289	44.006116	-90.0	-67	07/29/2021 00:06:08
35	-124.851122	44.006439	-89.8	-57	07/29/2021 00:06:14
36	-124.851114	44.006958	-89.6	-44	07/29/2021 00:06:25
37	-124.850801	44.007616	-88.3	-68	07/29/2021 00:06:38
38	-124.850662	44.012245	-83.3	-34	07/29/2021 00:08:09
39	-124.847513	44.071432	-94.4	-68	07/29/2021 00:27:00
40	-124.842340	44.127054	-105.9	-70	07/29/2021 00:44:26
41	-124.842037	44.141838	-93.5	-57	07/29/2021 00:49:01
42	-124.842459	44.142592	-92.3	-24	07/29/2021 00:49:15
43	-124.842741	44.143351	-92.2	-38	07/29/2021 00:49:29
44	-124.842207	44.144006	-90.3	-44	07/29/2021 00:49:41

#	Longitude	Latitude	Depth (m)	Rise Height (m)	Date Time UTC
45	-124.842349	44.144414	-89.3	-42	07/29/2021 00:49:49
46	-124.842029	44.145204	-92.8	-45	07/29/2021 00:50:03
47	-124.842353	44.148738	-85.7	-35	07/29/2021 00:51:08
48	-124.841614	44.168192	-82.6	-37	7/29/21 12:57 AM
49	-124.841238	44.168626	-82.5	-35	7/29/21 12:57 AM
50	-124.839691	44.194976	-90.9	-43	7/29/21 01:06 AM
51	-124.839328	44.195830	-90.6	-32	7/29/21 01:06 AM
52	-124.839590	44.196126	-91.7	-42	7/29/21 01:06 AM
53	-124.838960	44.196233	-89.2	-44	7/29/21 01:06 AM
54	-124.839394	44.196489	-91.4	-59	7/29/21 01:06 AM
55	-124.839203	44.196729	-92.0	-72	7/29/21 01:06 AM
56	-124.839812	44.196928	-90.4	-47	7/29/21 01:06 AM
57	-124.838750	44.196969	-91.8	-60	7/29/21 01:06 AM
58	-124.834596	44.251250	-128.7	-85	7/29/21 01:24 AM
59	-124.834164	44.251804	-128.5	-94	7/29/21 01:25 AM
60	-124.833313	44.254580	-128.6	-82	7/29/21 01:26 AM
61	-124.811649	44.661355	-357.5	-173	7/29/21 03:39 AM
62	-124.812415	44.662501	-350.0	-231	7/29/21 03:39 AM
63	-124.809991	44.663159	-341.7	-126	7/29/21 03:40 AM
64	-124.812123	44.665252	-348.6	-279	7/29/21 03:40 AM
65	-124.788820	44.968823	-540.5	-228	07/29/2021 05:15:39
66	-124.770157	45.265494	-500.0	-261	07/29/2021 06:43:47
67	-124.749002	46.723143	-165.4	-116	07/29/2021 14:59:13
68	-124.754813	46.745689	-164.6	-115	07/29/2021 15:08:46
69	-124.755792	46.746684	-164.5	-134	07/29/2021 15:09:15
70	-124.770228	46.802415	-150.4	-109	07/29/2021 15:30:02
71	-124.772879	46.885175	-148.0	-86	07/29/2021 16:01:01
72	-124.774067	46.886957	-149.7	-101	07/29/2021 16:01:51
73	-124.778079	46.887074	-149.5	-64	07/29/2021 16:13:09
74	-124.779075	46.885010	-152.9	-76	07/29/2021 16:14:05
75	-124.778476	46.883588	-151.2	-113	07/29/2021 16:14:46
76	-124.778440	46.883810	-150.5	-68	07/29/2021 16:25:34
77	-124.779060	46.885105	-152.2	-91	07/29/2021 16:28:01
78	-124.690368	46.717945	-149.3	-63	07/31/2021 08:46:48
79	-124.690637	46.718330	-149.1	-118	07/31/2021 08:46:58
80	-124.690190	46.718943	-149.0	-109	07/31/2021 08:47:13
81	-124.690586	46.719144	-148.5	-121	07/31/2021 08:47:19
82	-124.690080	46.719698	-146.9	-57	07/31/2021 08:47:32
83	-124.690602	46.720094	-147.8	-85	07/31/2021 08:47:43
84	-124.690369	46.720611	-146.3	-83	07/31/2021 08:47:55
85	-124.690737	46.720929	-144.9	-123	07/31/2021 08:48:04
86	-124.690250	46.721108	-145.4	-112	07/31/2021 08:48:07
87	-124.690250	46.721108	-145.4	-112	07/31/2021 08:48:07
88	-124.690544	46.722382	-144.6	-89	07/31/2021 08:48:40
89	-124.690861	46.722976	-143.8	-97	07/31/2021 08:48:56
90	-124.690943	46.723299	-143.5	-79	07/31/2021 08:49:06
91	-124.691095	46.723402	-143.1	-115	07/31/2021 08:49:09
92	-124.700389	46.729880	-148.8	-73	07/31/2021 08:55:08
93	-124.702956	46.723191	-151.1	-82	7/31/21 09:00 AM
94	-124.700902	46.722633	-150.5	-70	7/31/21 09:00 AM

#	Longitude	Latitude	Depth (m)	Rise Height (m)	Date Time UTC
95	-124.701618	46.721197	-150.9	-70	7/31/21 09:01 AM
96	-124.700854	46.720460	-150.8	-119	07/31/2021 09:11:26
97	-124.702122	46.721315	-150.9	-103	07/31/2021 09:11:55
98	-124.701848	46.721784	-150.5	-126	07/31/2021 09:12:11
99	-124.700752	46.722119	-149.8	-112	07/31/2021 09:12:21
100	-124.700966	46.722547	-150.0	-64	07/31/2021 09:12:37
101	-124.700896	46.722845	-149.1	-106	07/31/2021 09:12:48
102	-124.702399	46.723459	-148.7	-119	07/31/2021 09:13:15
103	-124.701875	46.724072	-149.3	-121	07/31/2021 09:13:38
104	-124.702305	46.724363	-149.3	-122	07/31/2021 09:13:48
105	-124.702087	46.724621	-149.0	-104	07/31/2021 09:13:58
106	-124.701851	46.724908	-149.1	-103	07/31/2021 09:14:08
107	-124.702602	46.725137	-150.3	-96	07/31/2021 09:14:21
108	-124.702819	46.725317	-148.8	-81	07/31/2021 09:14:29
109	-124.701902	46.725703	-149.8	-127	07/31/2021 09:14:42
110	-124.702238	46.725804	-151.0	-81	07/31/2021 09:14:49
111	-124.701136	46.726234	-149.0	-109	07/31/2021 09:15:05
112	-124.702075	46.726439	-149.7	-120	07/31/2021 09:15:21
113	-124.702759	46.726658	-148.3	-132	07/31/2021 09:15:36
114	-124.703508	46.727070	-149.2	-72	07/31/2021 09:16:17
115	-124.701791	46.727672	-148.6	-99	07/31/2021 09:16:37
116	-124.939908	46.173553	-810.8	-541	08/01/2021 09:31:53
117	-124.605398	46.241965	-777.5	-542	08/01/2021 11:31:35
118	-124.602785	46.239848	-760.9	-564	08/01/2021 11:32:45
119	-124.603986	46.241394	-776.7	-366	08/01/2021 11:55:08
120	-124.609602	46.244101	-778.8	-450	08/01/2021 11:57:44
121	-124.609439	46.244097	-777.6	-470	08/01/2021 11:57:47
122	-124.610013	46.244121	-767.0	-581	08/01/2021 12:00:11
123	-124.606541	46.240618	-781.3	-616	08/01/2021 12:03:41
124	-124.602990	46.239927	-763.0	-341	08/01/2021 12:05:45
125	-124.602727	46.239433	-772.5	-438	08/01/2021 12:12:04
126	-124.604503	46.241290	-778.5	-388	08/01/2021 12:13:53
127	-124.606090	46.242134	-775.5	-551	08/01/2021 12:15:01
128	-124.610217	46.243627	-770.4	-584	8/1/21 12:18 PM
129	-124.619647	46.234355	-812.4	-571	08/02/2021 15:12:20
130	-124.642904	46.230990	-717.6	-561	08/02/2021 15:20:33
131	-124.597520	46.232529	-778.9	-620	08/03/2021 14:28:39
132	-124.601703	46.237382	-782.5	-618	08/03/2021 14:31:46
133	-124.602065	46.238279	-782.9	-582	08/03/2021 14:32:45
134	-124.603016	46.239636	-768.6	-322	08/03/2021 14:35:39
135	-124.597477	46.232592	-777.6	-579	08/03/2021 14:28:39
136	-124.601709	46.237224	-781.9	-618	08/03/2021 14:31:40
137	-124.602153	46.238255	-779.0	-582	08/03/2021 14:32:45
138	-124.603125	46.239660	-764.0	-334	08/03/2021 14:35:42
139	-124.602483	46.240508	-756.2	-495	08/03/2021 14:37:14
140	-124.600888	46.242060	-722.3	-435	08/03/2021 15:15:48
141	-124.620463	46.251759	-790.5	-638	08/04/2021 04:24:57
142	-124.636706	46.249977	-831.9	-623	08/04/2021 04:29:09
143	-124.639061	46.253482	-832.8	-658	08/04/2021 04:30:27
144	-125.492546	46.786294	-1565.2	-683	08/04/2021 09:47:02

#	Longitude	Latitude	Depth (m)	Rise Height (m)	Date Time UTC
145	-125.495357	46.789631	-1649.9	-861	08/04/2021 09:48:34
146	-125.495076	46.794846	-1554.5	-760	08/04/2021 09:51:16
147	-125.494902	46.797174	-1558.3	-1050	08/04/2021 09:52:26
148	-124.825244	44.803095	-389.1	-271	07/22/2021 23:12:42
149	-124.922317	44.832648	-403.7	-180	07/23/2021 00:53:40
150	-124.924081	44.834666	-388.2	-281	07/23/2021 00:52:42
151	-124.922117	44.832616	-398.0	-148	07/23/2021 00:53:43
152	-124.872704	44.789540	-295.3	-228	07/23/2021 02:12:51
153	-124.871168	44.789250	-284.8	-249	07/23/2021 02:12:28
154	-125.096793	45.102276	-1509.8	-997	07/23/2021 07:21:38
155	-125.045956	44.917362	-876.6	-624	07/23/2021 09:59:01
156	-124.924752	44.834602	-493.2	-272	07/23/2021 13:33:11
157	-124.925099	44.835970	-490.8	-248	07/23/2021 13:33:16
158	-124.979739	45.583754	-1480.4	-719	07/24/2021 11:59:17
159	-124.992768	45.612936	-1577.2	-840	07/24/2021 12:12:50
160	-124.992449	45.611494	-1606.4	-4	07/24/2021 12:42:58
161	-124.978672	45.556327	-1592.2	-875	07/24/2021 13:13:38
162	-124.990473	45.558750	-1626.6	-656	07/24/2021 13:14:49
163	-124.988616	45.557384	-1612.8	-869	07/24/2021 13:26:31
164	-124.985964	45.572337	-1609.1	-1279	07/24/2021 13:35:48
165	-124.978276	45.584559	-1471.5	-825	07/24/2021 13:39:26
166	-124.995722	45.601777	-1596.8	-1369	07/24/2021 13:46:31
167	-124.991331	45.607318	-1587.3	-671	07/24/2021 13:49:18
168	-124.731267	45.624230	-373.8	-277	07/26/2021 10:55:36
169	-124.730367	45.619351	-387.2	-297	07/26/2021 10:57:54
170	-124.730953	45.615911	-400.7		07/26/2021 10:59:23
171	-124.717395	45.575696	-452.0	-295	07/26/2021 11:54:59
172	-124.729975	45.577370	-456.4	-368	07/26/2021 11:58:17
173	-124.767181	45.575921	-525.1	-293	07/26/2021 12:09:44
174	-124.769031	45.576448	-520.5	-381	07/26/2021 12:10:16
175	-125.197571	43.579090	-1560.6	-817	7/28/21 02:11 PM
176	-125.244102	43.533094	-1587.8	-861	07/28/2021 15:00:42
177	-125.226848	43.369001	-1840.3	-933	07/28/2021 16:12:45
178	-124.902079	43.169496	-508.0	-439	07/28/2021 18:10:45
179	-124.901410	43.161593	-513.0	-406	07/28/2021 18:14:15
180	-124.898703	43.155381	-504.1	-387	07/28/2021 18:35:22

NA128 High Resolution Norbit Mapping - Data Description

Kristopher Krasnosky Univ. of Rhode Island

System Overview:

Data was collected using the Norbit MBES mounted on the front light bar of Hercules. The unit was oriented in a forward-looking configuration for bubble hunting and in a downward looking configuration for mapping operations. The Norbit was operating at 400khz for all operations.

Raw navigation data was collected using a ParoScientific depth sensor, RDI workhorse DVL and an Octans AHRS. Raw data was recorded directly from serial off the herc topside multiplexer to reduce timing errors induced by the topside MOXA. Once received, the data was processed by a custom Robot Operating System (ROS) based software suite developed by Dr. Kristopher Krasnosky. This software suite produces a real-time navigation solution that can be used to guide surveys. All Norbit data was was collected through a ROS driver. All data is stored using rosbag format.

Data Location:

Raw rosbag data is available in NA128/raw/herc_mapping.

Data Products:

Data products were produced from 4 dives and are available in NA128/processed/herc_mapping.

All geotiffs have been imported and organized in a QGIS project “NA128.qgz”. This is probably a good place to start to get an overview of the data.

Each dive corresponds to a folder in that directory and includes:

- CloudCompare Renders for reference
- A CloudCompare project that can be used to view the data in its highest fidelity.
- Geotiffs for each site
  - backscatter
  - bathy

Fig. 4: Norbit Map of E of Kulm Deep (H1860)

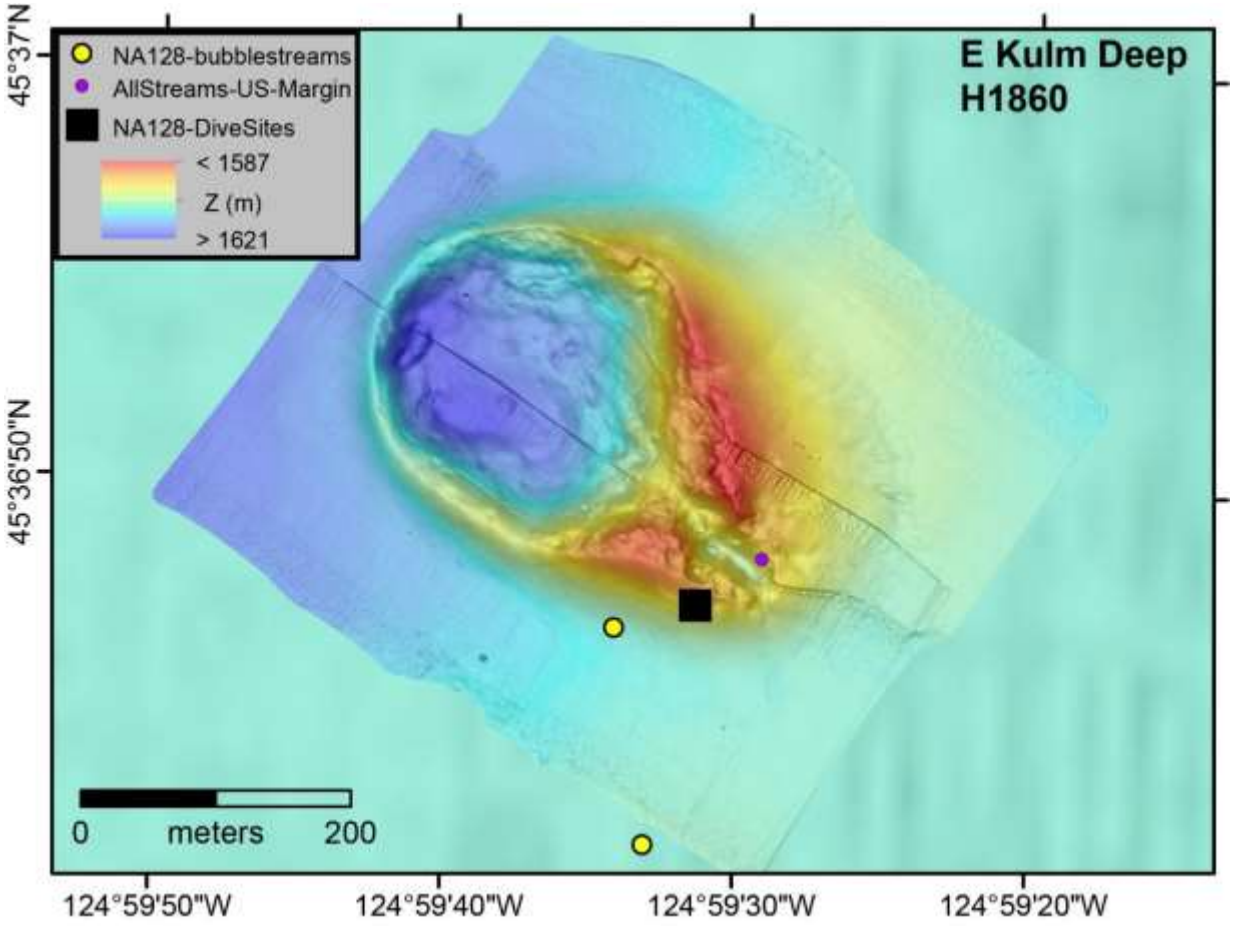


Fig. 5: Norbit Map of NW Coquille Base of Slope (H1862)

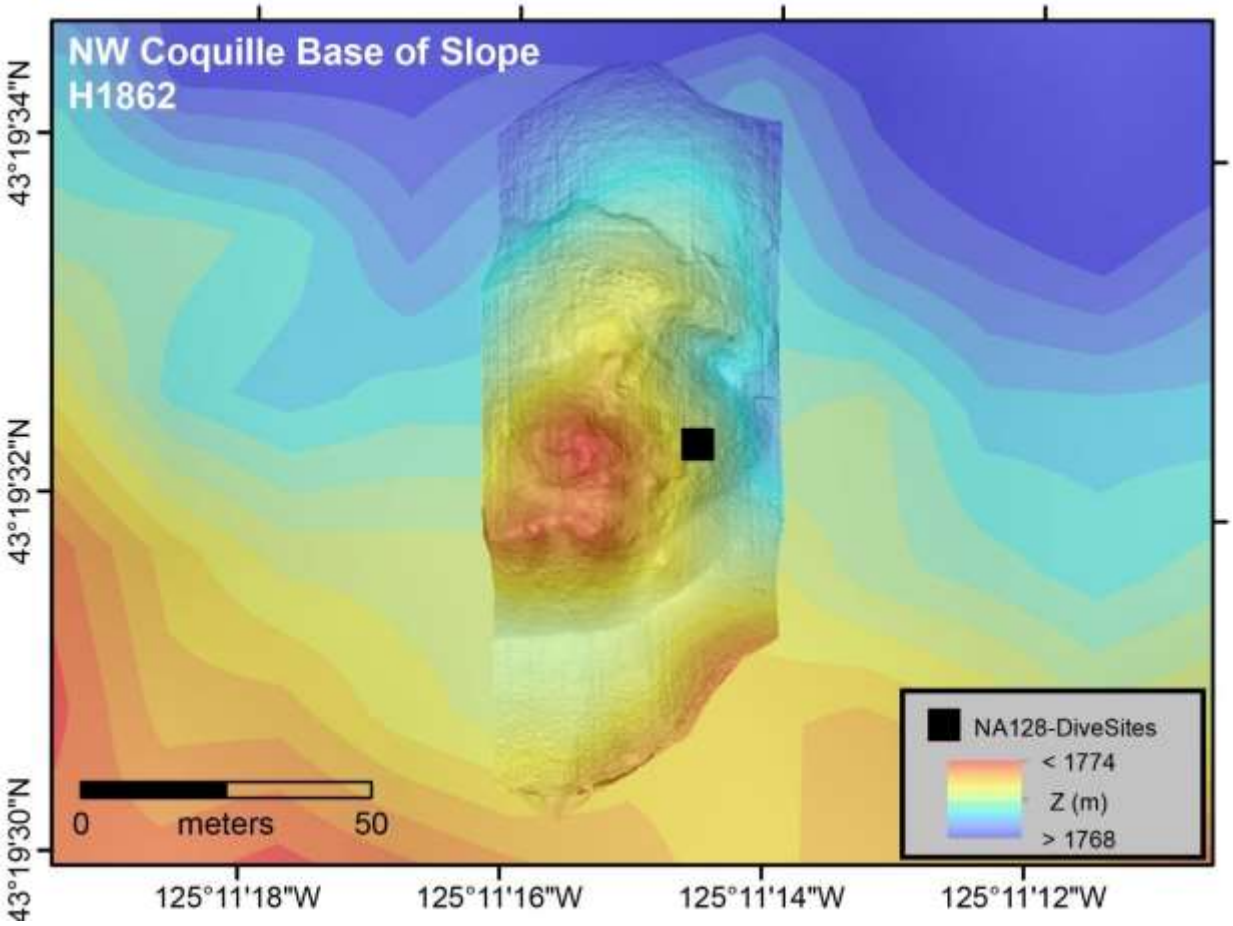


Fig. 6: Norbit Map of Astoria Canyon North Rim (H1866, H1867)

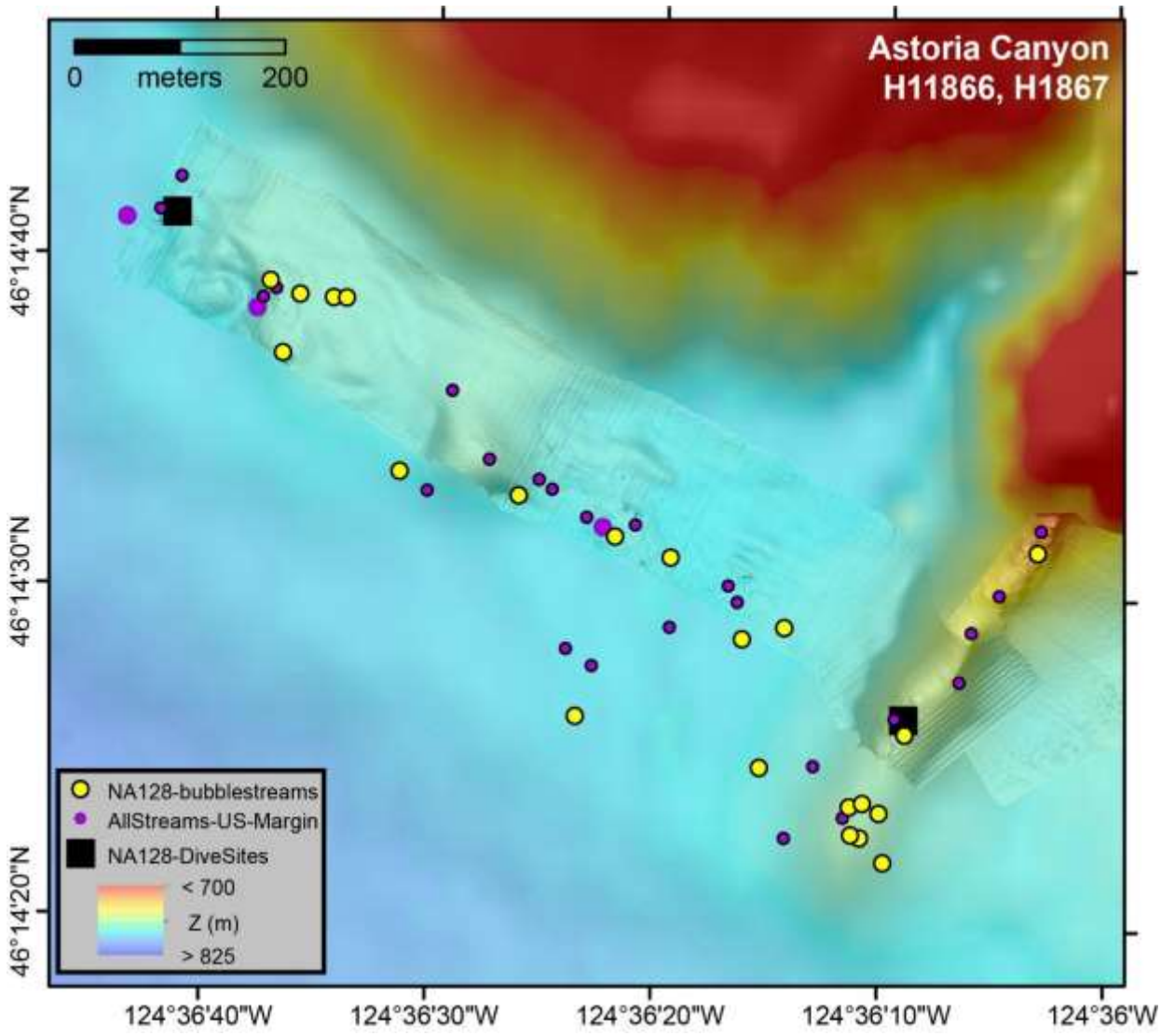


Fig. 7: Norbit Map Ridge SW of Grays Canyon (H1868)

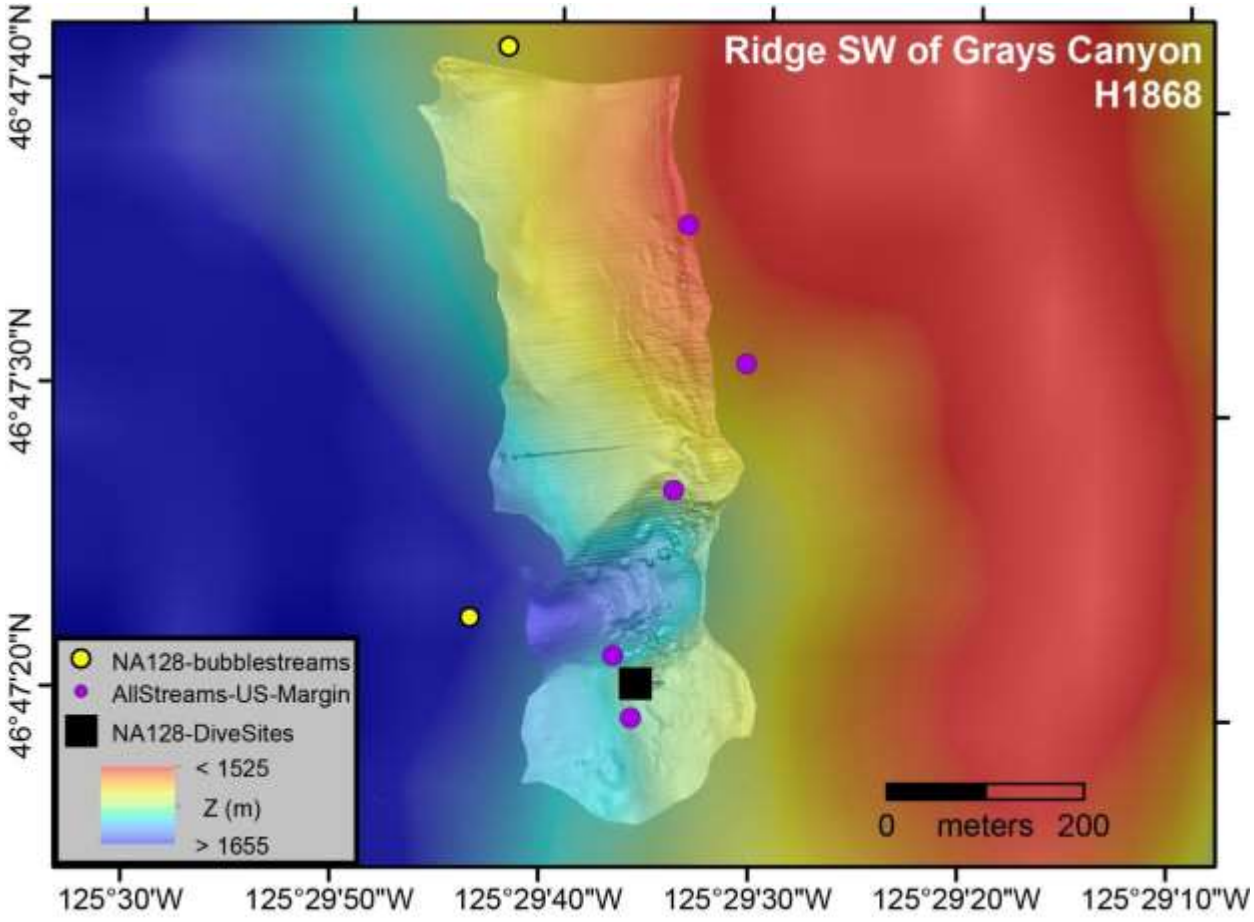


Table 10: PMEL Seafloor Markers on Cascadia Margin

Susan G. Merle

Marker	Cruise/year deployed	Dive	location	latitude	longitude	depth	Description
Mkr-262	NA128 2021	H1858	Carbonate Ridge	44.834602	-124.924761	495	near 2 bubble streams
Mkr-263	NA128 2021	H1858	Carbonate Ridge	44.832449	-124.922972	495	near 4 bubble streams
mkr-3	Falkor 2019	?	Astoria Canyon	46.253589	-124.639250	831	2021 position. Spotted on H1859. Deployed during USGS Falkor cruise in 2019
Mkr-235	NA128 2021	H1862	NW Coquille base of slope	43.325771	-125.187509	1768	Near bubble pit
Mkr-215	NA128 2021	H1863	SE of Grays Canyon (Salmi Plume)	46.885004	-124.779028	152	On carbonate boulder near bubble stream
Mkr-256	NA128 2021	H1864	Ridge SW of Grays Canyon	46.789404	-125.492861	1603	near hydrate sample with bubble stream
Mkr-209	NA128 2021	H1866	Astoria Canyon N Rim	46.240646	-124.602479	756	hydrate and bubble stream
Mkr-301	NA095 2018	H1671	S Coquille 700m	42.776083	-124.926949	700	S Coquille 700m site - on ledge next to depression (pit) with hydrate coating on sediments, where collected gastight samples on dive H1671 (2018)
Mkr-214	NA095 2018	H1675	Heceta 500m	44.249652	-124.957470	491	Heceta 500m site - deployed ~ 2 m from hydrophone on seafloor. Area (~3m across) of 6 -8 bubble streams coming out of sedimented seafloor with small bac mat patches.
Mkr-220	NA095 2018	H1678	SW Heceta 1235m	43.910806	-125.075843	1223	Heceta 1235m R site - deployed in 2016 and moved in 2018 to more active site of bubble stream curtain.
Mkr-282	NA095 2018	H1679	S of Astoria Canyon 1345m	45.943188	-125.177869	1354	S of Astoria Canyon site - (N summit?) hdg 77° time? 0050 6-7 bubble streams when sampled later.
Mkr-221	NA095 2018	H1679	S of Astoria Canyon 1345m	45.942021	-125.175513	1354	S of Astoria Canyon site - (S summit?) hdg 77° time 2030?
Mkr-208	NA072 2016	H1513	Juan de Fuca	48.102198	-125.554290	151	Area of carbonate and bubbles
Mkr-216	NA072 2016	H1518	Nehalem Bank	45.883821	-124.643297	186	Placed near bacterial mat?
Mkr-244	NA072 2016	H1519	Astoria Canyon (500m)	46.222493	-124.656443	494	Placed next to gastight sampling site. Steady bubble streams.
Mkr-273	NA072 2016	H1519	Astoria Canyon	46.242192	-124.649430	849	AC hydrate site. Visited on NA128 2021. (2021 pos: 46.242145, -124.649316)
Mkr-220	NA072 2016	H1520	Heceta SW	43.910851	-125.076410	1227	Area of hydrate and vigorous bubble streams
Mkr-233	NA072 2016	H1521	Coquille SW	42.712506	-124.901413	619	Area of bubbles and bacterial mat. Visited in 2018 - not as active as 2016 during 2018.
Mkr-288	NA072 2016	H1521	Coquille SW	42.710627	-124.901387	615	Area of nice bubble streams and clams. Visited in 2018. 4 active bubble streams in 2018. (2018 pos: 42.710633, -124.901297)

Table 11: Hercules NA128 Samples

OET team

Sample#	Dive	Date	start-hr	start-min	latitude	longitude	Z(m)	Type	Event Description	Wet lab description
NA128-001	H1858	2021-07-23	16	31	44.837953	-124.923443	539	Rock	Carbonate rock from 539 m. seafloor is mixed some soft sediment with rocky debris. Yellow staining color all the way around, approx. 12 cm in size. 15cm long	Tan/orange rock in 2 large fragments. 12cm x 15cm x 10cm, and a 13 x 7 x 8 cm piece. Some encrusting fauna, white bryozoan and an empty worm case. Solid rock throughout.
NA128-002	H1858	2021-07-23	18	35	44.834568	-124.924790	493	Niskin	1 meter above strong bubble stream. bubble stream is coming from a small hole in seafloor near carbonate rock, bacterial mats, and shell hash	Split between labs at PMEL for eDNA and geochemistry
NA128-003	H1858	2021-07-23	18	40	44.834569	-124.924790	484	Niskin	taken 10 meters above the bubble stream at 483m	Split between labs at PMEL for eDNA and geochemistry
NA128-004	H1858	2021-07-23	19	04	44.834604	-124.924750	494	GT	Gas tight sample (GT-07) from persistent stream of small bubbles near small white microbial mat, small thornyhead rockfish, and clam hash	Processed by PMEL
NA128-005	H1858	2021-07-23	19	18	44.834606	-124.924760	494	Biology	~15 clams and a crab from area near GT7, also some small white mat, thornyheads, and surrounding clam hash. SIphons seen. Near waypoint 3.	~40 living clams and re/pink crab, vesicomyid, all clams ~2-3cm long
NA128-006	H1858	2021-07-23	19	40	44.834585	-124.924751	494	Rock	carbonate rock with white mat from area of clam and GT sampling, ~10 cm wide, 30 cm long	~33cm in length, multiple colors throughout, mostly light grey with white bacterial mat. Multiple large holes. Covered in multiple small snails and some chitons.
NA128-007	H1858	2021-07-23	19	52	44.834581	-124.924724	494	Biology	Small Heteropolypus coral from on carbonate near clams and small white mat	small mushroom coral ~2.5cm wide, and a translucent polychaete
NA128-008	H1858	2021-07-23	20	16	44.835116	-124.924753	496	Niskin	Niskin from 25 m down current (heading 023 from sample site) of first seep sampling site	Split between labs at PMEL for eDNA and geochemistry
NA128-009	H1858	2021-07-23	21	46	44.832563	-124.922248	497	Biology	~10 clams from near waypoint 5, in clam bed surrounded by dover, thornyhead, sablefish, and small white mat	~30 live vesicomyid clams, all ~1.5-2.5cm long, 1 small squat lobster
NA128-010	H1858	2021-07-23	22	31	44.832563	-124.922134	498	Biology	Heteropolypus coral from right near white/gray microbial mat and clam bed near WP 5	Small heteropolypus ~3cm wide. Completely divided among sub-samples
NA128-011	H1858	2021-07-23	23	02	44.832463	-124.922935	495	GT	Near NWP5, GT2, 4 plumes, taking sample from largest plume, surrounded by microbial mats and carbonate cobbles	Processed by PMEL
NA128-012	H1858	2021-07-23	23	14	44.832468	-124.922933	494	Niskin	1 m above the seaflower, near GT2 sa	Split between labs at PMEL for eDNA and geochemistry
NA128-013	H1858	2021-07-23	23	17	44.832453	-124.922966	495	Rock	Near 4 plumes located near NWP5, ~10 cm, carbonate rock	Carbonate rock ~22cm x 11cm x 11cm. Light colored on the bottom and dark on the top, solid all the way through. One chiton on the surface.
NA128-014	H1858	2021-07-23	23	25	44.832433	-124.922983	486	Niskin	10 m above the 4 plumes, near GT2 sample location	Split between labs at PMEL for eDNA and geochemistry
NA128-015	H1858	2021-07-23	23	36	44.832447	-124.922617	493	Niskin	~25 m downstream from the plume sampled by GT2	Split between labs at PMEL for eDNA and geochemistry
NA128-016	H1858	2021-07-23	23	47	44.832457	-124.922941	495	Biology	Rathbunaster. ~4 cm, located near plume and marker 263, near clam hash and located on carbonate cobble	~4cm long orange rathbunaster sea star.

Sample#	Dive	Date	start-hr	start-min	latitude	longitude	Z(m)	Type	Event Description	Wet lab description
NA128-017	H1859	2021-07-25	20	40	46.253642	-124.639324	831	GT	Gas tight (GT18) sample from curtain of small bubble streams on edge of bacterial mat and reduced sediment-covered depression. ~8 m WNW of 2019 hydrate marker. Sample was attempted twice, first attempt may not have worked.	Processed by PMEL
NA128-018	H1859	2021-07-25	21	00	46.253636	-124.639341	831	GT	GT 17-2 gas tight with broken cone triggered near previous gas tight, background seawater near bubbles	Processed by PMEL, seems it may have captured some gas despite broken funnel
NA128-019	H1859	2021-07-25	21	05	46.253648	-124.639341	830	Niskin	Niskin taken ~1 m over bubble stream of GT sample location, bottle 1	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-020	H1859	2021-07-25	21	09	46.253647	-124.639339	828	Niskin	Niskin taken 4 m over bubble stream of GT sample location	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-021	H1859	2021-07-25	21	20	46.253646	-124.639336	825	Niskin	Niskin taken 10 m over bubble stream of GT sample location	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-022	H1859	2021-07-25	21	16	46.253633	-124.639365	831	Core	ported push core from within white/gray bacterial mat and black reduced sediment adjacent to gas tight sampling location. small white gastropods on top.	~13 cm core with black, sulfidic mud all the way through. Looser on top, slightly more gelatinous lower in core. Some small white mat on top. Did not find any living acharax or shells in core. Layering may have been influenced by gas bubbling on ascent.
NA128-023	H1859	2021-07-25	21	20	46.253633	-124.639367	831	Core	ported push core from within white/gray bacterial mat and black reduced sediment adjacent to gas tight sampling location and next to previous core. Small white gastropods on top.	~22 cm core with black, sulfidic mud all the way through. Looser on top, slightly more gelatinous lower in core. Some small white mat on top. Didn't find any living acharax or shells in core. Layering may have been influenced by gas bubbling on ascent.
NA128-024	H1859	2021-07-25	21	30	46.253675	-124.639378	831	Biology	5 pink sea stars ~10 cm arm tip to tip. Also collected in 2019 by USGS.	5 pink sea stars with disks ~2 cm in diameter. Species not identified on ship.
NA128-025	H1859	2021-07-25	21	47	46.253476	-124.639501	837	Niskin	Niskin from 25 m down current of GT sampling bubble plume (toward due S). ~1 m off seafloor over flat sediment w/ abundant pink sea stars.	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-026	H1859	2021-07-25	22	08	46.251853	-124.638381	838	Niskin	Niskin from 200 m away from GT bubble stream location, over flat sediment with seastars. 1 m off seafloor	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-027	H1859	2021-07-25	22	40	46.250160	-124.637226	837	Niskin	NIskin sample from 1 m above WP5 bubble stream near bacterial mat with small snails in depression feature	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-028	H1859	2021-07-25	22	52	46.250170	-124.637270	839	Core	ported core from white gray bacterial mat with small snails adjacent to depression where bubbles were	~20 cm core with black, sulfidic mud all the way through. Looser on top, slightly more gelatinous lower in core. Layering may have been influenced by gas bubbling on ascent.
NA128-029	H1859	2021-07-25	23	02	46.250177	-124.637270	838	Core	regular core from white gray bacterial mat with small snails adjacent to depression where bubbles were	~20 cm core with black, sulfidic mud all the way through. Looser on top, slightly more gelatinous lower in core. Layering may have been influenced by gas bubbling on ascent.

Sample#	Dive	Date	start-hr	start-min	latitude	longitude	Z(m)	Type	Event Description	Wet lab description
NA128-030	H1859	2021-07-25	23	09	46.250161	-124.637288	838	Core	regular core from white gray bacterial mat with small snails, 5 m SW of two previous cores along bacterial mat periphery	~18 cm black, sulfidic mud all the way through. Looser on top, slightly more gelatinous lower in core. Layering may have been disturbed during placement on vehicle (no hole in quiver for fluid evacuation).
NA128-031	H1860	2021-07-26	17	33	45.613338	-124.991851	1596	Biology	Basket star on top of carbonate rock, 1,596m depth, 4.85% O2 concentration	Orange/pink basket star with central disk ~10 cm, no visible associates
NA128-032	H1860	2021-07-26	17	38	45.613335	-124.991851	1596	Rock	Authigenic carbonate rock on the tip of a slope near bundles of tube worms with basket stars on top. Very crumbly when touched. 1,596m saturation of O2 is 4.85%	~19x13x8 cm conglomerate carbonate rock with multiple fragments and holes. Basket star was resting on top (separate sample). Small pale pink unknown associate ~2 cm.
NA128-033	H1860	2021-07-26	17	45	45.613354	-124.991890	1597	Core	Push core in sediment near bush of tube worms near bacterial mat and carboante rock. Depth 1596m O2 saturation 4.87%. nearby are bacterial mats,	~17 cm thick core of soft brown sediment, uniform throughout
NA128-034	H1860	2021-07-26	17	58	45.613332	-124.991878	1597	Biology	Bundle of tube worms (5-7 individuals) in soft sediment found near bacterial mats and carbonate rock, whelk egg tower possibly attached. red plumes	6 Siboglinid tube worms with ~60-80 cm cases. Body lengths ~10-20 cm, but not all recovered in their entirety. Tube cases imaged, but not kept.
NA128-035	H1860	2021-07-26	19	59	45.613544	-124.992486	1593	Biology	~3 empty shells, potentially acharax, may be able to analyze shell periostracum and carbonate. From medium sized patch of shells near tubeworms.	5 acharax shells, 2 ~8 cm long, the others are ~7, 5, and 3 cm long. Periostracum is dark brown and paper like
NA128-036	H1860	2021-07-26	20	48	45.613145	-124.992238	1597	Niskin	West of WP1, taken above white/gray bacterial mats and shell hash, near where minor bubbles may have been observed earlier in the dive, 1 m above the surface	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-037	H1860	2021-07-26	20	49	45.613162	-124.992214	1597	Niskin	10 m above the sea floor, above bacterial mats, right above where 1 m Niskin was sampled	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-038	H1860	2021-07-26	21	04	45.613065	-124.991981	1602	Core	core from within small patchy white gray orange bacterial mat	~27 cm thick with visible bacterial mat and a red polychaete worm and clam shell in the top layers. The bottom ~10cm is a lighter brown color than the top of the core which is dark brown/black.
NA128-039	H1860	2021-07-26	21	12	45.613062	-124.991986	1602	Core	replicate core from within small patchy white gray orange bacterial mat	Full ~28 cm core. Top cm is lighter brown, followed by dark brown/black sediment. Split/gap ~9cm from the bottom
NA128-040	H1860	2021-07-26	21	22	45.613222	-124.991724	1598	Niskin	NIskin from 25 m down current of microbial mats, 1m off seafloor	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-041	H1860	2021-07-26	21	27	45.613364	-124.991875	1600	Core	ported core from adjacent to previous tubeworm site earlier in dive, ~0.5 m from worm bush. top layer here may have been contaminated by cores shaken out nearby	~20 cm core of soft brown sediment, uniform throughout
NA128-042	H1860	2021-07-27	1	33	45.616263	-124.994447	1595	Niskin	Sampling near end of 3rd transect, 20 m above the sea floor	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-043	H1860	2021-07-27	1	35	45.616396	-124.994705	1585	Niskin	Right above previous Niskin sample, 30 m above the sea floor at the end of the 3rd transect line	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-044	H1860	2021-07-27	1	37	45.616455	-124.994849	1575	Niskin	Above the two previous Niskin samples, 40 m above the sea floor at the end of the 3rd transect line	Split between labs at PMEL for eDNA, geochemistry, and microplankton

Sample#	Dive	Date	start-hr	start-min	latitude	longitude	Z(m)	Type	Event Description	Wet lab description
NA128-045	H1861	2021-07-27	18	48	43.325748	-125.187508	1765	Niskin	taken 1 meter above a bubble stream coming out of a fairly large (~30cm) hole in the sea floor with mat and shell hash	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-046	H1861	2021-07-27	18	52	43.325744	-125.187526	1757	Niskin	Taken 10m above the same bubble stream as previous sample	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-047	H1861	2021-07-27	19	08	43.325758	-125.187484	1767	GT	Gas sample (GT17-1) From burping bubble stream (x2 burps) within small pit in seafloor surrounded by some white bacterial mat, many small ophiuroids, clam hash, and some living clams (some very large)	Processed by PMEL
NA128-048	H1861	2021-07-27	19	27	43.325758	-125.187508	1767	GT	Shimmering liquid sample ~6 degrees (GT18-1) From burping bubble stream within small pit in seafloor surrounded by some white bacterial mat, many small ophiuroids, clam hash, and some living clams (some very large)	Processed by PMEL
NA128-049	H1861	2021-07-27	19	44	43.325776	-125.187474	1768	Core	ported core from adjacent to GT sampling pit with bubble plume, over brittle stars and near clams. May have some hydrate or rocks in it.	Core off-gassed and mixed a lot during ascent. Will not use.
NA128-050	H1861	2021-07-27	19	45	43.325766	-125.187488	1768	Core	ported core from adjacent to GT sampling pit with bubble plume, over brittle stars and near clams. May have some hydrate or rocks in it. Shallower core	~15cm brown core, thicker texture in bottom 5cm
NA128-051	H1862	2021-07-28	5	11	43.325734	-125.187544	1763	Niskin	Niskin taken 4 m above bubble stream at waypoint 1. 1764m 7.20% O2/ 30.72 uM, water temp 2.29 C	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-052	H1862	2021-07-28	5	16	43.325711	-125.187501	1766	Core	Push core taken near large bubble stream hole with a lot of clams and a grenadier, where last niskin was taken	~27 cm full darker brown core with a split/gap within the bottom 5 cm. The bottom layer had multiple small bubble-like holes
NA128-053	H1862	2021-07-28	5	37	43.325699	-125.187540	1766	Biology	~20 ophiuroids near the base of bubble stream hole with clams, bacterial mats, and near site of shimmering water with max temp of 10.8C in the sediment underneath	~45 individuals from 053, plus ~45 individuals from 054 (adjacent clam slurps). Average disk diameter ~0.75 cm
NA128-054	H1862	2021-07-28	5	42	43.325720	-125.187497	1766	Biology	Clams ~20 individuals from a large clam bed (likely hundreds) near the base of the bubble stream hole where ophiuroids were collected. Many ophiuroid associates captured as well, will be joined with sample 053.	16 vesicomyid clams (live), one empty shell. Largest clam is ~6 cm long, smallest ~3 cm long.
NA128-055	H1862	2021-07-28	6	24	43.325697	-125.187531	1766	GT	Taken at 1766m, over medium sized hole in the seafloor with bacterial mat, clams, ophiuroids. constant bubble stream. there is a lot of shimmering water, close to the clam bed where the temperature that read 10.8 C	Processed by PMEL
NA128-056	H1862	2021-07-28	6	42	43.325704	-125.187542	1766	GT	Taken at same location as last gas tight. but taken over shimmering water rather than over the bubblesGT-7(red green)	Processed by PMEL
NA128-057	H1862	2021-07-28	7	14	43.325754	-125.187509	1768	GT	Gas tight from first bubble pit sampling location at this site during H1861, 4 burps	Processed by PMEL
NA128-058	H1862	2021-07-28	7	27	43.325708	-125.187447	1768	Rock	very crumbly carbonate rock ~20 cm long covered in white mat and small gastropods from ~6 m away from first bubble pit.	Crumbly pieces of brittle white and dark gray rock covered in bacterial mat and small gastropods. Best guess currently is that it might be barite, but did not bubble with HCl so likely not calcium carbonate.
NA128-059	H1862	2021-07-28	7	45	43.325744	-125.187553	1767	Core	ported core from periphery of large clam bed (near 052 and core from H1861)	~23cm core, uniform light brown/grey color throughout, visible small bubble holes

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NA128-060	H1862	2021-07-28	7	47	43.325734	-125.187535	1767	Core	ported core from periphery of large clam bed (near 052 and core from H1861)	~23cm core, uniform light brown/grey color throughout, visible small bubble holes
NA128-061	H1862	2021-07-28	7	57	43.325731	-125.187809	1770	Niskin	Niskin from 25 m down current (west) of original bubble pit GT sampling location, ~1 m off bottom	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-062	H1862	2021-07-28	9	08	43.325740	-125.187540	1749	Niskin	Niskin taken from 20 m altitude over seafloor near seep	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-063	H1862	2021-07-28	9	09	43.325718	-125.187565	1727	Niskin	Niskin taken from 44 m altitude over seafloor near seep	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-064	H1862	2021-07-28	9	10	43.325726	-125.187575	1720	Niskin	Niskin taken from 50 m altitude over seafloor near seep	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-065	H1862	2021-07-28	9	10	43.325726	-125.187575	1720	Niskin	Niskin taken from 50 m altitude over seafloor near seep	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-066	H1863	2021-07-29	18	23	46.884974	-124.779026	152	Rock	Grab of flat carbonate rock ~20cm (bubble site 1) near 2 bubble streams and large carbonate slabs with an anemone on top.	~37x3 cm flat, dark gray, solid rock with a bivalve and chiton associate
NA128-067	H1863	2021-07-29	18	37	46.884997	-124.779058	151	Niskin	1 meter directly above the bubble stream where the carbonate sample was from. 152m O2	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-068	H1863	2021-07-29	18	47	46.885003	-124.779073	143	Niskin	Taken 10m above same bubble stream as previous sample.	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-069	H1863	2021-07-29	19	22	46.885002	-124.779033	152	GT	Gas tight from bubble stream adjacent to large carbonate boulder, site of previous NIskins.	Processed by PMEL
NA128-070	H1863	2021-07-29	19	46	46.885013	-124.779032	149	Niskin	NIskin from 4 m above sampling bubble stream	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-071	H1863	2021-07-29	19	52	46.885174	-124.779278	151	Niskin	Niskin from 25 m down current (NW of bubble sample site), 1 m above seafloor	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-072	H1863	2021-07-29	20	28	46.884894	-124.779279	152	Biology	slurp targeting very small orange squat lobsters (Munida, maybe M. quadrispina) adjacent to small persistent bubble stream with very small white and orange bacterial mat	4 squat lobsters with ~1 cm long body
NA128-073	H1863	2021-07-29	21	30	46.883839	-124.778690	151	Core	ported core from very small patches of white bacterial mat surrounding small holes in sedimented seafloor	~26cm thick, brown sediment in the first 6cm followed by black sediment in the bottom of the core
NA128-074	H1863	2021-07-29	21	34	46.883838	-124.778691	151	Core	ported core from very small patches of white bacterial mat surrounding small holes in sedimented. Some sediment blew up during placement, but probably from outside of core liner	~20cm core, lighter brown sediment on top, darker on bottom. Some white mat on top.
NA128-075	H1863	2021-07-29	21	57	46.883703	-124.778720	151	Core	Background core between WP4 and WP5 bubble streams (~16 m away from closest bubbles observed) in soft background sediment	~20cm core, lighter brown sediment throughout.
NA128-076	H1863	2021-07-29	22	09	46.883849	-124.778706	152	Niskin	Gas tight sample GT10 from small, but persistent WP4 bubble stream near carbonate rocks	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-077	H1863	2021-07-29	22	25	46.883849	-124.778706	152	GT	Gas tight sample GT10 from small, but persistent WP4 bubble stream near carbonate rocks	Processed by PMEL

Sample#	Dive	Date	start-hr	start-min	latitude	longitude	Z(m)	Type	Event Description	Wet lab description
NA128-078	H1863	2021-07-29	22	55	46.883855	-124.778747	152	Biology	Two individuals, likely Pteraster, collected on WP4 at 152 m depth where GT-10 was taken; located on a carbonate cobble; used slurp to place individuals on the scoop for transport to biobox	2 vermillion sea stars with ~5 cm discs
NA128-079	H1863	2021-07-29	23	20	46.883856	-124.778745	152	Biology	Brachiopods, t WP4, located near sea star samples; slurping 4-5 individuals from carbonate cobble, several stuck in crevice	7 articulate brachiopods
NA128-080	H1863	2021-07-29	23	31	46.883854	-124.778746	152	Rock	Located at WP4; carbonate slab broken off larger piece near brachiopod and sea star samples	25x25x12 cm carbonate rock, various shades of gray and tan, holes throughout. Many associates including small tube warms, tunicates, and brachiopods
NA128-081	H1863	2021-07-29	23	39	46.883861	-124.778740	143	Niskin	Sampled 10 m above seafloor at WP4; sizable amount of turbidity within the water column	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-082	H1863	2021-07-30	0	18	46.884847	-124.779305	153	Biology	Small tube worms from on carbonate rock adjacent to bubble curtain site near WP2	2 tubeworms in cases, possibly serpulid. A squat lobster also recovered, possibly stuck in slurp from 072
NA128-083	H1864	2021-07-30	18	21	46.789422	-125.492843	1603	Hydrate	Hydrate found at the base of a bubble stream from within a crevice of large carbonate boulders. There is bacterial mat at the base of the hole, tube worms are all around. Depth is 1,603m depth, O2 is 4.42% or 17.67 umol/L, ambient temp is 2.64C	Processed by PMEL
NA128-084	H1864	2021-07-30	18	40	46.789431	-125.492854	1603	GT	Taken were the hydrate was sampled, Gas tight number 17-1 (white tape)	Processed by PMEL
NA128-085	H1864	2021-07-30	19	14	46.789430	-125.492861	1604	GT	Duplicate gas tight taken (GT 18-2), (orange, black, and white tape). Leftmost of 3 bubble streams. About half full funnel	Processed by PMEL
NA128-086	H1864	2021-07-30	19	40	46.789384	-125.492817	1601	Niskin	Niskin from 1 m over bacterial mat site	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-087	H1864	2021-07-30	19	52	46.789378	-125.492803	1601	Core	ported core from patchy bacterial mats a few meters wide with interspersed clams surrounded by carbonate walls	~21cm thick, grey color with air pockets throughout with white bacterial mat on top
NA128-088	H1864	2021-07-30	19	55	46.789375	-125.492804	1601	Core	ported core from patchy bacterial mats a few meters wide with interspersed clams surrounded by carbonate walls	~21cm thick, grey color with air pockets throughout with white bacterial mat on top
NA128-089	H1864	2021-07-30	20	04	46.789357	-125.492832	1601	Biology	~15 vesicomyid clams from small clam bed patch near bacterial mat where push coring was done	18 vesicomyid clams, ~4-7 cm long
NA128-090	H1864	2021-07-30	20	28	46.789342	-125.492827	1602	Biology	Acharax shells from adjacent to bacterial mat	4 Acharax shells w/ periostracum, ~5-8 cm long
NA128-091	H1864	2021-07-30	20	55	46.789354	-125.492858	1599	Biology	Tubeworms with anemone associates from on top of carbonate rock	15 tube worms, posterior not full intact, longest was ~25 cm. Associates were 9 small anemones ~ 1 cm each, and a small unknown red polychaete
NA128-092	H1864	2021-07-30	21	08	46.789318	-125.492883	1599	Rock	carbonate rock from carbonate wall	Carbonate rock ~16x12x7 cm, gray and white, mostly solid, but some holes. Associates included chiton, polychaete, and encrusting sponge possibly
NA128-093	H1864	2021-07-30	21	15	46.789374	-125.492836	1598	Niskin	Niskin from 4 m above push core microbial mat site	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-094	H1864	2021-07-30	21	19	46.789374	-125.492821	1593	Niskin	Niskin from 10 m up over push core mat site	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-095	H1864	2021-07-30	21	45	46.789562	-125.492614	1602	Niskin	Niskin from ~25 m NE of general sampling area, no obvious current direction. 2 m off bottom over steep sedimented slope with minimal fauna	Split between labs at PMEL for eDNA, geochemistry, and microplankton

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NA128-096	H1864	2021-07-30	21	50	46.789551	-125.492608	1593	Niskin	Niskin from 25 m away (same as previous), 10 m above seafloor for background	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-097	H1865	2021-07-31	18	09	46.720039	-124.690254	147	Niskin	1 meter above in site where bubbles were previously seen, but are not active at this time. target is called "bubble stream" Depth 147m O2 26.09umol/L, temp	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-098	H1865	2021-07-31	18	11	46.720039	-124.690255	138	Niskin	Taken 10m above bubble stream site where bubbles were previously seen.	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-099	H1865	2021-07-31	18	13	46.720030	-124.690208	147	Rock	Carbonate rock crumbles from a larger slab, near shell hash and bacterial mat where bubbles were seen previously, but not currently.	2 fragments of rock. 11x7x3 cm and 8x4x2 cm. Porous/holes throughout, brachipod associates.
NA128-100	H1865	2021-07-31	18	31	46.720061	-124.690544	147	Niskin	taken 25 m down current (south west) from previous niskin samples, 1 meter above the seafloor, and .14 knots speed of current	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-101	H1865	2021-07-31	19	05	46.718843	-124.690185	149	GT	Gas tight (GT2) from small bubble stream surrounded by very small white and orange bacterial mat. Stream became less frequent over time.	Processed by PMEL
NA128-102	H1865	2021-07-31	20	21	46.718843	-124.690185	149	Niskin	Niskin from 1 m off bottom over GT bubble sampling site	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-103	H1865	2021-07-31	20	23	46.718843	-124.690187	139	Niskin	Niskin from 10 m over GT bubble sampling site	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-104	H1865	2021-07-31	20	27	46.718830	-124.690202	149	Rock	Carbonate rock, 2 fragments. Associates include brachiopod.	Carbonate rock, 10x4x5 cm and 8x3x4 cm pieces. Light gray, solid carbonate rocks w/ some encrusting bio
NA128-105	H1865	2021-07-31	20	37	46.718830	-124.690203	149	Biology	5 brachiopods from on carbonate boulder	4 brachiopods intact, 1 cracked, 1.5-2.5 cm long
NA128-106	H1865	2021-07-31	20	42	46.718838	-124.690202	149	Biology	Cup coral from on carbonate boulder	1 cup coral, pale pink/white in color, ~1 cm
NA128-107	H1865	2021-07-31	20	57	46.718837	-124.690266	149	Core	Very shallow ported core from 6 m away from GT bubble stream sampling site, no seep fauna in close proximity.	~13 cm of dark brown sediment, small stalked organisms in top cm
NA128-108	H1865	2021-07-31	21	01	46.718835	-124.690266	149	Core	Very shallow ported core from 6 m away from GT bubble stream sampling site, no seep fauna in close proximity. Near carbonate rubble	~10 cm core, uniform brown color throughout, thicker bottom half starting ~5-6 cm.
NA128-109	H1865	2021-07-31	21	20	46.718994	-124.690529	148	Niskin	Niskin from 25 m down current (NW) of GT sampling bubble stream	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-110	H1865	2021-07-31	21	32	46.718696	-124.690326	149	Core	Ported core from small white bacterial mat adjacent to small holes, with no active bubble stream	~21 cm of sediment. White bacterial mat on top. First 10 cm is dark brown and last 10 cm is blackish.
NA128-111	H1865	2021-07-31	21	36	46.718699	-124.690326	149	Core	Ported core from small white bacterial mat adjacent to small holes, with no active bubble stream	~24 cm of sediment. First 3 cm is lighter in color, last 20 cm are blackish. White bacterial mat in top layer.
NA128-112	H1866	2021-08-01	20	48	46.240649	-124.602515	757	GT	gas tight sample (GT7) from bubble stream beside hydrate outcrop	Processed by PMEL
NA128-113	H1866	2021-08-01	21	15	46.240647	-124.602514	757	Hydrate	Hydrate sample from large overhanging hydrate ledge ~ 2 m long with adjacent seep habitat. ~14.5 turns on sampler.	Processed by PMEL
NA128-114	H1866	2021-08-01	22	18	46.240649	-124.602513	757	GT	Replicate gas tight (GT5) from adjacent to hydrate sample	Processed by PMEL
NA128-115	H1866	2021-08-01	22	32	46.240686	-124.602498	756	Niskin	Niskin 1 m off seafloor from adjacent to hydrate outcrop	Split between labs at PMEL for eDNA, geochemistry, and microplankton

Sample#	Dive	Date	start-hr	start-min	latitude	longitude	Z(m)	Type	Event Description	Wet lab description
NA128-116	H1866	2021-08-01	23	01	46.240683	-124.602471	758	Biology	5 sea stars and a handful of small bivalves from near hydrate outcrop. Near reduced sediments and gastropods.	6 sea stars; 3 darker pink, 2 lighter. Ranging from 0.5-1.5 cm discs. Sea stars generated a lot of mucus. Also ~160 bivalves ~0.5-1 cm long.
NA128-117	H1866	2021-08-01	23	53	46.240651	-124.602489	755	Niskin	4 m above the seafloor adjacent to bubble stream and hydrate located at Marker 209; seafloor dominated by sable fish; strong current present	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-118	H1866	2021-08-01	23	56	46.240650	-124.602486	749	Niskin	10 m above the seafloor adjacent to bubble stream and hydrate located at Marker 209; strong current present	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-119	H1866	2021-08-02	0	06	46.240500	-124.602281	762	Niskin	1 m above the seafloor about 25 m downstream (SE) from the hydrate and bubble stream at Marker 209	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-120	H1866	2021-08-02	0	47	46.240200	-124.602844	766	Core	Core taken at 765 m depth from a black patch of bacterial mat with thousands of small white gastropod	~29 cm, full core, black color throughout with small bit of bacterial mat visible on the top layer. Many air pockets throughout.
NA128-121	H1866	2021-08-02	0	50	46.240197	-124.602860	766	Core	Core taken at 765 m depth from a black patch of bacterial mat with thousands of small white gastropod; adjacent to last core	~23 cm core, black color throughout with small bit of bacterial mat visible on the top layer, visible air pockets
NA128-122	H1866	2021-08-02	1	06	46.240550	-124.603173	774	Core	Core taken at 774 m in a soft sediment patch dominated by sea stars and sable fish; soft gelatinous sediment	~20 cm brown consolidated core, lighter in top 3 cm
NA128-123	H1866	2021-08-02	1	35	46.241625	-124.604656	784	Core	Core taken at 784 m at black/gray bacterial mat with small gastropods; located near bubble stream SW of WP6	~19 cm full core black core, air pockets throughout
NA128-124	H1866	2021-08-02	1	45	46.241627	-124.604657	783	Pore water	Core taken at 784 m at black/gray bacterial mat with gastropods adjacent to previous core; visibility was low so core quality unknown	~19 cm full core black core, air pockets throughout
NA128-125	H1866	2021-08-02	2	08	46.241713	-124.604521	782	Niskin	Taken 1 m above the seafloor adjacent to strong bubble stream; potential bacterial mat with gastropods however visibility is low due to sablefish	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-126	H1866	2021-08-02	2	09	46.241710	-124.604526	773	Niskin	Taken 10 m above the seafloor and previous Niskin; adjacent to strong bubble stream	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-127	H1867	2021-08-03	16	21	46.240648	-124.602524	758	GT	Gas tight taken at 758m depth between two slabs of hydrate over a bubble stream. GT 17-1	Processed by PMEL
NA128-128	H1867	2021-08-03	16	32	46.240640	-124.602515	758	GT	GT 10 collected from same bubble stream between the two slabs of hydrate O2 saturation is 0.561%	Processed by PMEL
NA128-129	H1867	2021-08-03	17	46	46.240632	-124.602475	756	Hydrate	Collected from larger slab of the two slabs of hydrate found at seafloor marker 209	Processed by PMEL
NA128-130	H1867	2021-08-03	19	21	46.242370	-124.600648	705	Rock	very large sediment-covered carbonate ~30 cm long with white filamentous bacterial mat and small white gastropods	Large (~40 x30x20 cm) porous, brittle carbonate rock with white bacterial mat and dark sulfidic mud
NA128-131	H1867	2021-08-03	19	47	46.242370	-124.600638	691	Biology	Cup coral and delectopecten-like bivalves from small area of carbonate wall with many encrusting fauna, near hydrate.	Assortment of small, fragmented fauna including cup coral, delectopecten-like bivalve, arthropods, gastropod, and asbestopluma sponge
NA128-132	H1867	2021-08-03	21	02	46.243241	-124.606653	778	Niskin	niskin 1 m above large bacterial mat NE of WP4 near false pinnacle feature	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-133	H1867	2021-08-03	21	04	46.243235	-124.606719	778	Core	Ported core in large white bacterial mat over loose sediment, 95 m NE of WP4, maybe some gastropods on top	~19 cm black core with mat on top and a little on the sides from smearing while pushing core into sediment (sides always sliced off). Top half quite watery.

Sample#	Dive	Date	start-hr	start-min	latitude	longitude	Z(m)	Type	Event Description	Wet lab description
NA128-134	H1867	2021-08-03	21	26	46.243280	-124.606765	766	Niskin	Niskin 10 m	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-135	H1867	2021-08-03	21	46	46.244149	-124.609916	774	Niskin	NIskin 1 m up over bacterial mat and reduced sediment w/ pink sea stars adjacent	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-136	H1867	2021-08-03	21	49	46.244149	-124.609920	775	Core	Ported core in dense white bacterial mat about 1.5 m wide over loose sediment, with tiny gastropods, near bubbles 3/WP 3	~25 cm thick black core. Mat on top and a little on the sides from smearing while pushing core into sediment (sides always sliced off). Top half quite watery.
NA128-137	H1867	2021-08-03	21	56	46.244150	-124.609920	775	Core	Ported core in dense white bacterial mat about 1.5 m wide over loose sediment, with tiny gastropods, near bubbles 3/WP 3. May have gotten slightly mixed during collection	~25 cm thick black core. Mat on top and a little on the sides from smearing while pushing core into sediment (sides always sliced off). Top half quite watery.
NA128-138	H1867	2021-08-03	21	57	46.244153	-124.609922	775	Pore water	Ported core in dense white bacterial mat about 1.5 m wide over loose sediment, with tiny gastropods, near bubbles 3/WP 3. May have gotten slightly mixed during collection	~25 cm thick black core. Mat on top and a little on the sides from smearing while pushing core into sediment (sides always sliced off). Top half quite watery.
NA128-139	H1867	2021-08-03	22	02	46.244152	-124.609920	775		slurp targeting small gastropods	Sample not kept, unable to separate extremely small gastropods from mat fragments that were slurped up as well.
NA128-140	H1867	2021-08-03	22	10	46.244154	-124.609913	770	Niskin	Niskin 4 m above white mat sampling site	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-141	H1867	2021-08-03	22	11	46.244172	-124.609918	765	Niskin	Niskin 10 m above white mat and gastropod sampling site	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-142	H1867	2021-08-03	22	19	46.244376	-124.609803	775	Niskin	Niskin 15 m away from white mat and gastropod sampling site, 1 m over seafloor	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-143	H1867	2021-08-03	22	20	46.244384	-124.609801	776	Core	Push core from 25 m off of seep area in background sediments with sea stars	~21 cm semi-consolidated core, first 11 cm are lighter brown, bottom is darker reduced sediment.
No sample 144??										
NA128-145	H1868	2021-08-04	12	22	46.789409	-125.492885	1602	GT	Bubble stream at 1602 m located at Marker 256 and near previously sampled hydrate; GT-17-1 (white)	Processed by PMEL
NA128-146	H1868	2021-08-04	17	22	46.789039	-125.493133	1599	GT	Gas tight 18-1 taken near waypoint 2 at 1595m, ~.5 meters off the seafloor over a bubble stream. temp is 2.47, O2 is 17.50 uM	Processed by PMEL
NA128-147	H1868	2021-08-04	17	28	46.789083	-125.493128	1599	Niskin	taken 1 m above the seafloor in the bubble streams	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-148	H1868	2021-08-04	17	30	46.789079	-125.493137	1593	Niskin	Taken at ~4m of water in the bubble streams	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-149	H1868	2021-08-04	17	31	46.789066	-125.493155	1590	Niskin	taken 10m above the seafloor in the bubble streams	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-150	H1868	2021-08-04	17	32	46.789079	-125.493162	1579	Niskin	Taken 20m above the seafloor within bubble streams	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-151	H1868	2021-08-04	17	33	46.789084	-125.493146	1569	Niskin	Taken at 30m above the seafloor in bubble streams	Split between labs at PMEL for eDNA, geochemistry, and microplankton
NA128-152	H1868	2021-08-04	17	35	46.789077	-125.493189	1559	Niskin	taken 40 m above the seafloor in bubblestreams	Split between labs at PMEL for eDNA, geochemistry, and microplankton

Hercules NA128 Dive Maps

Created by Susan G. Merle. All times UTC (7 hours ahead of local PST)

Fig. 8: H1858 Dive Map: EM302 Bathymetry of E of Kulm - deep

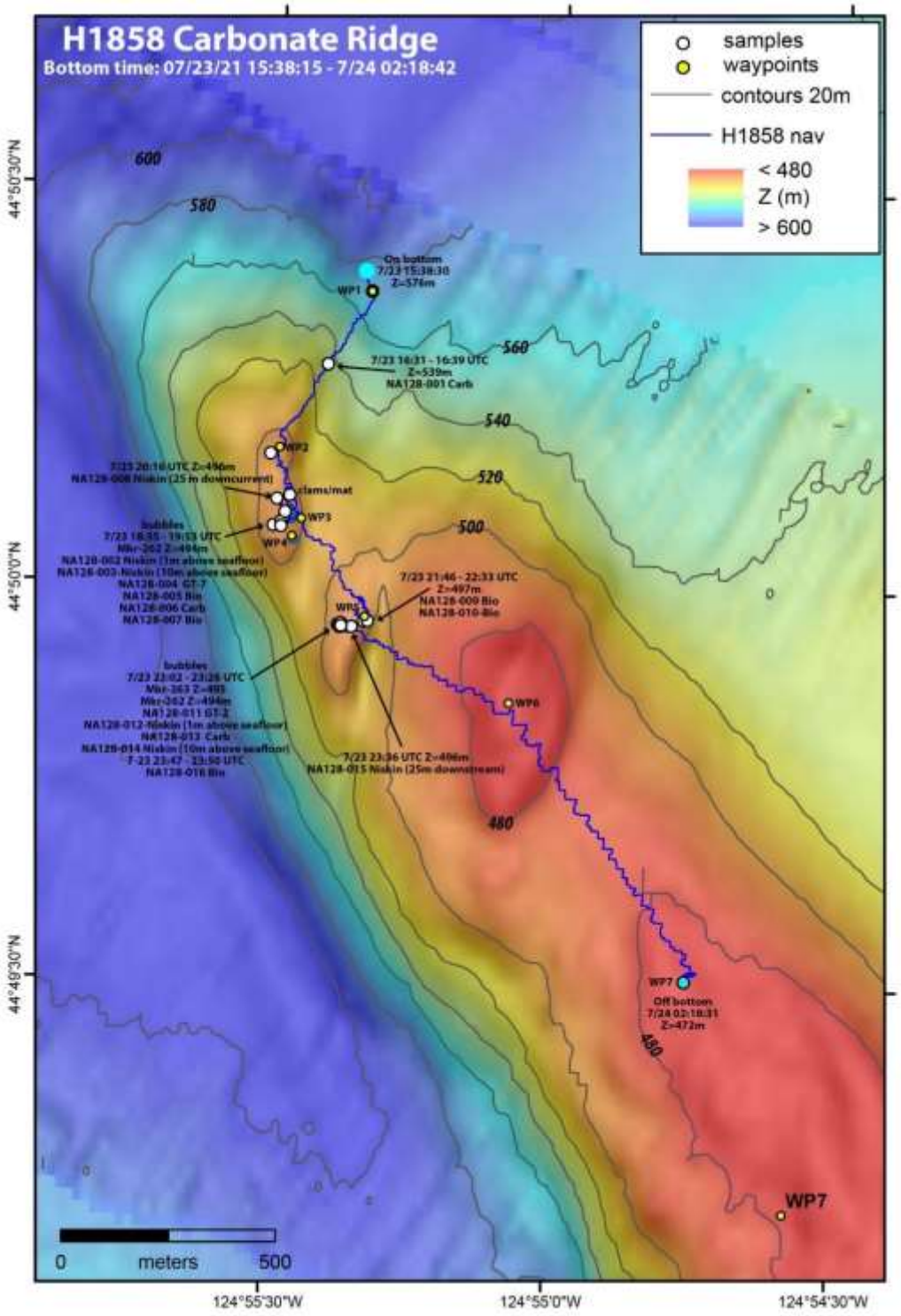


Fig. 9: H1859 Dive Map: EM302 Bathymetry Astoria Canyon Floor

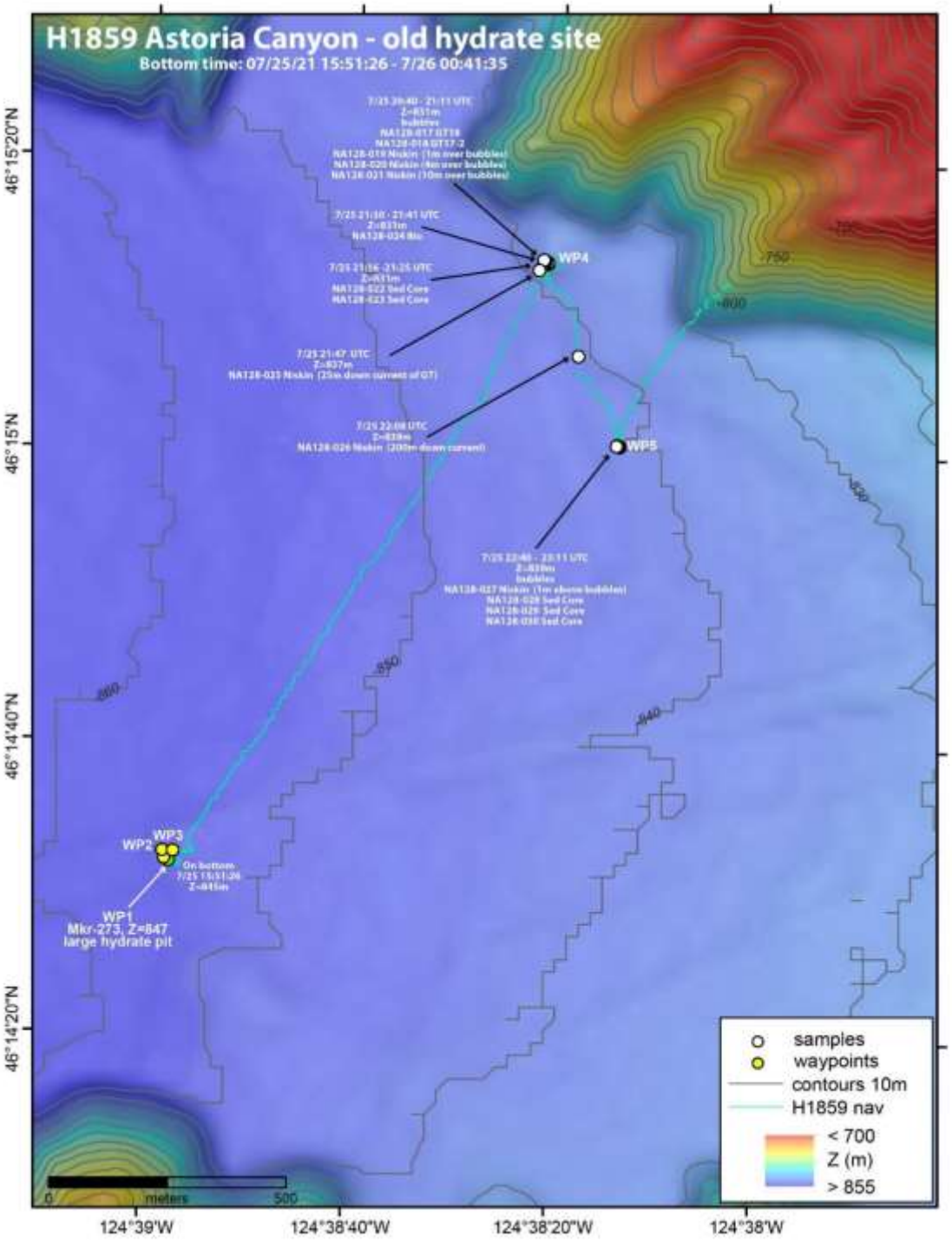


Fig. 10: H1860 Dive Map: EM302 and Norbit Bathymetry of E of Kulm - Deep

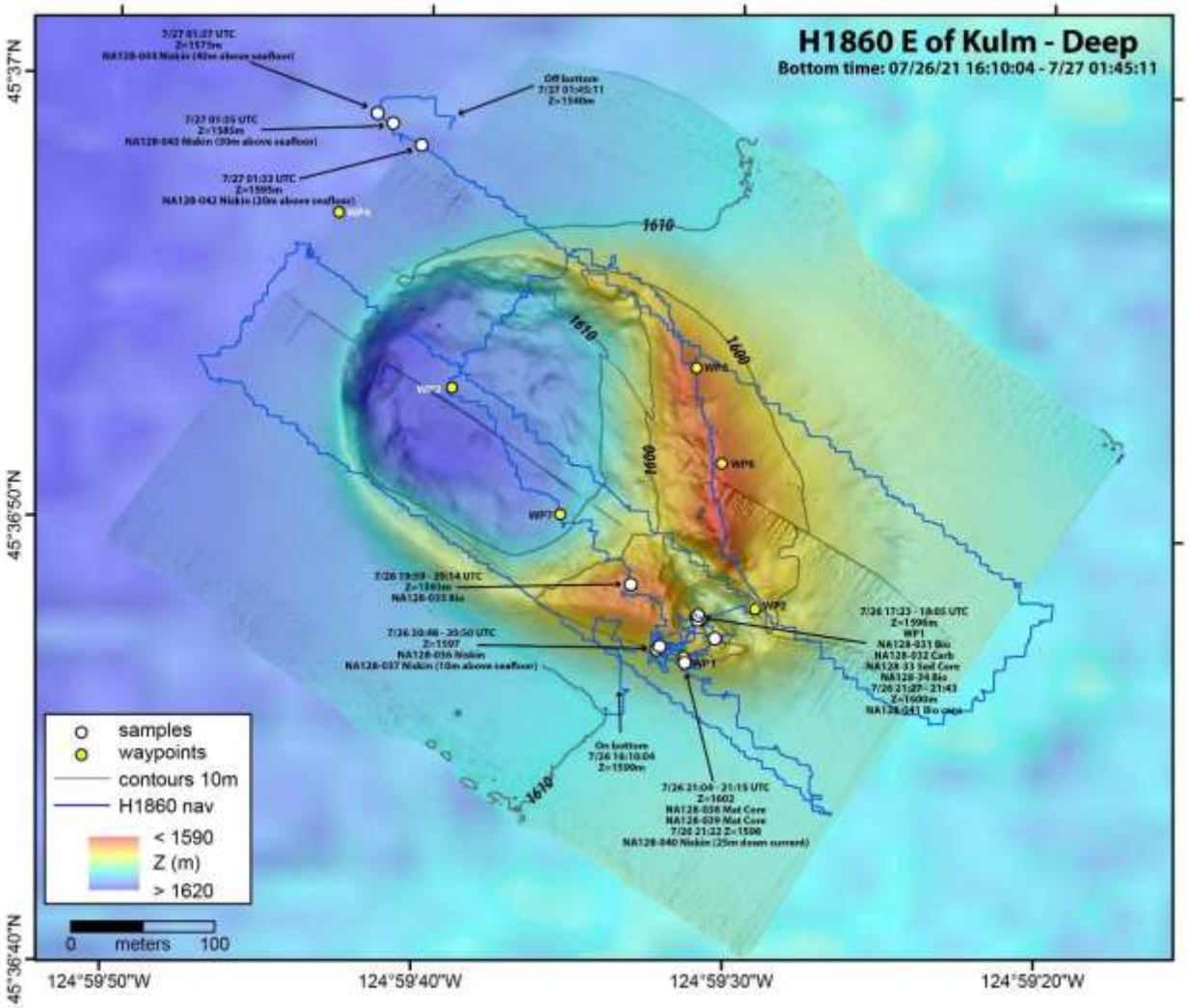


Fig. 11: H1861 Dive Map: EM302 Bathymetry of NW Coquille Base of Slope

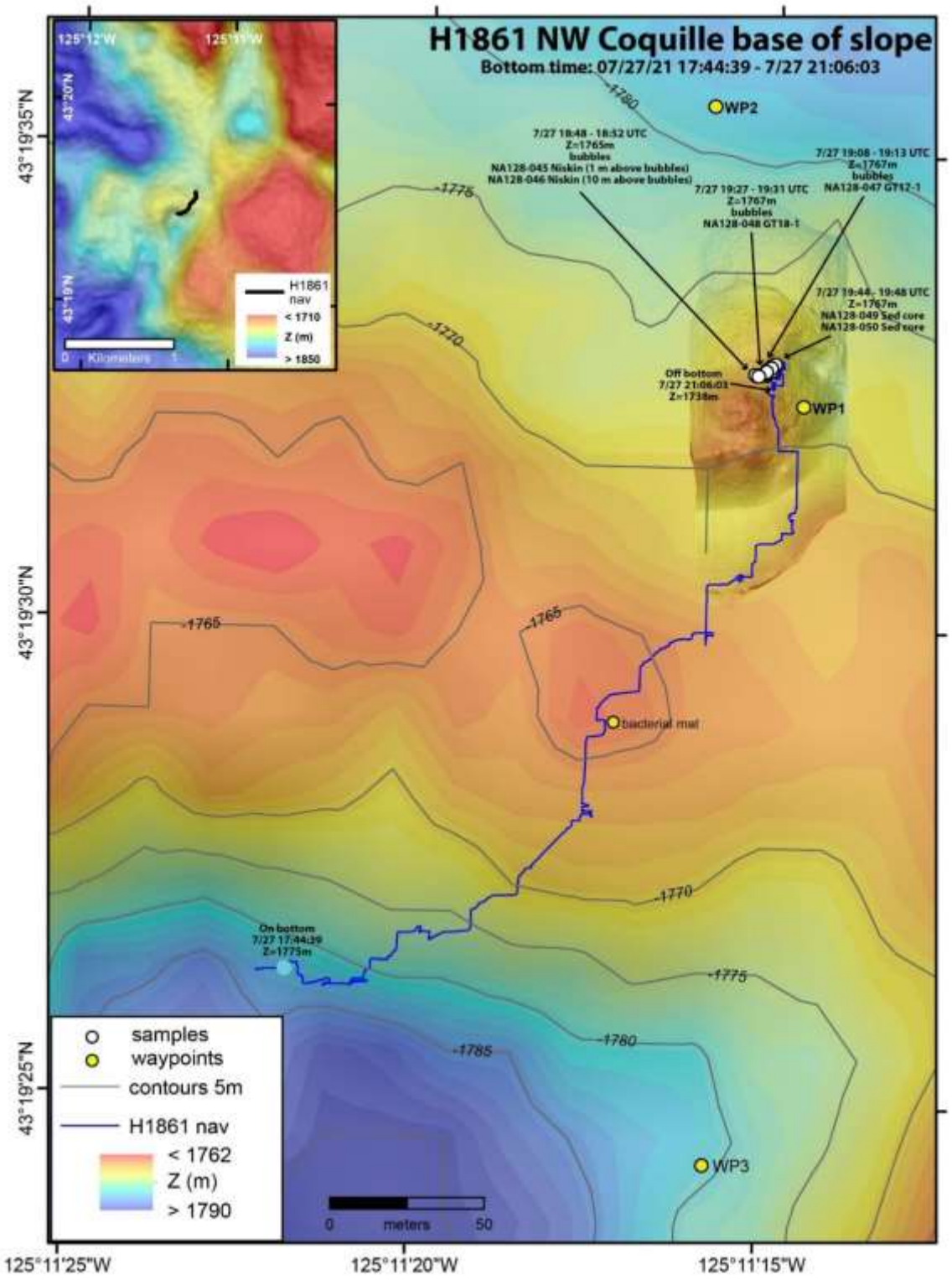


Fig. 12: H1862 Dive Map: EM302 Bathymetry of NW Coquille Base of Slope

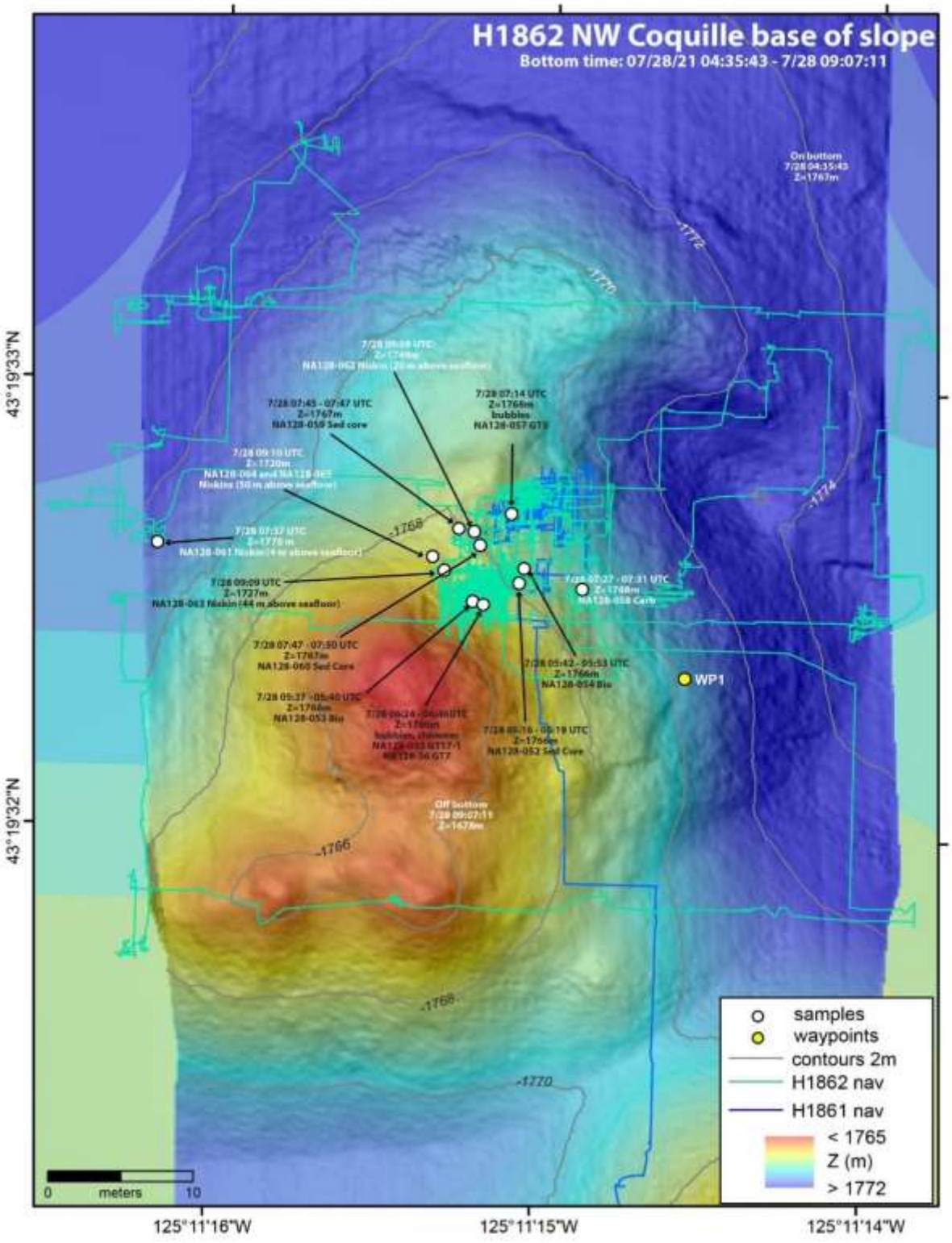


Fig. 13: H1863 Dive Map: EM302 Bathymetry SE of Grays Canyon

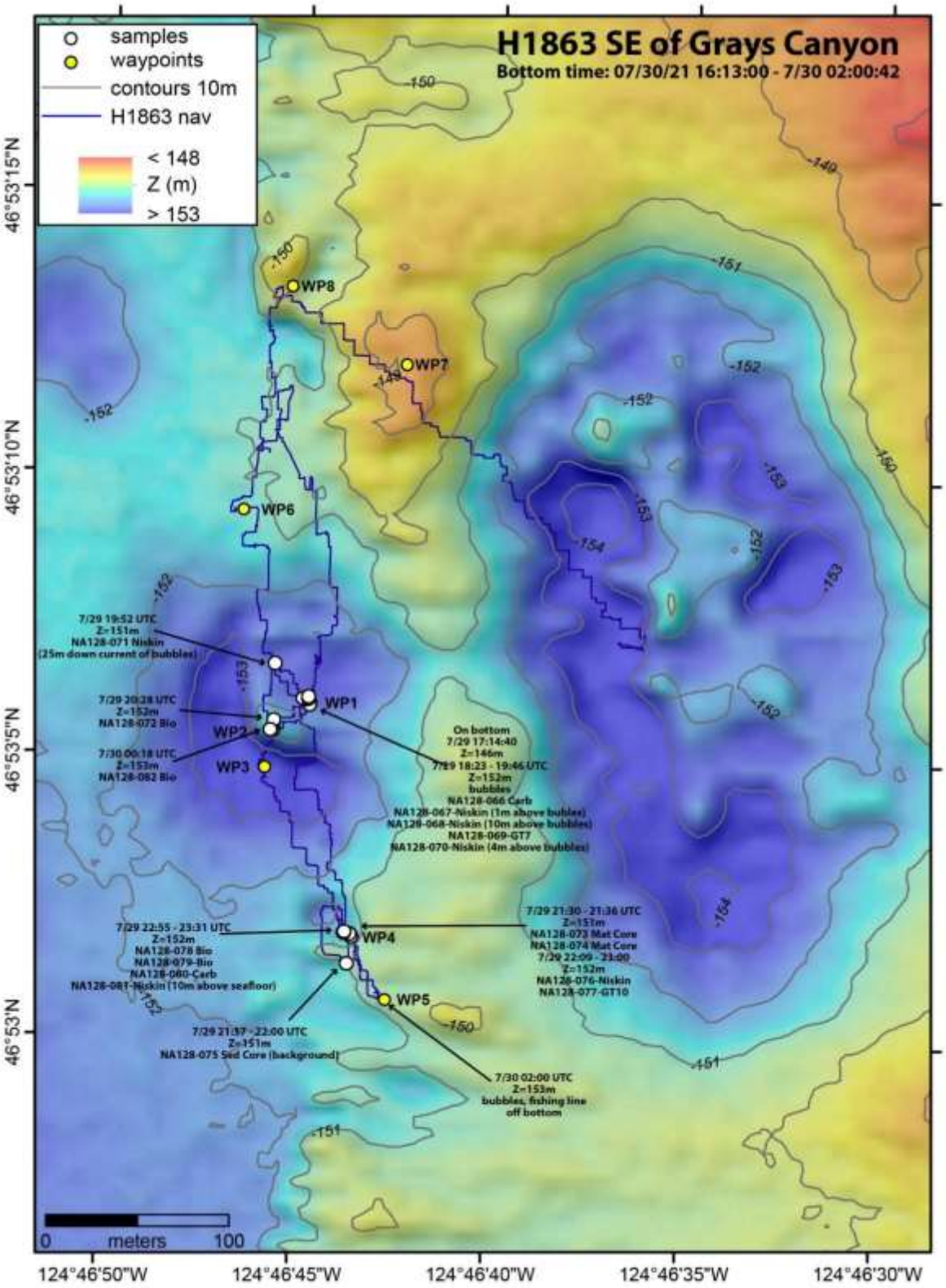


Fig. 14: H1864 Dive Map: EM302 Bathymetry of Ridge SW of Grays Canyon

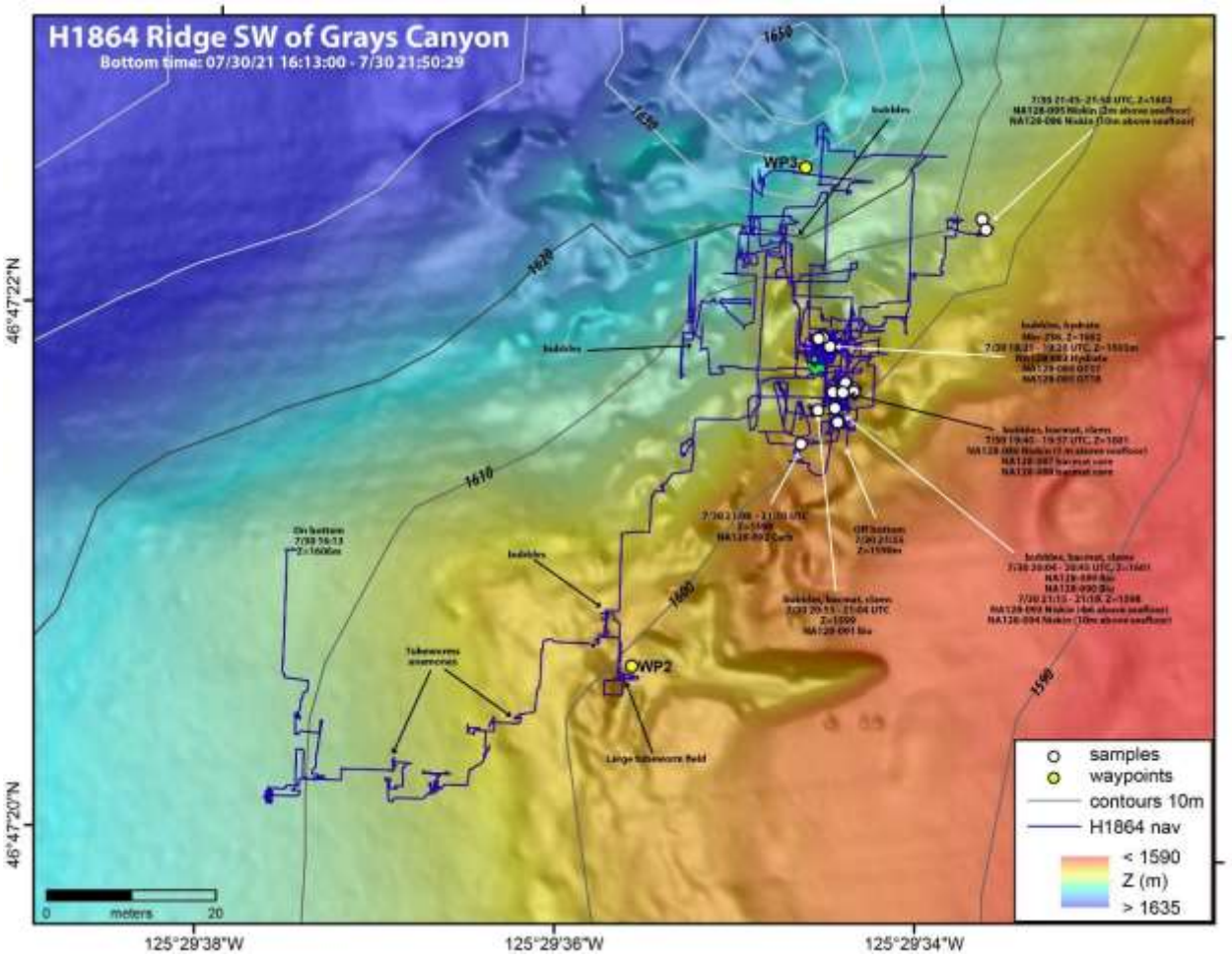


Fig. 15: H1865 Dive Map: EM302 Bathymetry of N Guide Canyon

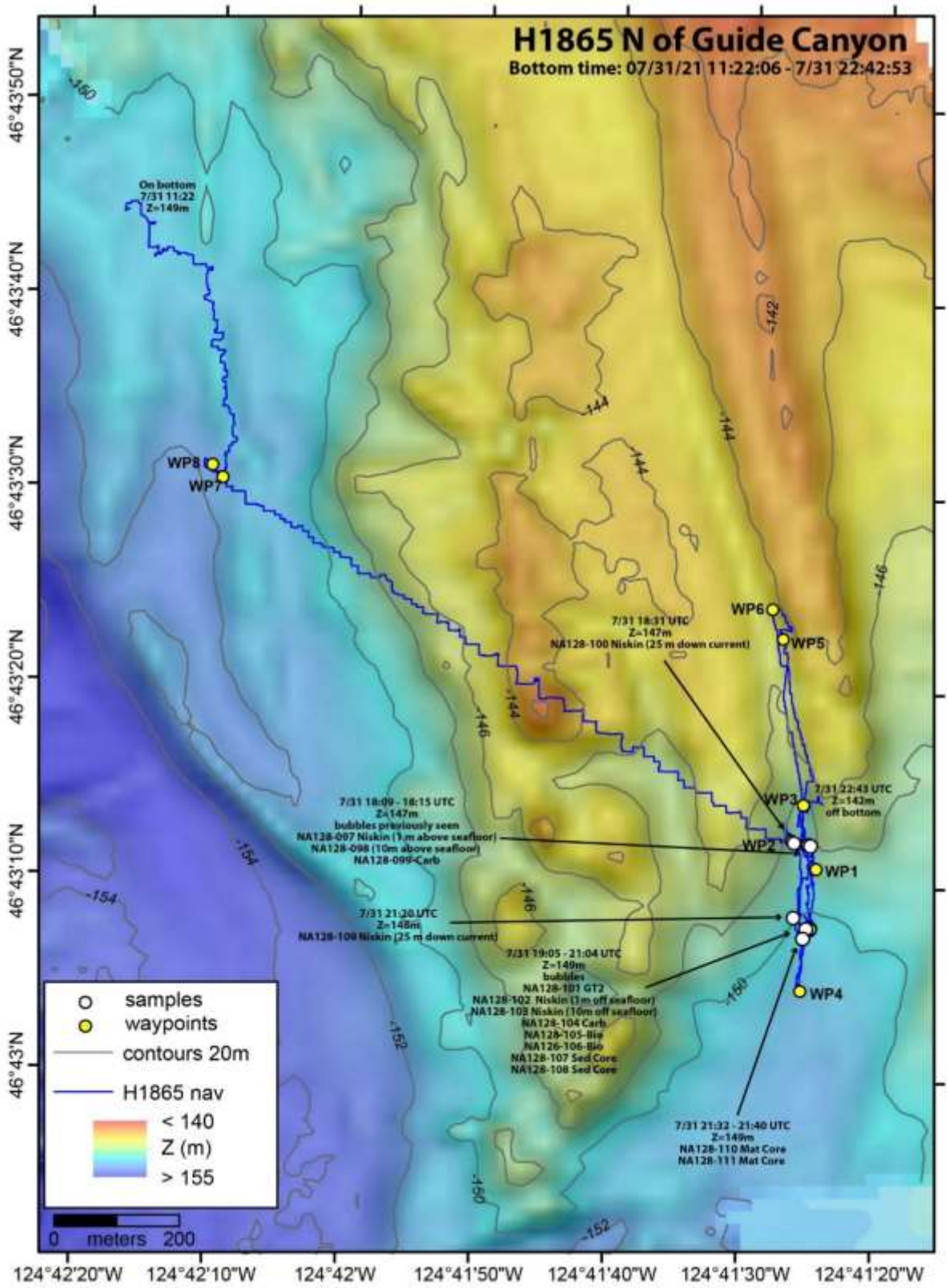


Fig. 16: H1866 Dive Map: EM302 and Norbit Bathymetry of Astoria Canyon – N Side of Canyon

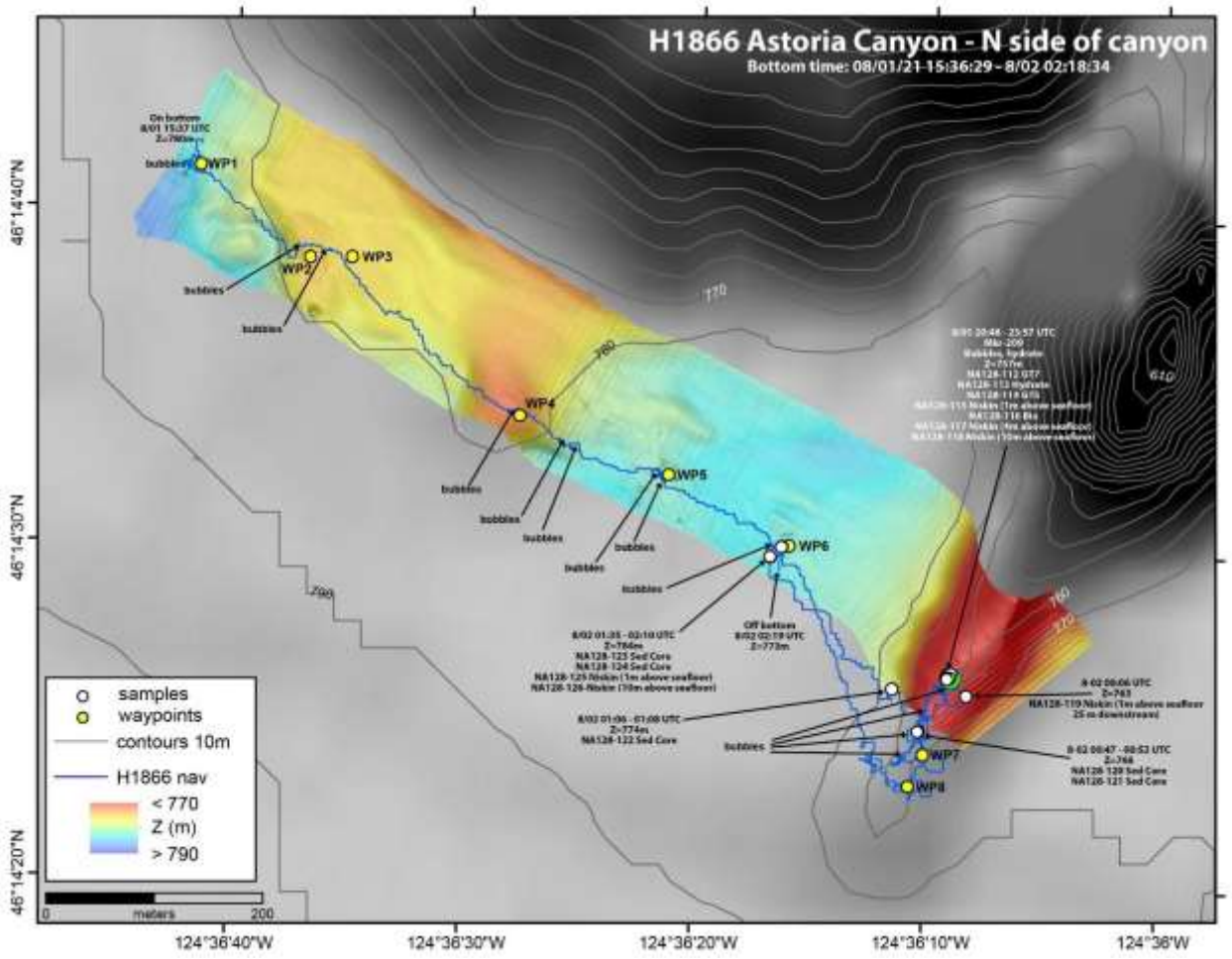


Fig. 17: H1867 Dive Map: EM302 and Norbit Bathymetry of Astoria Canyon – N Side of Canyon

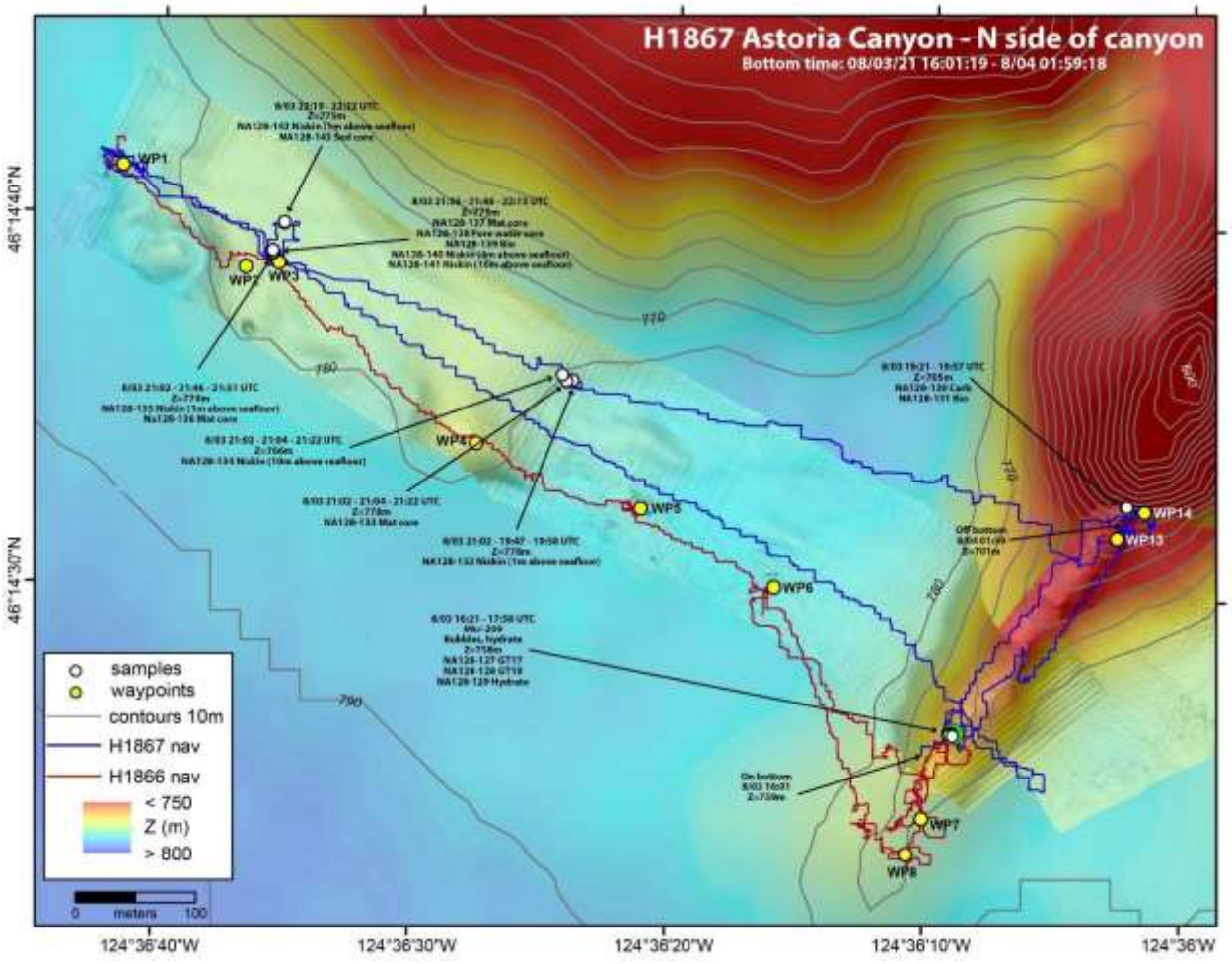
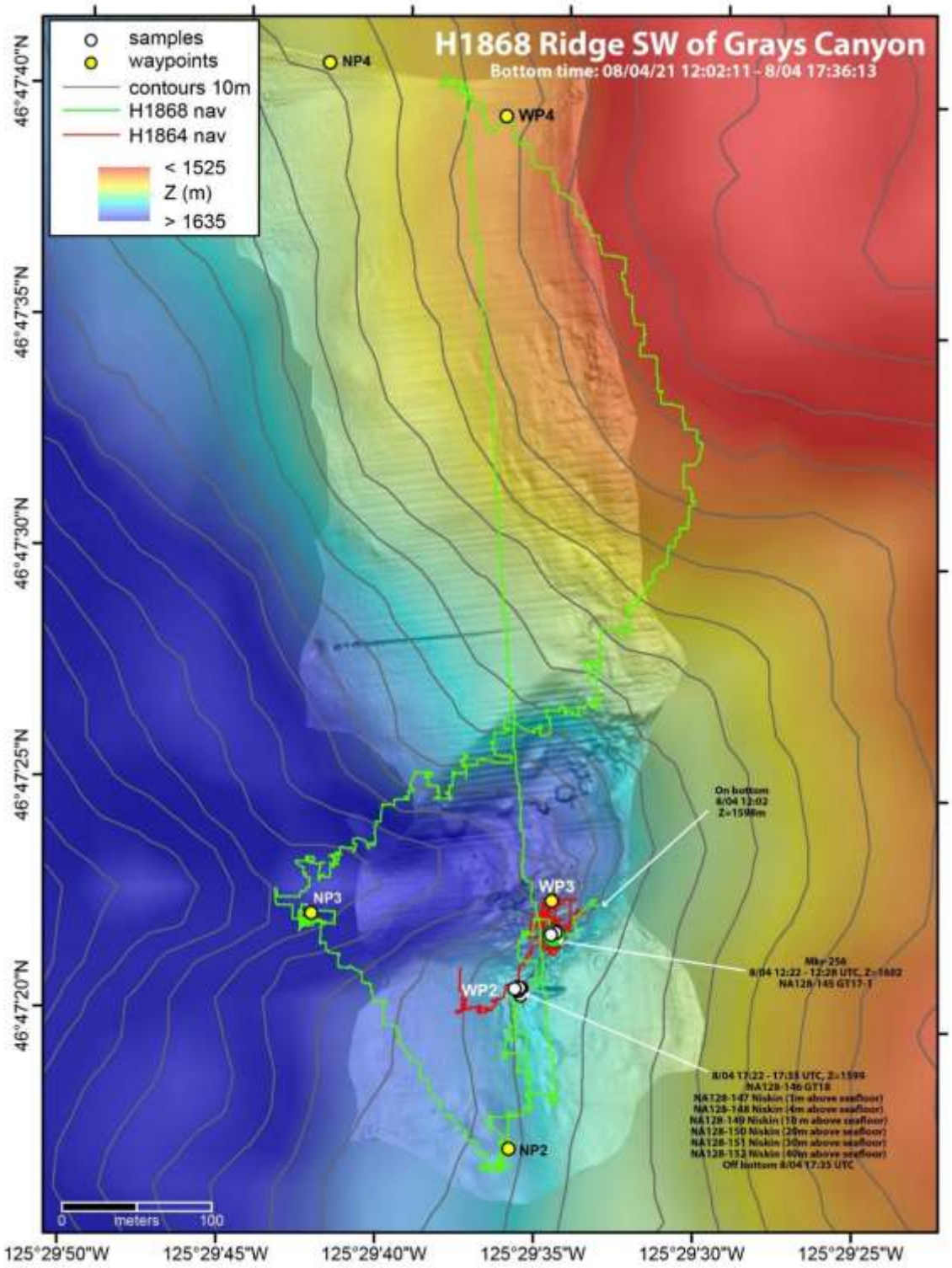


Fig. 18: H1868 Dive Map: EM302 and Norbit Bathymetry of Ridge SW of Grays Canyon



Hercules NA128 Dive Logs

Table 12: H1858 Carbonate Ridge Dive Log

date	hr	min	sec	latitude	longitude	Z(m)	H1858 Carbonate Ridge Descriptions
7/23/2021	15	27	49.0	44.840070	-124.923038	354	at 340m small silver fish are swimming downward toward sea flor
7/23/2021	15	29	33.4	44.840073	-124.923185	400	slight increase in marine snow, beginning to see some siphonophore chains, small shrimp, and jellies
7/23/2021	15	29	40.9	44.840073	-124.923186	403	larvacean house
7/23/2021	15	32	8.5	44.840086	-124.923327	463	red/maroon colored jelly with tube like shape
7/23/2021	15	36	30.2	44.839916	-124.923032	556	increase in invertebrate fauna
7/23/2021	15	37	44.8	44.839904	-124.922534	567	ctenophore
7/23/2021	15	38	12.7	44.839942	-124.922495	574	larvacean house
7/23/2021	15	38	21.1	44.839946	-124.922495	576	bottom in sight
7/23/2021	15	38	56.2	44.839944	-124.922437	576	Sea floor is patchy and soft. some darker patches in sediment with some brittle sea stars on the sea floor
7/23/2021	15	39	55.8	44.839964	-124.922340	576	large brittle stars and a large orange sea star on sea floor
7/23/2021	15	40	38.1	44.839965	-124.922346	576	White balance test
7/23/2021	15	44	16.1	44.839965	-124.922339	576	preparing to move towards first waypoint target
7/23/2021	15	44	48.0	44.839949	-124.922341	576	purple ctenophore
7/23/2021	15	45	33.9	44.839951	-124.922338	576	focusing stills camera
7/23/2021	15	48	46.9	44.839916	-124.922373	572	there are many ctenophores, shrimp, and jellies
7/23/2021	15	49	50.3	44.839910	-124.922379	568	Moving 10 m off sea floor. saw a red/orange squid briefly
7/23/2021	15	51	37.1	44.839906	-124.922398	568	Many pill shaped purple ctenophores, visible comb rows.
7/23/2021	15	52	1.5	44.839904	-124.922395	568	multiple siphonophore chains
7/23/2021	15	55	31.8	44.839804	-124.922373	566	large fish in the distance of herc cam
7/23/2021	15	57	12.7	44.839712	-124.922378	565	in transit to waypoint
7/23/2021	16	2	45.3	44.839539	-124.922227	563	nearing waypoint
7/23/2021	16	3	57.0	44.839511	-124.922205	563	at waypoint, beginning to climb up slope
7/23/2021	16	7	26.6	44.839367	-124.922163	569	Back to sea floor, still flat soft bottom with black patches. A hagfish, 2 brittle stars
7/23/2021	16	8	37.9	44.839361	-124.922167	569	eelpout
7/23/2021	16	9	25.6	44.839327	-124.922170	568	bearing 210 towards next waypoint
7/23/2021	16	10	1.8	44.839305	-124.922201	568	sculpin on the seafloor
7/23/2021	16	10	34.8	44.839270	-124.922227	568	another eel pout on seafloor near white sea star
7/23/2021	16	11	23.7	44.839243	-124.922247	567	6 brittle stars in one field of view
7/23/2021	16	11	38.9	44.839219	-124.922269	566	pacific black dragon swam by
7/23/2021	16	12	27.6	44.839060	-124.922376	564	2 large white sun stars, one large pencil urchin on sea floor, sculpin
7/23/2021	16	12	49.6	44.839030	-124.922379	564	correction, long spined thornyhead fish
7/23/2021	16	13	40.9	44.838997	-124.922435	564	pycnopodia white
7/23/2021	16	14	1.1	44.838989	-124.922439	564	pycnopodia on top of sediment covered sponge
7/23/2021	16	14	59.9	44.838979	-124.922461	564	Rathbunaster is sea stars we are observing, not pycnopodia
7/23/2021	16	16	3.4	44.838981	-124.922461	564	white shell buried in sediment
7/23/2021	16	16	42.4	44.838974	-124.922473	563	orange sea anemone
7/23/2021	16	17	7.3	44.838980	-124.922537	562	another longspine thornyhead
7/23/2021	16	18	32.0	44.838907	-124.922643	561	beginning to see some broken up rock
7/23/2021	16	18	57.0	44.838826	-124.922690	559	rocky debris is now covering most of the seafloor

date	hr	min	sec	latitude	longitude	Z(m)	H1858 Carbonate Ridge Descriptions
7/23/2021	16	19	50.6	44.838778	-124.922771	556	within the rocky debris there are sea stars, anemones, brittle stars, and some conical shelled organisms (possibly whelks)
7/23/2021	16	21	3.6	44.838591	-124.922886	551	as we travel up to the top of the we are seeing more rocky debris, and possibly spotted a bamboo coral skeleton fragment
7/23/2021	16	21	11.0	44.838564	-124.922895	551	flat fish
7/23/2021	16	22	32.8	44.838453	-124.922966	547	larger slab of rock than seen so far
7/23/2021	16	23	13.8	44.838426	-124.922977	547	back over bottom without rock fragments
7/23/2021	16	23	33.8	44.838397	-124.922982	547	flat fish
7/23/2021	16	23	59.7	44.838367	-124.923028	547	reappearance of rocky debris, along with a thornyhead
7/23/2021	16	25	31.3	44.838293	-124.923082	548	bamboo coral on top of rock; Isidella tentaculum,
7/23/2021	16	26	14.8	44.838275	-124.923095	547	brittle star swimming, larger slabs of carbonate rock
7/23/2021	16	26	56.3	44.838209	-124.923181	544	on top of the large slabs there are anemones, sea stars, brittle stars, small branches of corals
7/23/2021	16	27	19.1	44.838194	-124.923181	543	slabs of rock are getting larger in size
7/23/2021	16	28	2.0	44.838182	-124.923248	541	mushroom coral, branch of bamboo coral, rathbunaster sea stars
7/23/2021	16	28	29.9	44.838133	-124.923288	541	preparing for first sample of rock
7/23/2021	16	28	58.7	44.838095	-124.923375	540	another branch of coral
7/23/2021	16	29	52.9	44.837973	-124.923448	539	slabs of rock are now smaller in size and more separated with sediment in between
7/23/2021	16	36	5.0	44.837951	-124.923444	539	Sample taken at 539 m. More than half way up the slope.
7/23/2021	16	45	1.4	44.837939	-124.923456	538	In transit to WP2
7/23/2021	16	45	25.7	44.837883	-124.923515	538	flying over rocky debris
7/23/2021	16	45	42.7	44.837864	-124.923528	537	large white barrel sponge
7/23/2021	16	46	21.6	44.837860	-124.923531	537	white barrel sponge is covered in light pink brittle stars
7/23/2021	16	46	35.2	44.837856	-124.923531	536	crinoids on rocks
7/23/2021	16	47	12.1	44.837797	-124.923591	535	another white barrel sponge
7/23/2021	16	47	45.5	44.837785	-124.923597	534	beginning to see more white sponges on top of the rocky cluster
7/23/2021	16	48	13.8	44.837717	-124.923671	533	small fish, swam out of view before ID
7/23/2021	16	49	1.6	44.837696	-124.923691	532	clarify
7/23/2021	16	49	26.8	44.837652	-124.923748	530	flatfish, large sable fish swam by
7/23/2021	16	49	58.9	44.837566	-124.923756	528	starting to see more sable fish
7/23/2021	16	50	34.8	44.837563	-124.923865	526	anemones, scattered small barrel sponges, sea stars, some thornyhead as we travel up slope
7/23/2021	16	51	7.8	44.837551	-124.923878	526	light pink coral, possibly a bubble gum coral
7/23/2021	16	51	29.5	44.837503	-124.923871	525	rocks are increasing in size, boulder sized rock
7/23/2021	16	51	41.9	44.837366	-124.923869	524	~25m from the top of the ridge
7/23/2021	16	52	9.5	44.837280	-124.923892	522	increase in small corals on rock
7/23/2021	16	52	48.5	44.837218	-124.923963	520	large coral, flatfish, rock still appears to have yellow/gold hue
7/23/2021	16	52	57.3	44.837218	-124.923963	519	bamboo coral skeleton
7/23/2021	16	53	37.4	44.837188	-124.924015	516	number of fauna seen is increasing as we travel up the ridge
7/23/2021	16	55	16.6	44.837039	-124.924170	513	rocks are increasing in size, they are very large slabs, also observing an increase in sediment
7/23/2021	16	55	23.8	44.837034	-124.924170	513	hagfish
7/23/2021	16	55	48.6	44.837013	-124.924164	513	large mushroom corals

date	hr	min	sec	latitude	longitude	Z(m)	H1858 Carbonate Ridge Descriptions
7/23/2021	16	56	10.8	44.836966	-124.924206	512	large rock slabs appear to be carbonate
7/23/2021	16	56	49.7	44.836919	-124.924233	511	possible asbestopluma sponge, or small branched coral
7/23/2021	16	57	7.0	44.836918	-124.924234	512	small mushroom coral
7/23/2021	16	57	24.0	44.836920	-124.924234	512	landing in sediment to observe its thickness
7/23/2021	16	58	48.2	44.836915	-124.924227	512	mushroom corals that are commonly seen in this area are Heteropolypus ritteri
7/23/2021	17	0	42.1	44.836920	-124.924223	512	~ 15 m from the top of the ridge, sediment is at least 20cm thick in the pockets between rocky slabs
7/23/2021	17	1	17.9	44.836920	-124.924218	512	sediment between large rock slabs are not just a light dusting of sediment, but appears to be at least 20cm thick
7/23/2021	17	2	54.5	44.836918	-124.924218	512	heading towards the top of the ridge
7/23/2021	17	3	18.2	44.836895	-124.924250	510	rock slabs are very large in size, and very thick
7/23/2021	17	4	10.0	44.836809	-124.924357	507	another stick of coral, possibly a bubblegum coral
7/23/2021	17	4	23.2	44.836802	-124.924394	506	forrea sponge
7/23/2021	17	5	4.8	44.836783	-124.924423	505	mushroom coral, large sable fish, bamboo coral
7/23/2021	17	5	24.3	44.836779	-124.924450	505	plate like sponge, light yellow in color
7/23/2021	17	6	7.3	44.836759	-124.924464	502	approaching the top of the ridge, the rock is getting larger in size and more frequent
7/23/2021	17	7	33.6	44.836713	-124.924541	500	thornyhead, mushroom coral, large white sponge barrel shaped with lobes on the outside of it, referred to as the "cheeto sponge" last season
7/23/2021	17	7	57.6	44.836685	-124.924575	499	large white barrel sponge with large lobes on its outside
7/23/2021	17	8	18.3	44.836541	-124.924735	500	decrease in frequency of large boulder and slab rock
7/23/2021	17	9	40.1	44.836400	-124.924827	498	arrived at WP2, here there are rocky carbonate slabs, and small rocky crumble, slabs are fairly thin compared to previously noted thick slabs
7/23/2021	17	10	58.4	44.836337	-124.924679	498	sablefish
7/23/2021	17	11	21.6	44.836333	-124.924680	499	flatfish
7/23/2021	17	11	39.6	44.836242	-124.924687	499	large bamboo coral skeleton
7/23/2021	17	11	56.0	44.836202	-124.924714	496	reappearance of dense rocky debris
7/23/2021	17	12	5.9	44.836191	-124.924759	495	2 thornyhead
7/23/2021	17	12	27.7	44.836169	-124.924778	495	white crumble within the gaps of rocky substrate
7/23/2021	17	13	28.4	44.836155	-124.924784	494	grey/white matter on sediment and edges of rock, possibly bacterial mat
7/23/2021	17	13	48.8	44.836117	-124.924823	493	beginning to see the top of the ridge
7/23/2021	17	13	53.2	44.836117	-124.924826	493	slime star
7/23/2021	17	14	15.9	44.836106	-124.924827	493	giant pacific octopus
7/23/2021	17	16	32.9	44.836103	-124.924834	492	small white fuzzy worm like organism swimming near octopus
7/23/2021	17	16	44.4	44.836105	-124.924837	492	cup corals behind octopus
7/23/2021	17	17	5.4	44.836107	-124.924868	492	possible shell debris
7/23/2021	17	18	1.5	44.836112	-124.924879	494	shell debris within the cracks between rock slabs, also some white microbial mat
7/23/2021	17	18	9.8	44.836112	-124.924878	494	shells are from clams
7/23/2021	17	19	13.0	44.836118	-124.924889	492	Slowly moving towards next waypoint. we are observing signs of seeps
7/23/2021	17	20	55.7	44.835998	-124.924895	493	increased of clam shell debris
7/23/2021	17	21	23.4	44.835992	-124.924881	493	small cup corals
7/23/2021	17	21	45.7	44.835994	-124.924884	493	More microbial mat.
7/23/2021	17	22	15.4	44.835986	-124.924877	493	large, high stack of large slab of carbonate rock

date	hr	min	sec	latitude	longitude	Z(m)	H1858 Carbonate Ridge Descriptions
7/23/2021	17	22	34.3	44.835972	-124.924876	493	large bamboo coral, skeleton exposed at the base
7/23/2021	17	23	25.4	44.835864	-124.924869	494	cluster of singular branched coral
7/23/2021	17	25	44.7	44.835784	-124.924905	487	coming up off the sea floor to look for sights of interest with the sonar
7/23/2021	17	27	58.1	44.835783	-124.924881	487	had to recycle power to norbit, may have disrupted the still cam/sexton
7/23/2021	17	28	49.8	44.835783	-124.924878	488	sonar isn't working as expected
7/23/2021	17	31	32.3	44.835794	-124.924878	494	moving back to seafloor
7/23/2021	17	32	4.7	44.835756	-124.924776	496	moving to waypoint 3
7/23/2021	17	32	41.7	44.835749	-124.924762	498	possibly observing some asbestopluma sponges
7/23/2021	17	35	53.9	44.835712	-124.924634	501	moving down towards waypoint 3, observing some forrea sponges
7/23/2021	17	37	0.4	44.835633	-124.924688	500	pale yellow/white plate/bowl sponge
7/23/2021	17	37	49.0	44.835527	-124.924619	501	fairly thick amount of sedimentation on top of carbonate rock boulders
7/23/2021	17	38	5.8	44.835507	-124.924625	500	bamboo coral
7/23/2021	17	39	20.1	44.835424	-124.924681	498	approaching a large sediment patch with some rocky debris
7/23/2021	17	41	39.3	44.835398	-124.924476	501	Branched coral on top of sediment rock. fairly dense marine snow here
7/23/2021	17	42	5.5	44.835351	-124.924473	501	flat fish, thorny heads, sablefish
7/23/2021	17	42	39.0	44.835345	-124.924572	500	mushroom coral
7/23/2021	17	43	9.2	44.835315	-124.924653	498	in areas with large amounts of sediment there is less fauna
7/23/2021	17	45	4.7	44.835212	-124.924551	499	There is a bit of a drop at the edge of the fault. large slab covered in sediment and bacterial mat and white staining on the rock
7/23/2021	17	45	54.5	44.835166	-124.924492	500	clam shell debris
7/23/2021	17	46	37.1	44.835167	-124.924500	499	Fault zone here. Seeing some white staining on the rock.
7/23/2021	17	46	49.6	44.835167	-124.924503	499	clams/mat
7/23/2021	17	47	44.4	44.835148	-124.924514	498	large mats of clams
7/23/2021	17	48	30.6	44.835081	-124.924488	498	patches of clam debris are more frequent
7/23/2021	17	48	33.4	44.835055	-124.924488	498	Lots of evidence of seeps but no bubbles yet.
7/23/2021	17	48	52.9	44.835075	-124.924487	498	DESCRIP
7/23/2021	17	49	33.8	44.835072	-124.924358	500	2 flat fish
7/23/2021	17	50	43.9	44.834910	-124.924400	497	possibly large white sedimented sponges
7/23/2021	17	51	3.4	44.834894	-124.924411	497	very large patch of clam debris
7/23/2021	17	52	35.5	44.834831	-124.924263	499	approaching WP3 ~15m
7/23/2021	17	52	59.6	44.834793	-124.924236	500	Decrease in amount of large boulder rock and slabs. more sediment
7/23/2021	17	53	39.9	44.834796	-124.924154	501	Lots of evidence of seeps but no bubbles
7/23/2021	17	54	28.6	44.834734	-124.924164	500	edge of a fault, following the edge of the ridge
7/23/2021	17	55	4.7	44.834688	-124.924246	498	looking around for bubble streams along the fault
7/23/2021	17	55	28.9	44.834687	-124.924289	496	increase shell debris
7/23/2021	17	56	13.1	44.834662	-124.924442	494	squid
7/23/2021	17	56	48.3	44.834660	-124.924556	495	coming up off the sea floor to see bubble stream
7/23/2021	17	57	24.4	44.834666	-124.924580	494	approaching very large rock structure covered in white shell hash and bacterial mats
7/23/2021	17	58	5.0	44.834668	-124.924596	487	Coming up to look around with the new sonar.
7/23/2021	17	58	34.7	44.834669	-124.924596	487	norbit isn't functioning (sonar)
7/23/2021	18	2	35.6	44.834668	-124.924612	487	observing feedback on sonar

date	hr	min	sec	latitude	longitude	Z(m)	H1858 Carbonate Ridge Descriptions
7/23/2021	18	9	17.2	44.834670	-124.924615	486	following reading on sonar to find bubble streams
7/23/2021	18	11	34.4	44.834671	-124.924622	487	interesting feedback on sonar, going to investigate
7/23/2021	18	16	28.4	44.834669	-124.924629	492	reapproaching the sea floor
7/23/2021	18	17	40.6	44.834666	-124.924692	492	pockets of mat on seafloor
7/23/2021	18	18	24.0	44.834655	-124.924699	491	Bubbles!
7/23/2021	18	19	56.8	44.834663	-124.924680	494	small crack in the seafloor with a constant stream of bubbles, in the crack there are bacterial mats and shell hash
7/23/2021	18	20	25.1	44.834659	-124.924683	494	bearing 225
7/23/2021	18	21	31.5	44.834661	-124.924695	494	Bubbles coming out of the seafloor near the big seastar and fishing line. Off carbonate slab.
7/23/2021	18	22	23.2	44.834645	-124.924719	494	looking for a larger stream of bubbles about 10m ahead bearing 225
7/23/2021	18	26	9.4	44.834596	-124.924748	494	~2 streams of bubbles found coming out of small holes in the sea floor near a lot of white shell hash and bacterial mats, mushroom corals on top of carbonate slabs
7/23/2021	18	26	54.3	44.834602	-124.924758	494	bubbles are coming out of small hole in fissure
7/23/2021	18	33	27.3	44.834565	-124.924794	493	setting up ROV to be 1m directly above bubble stream
7/23/2021	18	40	51.2	44.834561	-124.924786	493	moving herc up to 10m above the bubble stream
7/23/2021	18	44	29.3	44.834579	-124.924807	489	preparing to place a marker on the sea floor
7/23/2021	18	48	18.1	44.834602	-124.924761	495	Deployed marker number 262 on seafloor near two bubble streams
7/23/2021	18	49	49.9	44.834606	-124.924757	495	Large patches of shell hash, some clams are alive, but a lot of what we see is dead, some small patches of bacterial mat are also nearby.
7/23/2021	18	50	33.1	44.834603	-124.924757	495	small mushroom coral
7/23/2021	18	51	31.5	44.834609	-124.924754	495	Small fissure with lots of shell debris and patches of microbial mat.
7/23/2021	18	52	25.5	44.834606	-124.924757	495	watch change
7/23/2021	18	52	47.7	44.834606	-124.924757	495	stick if bamboo coral skeleton near bubble streams
7/23/2021	19	0	38.8	44.834608	-124.924756	494	planning to do a gas tight sample at small bubble stream in front of us
7/23/2021	19	5	16.9	44.834603	-124.924760	494	starting to collect bubbles
7/23/2021	19	14	55.1	44.834603	-124.924755	494	done with gas tight sampling
7/23/2021	19	15	53.0	44.834606	-124.924753	494	stowing gas tight
7/23/2021	19	18	7.5	44.834607	-124.924755	494	preparing to core and sample bio
7/23/2021	19	18	57.1	44.834607	-124.924758	494	preparing to sample clams
7/23/2021	19	23	22.9	44.834606	-124.924753	494	crab near cluster of clams being slurped
7/23/2021	19	27	31.4	44.834606	-124.924759	494	preparing to core
7/23/2021	19	32	54.6	44.834609	-124.924757	495	seems not corable, carbonate layer below possibly
7/23/2021	19	34	27.7	44.834610	-124.924757	494	readjusting to get closer to carbonate outcrop and bacterial mat area, maybe more corable
7/23/2021	19	37	2.1	44.834588	-124.924746	494	repositioned ROV
7/23/2021	19	39	17.9	44.834592	-124.924750	494	no luck coring, planning to do carbonate rock
7/23/2021	19	45	56.2	44.834620	-124.924766	494	sampling heteropolypus
7/23/2021	19	55	39.6	44.834592	-124.924726	494	Preparing for NIskin sampling
7/23/2021	19	55	57.2	44.834596	-124.924725	494	Moving 25 m down current, current appeared to be to the north, will let it carry herc
7/23/2021	20	0	12.8	44.834529	-124.924784	486	putting in ship move 20 m 012 heading
7/23/2021	20	5	51.2	44.834824	-124.924796	483	accidentally moved herc SE instead of NE because of DVL/USBL setting issue

date	hr	min	sec	latitude	longitude	Z(m)	H1858 Carbonate Ridge Descriptions
7/23/2021	20	6	50.3	44.834986	-124.924772	481	putting in another ship move 10 m to the north
7/23/2021	20	8	14.4	44.834995	-124.924785	492	area we sampled at previously was characterized by carbonate mounds covered in thin sediment layer with small areas of white microbial mat, large areas of living clams and clam hash, heteropolypus and sunflower stars
7/23/2021	20	9	28.0	44.835014	-124.924800	495	approximately 19 m from sampling site
7/23/2021	20	10	13.6	44.835028	-124.924798	494	roughly 15 m away now
7/23/2021	20	11	3.7	44.835016	-124.924797	492	putting in another ship move 10 m to 012
7/23/2021	20	12	49.4	44.834998	-124.924791	496	seeing some coral, paragorgia
7/23/2021	20	14	28.0	44.835085	-124.924746	495	Passing over large carbonate boulders still with clam hash interspersed throughout. Also occasional heteropolypus coral and paragorgia
7/23/2021	20	14	56.2	44.835087	-124.924746	496	seeing occasional interspersed white mat as well
7/23/2021	20	15	1.5	44.835087	-124.924753	496	hagfish
7/23/2021	20	15	25.6	44.835116	-124.924749	496	a seastar here , can’t see species clearly
7/23/2021	20	16	9.3	44.835114	-124.924753	496	25 m away from sample site in heading 023
7/23/2021	20	18	11.6	44.835121	-124.924762	496	Now preparing to head toward waypoint 5, plumes observed last night during multibeam survey
7/23/2021	20	18	29.9	44.835121	-124.924759	495	heading ~144 and 315 m away
7/23/2021	20	19	8.9	44.835092	-124.924678	495	last niskin sample was over an area with carbonates and some clam hash
7/23/2021	20	20	10.1	44.835024	-124.924599	497	transiting now
7/23/2021	20	20	34.1	44.834970	-124.924495	497	moving over some fishing line
7/23/2021	20	21	26.0	44.834907	-124.924423	499	still moving over numerous heteropolypus corals and small thornyhead rockfish on carbonates, still seeing clam hash
7/23/2021	20	21	43.9	44.834901	-124.924423	499	carbonates here have been forming slabs in some areas
7/23/2021	20	22	1.0	44.834869	-124.924383	498	also passing over sunflower stars occasionally still
7/23/2021	20	23	25.8	44.834840	-124.924330	498	zooms on rockfish, very large, head maybe 30 cm across
7/23/2021	20	24	7.9	44.834769	-124.924178	502	now more over carbonate cobbles
7/23/2021	20	25	47.1	44.834655	-124.924083	504	Moving off of seep area, now just seeing cobble debris from carbonate mound area. Occasional fragile pink urchin, paragorgia, smaller sponge, thornyhead, solaster
7/23/2021	20	26	47.9	44.834437	-124.924081	504	still cobbles, but some occasional white patches of microbial mat and hash
7/23/2021	20	27	9.2	44.834436	-124.924040	505	occasional hagfish
7/23/2021	20	28	57.9	44.834238	-124.923719	503	some larger cobbles here now of carbonate, still some clam hash here, maybe very small mat patches
7/23/2021	20	29	12.6	44.834240	-124.923625	504	same fauna still as earlier
7/23/2021	20	30	21.7	44.834209	-124.923582	502	potentially seeing sable fish
7/23/2021	20	30	49.5	44.834208	-124.923572	502	still clam hash and same fauna over small carbonate cobbles
7/23/2021	20	31	49.4	44.834110	-124.923265	503	seeing a sole with clams next to it, may be living
7/23/2021	20	32	3.1	44.834108	-124.923269	503	ophiuroid on cobble nearby
7/23/2021	20	32	52.8	44.834090	-124.923171	500	seeing another long line
7/23/2021	20	33	14.2	44.834049	-124.923171	499	lots of clams or clam hash spread along seafloor
7/23/2021	20	33	38.5	44.834008	-124.923261	499	5 m off seafloor now readjusting to continue to WP 5
7/23/2021	20	35	43.4	44.833610	-124.923202	497	have been backing up toward WP 5 with herc for a bit now
7/23/2021	20	35	54.4	44.833610	-124.923074	497	trying to get enough slack to turn around
7/23/2021	20	36	15.4	44.833567	-124.922986	498	still over clam beds not sure if living or hash

date	hr	min	sec	latitude	longitude	Z(m)	H1858 Carbonate Ridge Descriptions
7/23/2021	20	36	24.4	44.833434	-124.922980	499	same fauna
7/23/2021	20	36	43.4	44.833365	-124.922907	498	some small patches of white microbial mat
7/23/2021	20	37	24.9	44.833214	-124.922735	497	approaching WP 5 and slowing down now
7/23/2021	20	37	36.6	44.833214	-124.922697	497	planning to use sonar to locate bubble stream now
7/23/2021	20	38	2.5	44.833128	-124.922643	494	still over mostly large cobbles with clam patches, very large solaster sea stars, occasional heteropolypus
7/23/2021	20	38	16.3	44.833110	-124.922630	492	lifting off seafloor to use sonar
7/23/2021	20	39	44.3	44.833106	-124.922638	492	seeing signal in sea king sonar right now about 15 m away, but think it's an artifact after spinning
7/23/2021	20	40	7.6	44.833103	-124.922617	492	range on sonar is 25 m, were looking WSW, now spinning other direction
7/23/2021	20	40	20.5	44.833117	-124.922615	492	Looking ESE now, letting scan a bit
7/23/2021	20	40	36.4	44.833116	-124.922617	492	at about 7 m altitude
7/23/2021	20	41	3.2	44.833116	-124.922620	492	mesotech and norbit not functioning properly currently
7/23/2021	20	42	27.8	44.833068	-124.922565	492	Moving closer to WP 5, currently 28 m off. will continue scanning
7/23/2021	20	43	8.5	44.833063	-124.922415	492	moving downslope slightly now, WP 5 is situated on western side of small peak
7/23/2021	20	44	3.2	44.833053	-124.922419	492	not seeing anything on seaking, now looking SW and scanning
7/23/2021	20	45	44.1	44.833056	-124.922431	492	14 m from waypoint now, going to move ship 14 m
7/23/2021	20	46	7.5	44.833060	-124.922443	492	doing quick sweep of area before ship starts moving
7/23/2021	20	47	15.8	44.833020	-124.922427	493	moving toward waypoint now, going to go a little closer to the seafloor
7/23/2021	20	48	1.9	44.833020	-124.922374	495	Seeing a lot of shell hash here over cobbles. Also hagfish and heteropolypus and some paragorgia
7/23/2021	20	49	43.7	44.832977	-124.922281	495	Seeing clam hash still, moving around near waypoint. basically on top of WP 5, planning to rise up and scan briefly
7/23/2021	20	50	31.5	44.832975	-124.922279	490	herc tugging on argus
7/23/2021	20	50	38.3	44.832975	-124.922279	491	picking up gain on seaking
7/23/2021	20	51	53.3	44.832986	-124.922298	491	looking ESE now, altitude about 8 m
7/23/2021	20	52	3.2	44.832991	-124.922302	491	not seeing any bubbles in sonar
7/23/2021	20	52	57.1	44.832990	-124.922275	491	already at 60% gain on seaking
7/23/2021	20	53	5.1	44.832987	-124.922275	491	spinning around now SW to scan
7/23/2021	20	54	7.5	44.832973	-124.922280	491	moving ship S 10 m
7/23/2021	20	55	29.3	44.833005	-124.922292	497	now back on seafloor
7/23/2021	20	55	58.5	44.833005	-124.922305	497	also have been looking in mesotech sonar
7/23/2021	20	56	41.6	44.833007	-124.922357	497	now going to survey clams and bacterial mat in region
7/23/2021	20	57	41.1	44.833025	-124.922372	497	may also take some biological or push core samples if we see a good area
7/23/2021	20	58	0.7	44.833029	-124.922375	497	large cushion-like sea start (not cushion, but not sure what species
7/23/2021	20	58	7.5	44.833025	-124.922386	497	resetting USBL/DVL
7/23/2021	21	0	20.7	44.833008	-124.922341	498	seeing some live and some fragmented shells in clam beds
7/23/2021	21	2	27.6	44.832969	-124.922371	497	seeing some anemones here as well on the carbonate cobbles, also hagfish
7/23/2021	21	3	59.3	44.832984	-124.922385	498	large sablefish passed by, also small rock fish off to the side, zooming in on white/gray bacterial mat
7/23/2021	21	5	11.1	44.832979	-124.922341	497	now heading back up slope toward waypoint 5 a bit

date	hr	min	sec	latitude	longitude	Z(m)	H1858 Carbonate Ridge Descriptions
7/23/2021	21	6	2.0	44.833013	-124.922402	498	I think seastars we have been seeing may have been rathbunaster, not solaster
7/23/2021	21	6	26.5	44.833020	-124.922402	498	zooming on small white mat
7/23/2021	21	6	59.9	44.833005	-124.922394	497	cushion-like star may have been Pteraster
7/23/2021	21	7	50.8	44.833044	-124.922430	498	zooms on some more clam beds slightly north of waypoint 5
7/23/2021	21	8	9.1	44.833043	-124.922420	497	planning to survey larger region for bubbles
7/23/2021	21	8	32.0	44.833045	-124.922447	498	widespread living clams seem to indicate active fluid flow below, but still have not located bubbles
7/23/2021	21	9	48.4	44.833034	-124.922333	497	also seeing some large ophiuroids
7/23/2021	21	12	4.7	44.832950	-124.922257	498	It seems that we weren't properly synced to USBL with the DVL. need to transit southward
7/23/2021	21	14	7.4	44.832818	-124.922221	497	now moving southward toward WP5 still
7/23/2021	21	15	25.0	44.832843	-124.922246	497	still over carbonate cobbles and same fauna as previously, clam hash, rathbunaster (quite a few), some fragile pink urchins, occasional heteropolypus
7/23/2021	21	16	33.7	44.832857	-124.922248	494	moving 20 meters 180 toward wp 5
7/23/2021	21	18	27.7	44.832791	-124.922136	497	another sole, some small sponges on a carbonate rock and heteropolypus
7/23/2021	21	19	12.1	44.832772	-124.922129	498	over some larger carbonate boulders now
7/23/2021	21	20	21.6	44.832753	-124.922250	496	coming up on a carbonate slab now, seeing some bacterial mat
7/23/2021	21	20	26.5	44.832755	-124.922253	497	also an orange anemone
7/23/2021	21	21	5.7	44.832743	-124.922243	497	zooms on small white mat under carbonate ledge, small thornyhead in corner
7/23/2021	21	22	16.4	44.832712	-124.922237	497	passing over some more rathbunaster and maybe a brisingid or large ophiuroid
7/23/2021	21	22	32.8	44.832711	-124.922241	496	about 5 m away from WP5 now
7/23/2021	21	22	43.4	44.832703	-124.922242	496	just completed ROV gauge check
7/23/2021	21	23	16.9	44.832658	-124.922248	497	Another area of clams, larger patches with thornyheads and another seastar species. Also a sole
7/23/2021	21	23	51.7	44.832644	-124.922249	497	now right on top of WP 5
7/23/2021	21	24	29.0	44.832641	-124.922248	495	coming off seafloor to scan with seaking now
7/23/2021	21	25	4.7	44.832703	-124.922208	491	facing SSW now 8 m off seafloor scanning
7/23/2021	21	26	13.6	44.832702	-124.922201	490	spinning E to scan
7/23/2021	21	27	14.0	44.832707	-124.922204	490	not seeing anything in either sonar currently
7/23/2021	21	27	24.2	44.832698	-124.922204	491	looking west now
7/23/2021	21	28	41.2	44.832698	-124.922219	496	back down on seafloor
7/23/2021	21	29	14.9	44.832701	-124.922213	497	over area of cobbles, some small carbonate ledge, large rathbunaster and small microbial mats under ledges, also clam hash
7/23/2021	21	29	24.4	44.832703	-124.922214	497	planning to move back to where we saw large clam area
7/23/2021	21	30	0.2	44.832699	-124.922250	497	salps in the water column near argus, have seen a lot here
7/23/2021	21	30	26.8	44.832646	-124.922250	497	back near area of clam beds
7/23/2021	21	30	46.9	44.832634	-124.922248	497	sablefish swimming in the background
7/23/2021	21	31	2.2	44.832627	-124.922223	497	zooming a little while moving on clams
7/23/2021	21	31	26.0	44.832619	-124.922218	497	several small white/gray mat patches interwoven with clams
7/23/2021	21	31	39.5	44.832617	-124.922218	497	also seeing neptunia/buccinidae snails
7/23/2021	21	34	32.8	44.832611	-124.922223	498	planning to slurp some clams

date	hr	min	sec	latitude	longitude	Z(m)	H1858 Carbonate Ridge Descriptions
7/23/2021	21	36	48.4	44.832609	-124.922233	498	zooming in on various patches of clam bed, seeing mostly only hash
7/23/2021	21	38	10.9	44.832573	-124.922255	497	seeing sole and a few sable fish here
7/23/2021	21	41	3.3	44.832563	-124.922260	497	seems like HPU is off
7/23/2021	21	42	43.3	44.832557	-124.922265	497	see lots of siphons in patch to be samples
7/23/2021	21	44	16.9	44.832560	-124.922258	498	Troubleshooting HPU issue, planning to shut HPU down and take over remote control (disable van remote). Need to resync traction winch
7/23/2021	21	47	47.2	44.832559	-124.922252	497	still troubleshooting winch, appears black is moving but cable is not
7/23/2021	21	48	10.9	44.832559	-124.922251	497	considering moving back to WP 3 to fill up other gas tight before doing some more exploration of the ridge, after this bio sampling
7/23/2021	21	48	18.9	44.832562	-124.922251	497	slurping now
7/23/2021	21	52	47.6	44.832561	-124.922253	497	retracting and extending slurp to try and get them into sample jar
7/23/2021	21	55	55.7	44.832561	-124.922248	497	still troubleshooting winch in between sampling
7/23/2021	21	56	34.0	44.832557	-124.922252	497	planning to head N again to same latitude as WP 5 but slightly west
7/23/2021	21	56	46.7	44.832562	-124.922252	497	clam sampling was 10 m or so south of WP 5
7/23/2021	21	57	37.3	44.832568	-124.922258	497	still seeing a few sablefish
7/23/2021	21	57	57.7	44.832588	-124.922258	497	trying to transit near seafloor for better view
7/23/2021	21	58	47.6	44.832591	-124.922252	497	passing winch control over to van
7/23/2021	22	0	9.0	44.832591	-124.922248	496	might be a camera issue in winch control room (frozen cameras) not winch control issue
7/23/2021	22	0	25.8	44.832602	-124.922242	496	another sole, maybe same as before when we were transiting south
7/23/2021	22	0	43.1	44.832654	-124.922229	496	siphonophore and solmissus jelly in argus cam
7/23/2021	22	1	11.0	44.832663	-124.922300	497	transiting over carbonate ledge and cobble area, not seeing as much clam hash right now
7/23/2021	22	2	39.4	44.832692	-124.922339	497	seems like argus thruster might be stuck, we have 6.2 0.69 wraps and -5 tether wraps
7/23/2021	22	6	4.3	44.832696	-124.922343	497	can see in argus that argus is slowly spinning, planning to spin argus in opposite direction to undo wraps
7/23/2021	22	9	49.4	44.832693	-124.922346	497	spinning argus is taking out 0.68 and tether wraps
7/23/2021	22	10	1.3	44.832693	-124.922346	497	winch control is back
7/23/2021	22	12	55.3	44.832696	-124.922347	497	Also seeing occasional shrimp (pandalopsis?)
7/23/2021	22	13	36.0	44.832696	-124.922349	497	sablefish
7/23/2021	22	14	13.3	44.832688	-124.922347	497	back to less than 1 wrap
7/23/2021	22	15	26.9	44.832693	-124.922335	497	seems now like argus doesn't have control, trying to sort out argus
7/23/2021	22	16	19.3	44.832693	-124.922333	496	seems like there are issues with herc driving argus, argus holding for herc to undo tether wrap currently
7/23/2021	22	18	0.9	44.832707	-124.922445	494	removing final tether wrap now, then should be good to go
7/23/2021	22	20	0.5	44.832763	-124.922489	493	now backing up toward waypoint 5 again, while troubleshooting ended up NW of WP
7/23/2021	22	21	47.3	44.832612	-124.922415	495	in transit back toward WP5 moving east, seeing small cobbles and some larger boulders , interspersed clam hash, rathbunaster, heteropolypus, etc.
7/23/2021	22	22	57.9	44.832611	-124.922215	497	back over large clam beds, two adjacent to one another

date	hr	min	sec	latitude	longitude	Z(m)	H1858 Carbonate Ridge Descriptions
7/23/2021	22	23	8.2	44.832611	-124.922129	498	one is the one we sampled at
7/23/2021	22	23	27.6	44.832608	-124.922125	498	some of the mushroom corals here are very large, maybe 20 cm wide
7/23/2021	22	24	23.4	44.832613	-124.922140	498	moving the ship south slightly, will look at microbial mat patches in clam bed
7/23/2021	22	24	57.2	44.832614	-124.922138	498	will fly low and slow over clam bed after southward ship move complete
7/23/2021	22	26	7.4	44.832609	-124.922140	498	oxygen saturation appears to be 4.7%, 18.28 uM around here
7/23/2021	22	27	34.1	44.832577	-124.922130	498	zooming now on clam bed, now will fly over
7/23/2021	22	36	7.7	44.832553	-124.922097	491	Planning to move 64 m to the west, based on new information from searching through water column data from last night
7/23/2021	22	36	20.8	44.832553	-124.922109	492	putting in ship move west
7/23/2021	22	36	35.6	44.832549	-124.922111	492	not seeing anything in sonar within 20 or so m
7/23/2021	22	38	30.9	44.832489	-124.922250	497	we've covered some of this area before when we were transiting east again after troubleshooting
7/23/2021	22	39	26.9	44.832484	-124.922445	495	holothurian
7/23/2021	22	40	8.6	44.832491	-124.922471	494	transiting again over some carbonate boulders and cobbles with interspersed clam hash and same fauna as before
7/23/2021	22	40	25.9	44.832492	-124.922511	495	little patches of white bacterial mat
7/23/2021	22	40	51.2	44.832501	-124.922519	493	rathbunaster and ophiuroids
7/23/2021	22	41	56.8	44.832447	-124.922677	489	Seems there are a lot of bubbles in argus, maybe large plume?
7/23/2021	22	42	50.9	44.832430	-124.922677	481	seem to see bubble stream in argus mesotech
7/23/2021	22	43	31.8	44.832429	-124.922679	478	can see plume in argus cam
7/23/2021	22	44	24.2	44.832449	-124.922690	491	descending back to seafloor
7/23/2021	22	45	44.1	44.832448	-124.922702	490	still chasing bubbles in argus mesotech
7/23/2021	22	47	0.8	44.832454	-124.922735	490	bubbles clear in argus cam
7/23/2021	22	51	11.8	44.832482	-124.922861	493	descending now, 5 m away from nwp5 target and from what we're seeing in sonar
7/23/2021	22	52	13.6	44.832500	-124.922911	495	have located bubble stream on seafloor
7/23/2021	22	52	48.9	44.832489	-124.922924	495	4 plumes of bubbles with white gray bacterial mat, left on seems strongest, all very persistent
7/23/2021	22	53	32.6	44.832476	-124.922918	495	thornyhead right nearby
7/23/2021	22	54	11.7	44.832477	-124.922918	495	seeing lots of white filamentous bacteria
7/23/2021	23	0	34.1	44.832474	-124.922927	495	Plan to leave a physical marker to mark the site and will attempt push cores if possible
7/23/2021	23	12	15.0	44.832467	-124.922924	495	DVL reset
7/23/2021	23	12	58.0	44.832463	-124.922938	494	Moving Herc to prepare for Niskin sampling
7/23/2021	23	17	50.1	44.832457	-124.922959	495	Reposition to grab carbonate rock
7/23/2021	23	22	7.0	44.832449	-124.922972	495	Leaving marker 263 near the 4 plumes located near NWP5
7/23/2021	23	24	27.6	44.832447	-124.922980	494	Moving up 10 m to collect Niskin sample above plumes near NWP5
7/23/2021	23	27	51.6	44.832431	-124.922984	494	Moving back to the seafloor in order to finish Niskin bottle sampling
7/23/2021	23	30	18.7	44.832439	-124.922955	493	Hovering above the plumes in order to determine the direction of the current
7/23/2021	23	31	5.5	44.832439	-124.922949	493	Current out of the west, backing up ~25 m due east

date	hr	min	sec	latitude	longitude	Z(m)	H1858 Carbonate Ridge Descriptions
7/23/2021	23	36	32.8	44.832446	-124.922615	493	Using autoheading on the Herc in order to go ~25 m downstream on autopilot
7/23/2021	23	39	48.0	44.832445	-124.922614	492	Having issues with the mesotech sonar, playing around with contrast settings
7/23/2021	23	40	58.1	44.832447	-124.922613	492	Changing the coloration of the mesotech sonar in order to allow for a better visual
7/23/2021	23	41	42.1	44.832447	-124.922599	493	Beginning search for pile of live clams, heading back to plume
7/23/2021	23	43	45.4	44.832443	-124.922915	494	Approaching the 4 plumes (i.e., marker 263)
7/23/2021	23	43	56.5	44.832444	-124.922921	495	Sable fish passing by
7/23/2021	23	44	21.8	44.832447	-124.922922	495	Environmental and fauna similar to previous areas (clams, microbial mats, etc.)
7/23/2021	23	45	14.0	44.832445	-124.922919	495	Zoom in on clam beads to see if there are any live clams to sample
7/23/2021	23	45	44.6	44.832459	-124.922932	495	Crab located under carbonate cobble
7/23/2021	23	47	41.4	44.832457	-124.922933	495	Reaching for suction sampler handle to grab bio sample of sea star
7/23/2021	23	53	2.0	44.832433	-124.922999	494	Moving west of the seep to examine clam beds for live organisms
7/23/2021	23	53	40.9	44.832459	-124.923002	495	Zooming into clam beds and microbial mats
7/23/2021	23	54	18.7	44.832480	-124.922984	494	Sable fish, hag fish, and small urchin
7/23/2021	23	54	58.0	44.832470	-124.922980	494	Making our way to WP6
7/23/2021	23	55	49.1	44.832445	-124.923000	494	~430 m to next waypoint (WP6)
7/23/2021	23	56	19.4	44.832444	-124.922994	494	Moving at 0.3 to allow for exploration
7/23/2021	23	59	38.1	44.832400	-124.922851	493	Moving past similar fauna as seen previous on the dive
7/24/2021	0	0	54.3	44.832328	-124.922661	494	1.3 m above the seafloor and heading towards WP6
7/24/2021	0	2	27.0	44.832369	-124.922619	494	Similar fauna including large patches of clam hash
7/24/2021	0	3	15.1	44.832370	-124.922619	494	Carbonate cobbles dispersed across the seafloor
7/24/2021	0	4	56.0	44.832350	-124.922386	496	Continuing to WP6 about 0.2-0.5 m above the seafloor
7/24/2021	0	7	2.1	44.832166	-124.922187	504	increase in marine snow in the water column
7/24/2021	0	7	21.9	44.832165	-124.922068	506	Heading towards waypoint 6
7/24/2021	0	8	19.9	44.832133	-124.921950	508	Soft bottom sediment floor with a lot of organic material in the water column. Rathbunaster sea star. some sediment covered sponge
7/24/2021	0	8	58.8	44.832185	-124.921933	506	cluster of rathbunaster sea stars, on top of rocky clusters there are some sponges that appear to be covered in sediment
7/24/2021	0	9	16.9	44.832185	-124.921889	505	pale yellow vase sponge
7/24/2021	0	9	46.0	44.832151	-124.921885	505	thornyhead rockfish, some mushroom coral, and rathbunaster
7/24/2021	0	11	19.9	44.832084	-124.921774	502	large bamboo coral skeleton with other organisms growing and living off of its structure including some brittle stars
7/24/2021	0	11	33.2	44.832077	-124.921705	502	coming across more large rock boulders
7/24/2021	0	12	0.1	44.832075	-124.921658	501	three bamboo corals in one frame
7/24/2021	0	12	49.5	44.832020	-124.921538	498	Flatfish. mushroom coral
7/24/2021	0	13	37.0	44.831988	-124.921466	498	new variation of mushroom coral, light pink in color instead of dark pink like previously seem
7/24/2021	0	13	58.0	44.831989	-124.921464	498	hagfish near large black rock
7/24/2021	0	14	29.7	44.831934	-124.921429	498	very large sized rockfish near a sable fish
7/24/2021	0	15	2.6	44.831931	-124.921402	497	sea cucumber mouth parts sticking out of the sediment

date	hr	min	sec	latitude	longitude	Z(m)	H1858 Carbonate Ridge Descriptions
7/24/2021	0	15	46.5	44.831933	-124.921249	496	beginning to leave valley area, coming uphill
7/24/2021	0	16	8.3	44.831861	-124.921245	496	on exposed edges of rock the color appears to be an eggshell white
7/24/2021	0	16	44.7	44.831778	-124.921244	496	mushroom coral near tubular sponge
7/24/2021	0	17	2.6	44.831776	-124.921210	495	forrea sponge
7/24/2021	0	17	32.0	44.831805	-124.921076	493	now approaching large rock boulders
7/24/2021	0	17	43.1	44.831807	-124.921041	492	stick of dark pink bubblegum coral
7/24/2021	0	18	11.5	44.831809	-124.920991	492	debris, flatfish, two medium sized round sponges, sablefish
7/24/2021	0	18	48.0	44.831775	-124.920948	492	More sea cucumber feeding parts sticking out of sediment, maybe possible to take a pushcore when those are visible?
7/24/2021	0	19	13.7	44.831751	-124.920921	492	stick of another dark pink bubblegum coral
7/24/2021	0	19	32.3	44.831710	-124.920906	491	dead bamboo coral skeleton
7/24/2021	0	19	53.9	44.831697	-124.920902	491	light pink bubblegum coral, singular branch
7/24/2021	0	21	30.6	44.831711	-124.920806	490	Large barrel sponge and nearby octopus
7/24/2021	0	22	1.1	44.831714	-124.920802	489	More complex terrain compared to previous sites
7/24/2021	0	22	42.6	44.831663	-124.920705	487	Continuing to explore towards WP6
7/24/2021	0	24	22.6	44.831644	-124.920277	485	Barrel sponge, rathbunaster, etc.
7/24/2021	0	24	38.3	44.831653	-124.920207	484	Fishing lines scattered between carbonate cobbles
7/24/2021	0	25	8.1	44.831608	-124.920188	484	Large sponge, brittle star, sole, and rathbunaster
7/24/2021	0	25	48.3	44.831459	-124.920182	483	Anemones and a small thornyhead
7/24/2021	0	26	25.8	44.831435	-124.920024	482	Passing by several larger Heteropolypus
7/24/2021	0	27	5.9	44.831363	-124.919989	480	Slowing down to observe surrounding area about 1 m above the seafloor
7/24/2021	0	27	49.7	44.831373	-124.919786	480	Small scatterings of clam hash but not as abundant as around NWP5, more boulders and pebbles
7/24/2021	0	28	36.2	44.831288	-124.919771	479	Passed over multiple asteroidae, including rathbunaster
7/24/2021	0	28	51.0	44.831287	-124.919776	479	Zooming into large patch of clams to determine if alive
7/24/2021	0	30	5.8	44.831277	-124.919765	479	Previous note about asteroidea could have also included a Pteraster
7/24/2021	0	30	35.3	44.831249	-124.919743	479	Looked closer at clam beds but not enough alive, determine due to carbonate cobble that it would not be a good candidate for a push core
7/24/2021	0	31	34.2	44.831266	-124.919531	477	Heading NE towards WP6 over carbonate cobble and clam hash, several large sable fish and rathbunaster
7/24/2021	0	31	49.7	44.831263	-124.919500	477	Passed over another sole
7/24/2021	0	32	54.8	44.831135	-124.919442	476	Massive group of sable fish (~15 individuals)
7/24/2021	0	33	48.0	44.831183	-124.919253	474	Large sable fish group swimming in multiple direction 0.5 m above the seafloor
7/24/2021	0	34	21.2	44.831198	-124.919050	472	Clusters of ophiuroids located on carbonate boulders
7/24/2021	0	35	12.0	44.831119	-124.918946	470	Heading SE, about ~50 m from WP6
7/24/2021	0	35	32.6	44.831096	-124.918945	470	Long fishing line
7/24/2021	0	35	41.6	44.831087	-124.918945	470	Similar fauna as before
7/24/2021	0	37	0.9	44.831094	-124.918720	467	Heteropolypus, rathbunaster, thoryheads, and ophiuroids
7/24/2021	0	37	34.8	44.831053	-124.918701	466	Modifying settings on the sea king sonar to allow for better viewing
7/24/2021	0	37	59.1	44.830999	-124.918683	466	Coming up on the winch
7/24/2021	0	38	56.6	44.830943	-124.918545	464	Seafloor covered with carbonate cobble and flat, intermittent patches of sedimentation

date	hr	min	sec	latitude	longitude	Z(m)	H1858 Carbonate Ridge Descriptions
7/24/2021	0	40	38.9	44.830940	-124.918505	463	Found another large group of sablefish and yellow coral
7/24/2021	0	41	51.8	44.830876	-124.918390	461	Yellow coral was a colonial zoanthid growing over something
7/24/2021	0	42	13.9	44.830786	-124.918367	461	Lots of sable fish and tow net
7/24/2021	0	43	50.1	44.830689	-124.918299	462	Fish appear to be bottom feeding as sediment is being stired up as they lunge towards the sea floor
7/24/2021	0	44	17.8	44.830699	-124.918165	462	Currently SW of WP6
7/24/2021	0	45	9.2	44.830685	-124.917964	463	Large density of fish are still present and continue to stir up the seafloor
7/24/2021	0	46	38.3	44.830768	-124.917830	463	Massive rathbunaster and pteraster
7/24/2021	0	47	3.6	44.830736	-124.917786	464	Vessel change bearing to 144, staying at current speed
7/24/2021	0	47	44.3	44.830582	-124.917771	465	Smaller carbonate boulders scattered through with more soft sediment in between
7/24/2021	0	48	48.7	44.830551	-124.917802	465	Zoom into Pteraster, crinoids, cup coral, ophiuroids, tube worms, and a sable fish that wants the spotlight
7/24/2021	0	49	59.8	44.830463	-124.917711	465	Large group of sable fish still present
7/24/2021	0	50	6.2	44.830463	-124.917671	466	Putting out the winch 2 m
7/24/2021	0	50	31.7	44.830469	-124.917493	466	Exploring towards WP7
7/24/2021	0	50	58.0	44.830474	-124.917409	466	Heteropolypus, rathbunaster, crinoids, and anemones
7/24/2021	0	51	36.0	44.830365	-124.917389	466	Heading along ridge, 3 m from the sea floor heading SW
7/24/2021	0	52	46.6	44.830241	-124.917461	466	Reached the apex of the ridge and are slowly heading down
7/24/2021	0	53	22.2	44.830237	-124.917490	466	Sponge with skate egg casing
7/24/2021	0	54	31.6	44.830157	-124.917498	466	Large school of sable fish moving along the ridge, most in motion
7/24/2021	0	55	34.7	44.830049	-124.917357	468	Carbonate cobbles present along the slight downslope
7/24/2021	0	55	50.2	44.830040	-124.917237	469	Staying around 1-1.5 m above the sea floor
7/24/2021	0	57	6.5	44.830078	-124.916994	470	Continuing to explore SE
7/24/2021	0	57	29.2	44.830078	-124.916951	470	Paragorgia on carbonated boulders
7/24/2021	0	58	26.0	44.830078	-124.916955	471	Neptunia (gastropod) sitting on top of a pile of eggs
7/24/2021	0	58	52.1	44.830021	-124.916959	471	100s of sable fish
7/24/2021	0	59	25.6	44.829912	-124.917009	471	Sable fish are disturbing the rathbunaster
7/24/2021	0	59	39.1	44.829876	-124.917009	471	Crinoids scattered across the seafloor
7/24/2021	1	0	33.9	44.829769	-124.916954	471	Large school of sable fish are easily scared by the Herc
7/24/2021	1	1	51.8	44.829645	-124.917005	469	Exploring SE, heading towards WP6 at about 2-3 m above the sea floor
7/24/2021	1	2	16.0	44.829615	-124.916913	470	Larger carbonate boulders down the ridge
7/24/2021	1	3	24.1	44.829514	-124.916793	474	Large grouping of sable fish
7/24/2021	1	4	9.9	44.829505	-124.916686	478	Coming down of the side of a ridge onto the seafloor
7/24/2021	1	4	31.4	44.829511	-124.916653	479	Similar fauna observed previously on the dive
7/24/2021	1	5	26.0	44.829583	-124.916535	479	Paragorgia on small carbonate cobbles
7/24/2021	1	6	29.2	44.829454	-124.916422	481	Crinoids and ophiuroids located on carbonate cobble patches
7/24/2021	1	6	53.9	44.829395	-124.916425	481	Large congregation of crinoids on sediment
7/24/2021	1	7	17.6	44.829360	-124.916466	481	Several medium rathbunaster
7/24/2021	1	7	40.6	44.829358	-124.916470	481	Sole
7/24/2021	1	8	16.6	44.829251	-124.916382	481	Flat substrate with a scattering of carbonate rocks, small glass bottle located on sea floor
7/24/2021	1	9	17.1	44.829244	-124.916411	481	Heteropolypus, ophiuroids, thornyhead, and chemical stains on the underside of carbonate rocks
7/24/2021	1	10	14.6	44.829115	-124.916327	481	Flat substrate with urchins, crinoids, and heteropolypus

date	hr	min	sec	latitude	longitude	Z(m)	H1858 Carbonate Ridge Descriptions
7/24/2021	1	10	38.1	44.829114	-124.916214	481	Large anemone and lots of crinoids
7/24/2021	1	11	32.6	44.829012	-124.916203	481	Similar fauna as observed earlier in the dive
7/24/2021	1	12	2.1	44.828941	-124.916186	481	Sable fish are present but far less abundant than previously
7/24/2021	1	12	24.1	44.828927	-124.916067	481	Several heteropolypus
7/24/2021	1	12	52.5	44.828923	-124.916010	482	Sable fish knocking the crinoids off the sea floor
7/24/2021	1	13	24.2	44.828920	-124.915982	482	Heading towards WP7 with a SE heading
7/24/2021	1	13	40.7	44.828920	-124.915976	482	Crinoids, urchins, rathbunaster
7/24/2021	1	14	22.2	44.828915	-124.915861	482	Heteropolypus, urchins, thornyheads, hagfish, crinoids
7/24/2021	1	14	54.3	44.828870	-124.915861	482	Flat substrate, very little rubble
7/24/2021	1	15	17.6	44.828829	-124.915914	482	Large school of sable fish
7/24/2021	1	16	48.4	44.828644	-124.915901	482	Continuing to explore soft substrate with rathbunaster, sole, sable fish, crinoids, thornyhead rockfish
7/24/2021	1	17	16.8	44.828624	-124.915793	482	Pteraster
7/24/2021	1	17	48.2	44.828621	-124.915773	483	Crinoids on the soft substrate
7/24/2021	1	18	26.4	44.828605	-124.915700	483	Barrel sponge, crinoids, ophiuroids, thornyheads, sable fish
7/24/2021	1	18	53.2	44.828605	-124.915606	483	Exploring as we head towards WP7, about 1-2 m above the sea floor
7/24/2021	1	20	24.1	44.828491	-124.915484	483	Crinoids, holothuroidea, and small thornyhead rockfish
7/24/2021	1	21	30.4	44.828415	-124.915548	483	Large field of crinoids some of soft sediment and some on small carbonate cobble
7/24/2021	1	21	36.0	44.828402	-124.915548	483	Hagfish
7/24/2021	1	22	29.4	44.828357	-124.915443	483	Several crinoids extending their arms into the water column to feed
7/24/2021	1	23	2.2	44.828315	-124.915434	483	Urchins and anemones
7/24/2021	1	23	34.8	44.828315	-124.915403	484	Anemone and crinoid on small piece of carbonate
7/24/2021	1	24	15.5	44.828268	-124.915389	483	Anemone is potentially a Stomphia
7/24/2021	1	24	42.3	44.828267	-124.915242	483	Large species of fish (rockfish?) and many sable fish stirring up the substrate
7/24/2021	1	25	1.6	44.828233	-124.915206	483	Hovering 1 m of the soft substrate as we continue to WP7
7/24/2021	1	25	20.8	44.828178	-124.915200	483	Large school of sable fish
7/24/2021	1	25	58.4	44.828124	-124.915181	483	Crinoids scattered across the soft substrate
7/24/2021	1	26	19.5	44.828124	-124.915040	483	Sable fish are stirring up the substrate
7/24/2021	1	26	47.9	44.828106	-124.915029	483	Active thornyhead rockfish
7/24/2021	1	27	49.2	44.827952	-124.915045	482	Barrel sponge, crinoids, urchins, and rathbunaster
7/24/2021	1	29	18.0	44.827902	-124.914933	482	Continuing over a flat seafloor scattered with crinoids, hagfish, thornyheads, sablefish, rathbunaster, sole, and ophiuroids
7/24/2021	1	29	31.2	44.827906	-124.914877	482	About ~1 m above the sea floor
7/24/2021	1	30	18.5	44.827827	-124.914785	482	Large schooling of sable fish
7/24/2021	1	30	29.5	44.827815	-124.914785	482	Sole and crinoids
7/24/2021	1	32	1.3	44.827699	-124.914747	481	Crinoids on the sediment and small carbonate rocks
7/24/2021	1	34	52.5	44.827490	-124.914473	480	Sable fish schooling with crinoids scattered on the sea floor
7/24/2021	1	35	23.1	44.827489	-124.914430	480	Sable fish stirred up the environment
7/24/2021	1	36	26.4	44.827420	-124.914446	480	~875 m away from WP7
7/24/2021	1	37	56.6	44.827304	-124.914318	480	Sable fish schooling near argus
7/24/2021	1	39	16.2	44.827188	-124.914336	480	Lots of crinoids with some pteraster
7/24/2021	1	39	37.6	44.827188	-124.914317	479	Large school of sable fish both in front of and above Herc

date	hr	min	sec	latitude	longitude	Z(m)	H1858 Carbonate Ridge Descriptions
7/24/2021	1	40	59.6	44.827103	-124.914144	479	Sable fish stirred up sediment and visibility is low
7/24/2021	1	42	32.9	44.826998	-124.914125	478	Large rathbunaster
7/24/2021	1	42	51.9	44.826958	-124.914116	478	Anemone and paragorgia
7/24/2021	1	43	12.0	44.826944	-124.914031	478	Heteropolypus on carbonate
7/24/2021	1	44	21.1	44.826962	-124.913864	478	Schooling sable fish, thornyheads, and feeding crinoids with their arms extended into the water column
7/24/2021	1	44	51.4	44.826902	-124.913852	478	Crinoid swimming through the water column
7/24/2021	1	45	10.8	44.826898	-124.913852	478	Paragorgia and lots of crinoids
7/24/2021	1	45	49.0	44.826816	-124.913847	479	Crinoids, Heteropolypus, and a moving thornyheads
7/24/2021	1	46	52.7	44.826736	-124.913733	477	Massive schooling of sable fish in front the Herc
7/24/2021	1	48	21.7	44.826675	-124.913608	473	Siphonophore in the water column in front of Herc
7/24/2021	1	49	21.7	44.826581	-124.913519	475	Paragorgia located in this patch of carbonate rubble
7/24/2021	1	49	35.6	44.826577	-124.913547	476	Similar fauna to earlier in the dive
7/24/2021	1	50	20.3	44.826426	-124.913604	477	Large mass of sable fish obstructing the view of the sea floor
7/24/2021	1	50	50.1	44.826400	-124.913546	476	Heading towards WP7, ~600 m away
7/24/2021	1	51	12.8	44.826378	-124.913503	476	Lots of sable fish between argus and herc
7/24/2021	1	52	8.4	44.826365	-124.913274	476	Continued turbidity due to sable fish, herc about ~1 m from the sea floor
7/24/2021	1	52	47.5	44.826294	-124.913259	477	Sole, urchin, and crinoids
7/24/2021	1	53	53.2	44.826206	-124.913306	477	Mid-point in a ridge, between the SE high spot and NW high spot. Solid sediment cover.
7/24/2021	1	54	32.0	44.826152	-124.913299	475	Rathbunaster, crinoids, and pteraster located on carbonate cobble
7/24/2021	1	54	49.3	44.826107	-124.913273	476	About 700 m from the high spot (i.e., Waypoint 6)
7/24/2021	1	55	27.8	44.826070	-124.913173	476	Schooling of sable fish surrounding the herc and located just below argus
7/24/2021	1	55	59.4	44.826008	-124.913102	476	Sponge surrounded by ophiuroids and crinoids
7/24/2021	1	58	9.6	44.825881	-124.912977	477	Continuing to move towards WP7 on an exploratory mission
7/24/2021	1	58	42.1	44.825836	-124.912892	477	Lots of turbidity due to sable fish
7/24/2021	1	59	7.8	44.825818	-124.912892	477	Large schooling of sable fish around Herc and near argus
7/24/2021	2	2	57.1	44.825551	-124.912669	477	Large pile of carbonate rocks with massive school of sable fish above them
7/24/2021	2	3	12.2	44.825544	-124.912673	477	Going to attempt to core. Stopping the vessel.
7/24/2021	2	3	39.4	44.825546	-124.912671	477	Bumping argus camera down to keep herc in the frame during coring process
7/24/2021	2	4	32.5	44.825544	-124.912671	477	Herc set down on seafloor to begin coring process
7/24/2021	2	6	22.9	44.825556	-124.912656	477	Herc is preparing to core
7/24/2021	2	7	52.0	44.825528	-124.912650	477	Failed attempt at coring as the sediment is not suitable
7/24/2021	2	8	14.1	44.825539	-124.912651	477	Oxygen saturation around 3.26%, 12.72 umol/L
7/24/2021	2	9	26.6	44.825532	-124.912627	477	0.2 knots on the vessel, herc beginning to move again towards WP7
7/24/2021	2	10	49.4	44.825483	-124.912420	477	Similar fauna as observed previously, large abundance of sable fish
7/24/2021	2	11	47.3	44.825415	-124.912413	477	Low visibility due to sable fish activity
7/24/2021	2	12	14.5	44.825413	-124.912419	477	Larger carbonate boulders
7/24/2021	2	12	35.6	44.825402	-124.912421	477	Crinoids on the carbonate cobbles and rathbunaster on the soft sediment
7/24/2021	2	13	3.4	44.825365	-124.912407	477	Paragorgia on a carbonate boulder
7/24/2021	2	14	9.0	44.825350	-124.912260	477	Low visibility

date	hr	min	sec	latitude	longitude	Z(m)	H1858 Carbonate Ridge Descriptions
7/24/2021	2	15	4.3	44.825304	-124.912340	477	Large schooling located between the herc and argus
7/24/2021	2	15	41.8	44.825307	-124.912440	476	Setting up for recovery
7/24/2021	2	16	22.6	44.825295	-124.912489	476	Vessel all stopped
7/24/2021	2	16	41.0	44.825287	-124.912488	477	Vessel heading is around 50 degrees
7/24/2021	2	17	49.4	44.825332	-124.912388	476	Readjusting the position of herc and argus to prepare for vehicle recovery
7/24/2021	2	18	54.6	44.825138	-124.912624	468	Herc beginning to move off bottom
7/24/2021	2	21	35.0	44.824997	-124.912587	438	Continuing to slower make our way to the surface
7/24/2021	2	22	41.5	44.825052	-124.912624	427	Sable fish schools still present at 50 min above the sea floor
7/24/2021	2	26	39.4	44.825263	-124.912754	383	Pulling plate? with claw and hose came loose during ascent
7/24/2021	2	27	1.2	44.825277	-124.912751	377	Less schooling of sable fish around 100 m
7/24/2021	2	27	30.7	44.825280	-124.912772	369	Ascending at 16 m/min
7/24/2021	2	28	26.7	44.825228	-124.912782	352	Now increased to 18 m/min
7/24/2021	2	32	2.0	44.825085	-124.912617	285	Vessel starting to move at 0.3 knots at current heading
7/24/2021	2	33	35.9	44.825083	-124.912608	261	About 17 min to the surface, moving at 15.1 m/min and at ~260 m
7/24/2021	2	40	28.7	44.825614	-124.912126	156	Ascending at 16 m/min, ~10 min left until we it reaches the surface and ~160 m down
7/24/2021	2	45	0.2	44.825842	-124.911966	81	Ascending at 16.7 m/min, 5 min remaining in ascent, and herc is ~80 m from the surface
7/24/2021	2	47	51.4	44.826110	-124.912014	45	Holding on recovery at 50 until the vessel is repositioned
7/24/2021	2	52	16.4	44.826351	-124.911777	50	Hovering at 50 min, waiting on recovering
7/24/2021	2	53	37.4	44.826474	-124.911705	50	Going forward with recovery
7/24/2021	2	57	48.4	44.827531	-124.911692	8	Herc visible at the surface, vessel moving 3.0 m to ship port to intercept
7/24/2021	3	1	21.3	44.827639	-124.911908	8	Vessel change heading to 020 to accommodate for wind
7/24/2021	3	5	19.3	44.827492	-124.912163	8	Manual thrust forward on vessel to combat the wind and drift closer to herc
7/24/2021	3	8	41.2	44.828087	-124.913071	8	Argus being brought on board
7/24/2021	3	19	32.7	44.829649	-124.915749	8	Need to undo wraps in Herc line before recovery
7/24/2021	3	20	42.0	44.829758	-124.915997	8	Line attached to crane, beginning the recovery process
7/24/2021	3	22	40.6	44.829963	-124.916382	8	Herc coming out of the water

Table 13: H1859 Astoria Canyon (2016 Hydrate Site) Dive Log

date	hr	min	sec	latitude	longitude	Z(m)	H1859 Astoria Canyon 2019 Hydrate Site Description
7/25/2021	15	17	18.8	46.242076	-124.649296	107	light marine snow and occasional jelly in the water column
7/25/2021	15	26	13.2	46.242020	-124.648734	322	siphonophore, beginning to see some small silver fish swimming downward at 315m
7/25/2021	15	26	28.9	46.242020	-124.648731	328	larvacean house
7/25/2021	15	31	16.0	46.241997	-124.648764	446	ctenophore
7/25/2021	15	33	11.2	46.241953	-124.648828	492	seeing an increase in ctenophores and larvacean houses
7/25/2021	15	36	22.3	46.241916	-124.648728	567	organic matter in the water column (marine snow) has increased
7/25/2021	15	36	47.8	46.241914	-124.648733	577	large amount of ctenophores here at 573m
7/25/2021	15	38	2.3	46.241957	-124.648725	607	small light pink squid quickly off screen
7/25/2021	15	41	41.0	46.241991	-124.648574	698	large pink jelly with maroon red ring at base of tentacles

date	hr	min	sec	latitude	longitude	Z(m)	H1859 Astoria Canyon 2019 Hydrate Site Description
7/25/2021	15	42	31.7	46.241977	-124.648552	718	shrimp, long siphonophore chain
7/25/2021	15	46	58.6	46.242081	-124.648297	823	large orange squid, 817m
7/25/2021	15	51	44.3	46.242321	-124.648629	845	bottom is in sight
7/25/2021	15	52	9.5	46.242321	-124.648651	846	on the seafloor there are a lot of pink sea stars
7/25/2021	15	53	24.1	46.242341	-124.648676	846	seafloor appears to be soft bottom
7/25/2021	15	55	47.2	46.242370	-124.648680	845	preparing to land Herc
7/25/2021	15	56	59.7	46.242375	-124.648680	845	white balance
7/25/2021	16	4	34.3	46.242400	-124.648706	846	stills cam on and focused
7/25/2021	16	5	30.2	46.242404	-124.648699	846	Herc pilot training
7/25/2021	16	6	34.4	46.242397	-124.648700	846	eel pout
7/25/2021	16	7	20.0	46.242390	-124.648700	846	first goal of this dive is to find the seafloor marker 273
7/25/2021	16	8	48.7	46.242325	-124.648855	847	back on seafloor, observing highly sedimented sea floor with sea stars, hagfish
7/25/2021	16	9	8.4	46.242325	-124.648858	847	water column is fairly turbid
7/25/2021	16	9	50.8	46.242300	-124.649124	847	dark purple jellies swimming near the sea floor
7/25/2021	16	10	37.8	46.242189	-124.649189	847	large thornyheads sitting on the seafloor
7/25/2021	16	12	25.3	46.242202	-124.649318	848	Approaching a very large hydrate pit, covered in hydrate. Dark grey in color with white tips. Some dead seaweed piled in the center of the pit.
7/25/2021	16	13	46.6	46.242190	-124.649344	848	Large pit is very close to the marker placed in 2016, but we have not yet seen the marker. When the marker was originally placed, the seafloor was flat. going to continue to search for marker 273
7/25/2021	16	14	33.2	46.242188	-124.649350	848	preparing to "poke" sea floor to determine the depth and texture of the seafloor
7/25/2021	16	15	38.9	46.242185	-124.649359	848	trash on seafloor
7/25/2021	16	16	50.8	46.242180	-124.649336	848	continuing to search for seafloor marker
7/25/2021	16	17	39.4	46.242152	-124.649325	847	Along the top ridges of the pit, there is a lot of grey/white powder like material.
7/25/2021	16	18	13.6	46.242145	-124.649316	847	seafloor marker 273 was found, very fouled with bryozoans
7/25/2021	16	19	46.8	46.242146	-124.649330	847	white spots on seafloor appears to be hydrate; pooled near the base of the seafloor marker
7/25/2021	16	20	28.4	46.242144	-124.649324	847	taking a closer look at the hydrate
7/25/2021	16	22	30.5	46.242142	-124.649311	846	coming off of the seafloor to find bubble streams using sonar
7/25/2021	16	25	50.3	46.242159	-124.649285	843	investigating feedback on sonar for possible bubble streams
7/25/2021	16	27	38.0	46.242283	-124.649320	848	Approaching target from sonar; observing what appears to be another pit covered in white/grey bacterial mat, shell hash. more fishing line
7/25/2021	16	28	15.8	46.242288	-124.649325	848	very fouled fishing line
7/25/2021	16	29	4.0	46.242289	-124.649334	848	bubble stream found coming out of a fracture within a pit, surrounded by bacterial mats
7/25/2021	16	29	26.1	46.242289	-124.649338	848	thornyhead
7/25/2021	16	31	20.8	46.242291	-124.649332	848	Within the pit there are a lot of rocky edges that bacterial mat have congregated. possible hydrate chunk is hanging off the edge of pit
7/25/2021	16	32	43.1	46.242295	-124.649345	848	investigating possible hydrate for sampling
7/25/2021	16	35	16.6	46.242300	-124.649345	848	at second pit, what we thought may be hydrate was bacterial mat, going to look around here more to find hydrate
7/25/2021	16	36	52.3	46.242297	-124.649349	848	plastic bag

date	hr	min	sec	latitude	longitude	Z(m)	H1859 Astoria Canyon 2019 Hydrate Site Description
7/25/2021	16	38	32.5	46.242306	-124.649351	848	bubbles near kelp/fishing line are getting stronger
7/25/2021	16	41	15.1	46.242304	-124.649342	848	Pit site 2 is at ~848m depth. O2= 0.244%, temp is 4.17C
7/25/2021	16	50	54.5	46.242354	-124.649379	847	still looking around for hydrate
7/25/2021	16	51	16.2	46.242356	-124.649355	847	sablefish resting along the pit in area of soft sediment
7/25/2021	16	52	16.5	46.242360	-124.649238	845	Near pit site, soft sediment is all around. in the soft sediment there are many sea stars
7/25/2021	16	53	19.8	46.242332	-124.649222	848	returning to area with seafloor marker 273 to sample hydrate and bubble streams
7/25/2021	16	55	28.3	46.242285	-124.649256	847	flatfish semi buried in sediment near the second pit site
7/25/2021	16	56	7.2	46.242211	-124.649288	847	traveling over soft sediment en route to marker, observing sea stars, hagfish, and thornyhead on seafloor
7/25/2021	16	58	44.2	46.242200	-124.649319	848	water column is very turbid, there are 2 or more collapsed pits near the marker
7/25/2021	17	0	8.8	46.242177	-124.649310	847	found marker 273 again
7/25/2021	17	1	20.5	46.242138	-124.649300	848	investigating possible hydrate for sampling
7/25/2021	17	11	24.9	46.242155	-124.649342	848	what we thought was hydrate was bacterial mat
7/25/2021	17	12	39.7	46.242154	-124.649339	848	cleaning off marker
7/25/2021	17	15	4.0	46.242149	-124.649341	848	going to explore this area for hydrate/bubble streams
7/25/2021	17	17	20.3	46.242061	-124.649084	839	cleaning dirt off of herc before continuing exploration
7/25/2021	17	25	51.0	46.242110	-124.649199	846	returned to the seafloor over a soft sediment bottom
7/25/2021	17	26	9.0	46.242049	-124.649203	847	sea floor is covered in sea stars
7/25/2021	17	27	13.4	46.242119	-124.649213	847	some black rocky debris in the sediment
7/25/2021	17	27	29.7	46.242122	-124.649280	847	flatfish in soft sediment near large pit
7/25/2021	17	28	9.0	46.242114	-124.649301	847	looking around the edges of the pit with marker 273 for hydrate
7/25/2021	17	28	26.3	46.242113	-124.649327	847	eel pout
7/25/2021	17	32	19.0	46.242164	-124.649417	847	continuing to search for hydrate
7/25/2021	17	35	53.2	46.242195	-124.649297	847	traveling over to the north side of the canyon to find hydrate, waypoint 4
7/25/2021	17	41	4.8	46.242387	-124.649019	847	moving over soft bottom with sea stars
7/25/2021	17	41	50.1	46.242348	-124.648982	847	bubbles in argus cam
7/25/2021	17	43	8.2	46.242300	-124.648788	847	current is strong here
7/25/2021	17	44	20.0	46.242330	-124.648781	848	still traveling over soft sediment with sea stars, flatfish, thornyhead, and hagfish
7/25/2021	17	44	45.2	46.242380	-124.648769	848	sea pen, umbulella
7/25/2021	17	45	2.1	46.242380	-124.648772	848	rathbunaster sea star
7/25/2021	17	46	4.3	46.242535	-124.648780	848	water column is still turbid with strong current
7/25/2021	17	46	53.6	46.242634	-124.648763	848	large red jelly with ruffle like bottom, and white patch on top
7/25/2021	17	50	13.6	46.242797	-124.648630	849	~1400 meters away from next waypoint target; exploring over soft bottom with the same fauna as previously described
7/25/2021	17	54	27.3	46.243054	-124.648331	849	purple sea cucumber
7/25/2021	17	55	4.2	46.243132	-124.648272	849	slight increase in number of sea stars on seafloor
7/25/2021	18	2	44.0	46.243791	-124.647688	849	sea stars that are scattered all over the seafloor may be zoroasteridae
7/25/2021	18	8	15.8	46.244380	-124.647063	849	kelp on sea floor
7/25/2021	18	8	44.3	46.244452	-124.646989	849	benthecodon jelly
7/25/2021	18	12	47.8	46.244964	-124.646529	849	continuing to travel over flat sediment seafloor with seastars, hagfish,
7/25/2021	18	13	46.5	46.245046	-124.646503	850	crab, possible tanner grab

date	hr	min	sec	latitude	longitude	Z(m)	H1859 Astoria Canyon 2019 Hydrate Site Description
7/25/2021	18	15	59.9	46.245301	-124.646210	849	most common fauna over the flat sediment are sea stars, flatfish, hagfish, thornyhead, jellies, ctenophores, occasional unbellula sea pens, and sea cucumbers
7/25/2021	18	16	54.6	46.245431	-124.646153	849	beginning to see more seapens sticking out of the sediment
7/25/2021	18	17	53.1	46.245599	-124.645985	849	umbellula are more common here
7/25/2021	18	22	55.4	46.246129	-124.645466	848	sea cucumber
7/25/2021	18	24	18.6	46.246297	-124.645384	848	seaweed on seafloor
7/25/2021	18	26	38.3	46.246592	-124.645040	847	some visible small holes in the seafloor
7/25/2021	18	27	25.9	46.246710	-124.644994	847	increasing speed to 0.7 knots to get to target faster
7/25/2021	18	29	19.0	46.246999	-124.644771	848	still traveling over soft sediment bottom with sea stars, umbellula sea pens, thornyhead, hagfish, flatfish, and eelpouts
7/25/2021	18	30	11.9	46.247044	-124.644645	847	depression on seafloor
7/25/2021	18	32	51.8	46.247419	-124.644424	848	strong current
7/25/2021	18	35	27.5	46.247879	-124.643924	848	another tanner crab
7/25/2021	18	36	4.3	46.247888	-124.643909	848	pair of 2 sable fish
7/25/2021	18	36	57.4	46.248015	-124.643771	848	macrocystis holdfast
7/25/2021	18	38	38.2	46.248348	-124.643416	847	red jellies are peralia
7/25/2021	18	42	46.9	46.249011	-124.642889	847	continuing to observe similar habitat with same fauna while traveling to waypoint 4, ~580m meters away
7/25/2021	18	43	58.3	46.249127	-124.642726	846	Pennatulacea sea pen
7/25/2021	18	46	18.5	46.249516	-124.642340	846	large pile of sea stars possibly feeding on something
7/25/2021	18	53	20.8	46.250647	-124.641441	843	watch change
7/25/2021	18	58	48.8	46.251663	-124.640700	842	increase in number of jellies
7/25/2021	19	4	19.0	46.252589	-124.640038	840	I think the seastars we are seeing in abundance here on flat sediment plane may be henricia
7/25/2021	19	7	13.3	46.253143	-124.639680	837	We are ~63 m away from WP 4 now, location where we saw bubble stream in survey last night. also saw exposed hydrate here in 2019 on USGS cruise
7/25/2021	19	9	55.4	46.253417	-124.639369	836	Crab, maybe tanner crab?
7/25/2021	19	11	23.8	46.253495	-124.639295	831	just started seeing medium size white gray bacterial mats with a sole nearby
7/25/2021	19	12	6.7	46.253497	-124.639185	829	we are just about at waypoint 4 now
7/25/2021	19	12	51.8	46.253509	-124.638943	829	ROV picked up quite a bit of sediment, cleaning it off now
7/25/2021	19	12	59.6	46.253513	-124.638924	829	doing so a bit east of the site
7/25/2021	19	17	0.9	46.253706	-124.639370	828	Finished cleaning, now at WP4, seeing large strips of white gray bacterial mat, surrounding area still looks similar to what we covered during transit over. lots of flat sediment with hundreds of sea stars, will refer to as henricia but not sure
7/25/2021	19	17	30.5	46.253667	-124.639301	828	seeing the occasional sole and rockfish
7/25/2021	19	18	1.2	46.253633	-124.639282	829	just located bubble stream, now trying to orient rov down current to avoid blowing mud over bubbles
7/25/2021	19	18	44.8	46.253664	-124.639258	828	moving ship due south 20 m over WP4
7/25/2021	19	18	55.0	46.253666	-124.639258	828	still ~3 m off seafloor
7/25/2021	19	21	12.4	46.253628	-124.639345	830	zooms on bubble stream
7/25/2021	19	21	46.1	46.253628	-124.639345	831	site just started bubbling more
7/25/2021	19	22	12.8	46.253638	-124.639338	831	want to zoom to see if white sections behind stream are hydrate or mat
7/25/2021	19	23	57.7	46.253639	-124.639315	831	depth currently is 830 m and oxygen is about 0%, 0.83 uM

date	hr	min	sec	latitude	longitude	Z(m)	H1859 Astoria Canyon 2019 Hydrate Site Description
7/25/2021	19	24	29.6	46.253639	-124.639322	831	bacterial mat surrounding this bubble stream is covered in thousands of tiny white snails
7/25/2021	19	25	5.3	46.253635	-124.639329	831	going to try poking white/gray section to see if hydrate or mat
7/25/2021	19	27	36.5	46.253634	-124.639329	831	when we poked with the manipulator a piece fell down, going to try and look now if this was hydrate or not, some white bits floated away that looked like mat when it fell
7/25/2021	19	29	30.4	46.253644	-124.639332	831	going to move backward and survey the area a bit
7/25/2021	19	29	51.2	46.253630	-124.639328	831	currently sitting in a bit of a bowl where the first stream was located
7/25/2021	19	34	17.1	46.253651	-124.639429	830	General area appears to be white/gray bacterial mat and reduced sediment patches on lumpy large depressions. There are thousands of snails scattered throughout the sediment and also the occasional henricia sea star, thornyhead, and large sole, and grenadier
7/25/2021	19	35	9.6	46.253634	-124.639422	831	at edge of patch in this direction (NW of waypoint 4), now going to head south east again
7/25/2021	19	36	32.8	46.253564	-124.639352	831	heading toward 2019 hydrate marker
7/25/2021	19	37	15.3	46.253456	-124.639452	827	going up in water column now to clean off herc and do some bubble searching in the sonar
7/25/2021	19	37	32.2	46.253456	-124.639448	826	cleaning herc southward of WP4 and hydrate site
7/25/2021	19	40	5.7	46.253464	-124.639433	826	putting away poking stick in porch
7/25/2021	19	40	59.6	46.253468	-124.639438	825	trying to clean sediment off porch in water column
7/25/2021	19	42	12.5	46.253611	-124.639332	828	seeing signal in sonar 5 m away
7/25/2021	19	42	44.1	46.253612	-124.639356	828	looks like it might be the same bubble stream we just saw
7/25/2021	19	44	13.4	46.253628	-124.639336	829	this is the same spot as we were at previously
7/25/2021	19	44	40.5	46.253627	-124.639272	829	now going 5 m south to 2019 hydrate marker
7/25/2021	19	45	20.5	46.253620	-124.639313	830	retracting porch to improve view
7/25/2021	19	45	48.7	46.253619	-124.639331	830	still over same general area as previously described
7/25/2021	19	46	51.5	46.253569	-124.639302	831	mat seems concentrated along high points in slight NW/SE ledge
7/25/2021	19	47	58.3	46.253547	-124.639200	832	Seeing some interspersed small brighter white patches, not sure if they are denser mat patches or clam. probably not clam
7/25/2021	19	48	46.4	46.253456	-124.639168	832	moving ship and ROV south so we can come to marker facing into current instead of with current to tail, for better viz
7/25/2021	19	51	46.5	46.253582	-124.639133	821	now slightly northeast of 2019 hydrate marker, planning to come back down to the seafloor shortly and observe hydrate marker
7/25/2021	19	53	59.8	46.253327	-124.639340	809	we dropped a marker slightly south of the 2019 hydrate marker, where bubbles were just seen in Argus and norbit
7/25/2021	19	58	0.9	46.253325	-124.639256	825	coming back down to seafloor now from around 20 m up
7/25/2021	19	58	25.7	46.253318	-124.639255	834	around 25 m south of hydrate marker now
7/25/2021	19	59	4.2	46.253357	-124.639237	836	now seeing seafloor again, flat and covered in sea stars as earlier
7/25/2021	20	4	8.6	46.253538	-124.639275	832	now 5 or so meters south of bubble marker and hydrate marker
7/25/2021	20	4	36.0	46.253542	-124.639276	831	started seeing white/gray mat again with sea stars surrounding on non-reduced sediment and grenadier, also still poralia floating around
7/25/2021	20	5	37.6	46.253578	-124.639244	831	seeing one large depression ahead of us
7/25/2021	20	6	31.0	46.253585	-124.639250	831	looks like this depression is the 2019 sampling location, impression beside it looks like it may be one of the clam pots

date	hr	min	sec	latitude	longitude	Z(m)	H1859 Astoria Canyon 2019 Hydrate Site Description
7/25/2021	20	6	46.4	46.253589	-124.639250	831	confirmed, just located marker 3 from falkor cruise
7/25/2021	20	8	18.5	46.253592	-124.639280	830	now looking around to see if there is exposed hydrate where we are and near the depression
7/25/2021	20	9	13.0	46.253604	-124.639300	830	just seeing bacterial mat and gastropods on depression edge
7/25/2021	20	10	33.4	46.253638	-124.639331	830	now back at previous bubble stream NE of 2019 marker depression
7/25/2021	20	16	0.5	46.253566	-124.639382	830	Appears bacterial mat continues NE past the NE bubblestream site. Turning to observe waypoint 4 now
7/25/2021	20	16	45.8	46.253558	-124.639283	831	boarder of seep seems to be 5 m or so SE of NE bubble markers we dropped
7/25/2021	20	18	47.2	46.253580	-124.639242	831	now seeing bacterial mat start again
7/25/2021	20	19	1.8	46.253580	-124.639242	831	had just been transiting over background sediment east of 2019 marker
7/25/2021	20	19	36.9	46.253597	-124.639232	831	cleaning marker 3 off a bit now
7/25/2021	20	21	28.7	46.253605	-124.639233	831	trying to adjust poking stick on porch
7/25/2021	20	24	48.3	46.253605	-124.639232	830	marking current marker location again, to compare to previous navigation
7/25/2021	20	25	42.7	46.253587	-124.639297	830	now will take a gas tight sample at the previous NE bubble stream marker
7/25/2021	20	26	36.7	46.253598	-124.639420	830	seeing large scar in mat just south of general NW/SE depression and mat ridge we've been on
7/25/2021	20	27	11.6	46.253630	-124.639424	829	scar was a few meters long and about a meter wide
7/25/2021	20	28	8.7	46.253650	-124.639329	830	back near first depression looking for bubble curtain
7/25/2021	20	28	44.6	46.253646	-124.639310	831	back at bubble curtain
7/25/2021	20	30	0.2	46.253518	-124.639309	829	Was actually a new third bubble stream. There are 3 in a row here (running SW To NE) in the NW portion of the field we've been on
7/25/2021	20	31	31.6	46.253586	-124.639256	831	see bubble stream in seaking trying to get back to curtain
7/25/2021	20	31	55.6	46.253598	-124.639321	830	possible large empty clam shell, just one
7/25/2021	20	32	20.6	46.253640	-124.639322	831	now found curtain, setting back down in large depression here to sample gas tight
7/25/2021	20	36	2.9	46.253643	-124.639333	831	Just punched bubble stream because manipulator was stuck. Looks like funnel cracked all the way through. going to try sampling with it anyway
7/25/2021	20	40	4.4	46.253641	-124.639330	831	Going to try to sample with other GT, first one is caught in porch crate
7/25/2021	20	40	54.5	46.253641	-124.639327	831	filling now
7/25/2021	20	41	9.3	46.253639	-124.639328	831	enough gas now, forming hydrate
7/25/2021	20	42	54.2	46.253642	-124.639332	831	not sure that gas tight properly triggered
7/25/2021	20	43	19.7	46.253641	-124.639331	831	will try to trigger with two arms
7/25/2021	20	43	44.6	46.253637	-124.639332	831	if this second attempt at triggering with single arm doesn't work
7/25/2021	20	46	11.6	46.253642	-124.639330	831	using second arm now to adjust hydrate sampler position
7/25/2021	20	48	26.1	46.253635	-124.639331	831	going to hand hydrate sampler to secondary manipulator and push trigger with primary
7/25/2021	20	52	43.6	46.253639	-124.639328	831	looks like the O-ring came further out this time (maybe about 1/4 of the way up the actuator)
7/25/2021	20	52	56.1	46.253640	-124.639327	831	Tamara thinks that's enough
7/25/2021	20	54	15.5	46.253632	-124.639327	831	going to try and push in more again
7/25/2021	20	55	8.5	46.253644	-124.639324	831	now seems to be enough
7/25/2021	20	56	21.4	46.253637	-124.639331	831	last sample was GT 18-2 correction (indicates mini body)

date	hr	min	sec	latitude	longitude	Z(m)	H1859 Astoria Canyon 2019 Hydrate Site Description
7/25/2021	20	57	35.6	46.253638	-124.639336	831	now going to attempt to use hydrate sampler with broken cone
7/25/2021	20	58	31.6	46.253640	-124.639334	831	GT 17-2 cone was just completely broken
7/25/2021	20	58	55.5	46.253638	-124.639336	831	got stuck again somewhere and then cracked
7/25/2021	21	0	3.6	46.253632	-124.639332	831	readjusting grip on GT17-2 so we can sample background water near bubble plume
7/25/2021	21	2	55.5	46.253636	-124.639337	831	will now take niskins 1, 4, and 10 m over bubble plume area
7/25/2021	21	4	36.4	46.253637	-124.639335	831	lots of hydrate forming on Herc deck
7/25/2021	21	5	36.6	46.253637	-124.639320	830	Amanda Demopoulos updated to say the scattered dead shells we have been seeing are acarax
7/25/2021	21	7	53.7	46.253659	-124.639341	831	positioning for niskin 1 m up
7/25/2021	21	13	31.5	46.253643	-124.639353	830	now going to core
7/25/2021	21	19	13.6	46.253630	-124.639374	831	seemed hard halfway through
7/25/2021	21	25	55.3	46.253635	-124.639368	831	retrieving core liner that was just dropped prior to second push core
7/25/2021	21	28	44.6	46.253633	-124.639366	831	just finished returning dropped push core to quiver
7/25/2021	21	31	43.8	46.253681	-124.639368	831	sampling sea stars
7/25/2021	21	39	12.3	46.253676	-124.639378	831	seeing some sablefish
7/25/2021	21	41	59.9	46.253674	-124.639378	830	Preparing to take 25 m down current NIskin
7/25/2021	21	46	21.9	46.253476	-124.639504	837	Sea stars we are sampling were also sampled in 2019. Still not sure what species these are, will get close up to try and ping Chris Mah for ID
7/25/2021	21	46	33.6	46.253476	-124.639504	837	will also be good to compare to 2019 samples
7/25/2021	21	47	53.1	46.253476	-124.639504	837	spelling correction, acharax (solemyid clam)
7/25/2021	21	48	3.2	46.253476	-124.639503	837	waiting for dust to clear for 25 m niskin
7/25/2021	21	50	24.0	46.253475	-124.639504	837	still waiting for dust to clear
7/25/2021	21	53	45.2	46.253477	-124.639499	837	last 25 m off niskin was ~1 m above seafloor
7/25/2021	21	54	47.1	46.253380	-124.639317	837	now going to transit toward waypoint 5, stepping ship 408 m bearing 156, moving 0.5 kts
7/25/2021	21	55	8.8	46.253356	-124.639264	837	around 200 m away from GT site we will trigger a 4th niskin
7/25/2021	21	56	1.3	46.253325	-124.639231	834	25 m off niskin was over area similar to that previously seen, flat with abundant red sea stars and this is the terrain and fauna we are seeing during transit currently
7/25/2021	21	56	60.0	46.253299	-124.639234	823	seems we lost scoop
7/25/2021	21	59	29.6	46.253122	-124.638994	832	around 11 m off bottom (were just around 30 m off bottom) trying to clean mud off herc during transit
7/25/2021	22	1	13.3	46.253008	-124.638760	836	back on seafloor, still over flat sediment with 100s of small sea stars
7/25/2021	22	4	43.9	46.252602	-124.638519	836	about 112 meters from GT sampling location now, still transiting directly toward WP5 around 2-3 m off the seafloor
7/25/2021	22	4	55.4	46.252584	-124.638519	836	fauna and terrain have not changed
7/25/2021	22	5	6.0	46.252563	-124.638519	836	the occasional thornyhead
7/25/2021	22	14	60.0	46.251111	-124.637807	839	Changing ship step size to 75 m at the same heading
7/25/2021	22	15	37.8	46.251007	-124.637657	839	lots of seastars at the seafloor
7/25/2021	22	19	5.7	46.250604	-124.637439	838	15 m from ship stop which should be over WP5
7/25/2021	22	20	44.5	46.250541	-124.637400	838	ship is in position, waiting for vehicles to catch up
7/25/2021	22	22	21.0	46.250478	-124.637413	838	zooms on large crabs, maybe tanner crab
7/25/2021	22	23	11.7	46.250413	-124.637243	838	saw another large crab

date	hr	min	sec	latitude	longitude	Z(m)	H1859 Astoria Canyon 2019 Hydrate Site Description
7/25/2021	22	23	38.1	46.250330	-124.637253	838	occasional hagfish and thornyhead, still mostly hundreds of small pink sea stars and flat bottom sediment
7/25/2021	22	24	34.5	46.250315	-124.637223	835	seeing bubble signal ~15 m out in NORBIT and seaking
7/25/2021	22	26	13.4	46.250325	-124.637223	837	Can see a depression surrounding bubble stream in sonar
7/25/2021	22	28	22.8	46.250247	-124.637195	837	starting to see edge of bacterial mat
7/25/2021	22	30	10.1	46.250192	-124.637214	836	now over the depression we were seeing, surrounded by white bacterial mat and black reduced sediment
7/25/2021	22	30	25.9	46.250193	-124.637212	836	located bubble stream on southern end of small depression, a few meters wide
7/25/2021	22	31	40.7	46.250191	-124.637210	838	seeing a piece of wood right next to the bubble stream
7/25/2021	22	32	0.5	46.250191	-124.637214	838	will take a niskin above the bubble stream
7/25/2021	22	32	59.2	46.250185	-124.637210	838	zooming on bubble source, about 3 little streams
7/25/2021	22	34	49.2	46.250180	-124.637221	838	might be seeing a little hydrate above the bubble stream, not sure though and probably not big enough to sample
7/25/2021	22	35	54.3	46.250194	-124.637220	838	looks like maybe just a hydrate coating on sediment
7/25/2021	22	41	26.7	46.250188	-124.637217	837	lifting 1 m up for niskin
7/25/2021	22	42	43.5	46.250160	-124.637244	837	depth here has been ~836 m and oxygen still ~0%, 0.9 uM
7/25/2021	22	44	39.0	46.250155	-124.637294	837	bumped too low, got rov dirty again and had to clean it off just now, now approaching bubble stream again for Niskin
7/25/2021	22	45	46.4	46.250190	-124.637277	837	note that bubble site we have been at is ~6 m NW of WP5, likely what we saw in water column data though
7/25/2021	22	53	9.8	46.250170	-124.637268	838	coring now at top of depression near bubbles
7/25/2021	23	2	37.6	46.250173	-124.637267	838	Working on our 4th core sample
7/25/2021	23	6	57.8	46.250173	-124.637272	838	Pushcore #4 successful, moving on to take another pushcore 5 m from the plume
7/25/2021	23	8	5.7	46.250158	-124.637289	838	Hagfish and sea stars across the flat sea floor
7/25/2021	23	13	53.9	46.250154	-124.637280	838	Holder for Core #5 might not have a proper exit for water as a sizable amount of sediment escaped when returning the sample
7/25/2021	23	14	42.6	46.250156	-124.637283	838	Looking to continue to explore this small crater area (~10m) via survey lines
7/25/2021	23	16	9.4	46.250114	-124.637298	838	Likely going to stir up mud as we continue to move; tentatively plan to move higher in the water column to clear Herc
7/25/2021	23	16	49.0	46.250069	-124.637293	838	Zoarcidae (eel pout), thornyheads, and hundreds of sea stars are scattered across the sedimented bottom
7/25/2021	23	17	39.2	46.250067	-124.637289	838	Heading east to continue exploring the area
7/25/2021	23	18	1.7	46.250108	-124.637275	838	Argus moving lower in the water column, now at 23 m
7/25/2021	23	19	0.6	46.250109	-124.637214	837	Sablefish captured eelpout
7/25/2021	23	19	25.7	46.250114	-124.637189	837	Big red jelly fish seen hovering over the sea floor
7/25/2021	23	20	30.6	46.250108	-124.637077	837	Plan to travel in a square in order to properly survey the area
7/25/2021	23	21	27.9	46.250115	-124.637258	837	Sizable amount of turbidity due to loss nature of sea floor and sedimentation already on herc
7/25/2021	23	22	26.4	46.250112	-124.637272	837	Waiting for turbidity to clear before continuing exploration
7/25/2021	23	22	43.1	46.250113	-124.637271	837	300 m from the crater wall
7/25/2021	23	23	20.5	46.250112	-124.637270	837	Ctenophores and jellies in the water column
7/25/2021	23	23	40.2	46.250112	-124.637258	837	Approaching grey/white microbial mats
7/25/2021	23	24	52.0	46.250183	-124.637222	837	Large thornyhead, sole, and eelpout

date	hr	min	sec	latitude	longitude	Z(m)	H1859 Astoria Canyon 2019 Hydrate Site Description
7/25/2021	23	25	46.3	46.250103	-124.637280	836	Herc is rising in the water column to remove sedimentation and wait for better visibility
7/25/2021	23	27	48.6	46.250125	-124.637276	837	Now the visibility has increased, Herc is taking another pass over this small crater
7/25/2021	23	28	21.5	46.250150	-124.637252	838	Passing over large piece of wood in depression again
7/25/2021	23	29	12.6	46.250186	-124.637206	837	Sable fish, thornyheads, eelpouts, sea stars, and microbial mats scattered across the sea floor
7/25/2021	23	29	43.5	46.250185	-124.637221	836	Several poralia floating past Herc forward camera
7/25/2021	23	30	16.9	46.250131	-124.637395	836	Low visibility; waiting for visibility to clear before starting on the next pass
7/25/2021	23	31	50.1	46.250133	-124.637317	838	Currently exploring a small crater at 837 m, the oxygen saturation is 0.236% and 0.89 umol/L
7/25/2021	23	32	36.9	46.250181	-124.637300	838	Sea stars appear more abundant outside the border of the grey/white microbial mat
7/25/2021	23	33	13.7	46.250141	-124.637278	838	Depression made by Herc visible on the sea floor
7/25/2021	23	34	32.2	46.250127	-124.637239	837	Visible crater likely an example of a large pocket of methane and once collapsed a pit was created
7/25/2021	23	35	23.0	46.250184	-124.637234	837	Bubble stream clearly visible
7/25/2021	23	36	51.9	46.250122	-124.637174	834	Reposition to zoom into the "log" located at the bottom of the pit near the methane plume
7/25/2021	23	39	13.7	46.250133	-124.637219	836	Poralia seen floating through the water column
7/25/2021	23	40	26.0	46.250149	-124.637215	837	Several large sable fish and thornyhead rockfish
7/25/2021	23	41	8.0	46.250149	-124.637248	838	Tornado of sediment and everything is being stired up
7/25/2021	23	41	18.5	46.250149	-124.637249	838	Waiting a min or two for better visibility
7/25/2021	23	45	54.9	46.250147	-124.637237	838	Heading NE to explore the canyon wall
7/25/2021	23	47	53.2	46.250145	-124.637239	838	Vessel takes 031 heading to next exploration destination
7/26/2021	0	0	57.5	46.251273	-124.636725	836	seafloor is covered in patches of sea stars, and sea pens, flat sediment bottom
7/26/2021	0	1	53.3	46.251332	-124.636675	835	water column is still turbid with marine snow
7/26/2021	0	2	35.6	46.251427	-124.636531	835	thornyhead resting on seafloor
7/26/2021	0	3	38.1	46.251430	-124.636505	834	sea stars appear to be on top of something possibly a food source
7/26/2021	0	4	45.4	46.251450	-124.636475	834	exploring seafloor to find a site with hydrate for sampling
7/26/2021	0	5	29.0	46.251506	-124.636396	834	large piece of trash, plastic
7/26/2021	0	6	40.9	46.251609	-124.636332	833	continuing to see large clusters of sea stars on sea floor, turbid water column, and a strong current
7/26/2021	0	7	29.2	46.251773	-124.636216	833	~180m away from next target
7/26/2021	0	9	49.3	46.251783	-124.636098	833	`First sablefish in a while seen
7/26/2021	0	11	38.0	46.251978	-124.636024	832	most prominent fauna present on soft bottom seafloor are sea stars, rathbunaster sea stars, hagfish, thornyhead, sea pens
7/26/2021	0	12	47.4	46.252139	-124.635878	831	interesting feedback on sonar
7/26/2021	0	17	55.8	46.252306	-124.635591	831	Continuing to head NE towards canyon wall
7/26/2021	0	18	39.2	46.252358	-124.635557	831	More sablefish, a rathbunaster, multiple poralia, and endless sea stars
7/26/2021	0	20	34.1	46.252460	-124.635503	830	Herc touched down on the slight incline resulting in more turbidity
7/26/2021	0	21	15.3	46.252487	-124.635460	829	Big red jelly floating along the sea floor
7/26/2021	0	22	3.1	46.252501	-124.635422	827	Traversing towards canyon wall, Herc is currently 2 m above the sea floor, and the oxygen saturation is 0.228%
7/26/2021	0	22	50.2	46.252537	-124.635361	824	Lots of poralia in between herc and argus
7/26/2021	0	23	2.4	46.252543	-124.635361	823	Potential sea fan

date	hr	min	sec	latitude	longitude	Z(m)	H1859 Astoria Canyon 2019 Hydrate Site Description
7/26/2021	0	23	26.5	46.252566	-124.635354	823	Large thornyhead rockfish and several soles
7/26/2021	0	23	47.1	46.252567	-124.635333	823	Going to move alongside the side of the canyon and then continue exploring up the canyon wall
7/26/2021	0	23	55.1	46.252566	-124.635333	823	Vessel is stopped
7/26/2021	0	24	37.1	46.252554	-124.635257	823	Climbing the canyon slope
7/26/2021	0	25	10.7	46.252567	-124.635257	821	Vessel stepping 50 m at 050
7/26/2021	0	25	32.3	46.252600	-124.635257	820	Sole
7/26/2021	0	28	45.5	46.252741	-124.635118	809	Sea stars less abundant on canyon slope, multiple eelpout, and potentially small sponge or zoanthids on the sea floor
7/26/2021	0	32	28.3	46.253000	-124.634861	798	Sponge-like cobbles likely carbonate
7/26/2021	0	32	58.1	46.252995	-124.634838	797	Traversing NE up the sloped canyon wall, currently at 797 m
7/26/2021	0	34	39.2	46.253049	-124.634710	792	Small sea stars scattering the sea floor, the large clusters appear cobble-like
7/26/2021	0	34	57.6	46.253050	-124.634690	790	Poralia still abundant between Herc and Argus
7/26/2021	0	36	27.5	46.253121	-124.634587	784	Carbonate cobbles, big red jellies, and thornyhead rockfish
7/26/2021	0	37	16.3	46.253139	-124.634502	780	Carbonate cobbles have become more abundant as we head up the slope
7/26/2021	0	37	41.2	46.253171	-124.634487	779	Sole and thornyhead rockfish
7/26/2021	0	38	15.5	46.253178	-124.634484	777	Vessel moves 50 m at 050 heading
7/26/2021	0	39	38.3	46.253221	-124.634363	774	Big red jelly fish
7/26/2021	0	40	11.8	46.253260	-124.634378	774	Continuing to traverse upwards on the canyon wall
7/26/2021	0	40	30.4	46.253263	-124.634259	774	Vessel full stop; beginning the recovery process
7/26/2021	0	40	58.8	46.253281	-124.634272	773	Sole, thornyhead fish, and sea fan spotted on the sea floor
7/26/2021	0	41	52.8	46.253009	-124.634434	775	Sizably turbidity water column filled with particles and jellies
7/26/2021	0	42	51.9	46.252842	-124.634400	771	Herc recovery process has begun; currently at 772 m
7/26/2021	0	43	49.7	46.252786	-124.634519	759	Moving at 12 m/min
7/26/2021	0	49	23.4	46.252806	-124.634842	690	Ctenophore and poralia in front of herc
7/26/2021	0	50	31.4	46.252805	-124.634799	673	Continuing upwards in the water column, 15 m/min, currently at ~675 m
7/26/2021	1	1	3.1	46.252912	-124.634783	508	Quiver #1 appeared to lose some sedimentation during ascent
7/26/2021	1	4	29.2	46.252795	-124.634673	458	Continuing our ascent to the surface at 15 m/min, currently at ~460 m
7/26/2021	1	4	46.3	46.252774	-124.634637	454	Oxygen saturation is now 5.10%
7/26/2021	1	8	58.6	46.252695	-124.634325	391	Visibility has increased as we ascend in the water column, currently at ~390 m
7/26/2021	1	13	23.6	46.252698	-124.633893	326	Estimated 30 min on deck
7/26/2021	1	17	9.4	46.252804	-124.633753	271	Ascending at 15 m/min, currently at around 270 m
7/26/2021	1	18	56.5	46.252961	-124.633822	243	Checking the status of the boxes and sampling tools to make sure everything is stowed for recovery
7/26/2021	1	22	25.0	46.253205	-124.633968	190	Estimated time to the surface is ~12-15 min
7/26/2021	1	29	34.3	46.253775	-124.634329	75	Ascending at 13 m/min, currently at 75 m
7/26/2021	1	30	48.1	46.253940	-124.634380	59	Herc and Argus are lined up well behind the vessel, we are approaching 50 m
7/26/2021	1	31	43.9	46.254035	-124.634360	51	Holding at 50 m, waiting on deck crew to assemble for recovery
7/26/2021	1	35	5.9	46.254271	-124.634438	14	Argus camera leveled for recovery
7/26/2021	1	39	32.0	46.255115	-124.634700	9	Argus on deck, the recovery of Herc continues

Table 14: H1860 East of Kulm Deep Dive Log

date	hr	min	sec	latitude	longitude	Z(m)	H1860 E of Kulm Deep Description
7/26/2021	15	17	4.0	45.612847	-124.993038	138	USBL technical issues, repowered
7/26/2021	15	21	58.3	45.612837	-124.993179	278	larvacean houses and marine snow in the water column
7/26/2021	15	26	21.5	45.612859	-124.993148	403	small shrimp, beginning to see lanternfish swim down at 400m
7/26/2021	15	34	57.8	45.612907	-124.993258	643	poralia jelly
7/26/2021	15	37	10.0	45.612932	-124.993369	704	ctenophore
7/26/2021	15	44	59.2	45.612863	-124.993265	928	larvacean house, steady amount of marine snow in water column, occasional jellies
7/26/2021	16	12	43.6	45.612915	-124.992559	1599	Made contact with the seafloor, going to waypoint one in search of bubble streams
7/26/2021	16	13	50.2	45.613179	-124.992772	1598	doppler reset
7/26/2021	16	15	10.5	45.613270	-124.992813	1598	soft sediment seafloor
7/26/2021	16	15	25.0	45.613273	-124.992813	1597	white balance
7/26/2021	16	20	50.8	45.613316	-124.992604	1593	rattail resting on seafloor
7/26/2021	16	22	29.8	45.613259	-124.992611	1593	Poralia jelly moving along seafloor
7/26/2021	16	24	18.9	45.613152	-124.992547	1598	octopus, purple on seafloor
7/26/2021	16	25	12.5	45.613129	-124.992424	1599	markings on seafloor, multiple pacific grenadier
7/26/2021	16	25	56.8	45.613146	-124.992409	1599	a lot of white shell debris on the seafloor, and two sea pigs
7/26/2021	16	26	34.4	45.613151	-124.992387	1599	large grenadier
7/26/2021	16	27	19.3	45.613142	-124.992351	1599	lot of "path" markings on the seafloor, beginning to see some bacterial mat, white in color
7/26/2021	16	27	36.8	45.613141	-124.992346	1599	zoom on a sea pig
7/26/2021	16	29	5.7	45.613133	-124.992269	1599	large clam shell fragments near bacterial mat, sea pigs are scattered throughout sediment
7/26/2021	16	29	25.6	45.613132	-124.992262	1599	larger patch of bacterial mat, appears to be on a slope
7/26/2021	16	31	7.0	45.613138	-124.992231	1598	Possible sighting of bubbles in niskin cam. not a stream
7/26/2021	16	32	15.4	45.613151	-124.992119	1596	Beginning to see sea pens, larger shell fragments, and grenadier fish. markings on seafloor may be from sea pigs
7/26/2021	16	33	30.7	45.613097	-124.992001	1597	large area of bacterial mats, multiple patches, on top of waypoint1
7/26/2021	16	35	14.4	45.613078	-124.991989	1598	Poralia jellies flowing along the sea floor near bacterial mats
7/26/2021	16	37	36.1	45.613038	-124.991967	1600	large conical whelk shell in bubblecam
7/26/2021	16	40	11.9	45.613152	-124.992130	1595	on the slope there are bacterial mats and large shell hash fragments
7/26/2021	16	40	32.3	45.613165	-124.992126	1592	Using norbit to locate bubble streams, coming off the sea floor
7/26/2021	16	47	12.4	45.613167	-124.992112	1585	there is more noise from the water column when norbit is facing in the downward position, not locating any bubble streams on the Norbit sonar
7/26/2021	16	48	12.2	45.613162	-124.992118	1588	coming back down to the seafloor
7/26/2021	16	53	24.3	45.613092	-124.992167	1597	returning to seafloor near first waypoint where we previously saw minor bubbling
7/26/2021	16	54	2.8	45.613096	-124.992193	1597	continuing to see bacterial mat on the slope, Poralia, and grenadier
7/26/2021	16	55	37.8	45.613140	-124.992209	1596	looking for bubble streams
7/26/2021	16	57	8.8	45.613180	-124.992242	1596	some sea pens with sediment on surface

date	hr	min	sec	latitude	longitude	Z(m)	H1860 E of Kulm Deep Description
7/26/2021	17	0	16.9	45.613158	-124.992256	1596	There are small holes in the seafloor. and many signs of bubble streams, however none have been seen yet
7/26/2021	17	2	23.8	45.613103	-124.992172	1597	near the base of the slope, many bacterial mats here
7/26/2021	17	3	38.1	45.613083	-124.992165	1599	large conical shell, possibly with an live organism inside
7/26/2021	17	4	13.0	45.613046	-124.992171	1600	lower down on the slope there are more shell hash fragments
7/26/2021	17	4	35.9	45.613027	-124.992144	1600	grenadier fish
7/26/2021	17	5	18.7	45.613021	-124.992141	1601	hagfish
7/26/2021	17	6	51.1	45.613025	-124.992183	1601	moving up slope to find bubble streams
7/26/2021	17	7	28.1	45.613045	-124.992210	1600	very large bivalve shells
7/26/2021	17	8	14.0	45.613045	-124.992202	1600	possible orange whelk
7/26/2021	17	13	24.9	45.613085	-124.992230	1599	denser/fuzzy bacterial mat with shell hash, going to look around it for bubbles
7/26/2021	17	14	51.7	45.613073	-124.992246	1599	pink anemone
7/26/2021	17	17	43.2	45.613107	-124.992242	1598	when the ROV briefly made contact with the sea floor, bubbles escaped at the point of contact
7/26/2021	17	18	18.2	45.613107	-124.992239	1598	heading over to waypoint 2
7/26/2021	17	20	45.0	45.613178	-124.992104	1596	Long sea pens, possibly sea whips all leaning forward in the same direction. no more bacterial mat in soft sediment, less sea pigs
7/26/2021	17	23	19.1	45.613267	-124.991909	1593	large depressions in the seafloor with shell hash
7/26/2021	17	24	10.6	45.613284	-124.991928	1592	sediment covered debris, possibly rock
7/26/2021	17	25	40.1	45.613371	-124.991900	1595	large bundles of tube worms, thin and fuzzy with 2 flytrap anemones resting on top of them
7/26/2021	17	26	26.9	45.613353	-124.991902	1595	near the tube worms there is fairly light white staining on the sediment, indicative of bacterial mat
7/26/2021	17	27	12.6	45.613342	-124.991854	1595	Large fragment of carbonate rock with many holes and crevices. two basket stars are settling on the rock
7/26/2021	17	48	27.9	45.613350	-124.991886	1597	crab inside of a conical shell, almost looks like a hermit crab, but larger in size, orange
7/26/2021	17	51	49.1	45.613356	-124.991893	1597	pause bio break
7/26/2021	18	6	13.9	45.613329	-124.991879	1597	heading to waypoint 2
7/26/2021	18	7	48.1	45.613370	-124.991779	1596	traveling over soft sediment on a slight slope
7/26/2021	18	9	4.1	45.613429	-124.991454	1601	large white rathbunaster sea star, approaching more shell hash
7/26/2021	18	10	10.6	45.613391	-124.991463	1601	nearing waypoint 2
7/26/2021	18	11	28.0	45.613407	-124.991368	1601	at waypoint 2; slime star resting in shell hash, eel pout, sea pig, still observing markings/lines in sediment
7/26/2021	18	11	42.6	45.613407	-124.991366	1601	moving over to waypoint 3
7/26/2021	18	12	27.8	45.613416	-124.991362	1600	ophiuroid
7/26/2021	18	13	21.0	45.613432	-124.991314	1597	within the shell hash there are more authigenic carbonate bits
7/26/2021	18	14	19.5	45.613581	-124.991458	1596	facing the edge of a slope
7/26/2021	18	15	51.0	45.613709	-124.991575	1592	on the side of the slope there are more authigenic carbonate pieces scattered
7/26/2021	18	18	38.7	45.613747	-124.991541	1589	small shallow shelf/ledge feature with Neptunia egg towers and basket star
7/26/2021	18	19	19.6	45.613734	-124.991619	1590	moving to waypoint 3
7/26/2021	18	21	56.3	45.613772	-124.991678	1592	instead of moving to waypoint 3, we are going to waypoint 6
7/26/2021	18	22	40.9	45.613795	-124.991689	1593	kelp blades

date	hr	min	sec	latitude	longitude	Z(m)	H1860 E of Kulm Deep Description
7/26/2021	18	23	31.7	45.613812	-124.991666	1592	repositioning ship and vehicles to move towards waypoint 6
7/26/2021	18	28	19.7	45.613940	-124.991680	1586	as we travel up on the slope, areas that "hang" more freely in the water column seem to have more authigenic carbonate compared to flat sedimented areas
7/26/2021	18	29	9.0	45.614087	-124.991720	1587	deep sea hermit crab
7/26/2021	18	31	53.8	45.614195	-124.991796	1587	tanner crab,
7/26/2021	18	33	47.5	45.614288	-124.991783	1588	another authigenic carbonate ledge with rathbunaster seastars and sea pens nearby
7/26/2021	18	38	10.9	45.614539	-124.991803	1589	sea pigs, shell hash, deep sea hermit crabs, brittle stars, and a patch of sea pens near waypoint 6
7/26/2021	18	39	52.8	45.614602	-124.991870	1591	Increase in number of sea pens, more scattered carbonate on seafloor with shell hash and faint bacterial mats. sea pigs, brittle stars
7/26/2021	18	41	15.1	45.614679	-124.991891	1592	Large flytrap anemone resting on sea floor. two large red shrimp
7/26/2021	18	42	35.1	45.614718	-124.991892	1591	patch of white material in soft sediment, shell hash or bacterial mat
7/26/2021	18	44	12.0	45.614915	-124.991946	1590	deep sea hermit crab
7/26/2021	18	44	28.1	45.614938	-124.991961	1590	at waypoint 5
7/26/2021	18	45	45.4	45.614977	-124.991953	1591	similar habitat at waypoint 5
7/26/2021	18	46	20.0	45.614950	-124.991961	1591	doppler reset
7/26/2021	18	47	51.6	45.614948	-124.992080	1589	approaching the edge of the ridge; on this small edge there is more carbonate and shell hash
7/26/2021	18	48	38.0	45.615097	-124.992084	1590	beginning to enter the 20m deep "crater" in the seafloor
7/26/2021	18	49	23.9	45.615214	-124.992191	1592	moving back over soft sediment with sea pens, poralia jellies
7/26/2021	18	51	58.1	45.615331	-124.992264	1594	watch change
7/26/2021	18	53	11.4	45.615361	-124.992328	1594	Traveling over mostly soft sediment bottom with occasional patches of authigenic carbonate and shell hash patches. sea pens are located in soft sediment along with rathbunaster sea stars
7/26/2021	18	57	38.8	45.615460	-124.992471	1596	some shell hash in front of us on the top of the ridge feature we've been traversing
7/26/2021	18	58	52.5	45.615492	-124.992650	1595	Besides clam hash and carbonate bits on top of ridge, seeing light sediment without much on it. The occasional crab, genadier, and orange anemone
7/26/2021	18	59	40.0	45.615527	-124.992672	1596	anemones maybe actinoscyphia
7/26/2021	19	1	49.3	45.615535	-124.992750	1596	we are currently 146 m away from waypoint 3, To the northeast
7/26/2021	19	2	32.4	45.615527	-124.992803	1595	we are going to head toward WP3 in middle of depression now (original WP3)
7/26/2021	19	3	21.0	45.615530	-124.992795	1595	the ridge we have been on is along the East side of the very large crater that WP3 is at the center of
7/26/2021	19	8	33.9	45.615503	-124.993132	1603	starting our descent into the crater
7/26/2021	19	10	21.5	45.615457	-124.993339	1610	we are around 1608 m currently (ridge was a bit higher)
7/26/2021	19	11	9.5	45.615454	-124.993463	1611	current is flowing to the East
7/26/2021	19	12	25.3	45.615386	-124.993453	1611	seeing large fish that looks like grenadier but isn't, different tail and very long dorsal fin
7/26/2021	19	13	18.5	45.615361	-124.993470	1609	seeing scattered translucent holothurians along the seafloor
7/26/2021	19	13	28.7	45.615365	-124.993480	1609	also seeing large poralia jellies

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7/26/2021	19	15	28.5	45.615289	-124.993579	1611	Zooms on orange anemone that might be actinoscyphia, also saw some black ridged things that might have been shells?
7/26/2021	19	16	33.3	45.615220	-124.993623	1612	about 50 m NE of WP3 now, still seeing just sloped flat light sediment with scattered shells and holothurians
7/26/2021	19	16	57.6	45.615214	-124.993623	1612	shells seem almost ten cm long and ridged on the outside, all empty
7/26/2021	19	18	0.1	45.615174	-124.993705	1611	octopus
7/26/2021	19	21	19.4	45.614971	-124.994005	1615	last fish was a pacific flat nose, antimora microlepsis
7/26/2021	19	23	40.0	45.614872	-124.994050	1615	seeing occasional neptunia
7/26/2021	19	24	57.9	45.614770	-124.994154	1616	now just over waypoint 3, will now head back upslope SE toward WP7
7/26/2021	19	25	10.3	45.614762	-124.994154	1616	pacific flat nose, maybe same one
7/26/2021	19	25	23.0	45.614758	-124.994153	1616	sablefish
7/26/2021	19	29	16.1	45.614697	-124.994045	1616	lone anemone with a shrimp
7/26/2021	19	31	5.0	45.614641	-124.993805	1616	transiting toward WP7, still seeing same terrain and almost no fauna, but when present same as before
7/26/2021	19	34	9.5	45.614414	-124.993644	1616	another pacific flat nose
7/26/2021	19	36	29.8	45.614294	-124.993598	1615	Now about halfway through WP3 and WP7, heading gently upslope. Still just some scattered holothurians, now a grenadier, and an anemone. very little fauna generally
7/26/2021	19	39	28.1	45.614104	-124.993317	1614	just passed by a trash pile with tarp and line, covered in multiple anemones, neptunia egg stacks and neptunia, and some large shrimp
7/26/2021	19	40	24.7	45.614064	-124.993178	1612	grenadier
7/26/2021	19	42	0.4	45.613960	-124.993139	1611	we're just about at WP7, not much to see here
7/26/2021	19	43	11.7	45.613904	-124.993109	1609	heading now to minor bubbling target, near original dive site
7/26/2021	19	43	41.1	45.613906	-124.993107	1609	still seeing occasional acharax shell
7/26/2021	19	44	40.6	45.613924	-124.992957	1607	small crab
7/26/2021	19	45	57.3	45.613945	-124.992856	1605	doing gauge checks
7/26/2021	19	46	53.7	45.613882	-124.992852	1604	still seeing same sparse fauna and terrain
7/26/2021	19	51	18.5	45.613700	-124.992689	1595	back over some carbonate rubble approaching ridge top
7/26/2021	19	52	12.6	45.613699	-124.992709	1595	skate body maybe 70 cm from tail base to nose
7/26/2021	19	53	21.6	45.613639	-124.992512	1592	small hermit crab
7/26/2021	19	55	18.7	45.613558	-124.992485	1592	small depression here with acharax shells
7/26/2021	20	8	4.1	45.613544	-124.992497	1593	going to secure acharax shell scoop now, have been sampling these shells from on tube worm bed since ~19
7/26/2021	20	23	58.9	45.613464	-124.992310	1593	Vessel stepping 20 at 090
7/26/2021	20	24	44.9	45.613464	-124.992312	1593	Carbonate slabs with an octopus underneath
7/26/2021	20	24	53.1	45.613465	-124.992312	1593	Anemones and crab
7/26/2021	20	26	7.0	45.613460	-124.992318	1593	Potential egg sac located underneath the resting octopus
7/26/2021	20	27	19.5	45.613468	-124.992314	1593	Beginning to move towards the bubbles, using Norbit sonar to locate additional streams
7/26/2021	20	28	14.2	45.613435	-124.992250	1593	Rathbunaster in pile of authigenic carbonate cobbles
7/26/2021	20	29	27.9	45.613331	-124.992189	1594	DVL reset
7/26/2021	20	30	36.8	45.613293	-124.992254	1595	Opened shells scattered on the flat sea floor surface
7/26/2021	20	31	58.6	45.613222	-124.992225	1597	Working to bring up Norbit sonar to survey for bubble streams; heading SE towards were minor bubbles were observed earlier in the dive
7/26/2021	20	33	20.3	45.613201	-124.992199	1597	Grenadier

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7/26/2021	20	33	48.6	45.613197	-124.992198	1598	Vessel stepping 10 at 225
7/26/2021	20	34	15.7	45.613172	-124.992198	1599	Traverse S at 1 m above the sea floor in search of bubble stream
7/26/2021	20	35	37.1	45.613162	-124.992179	1599	Gray/white bacterial mats visible with shell hash scattered throughout
7/26/2021	20	35	56.9	45.613162	-124.992157	1599	Vessel stepping 10 at 180
7/26/2021	20	37	21.8	45.613160	-124.992178	1599	Planning to approach bacterial mats, take several Niskins and cores
7/26/2021	20	38	40.3	45.613125	-124.992208	1600	Poralia located between Herc and Argus
7/26/2021	20	38	57.4	45.613125	-124.992202	1600	Waiting on vessel to reposition between exploring bacterial mat region
7/26/2021	20	40	34.8	45.613107	-124.992203	1601	Black and grey bacterial mats, anemones, and shell hash
7/26/2021	20	41	55.6	45.613105	-124.992221	1601	Hermit crab
7/26/2021	20	42	23.6	45.613105	-124.992216	1602	Hermit crab is potentially in the Family Parapaguridae
7/26/2021	20	42	54.7	45.613139	-124.992217	1601	Zooming in and out to determine the best location for cores
7/26/2021	20	43	15.7	45.613123	-124.992223	1600	Passing over previous Herc landing site
7/26/2021	20	45	41.8	45.613168	-124.992213	1600	Bacterial mats on the slope are better suited for Niskin and core sampling
7/26/2021	20	54	53.8	45.613151	-124.992243	1601	whelk shell
7/26/2021	20	56	25.9	45.613127	-124.992238	1601	Niskins at 1 m and 10 m taken successfully; moving on to take two adjacent push cores on the slope
7/26/2021	20	57	4.4	45.613146	-124.992244	1601	Zooming into bacterial mats before sampling
7/26/2021	20	58	34.2	45.613155	-124.992236	1601	Positioning Herc for sampling
7/26/2021	21	0	14.5	45.613093	-124.992155	1602	Tiny octopus and fish
7/26/2021	21	1	19.5	45.613085	-124.991989	1602	Fish likely Psychrolutes phrictus (Blob Sculpin)
7/26/2021	21	1	35.5	45.613082	-124.991985	1601	Vessel moving 10 at 090
7/26/2021	21	1	55.3	45.613077	-124.992018	1601	Moving to find a better bacterial mat for sampling as the other area had too high of current
7/26/2021	21	16	53.5	45.613131	-124.991895	1599	moving 25 m down current to the NE to take another niskin
7/26/2021	21	25	36.2	45.613332	-124.991806	1597	moving 20 m NW to previous tubeworm sampling site to sink second core
7/26/2021	21	26	13.1	45.613369	-124.991811	1598	just located tubeworms
7/26/2021	21	33	59.7	45.613377	-124.991865	1599	first core attempt not successful, either carbonate or tube worms
7/26/2021	21	37	13.9	45.613366	-124.991875	1600	shaking out second attempt, core was taken sideways because vehicle started to slip
7/26/2021	21	41	34.8	45.613361	-124.991873	1600	shook out third attempt
7/26/2021	21	47	48.7	45.613269	-124.991954	1597	now going back to minor bubble site while we wait for Kris for NORBIT scanning
7/26/2021	21	48	10.1	45.613241	-124.991630	1597	on the south edge of the rim, looked at steep carbonate ledge a little
7/26/2021	21	48	22.1	45.613248	-124.991638	1598	now just back over carbonate ridge
7/26/2021	21	48	47.4	45.613244	-124.991555	1599	just saw another tubeworm bush
7/26/2021	21	50	21.1	45.613236	-124.991664	1597	blob sculpin
7/26/2021	21	57	9.5	45.613180	-124.991999	1599	still over sediment between tube worms and minor bubbling, lots of translucent holothurians and clam hash, not much else
7/26/2021	21	57	37.8	45.613184	-124.992088	1599	clam hash
7/26/2021	22	2	6.3	45.613225	-124.992262	1598	just reset DVL to USBL
7/26/2021	22	3	59.8	45.613018	-124.992016	1599	now rising up to start NORBIT sonar survey

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7/26/2021	22	6	52.7	45.613065	-124.991885	1588	will survey from ~20 or so m over seafloor
7/26/2021	22	8	24.4	45.613029	-124.991868	1582	still setting up survey
7/26/2021	22	12	42.9	45.612864	-124.991588	1583	now moving to just SE of the crater feature, will then do a survey transiting NW first across the feature to the NW and then mowing the lawn back and forth to capture the whole feature
7/26/2021	22	12	49.6	45.612866	-124.991588	1582	ship is moving at 1 kt
7/26/2021	22	17	46.7	45.612548	-124.991356	1583	Waiting for ship to get in position to start the high resolution Norbit survey
7/26/2021	22	20	10.3	45.612508	-124.991101	1583	we are currently around 26 m off bottom, about 50 m from start target
7/26/2021	22	20	24.5	45.612503	-124.991089	1583	ship slowed down to 0.3 kts
7/26/2021	22	25	37.3	45.612271	-124.990844	1585	30 m altitude now, just around start waypoint
7/26/2021	22	31	39.8	45.612140	-124.990666	1579	survey officially starting now
7/26/2021	22	34	47.2	45.612145	-124.990657	1579	ship moved 25 m or so before argus started to swing, this is the layback approximately
7/26/2021	22	35	12.4	45.612143	-124.990654	1579	500 m ship move 305 (NW)
7/26/2021	22	46	35.0	45.612659	-124.991671	1579	still transiting, now about 1/3 of the way between survey start and endpoint of this line, still 30 m off seafloor at ~1579 m water depth
7/26/2021	22	51	51.7	45.612849	-124.992105	1579	about to pass parallel to bubble stream, about 18 m distance
7/26/2021	22	52	9.4	45.612851	-124.992105	1578	bubble stream being the minor stream seen in the first watch
7/26/2021	22	53	23.8	45.612883	-124.992203	1578	seeing edge of ridge along crater feature in NORBIT sonar, keeping an eye out for any bubbles
7/26/2021	22	57	26.8	45.613085	-124.992584	1577	Thinking about speeding up ship a little, not sure we will finish survey at this rate. now 1/2 way between endpoints of first survey line
7/26/2021	23	1	7.7	45.613255	-124.992987	1575	watch change
7/26/2021	23	3	1.9	45.613337	-124.993111	1574	Going to speed ship up to 0.6 knots to continue survey at faster pace.
7/26/2021	23	4	43.6	45.613426	-124.993324	1574	past ridge feature on E side of crater, not starting to survey lower section of crater
7/26/2021	23	17	36.5	45.614129	-124.994806	1580	Vessel moving 30 m at 315
7/26/2021	23	18	23.9	45.614193	-124.994874	1581	82 m left on 2nd transect
7/26/2021	23	23	12.6	45.614502	-124.995639	1585	Using the Norbit multibeam sonar to survey this area; completing transects at 30 min above the sea floor
7/26/2021	23	24	25.5	45.614605	-124.995797	1586	Vessel coming to a full stop
7/26/2021	23	25	2.2	45.614617	-124.995893	1586	8 m left on this transect line
7/26/2021	23	25	47.7	45.614677	-124.995952	1586	End of line
7/26/2021	23	26	44.6	45.614675	-124.995945	1587	Moving the vessel and Herc 100 m NE to beginning the next transect line
7/26/2021	23	34	14.3	45.615007	-124.996028	1587	Repositioning the boat before beginning the next transect
7/26/2021	23	45	14.0	45.615600	-124.995445	1586	Waiting on Argus to reposition before beginning next transect line
7/26/2021	23	45	47.1	45.615594	-124.995444	1587	DVL reset
7/26/2021	23	49	55.3	45.615565	-124.995448	1587	Beginning transect at 125 bearing
7/26/2021	23	51	4.6	45.615538	-124.995340	1586	Moving along transect line a 0.5 knots
7/26/2021	23	54	38.3	45.615339	-124.995006	1584	Putting in Waypoint at the end of the transect in order to estimate traverse time

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7/27/2021	0	0	37.5	45.614926	-124.994212	1589	Currently at 30 m above sea level, but planning to increase altitude to 35-40 m in order to properly map the shallower area
7/27/2021	0	3	15.8	45.614728	-124.993837	1587	About 100 m into the second transect line
7/27/2021	0	9	11.3	45.614280	-124.992972	1583	grenadier fish
7/27/2021	0	24	44.9	45.612988	-124.990444	1573	Ctenophores (comb jellies) visible in the water column in front of Herc and below Argus
7/27/2021	0	26	32.1	45.612848	-124.990184	1573	Vessel stopping; Herc will catch up as it finishes this transect line
7/27/2021	0	27	15.8	45.612784	-124.990084	1573	Transect line complete; repositioning 100 m for next transect line
7/27/2021	0	34	46.6	45.612927	-124.989260	1579	Moving into position for the next transect line; waypoint set at beginning of transect line
7/27/2021	0	37	57.5	45.613252	-124.988919	1574	Adjusting for next transect line
7/27/2021	0	44	12.8	45.613614	-124.989001	1574	Vessel move 400 m at 305
7/27/2021	0	47	40.2	45.613592	-124.989060	1574	Starting the third transect line
7/27/2021	0	57	54.8	45.614127	-124.990108	1572	Poralia between Argus and Herc
7/27/2021	0	59	46.9	45.614262	-124.990421	1571	Running through the gauges
7/27/2021	1	11	23.4	45.615077	-124.992037	1562	Target dropped 16 m starboard of Herc
7/27/2021	1	14	53.7	45.615371	-124.992517	1566	Finishing our final transect of the site at 35 m above the sea floor
7/27/2021	1	29	23.7	45.616076	-124.994095	1580	Plan to finish survey line then take 3 Niskins at 20 m, 30 m, and 40 m above the sea floor before returning to surface
7/27/2021	1	31	6.5	45.616167	-124.994243	1581	Finished transect; vessel hold
7/27/2021	1	31	44.5	45.616221	-124.994360	1589	Dropping to 20 m altitude in order to complete niskin sampling
7/27/2021	1	37	59.2	45.616456	-124.994849	1576	Finished with Niskin sampling; beginning our trek to the surface
7/27/2021	1	39	60.0	45.616463	-124.994841	1575	Herc dropped a weight
7/27/2021	1	42	30.6	45.616448	-124.994157	1558	Ships heading is 348
7/27/2021	1	43	8.7	45.616440	-124.994166	1549	Starting to come up at !~14 m/min; Herc is currently at 1550 m
7/27/2021	1	43	41.0	45.616412	-124.994190	1540	Screen with Herc navigation shut off
7/27/2021	1	44	1.3	45.616402	-124.994191	1535	Looking via bubble camera to determine if the lanyard for the other weight can be seen
7/27/2021	1	45	38.9	45.616362	-124.994213	1510	Watching Delta Depth to ensure that Herc and Argus maintain an optimal distance while the monitor is down
7/27/2021	1	47	14.9	45.616302	-124.994263	1485	Second weight successfully dropped
7/27/2021	1	48	29.2	45.616271	-124.994273	1464	Dropping both weights allowed Herc to increases its ascent speed to 17 m/min
7/27/2021	1	49	17.1	45.616252	-124.994283	1450	Estimated time to the surface is ~90 min; Herc is currently at 1450 m
7/27/2021	1	51	45.3	45.616222	-124.994186	1409	Monitor has been successfully fixed; ascent continues at ~18 m/min
7/27/2021	1	55	13.6	45.616296	-124.994116	1341	Weight lanyard on both the port and starboard side need to be moved for better visibility; hydrate sampler obstructs view of port side lanyard
7/27/2021	1	56	53.2	45.616353	-124.994106	1307	Herc is ascending at 20 m/min and is currently at 1300 m; estimated time to the surface is 64 min
7/27/2021	2	2	3.6	45.616373	-124.994257	1206	Turning off the Norbit sonar
7/27/2021	2	8	59.4	45.616490	-124.994408	1058	Ascending at 21 m/min; currently at 1060 m
7/27/2021	2	12	48.6	45.616513	-124.994418	976	Checking the sample camera settings and displays

date	hr	min	sec	latitude	longitude	Z(m)	H1860 E of Kulm Deep Description
7/27/2021	2	13	0.2	45.616511	-124.994420	971	Estimated time to surface is 44 min
7/27/2021	2	19	37.7	45.616551	-124.994373	831	Ascending at 16 m/min and Herc's current depth is 830 m
7/27/2021	2	28	23.1	45.616140	-124.994691	675	Ascending at ~20 m/min; currently at 675 m
7/27/2021	2	29	49.7	45.616197	-124.994690	644	Estimated time to surface is 29 min
7/27/2021	2	41	0.1	45.616427	-124.994509	400	Ascending at 22 m/min and Herc is currently at 403 m
7/27/2021	2	41	20.0	45.616430	-124.994514	393	Vessel to begin tracking forward at 0.3 knots
7/27/2021	2	54	31.1	45.617215	-124.995002	96	100 m away from the surface
7/27/2021	2	56	53.1	45.617456	-124.995204	48	50 m from the surface
7/27/2021	2	57	30.0	45.617470	-124.995223	48	Recovery is a go
7/27/2021	2	58	30.5	45.617567	-124.995283	34	Slowing winch speed to 15 m/min
7/27/2021	3	0	48.9	45.618464	-124.995462	10	Killing lights on argus; argus being recovered
7/27/2021	3	1	27.1	45.618545	-124.995481	10	Argus on deck
7/27/2021	3	8	15.7	45.618535	-124.995481	10	Daisy chain caught up
7/27/2021	3	11	14.6	45.618507	-124.995468	10	Herc coming out of the water now

Table 15: H1861 NW Coquille Base of Slope Dive Log

date	hr	min	sec	latitude	longitude	Z(m)	H1861 NW Coquille Base of Slope Description
7/27/2021	16	37	28.1	43.323797	-125.189631	92	New Herc pilot training
7/27/2021	16	47	22.6	43.324014	-125.189845	353	Light marine snow. siphonophore chains
7/27/2021	17	2	43.6	43.323883	-125.190063	740	turning +/- 30 degrees during descent to use NORBIT sonar
7/27/2021	17	8	37.0	43.323728	-125.190184	898	larvacean houses ~895m
7/27/2021	17	35	27.4	43.323711	-125.190398	1632	within 200m of the bottom
7/27/2021	17	41	37.5	43.323874	-125.190123	1774	bottom in sight
7/27/2021	17	45	32.4	43.323980	-125.189377	1775	seafloor is soft sediment bottom with a hundreds of sea pens,
7/27/2021	17	45	51.9	43.323999	-125.189365	1774	deep sea hermit crab
7/27/2021	17	46	29.2	43.323999	-125.189328	1772	bottom depth is 1772
7/27/2021	17	48	10.9	43.323939	-125.189302	1773	sea pens may be pennatula
7/27/2021	17	53	48.1	43.323950	-125.189043	1772	moving over to waypoint 1
7/27/2021	17	54	24.9	43.323945	-125.189090	1772	large grenadier fish
7/27/2021	17	55	15.2	43.323946	-125.189109	1772	small "snail" trails visible in the sea floor in addition to small holes
7/27/2021	17	56	25.4	43.323985	-125.189035	1771	Large whelk moving across the seafloor making trail markings. soft sediment bottom still covered in sea whips
7/27/2021	17	56	57.6	43.324011	-125.189034	1770	~250m from waypoint 1
7/27/2021	17	59	38.3	43.324095	-125.188838	1766	shell hash, Ophiuroids,
7/27/2021	18	3	44.2	43.324210	-125.188503	1762	possible spoon worms or acorn worms
7/27/2021	18	5	20.3	43.324418	-125.188243	1760	closer to seafloor, fewer sea whips
7/27/2021	18	6	36.6	43.324452	-125.188167	1757	approaching a peak feature with shell hash and Neptunia egg towers all along the edges of the peak
7/27/2021	18	7	26.2	43.324445	-125.188167	1757	over the peak feature on the bottom of the seafloor, there are dozens of neptunia egg cases with ~ two large crabs nearby
7/27/2021	18	8	21.8	43.324670	-125.188193	1758	beginning to see an increase in shell hash and small bits of bacterial mat
7/27/2021	18	8	50.7	43.324727	-125.188142	1757	undulations in the seafloor, dark sediment
7/27/2021	18	9	0.5	43.324727	-125.188148	1757	approaching waypoint 1
7/27/2021	18	13	0.8	43.325124	-125.187726	1764	Pannychia sea cucumbers

date	hr	min	sec	latitude	longitude	Z(m)	H1861 NW Coquille Base of Slope Description
7/27/2021	18	13	42.8	43.325159	-125.187590	1764	Hymenaster sea star
7/27/2021	18	14	39.9	43.325147	-125.187602	1765	purple octopus, possibly muusoctopus robustus
7/27/2021	18	15	48.2	43.325273	-125.187432	1765	ctenophore in water column
7/27/2021	18	16	58.3	43.325325	-125.187402	1765	Anemone - previous octopus was not muusoctopus but boreopacifica
7/27/2021	18	17	51.2	43.325358	-125.187380	1765	continuing to observe small holes in the seafloor
7/27/2021	18	18	33.4	43.325520	-125.187378	1766	sea whips are making an appearance again
7/27/2021	18	19	10.8	43.325613	-125.187472	1765	beginning to see clam shells again with light bacterial mat ~25m from target
7/27/2021	18	20	42.5	43.325707	-125.187501	1764	very large patch of shell hash and bacterial mat
7/27/2021	18	21	25.9	43.325725	-125.187486	1765	moving toward possible bubble stream located in NORBIT
7/27/2021	18	21	34.9	43.325726	-125.187484	1765	Bubbles were found
7/27/2021	18	23	20.8	43.325717	-125.187484	1766	Fairly strong stream of bubbles coming from a hole in the sea floor. the stream does not appear to be constant
7/27/2021	18	24	55.3	43.325777	-125.187463	1766	There is a little patch of white mat on the opening of the bubble stream hole. the bubbles are not continuous,
7/27/2021	18	25	47.4	43.325770	-125.187460	1767	the hole the bubbles are coming from a fairly large hole in the sea floor ~25-30cm wide
7/27/2021	18	27	3.4	43.325767	-125.187467	1767	there are many conical shaped shelled near the bubble stream, possibly shells of neptunia, there are also ophiuroids and clams near the hole of the bubble stream
7/27/2021	18	29	33.3	43.325764	-125.187482	1767	possible shimmering water, searching for
7/27/2021	18	30	22.0	43.325758	-125.187491	1767	preparing to take a temperature reading from within the bubble stream hole
7/27/2021	18	35	56.0	43.325747	-125.187457	1767	Skate swimming along in argus view
7/27/2021	18	38	11.4	43.325760	-125.187471	1767	Temperature outside of the hole
7/27/2021	18	40	20.0	43.325752	-125.187503	1767	Max temperature from the bubble stream hole was 6.7C. there was visible shimmering
7/27/2021	18	40	33.7	43.325753	-125.187501	1767	There is shimmer at this bubble stream. >6.5C. Tamb=2.2. Bubble stream is intermittent but good flow when it turns on.
7/27/2021	18	41	31.5	43.325751	-125.187502	1767	Area of shell hash. Looks like some live clams(?). Reduced sediments.
7/27/2021	18	41	59.3	43.325744	-125.187504	1767	at the site of the bubble stream hole
7/27/2021	18	43	15.4	43.325754	-125.187494	1767	Sparse mat above this. Various gastropods and brittle stars in the area.
7/27/2021	18	54	16.7	43.325756	-125.187525	1762	Going back to the seafloor to look around near bubble stream
7/27/2021	18	54	54.4	43.325759	-125.187508	1763	there is a strong possible bubble stream 5m south of here
7/27/2021	19	0	30.4	43.325767	-125.187450	1766	watch change
7/27/2021	19	2	15.0	43.325763	-125.187467	1766	will take both gas tight samples, one trying to capture bubble stream and another trying to capture warmer water
7/27/2021	19	3	26.2	43.325769	-125.187471	1766	repositioning vehicle to conduct GT sampling
7/27/2021	19	5	43.4	43.325764	-125.187502	1768	if not noted previously, seeing ophiuroids and clam hash around pit with bubble stream, also seeing some large living clams (~10 cm)
7/27/2021	19	6	37.2	43.325763	-125.187500	1767	will use GT17
7/27/2021	19	8	29.7	43.325759	-125.187498	1767	zooms on shimmering water
7/27/2021	19	12	38.6	43.325758	-125.187484	1767	triggering after second burp
7/27/2021	19	15	46.2	43.325754	-125.187474	1767	funnel just cracked on GT17-1 in trying to replace GT sample in fwd biobox

date	hr	min	sec	latitude	longitude	Z(m)	H1861 NW Coquille Base of Slope Description
7/27/2021	19	16	33.9	43.325764	-125.187481	1767	now trying to get pure fluid phase in this GT 18-1
7/27/2021	19	19	53.7	43.325754	-125.187481	1767	trying to find location of shimmering fluid source, appears to be NW side of fluid pit
7/27/2021	19	21	53.6	43.325754	-125.187497	1767	positioning GT18-1
7/27/2021	19	23	46.6	43.325755	-125.187488	1767	disturbed some sediment on the pit rim, waiting for it to settle a bit now
7/27/2021	19	25	51.8	43.325758	-125.187490	1767	Observing a few more bubble burps as we wait for sediment to settle, side of pit is still caving in a bit.
7/27/2021	19	27	50.8	43.325762	-125.187485	1767	burps seem to last ~3-15 seconds
7/27/2021	19	31	18.1	43.325767	-125.187498	1767	positioning GT18-1
7/27/2021	19	32	53.2	43.325759	-125.187506	1767	Putting GT in biobox
7/27/2021	19	34	41.5	43.325764	-125.187502	1768	correction last sample was GT18-2
7/27/2021	19	38	1.5	43.325771	-125.187494	1767	starting coring
7/27/2021	19	46	10.3	43.325756	-125.187473	1768	Going for second core
7/27/2021	19	51	39.9	43.325757	-125.187511	1768	now going to slurp for ophiuroids
7/27/2021	19	52	15.1	43.325762	-125.187491	1768	trying to troubleshoot jaw closing issue right now
7/27/2021	19	52	57.2	43.325767	-125.187483	1768	jaw currently won't close, may not be getting signal
7/27/2021	19	56	22.2	43.325761	-125.187498	1769	rebooting kraft manipulator system to see if that fixes the issue
7/27/2021	19	58	16.7	43.325755	-125.187507	1768	Never had this jaw signal issue happen on a push core, seems to have happened in the past after trying to pry big rocks.
7/27/2021	19	58	54.1	43.325752	-125.187504	1768	have been seeing a pacific flat nose circulating the vehicle
7/27/2021	20	2	24.2	43.325701	-125.187545	1750	current depth at bubble sampling site is 1768 m if not mentioned previously
7/27/2021	20	6	25.6	43.325701	-125.187556	1750	plan currently is to conduct NORBIT bubble surveying while manipulator master is fixed on topside
7/27/2021	20	8	43.7	43.325706	-125.187551	1750	just saw huge bubble burp
7/27/2021	20	9	59.8	43.325706	-125.187563	1750	planning to survey the area to see how far the influence of this bubbling and fluid flow extends
7/27/2021	20	10	36.3	43.325703	-125.187573	1750	big clam bed ahead SW of bubble pit
7/27/2021	20	11	53.5	43.325707	-125.187558	1744	clam bed not super large but surrounded by a lot of diffuse bubbling from the seafloor
7/27/2021	20	12	18.8	43.325708	-125.187544	1744	ophiuroids seem to scatter the seafloor all over
7/27/2021	20	12	46.8	43.325711	-125.187545	1744	whole sediment layer seems oversaturated with methane here
7/27/2021	20	16	46.3	43.325628	-125.187541	1744	seeing lots of small bubble streams around medium clam sampling site with hundreds of clams
7/27/2021	20	18	4.0	43.325602	-125.187531	1745	moved back to bubble pit, also seeing a lot of acharax shells scattered around it
7/27/2021	20	18	46.0	43.325581	-125.187520	1743	planning to sit on the seafloor in same spot as we conducted sampling, will use NORBIT to survey bubbles while stationary
7/27/2021	20	20	30.0	43.325569	-125.187527	1752	currently set down around 5 m from bubble pit on seafloor, but facing it from the side opposite where we sampled
7/27/2021	20	23	42.7	43.325581	-125.187552	1751	taking some time for bubbling to appear again, we saw a larger burst last time so a lot might have emptied more of reservoir
7/27/2021	20	24	26.7	43.325589	-125.187509	1752	1-2 second delay to see bubbles in norbit
7/27/2021	20	24	50.4	43.325593	-125.187512	1752	planning to back up a little bit to survey better in NORBIT

date	hr	min	sec	latitude	longitude	Z(m)	H1861 NW Coquille Base of Slope Description
7/27/2021	20	27	53.9	43.325604	-125.187525	1752	just captured large bubble stream in NORBIT
7/27/2021	20	28	1.3	43.325605	-125.187524	1751	from bubble pit
7/27/2021	20	30	30.3	43.325602	-125.187518	1751	seeing another further stream possibly
7/27/2021	20	31	0.3	43.325601	-125.187525	1751	No bubbling currently, waiting for another stream. hoping to be somewhere we can see bubbles visually
7/27/2021	20	33	44.5	43.325607	-125.187520	1752	slightly repositioned herc, seeing in both cams
7/27/2021	20	35	11.2	43.325605	-125.187515	1753	having Herc USBL issue, will have to keep an eye on DVL and reset DVL to under Argus
7/27/2021	20	35	55.0	43.325632	-125.187494	1752	sonar range has been set to 10 m and using 400 kHz
7/27/2021	20	36	39.7	43.325615	-125.187502	1751	waiting for next burp, haven't seen one in the past few minutes
7/27/2021	20	37	27.1	43.325602	-125.187517	1752	must be smaller bubble stream to the East, because seeing occasional blips
7/27/2021	20	38	40.5	43.325625	-125.187513	1751	Seems we are seeing a different release phase in this plume than previously. Previous bubble were more frequent but less persistent. now less frequent but seeing longer and more consistent streams of bubbles during these episodes
7/27/2021	20	39	50.6	43.325602	-125.187504	1751	bubble pit is releasing stream now
7/27/2021	20	41	56.4	43.325607	-125.187495	1753	getting update on manipulator
7/27/2021	20	47	25.5	43.325624	-125.187526	1752	hasn't been a bubble burp for a while, doing planning in the back row
7/27/2021	20	53	48.0	43.325630	-125.187503	1753	still waiting for next burp
7/27/2021	20	59	36.0	43.325647	-125.187500	1753	burping currently
7/27/2021	21	0	36.1	43.325627	-125.187506	1753	last burp done
7/27/2021	21	0	52.7	43.325683	-125.187467	1752	may still be some small ones, still seeing it in norbit
7/27/2021	21	1	31.5	43.325672	-125.187479	1753	still seeing this broad signature that may be from very small bubbles
7/27/2021	21	3	3.8	43.325637	-125.187505	1753	going to start recovering vehicles, will process and go out for more
7/27/2021	21	3	26.3	43.325642	-125.187510	1750	after fixing manipulator and usbl issues
7/27/2021	21	4	37.6	43.325634	-125.187511	1747	passing over numerous small bubble streams on way out
7/27/2021	21	4	58.6	43.325624	-125.187509	1747	holothurians scattered here
7/27/2021	21	6	13.8	43.325631	-125.187507	1738	use nav off bottom that was first
7/27/2021	21	6	56.1	43.325560	-125.187488	1729	front core looks like it’s off gassing a lot
7/27/2021	21	18	27.4	43.325607	-125.187486	1546	planning to potentially do 4 hour turn around and dive again
7/27/2021	22	20	42.0	43.325623	-125.187529	483	Started streaming at 500 m, could tell that Herc was under boat and did not want to start burning ascent power to lateral around.
7/27/2021	22	23	26.3	43.325806	-125.187513	426	seeing bubbles in water column a little bit ago, seemingly over the seep site
7/27/2021	22	25	0.7	43.325936	-125.187490	392	herc usbl hasn't been working in either responder or transponder mode (electrical or acoustic)

Table 16: H1862 NW Coquille Base of Slope Dive Log

date	hr	min	sec	latitude	longitude	Z(m)	H1862 NW Coquille Base of Slope Description
7/28/2021	3	8	21.7	43.328725	-125.188765	81	marine snow, jellies, and myctophids
7/28/2021	3	10	46.6	43.328813	-125.188722	146	a lot of myctophids

date	hr	min	sec	latitude	longitude	Z(m)	H1862 NW Coquille Base of Slope Description
7/28/2021	3	13	56.7	43.328752	-125.188720	206	large larvacean house in the water column
7/28/2021	3	16	13.5	43.328668	-125.188784	255	pretty large fish in the water column after lantern fish
7/28/2021	3	17	58.9	43.328625	-125.188847	294	increase in number of fish at 291m
7/28/2021	3	22	59.4	43.328738	-125.188943	423	continuing to see the same species of fish, they are grey/silver colored with a forked tail, possibly herring
7/28/2021	3	24	1.2	43.328774	-125.188991	450	increase in fish, there are hundreds swimming in all directions in front of herc
7/28/2021	3	30	42.7	43.328997	-125.188814	607	continuing to see school of fish, it has decreased in size
7/28/2021	3	38	46.4	43.329079	-125.188767	753	no more fish 751m
7/28/2021	3	41	59.8	43.329070	-125.188776	812	continuing to see marine snow
7/28/2021	3	58	31.6	43.328396	-125.188922	1224	seeing more larvacean houses
7/28/2021	4	6	58.3	43.328175	-125.188836	1457	250m from bottom
7/28/2021	4	12	49.5	43.328045	-125.188262	1622	red jelly
7/28/2021	4	13	28.3	43.328021	-125.188201	1641	ctenophores in argus view
7/28/2021	4	13	42.7	43.328020	-125.188203	1647	~143m to bottom
7/28/2021	4	26	25.6	43.327132	-125.187158	1692	red/purple lobe shaped ctenophores
7/28/2021	4	29	36.7	43.326701	-125.187292	1692	very small jelly ~1/2 cm
7/28/2021	4	35	17.7	43.325974	-125.187264	1767	bottom in sight
7/28/2021	4	36	47.9	43.325802	-125.187418	1768	Right on top of soft sediment bottom with large shell debris and light/faint bacterial mats scattered throughout. Some flytrap anemones.
7/28/2021	4	36	57.8	43.325802	-125.187430	1768	ROV set up
7/28/2021	4	37	4.1	43.325802	-125.187437	1768	tanner crab
7/28/2021	4	37	30.0	43.325754	-125.187428	1768	sea floor is on a slope, moving upwards
7/28/2021	4	39	6.2	43.325708	-125.187366	1769	Hymenaster laying in soft sediment near shell hash and bacterial mat
7/28/2021	4	39	42.0	43.325708	-125.187354	1769	there are multiple small holes in the sea floor
7/28/2021	4	40	46.9	43.325699	-125.187374	1768	on bottom depth is ~1768m O2
7/28/2021	4	40	56.6	43.325702	-125.187396	1768	White balance
7/28/2021	4	44	57.0	43.325726	-125.187357	1768	grenadier fish
7/28/2021	4	47	16.3	43.325769	-125.187301	1770	backing up south towards first waypoint
7/28/2021	4	48	22.1	43.325808	-125.187245	1770	poralia jelly near crab on the seafloor
7/28/2021	4	48	46.9	43.325813	-125.187242	1770	doppler reset
7/28/2021	4	52	41.0	43.325820	-125.187384	1769	California grenadier fish
7/28/2021	4	53	13.8	43.325772	-125.187380	1769	beginning to enter area with a lot of shell hash and a thin layered rock shelf
7/28/2021	4	53	43.9	43.325772	-125.187462	1768	another large tanner crab
7/28/2021	4	54	0.7	43.325771	-125.187468	1768	Heading to bubbles and depression target, which is where we sampled on the last dive.
7/28/2021	4	54	35.6	43.325768	-125.187497	1766	We are there.
7/28/2021	4	54	44.3	43.325766	-125.187499	1766	located the large hole in the sea floor discovered on the last watch
7/28/2021	4	55	31.1	43.325746	-125.187489	1766	bubbles are still coming out in bursts
7/28/2021	4	56	58.3	43.325765	-125.187490	1766	hole only releases bubbles sporadically
7/28/2021	4	57	47.8	43.325769	-125.187482	1766	The bubbles are very intermittent. Not sure it is worth a Niskin right now.
7/28/2021	5	0	10.5	43.325764	-125.187495	1766	Preparing to take a niskin 4m above bubble stream.
7/28/2021	5	0	45.1	43.325765	-125.187487	1766	the bubble stream hole still has shimmering water
7/28/2021	5	1	2.3	43.325765	-125.187495	1766	Going for the Niskin. Bubbles are intermittent. 4m off the bottom.
7/28/2021	5	10	29.1	43.325728	-125.187504	1763	still prepping to collect a niskin

date	hr	min	sec	latitude	longitude	Z(m)	H1862 NW Coquille Base of Slope Description
7/28/2021	5	15	40.9	43.325717	-125.187551	1766	push core in clam bed near the last sample (the hole)
7/28/2021	5	20	53.7	43.325705	-125.187539	1766	Bed has clams and ophiuroids - a bit of white bacterial mat surrounding it.
7/28/2021	5	30	44.7	43.325699	-125.187514	1766	Temperature reading near push core sample in clam bed where shimmering was seen after sampling. ambient Temperature is 2.28C and in the sediment near the shimmering by the sample max is
7/28/2021	5	33	12.6	43.325699	-125.187558	1766	preparing to slurp sample ophiuroids
7/28/2021	5	37	10.6	43.325725	-125.187500	1766	Tambient = 2.28C. Temp in fauna is 10.8C.
7/28/2021	5	56	51.0	43.325700	-125.187525	1766	Samples 52 - 54 all from the same biota bed next to the bubble stream.
7/28/2021	5	57	20.4	43.325689	-125.187527	1766	Lots of shimmer in this stream right outside the bed.
7/28/2021	5	57	55.2	43.325708	-125.187513	1766	Another small bubble stream is coming out of a small hole with a lot of shimmering. located right outside of the clam bed we just sampled from
7/28/2021	5	59	17.7	43.325722	-125.187523	1766	two more small holes with bubble streams, also a lot of shimmering near them,
7/28/2021	6	1	38.6	43.325705	-125.187559	1767	total of 4 bubble streams so far ~2/3 meters away from the original large hole we sampled from
7/28/2021	6	1	47.5	43.325705	-125.187557	1767	two eel pouts
7/28/2021	6	4	22.1	43.325706	-125.187514	1767	2-3 m from hole (6.8C) to clam bed (10.8 C max). See several bubble streams around the clam bed.
7/28/2021	6	4	54.5	43.325704	-125.187535	1766	Clam bed is ~3 m long and 2 m wide. Some bac mat surrounding the biota.
7/28/2021	6	5	50.5	43.325714	-125.187519	1767	preparing to look around to get an idea of how large this area is and what is here
7/28/2021	6	6	51.0	43.325738	-125.187492	1766	Pannychia sea cucumber, tube worms near areas of shimmer
7/28/2021	6	10	31.0	43.325736	-125.187451	1766	still preparing to complete a grid search of the area to characterize
7/28/2021	6	18	40.8	43.325708	-125.187519	1766	large amount of shimmering
7/28/2021	6	21	24.1	43.325706	-125.187543	1766	Hole 1/3 of the size of the first large hole we saw. There seems to be a constant bubble stream, a lot of shimmering here. preparing to take a gas tight here
7/28/2021	6	39	4.0	43.325695	-125.187532	1766	Temp at site of collection of GT-17 (NA128-055) Ambient
7/28/2021	6	44	47.8	43.325703	-125.187543	1766	skate
7/28/2021	6	53	59.4	43.325700	-125.187549	1766	Temp taken from shimmering area outside of the hole where gas tights were collected. Ambient
7/28/2021	6	54	18.9	43.325701	-125.187551	1766	Watch change
7/28/2021	7	7	17.4	43.325723	-125.187509	1767	picking up to look for bubble stream elsewhere nearby
7/28/2021	7	12	40.0	43.325761	-125.187500	1768	set down to sample original bubble pit plume from H1861
7/28/2021	7	13	28.6	43.325761	-125.187495	1768	Seeing intermittent bubbling from bubble pit
7/28/2021	7	14	59.1	43.325775	-125.187499	1768	filling up gas tight
7/28/2021	7	17	53.1	43.325765	-125.187497	1768	have captured gas from 3 burps so far, waiting for one more
7/28/2021	7	22	9.7	43.325734	-125.187541	1767	Relocating to another clam bed nearby
7/28/2021	7	25	21.3	43.325712	-125.187447	1768	going to set down and pick up a carbonate chunks
7/28/2021	7	31	58.1	43.325708	-125.187454	1768	Rock we are sampling seems not like rock, very crumbly. mostly white with some black areas, covered in mat and gastropods

date	hr	min	sec	latitude	longitude	Z(m)	H1862 NW Coquille Base of Slope Description
7/28/2021	7	37	0.1	43.325653	-125.187428	1766	Zooms on a cavern in the material we just sampled, can see white mat on top, chalky piece white layer below, and then dark. Top is covered in sediment with tiny siboglinid tube worms and gastropods
7/28/2021	7	37	3.0	43.325653	-125.187434	1766	going back to first clam bed
7/28/2021	7	37	32.5	43.325700	-125.187517	1765	crab, tanner crab?
7/28/2021	7	39	59.6	43.325705	-125.187545	1766	back at sampling location of core 052, all have been generally sort of same patchy connected clam bed
7/28/2021	7	40	10.5	43.325705	-125.187545	1766	positioning vehicle
7/28/2021	7	52	24.2	43.325752	-125.187540	1767	now repositioning to take Niskin 25 m from original bubble pit
7/28/2021	7	53	36.6	43.325758	-125.187580	1767	Stepping ship west in direction of current
7/28/2021	7	59	24.4	43.325731	-125.187810	1770	Now transitioning over to NORBIT mapping (downward facing norbit)
7/28/2021	8	3	38.7	43.325762	-125.187863	1755	Stepping ship 20 m 070 (NE) to get Argus over location of the sampling we've done on this and the last dive. Will then run a line with Herc that is about one tether length. Next line will step ship over and do another parallel Herc length line
7/28/2021	8	10	16.2	43.325984	-125.187685	1766	just positioned vehicles 8 m above seafloor, argus 24 m N of sampling site, Herc 30 m away at bearing 331 from site
7/28/2021	8	12	3.3	43.325881	-125.187718	1765	reducing delta depth to make herc tether length we can survey longer
7/28/2021	8	12	42.2	43.325881	-125.187736	1765	now delta is ~12
7/28/2021	8	20	55.5	43.325884	-125.187791	1766	have been troubleshooting vehicle sonars
7/28/2021	8	21	9.5	43.325872	-125.187807	1766	mesotech
7/28/2021	8	24	55.7	43.325884	-125.187804	1766	starting norbit survey E to W now, will be 50 m line 8 m off bottom with delta ~12 at least
7/28/2021	8	26	10.5	43.325879	-125.187778	1766	argus will be winching up slowly and increasing delta as herc flies under
7/28/2021	8	28	5.1	43.325884	-125.187480	1762	about halfway through line now
7/28/2021	8	30	58.3	43.325864	-125.187152	1766	completing first line
7/28/2021	8	31	16.2	43.325882	-125.187151	1766	stepping 20 m south with both vehicles to start next parallel line
7/28/2021	8	36	19.6	43.325695	-125.187194	1767	waiting for argus to swing into position
7/28/2021	8	41	27.7	43.325690	-125.187194	1767	now starting second survey line, argus has swung far enough S
7/28/2021	8	41	38.0	43.325691	-125.187200	1767	lines are ~50 m long
7/28/2021	8	41	57.9	43.325690	-125.187206	1767	270 is heading, due W
7/28/2021	8	43	19.1	43.325689	-125.187437	1763	Kris is noticing an issue in lateral velocity on norbit, fwd and after appear to match actual movement
7/28/2021	8	46	34.2	43.325693	-125.187838	1762	ending second line now
7/28/2021	8	47	4.8	43.325694	-125.187845	1763	putting in another southward ship move
7/28/2021	8	49	1.6	43.325558	-125.187817	1761	Kris is thinking coordinate frame is upside down from what he was expecting in his software
7/28/2021	8	55	21.7	43.325524	-125.187823	1761	argus has swung into place, starting W to E line, final pass
7/28/2021	9	0	53.0	43.325507	-125.187190	1764	calling in ship move toward sample location so we can drop a marker
7/28/2021	9	0	59.2	43.325507	-125.187165	1764	finishing third line
7/28/2021	9	3	4.2	43.325766	-125.187476	1767	grenadier

date	hr	min	sec	latitude	longitude	Z(m)	H1862 NW Coquille Base of Slope Description
7/28/2021	9	3	13.2	43.325763	-125.187477	1768	also passed a hymenaster and holothurians
7/28/2021	9	3	23.8	43.325765	-125.187487	1768	placing marker on seafloor now, just got back to sampling site
7/28/2021	9	5	33.6	43.325771	-125.187509	1768	dropped PMEL marker 235 near original bubble pit
7/28/2021	9	14	35.1	43.325568	-125.187546	1678	Dropping an Alvin weight south of the site
7/28/2021	9	16	42.4	43.325407	-125.187614	1643	ascent rate currently 17 m a min
7/28/2021	9	16	47.6	43.325407	-125.187619	1641	dropping another weight
7/28/2021	9	24	38.8	43.325564	-125.187541	1502	first core 052 may not have been seated well
7/28/2021	9	45	0.8	43.327351	-125.187281	1052	Pushcore 059 is losing sediment during ascent
7/28/2021	9	45	46.9	43.327438	-125.187314	1035	We see the flapper moving
7/28/2021	9	46	21.3	43.327472	-125.187317	1022	biobox cover may have to go back on, appears vertical thruster is blowing out cores
7/28/2021	9	55	15.3	43.328226	-125.187754	815	OET Science Portal CTD Salinity started to display again after being N/A for dives H1862 and H1861
7/28/2021	10	9	8.9	43.329474	-125.188121	497	Argus gooey software flaky
7/28/2021	10	21	18.5	43.330560	-125.188184	219	slowing ROV ascent down because deck is not yet ready
7/28/2021	10	43	8.2	43.333383	-125.188354	9	Argus on deck
7/28/2021	10	52	35.5	43.333198	-125.188363	9	ROV out of water
7/28/2021	10	53	5.2	43.333173	-125.188313	9	on deck

Table 17: H1863 SE of Grays Canyon (Salmi Plume) Dive Log

date	hr	min	sec	latitude	longitude	Z(m)	H1863 SE of Grays Canyon (Salmi) Description
7/29/2021	17	5	40.8	46.886902	-124.778886	10	at 4m the water column is very green
7/29/2021	17	6	41.7	46.886900	-124.778878	10	Multiple jellies in water column and a lot of marine snow.
7/29/2021	17	10	46.5	46.886229	-124.779361	108	~50m from bottom
7/29/2021	17	11	20.8	46.886222	-124.779442	117	there is a lot of zooplankton in the water column
7/29/2021	17	13	51.6	46.886540	-124.779213	148	bottom in sight
7/29/2021	17	14	39.5	46.886517	-124.779270	148	made contact with the seafloor, visibility is very murky, mostly due to the ROV landing
7/29/2021	17	16	4.7	46.886323	-124.779284	146	doppler reset
7/29/2021	17	17	33.0	46.886093	-124.779048	145	Heading to WP1 the strongest flare of the quimera pics this morning.
7/29/2021	17	18	45.5	46.885751	-124.778903	146	3-4m off the seafloor, difficult to see- visibility is low
7/29/2021	17	28	25.0	46.885213	-124.778988	151	stills camera set up, but visibility is very low, unsure how well it will Auto focus
7/29/2021	17	28	58.6	46.885216	-124.778987	151	soft sediment bottom visibility is very low,
7/29/2021	17	29	25.0	46.885218	-124.778993	151	24m away from WP1
7/29/2021	17	30	7.1	46.885210	-124.778990	151	fish in view, hard to ID
7/29/2021	17	32	13.8	46.885058	-124.779006	151	anemone, flatfish, sea star, one large rock in the middle of soft sediment
7/29/2021	17	33	9.3	46.885045	-124.778999	151	rockfish, ling cod
7/29/2021	17	34	22.5	46.885000	-124.779009	151	changing camera settings so that argus cam can have better visibility
7/29/2021	17	35	1.9	46.885001	-124.779029	149	Beginning to see some carbonate slabs ~ 6m from the first waypoint. on the rocky slabs there are sea anemones
7/29/2021	17	35	22.8	46.885005	-124.779033	149	going up in the water column to find bubbles, bubbles seen
7/29/2021	17	36	13.9	46.885025	-124.779033	150	visibility is very poor
7/29/2021	17	37	47.9	46.885022	-124.779034	150	waiting for bubble stream to start again

date	hr	min	sec	latitude	longitude	Z(m)	H1863 SE of Grays Canyon (Salmi) Description
7/29/2021	17	39	9.8	46.885009	-124.779028	152	bubbles spotted in bubble cam
7/29/2021	17	39	58.1	46.885008	-124.779028	152	large lingcod next to large carbonate rock with three bubble streams coming from holes near the same carbonate slab
7/29/2021	17	40	11.2	46.885008	-124.779028	152	Several streams bubbling up around and under this carbonate slab.
7/29/2021	17	41	51.2	46.885007	-124.779033	152	moving 45 deg. starboard to find more bubble streams
7/29/2021	17	42	40.6	46.884993	-124.779065	151	bubbles appear to be very wobbly, so they may have a coating on them
7/29/2021	17	43	20.4	46.884991	-124.779067	152	another bubble stream found coming from a small hole in the seafloor
7/29/2021	17	44	48.5	46.884999	-124.779062	151	15 degrees to starboard ~5 m away there may be another bubble stream
7/29/2021	17	46	12.2	46.884986	-124.779067	152	stronger bubble stream is found, (target name bubble3)
7/29/2021	17	47	15.4	46.884985	-124.779067	151	small bit of bacterial mat around the base of the hole of the steady bubble stream
7/29/2021	17	48	44.5	46.884987	-124.779071	151	site ahead that periodically comes up as a big target in the sonar
7/29/2021	17	50	42.8	46.884985	-124.779101	151	another bubble stream found using the sonar, at a total of ~6 bubble streams seen so far on this dive
7/29/2021	17	53	5.1	46.884985	-124.779096	151	coming off the seafloor to use norbit to find stronger bubble streams
7/29/2021	17	54	19.8	46.884986	-124.779101	148	turning 180 degrees to see if there are bubble streams in the other directions
7/29/2021	17	56	39.3	46.884990	-124.779095	147	visibility is still very poor
7/29/2021	17	57	26.7	46.884990	-124.779087	147	heading to target seen in sonar near waypoint 1 to find a stronger bubble stream
7/29/2021	18	1	23.3	46.884994	-124.778989	151	more carbonate slabs, a white barrel sponge and an anemone, bubbles seen off to port
7/29/2021	18	3	50.3	46.884993	-124.778976	152	Orange colored microbial mat, fuzzy texture, at the base of a bubble stream. there are ~6 shrimp resting near the bubble streams
7/29/2021	18	3	53.2	46.884993	-124.778977	152	Area of heavy sediments, carbonate slabs
7/29/2021	18	4	6.0	46.884993	-124.778976	152	Orange mat and bubbles here
7/29/2021	18	4	56.1	46.884993	-124.778977	152	there are two bubble streams here (bubble 5 orange target on hypack)
7/29/2021	18	5	49.6	46.884993	-124.778976	152	2 streams here with orange mat in area. One constant and one burper.
7/29/2021	18	13	42.3	46.885000	-124.778986	152	Large kelp fall with a lot of shrimp (~80) nearby
7/29/2021	18	14	26.2	46.885002	-124.778987	152	Heading back to the area with several bubble streams.
7/29/2021	18	17	56.3	46.884992	-124.779021	151	more bubbles near two large carbonate slabs same as first site (bubble1)
7/29/2021	18	20	51.7	46.884983	-124.779028	152	Will grab a piece of carbonate in the area of the bubble stream that we are going to sample.
7/29/2021	18	25	12.5	46.884974	-124.779026	152	Grabbed a piece of carbonate slab - flat 20cm or so 8 inches long. Sample 066.
7/29/2021	18	31	3.0	46.884979	-124.779030	152	small worm tubes near the carbonate rock slab that we sampled from
7/29/2021	18	31	15.0	46.884979	-124.779030	152	Carbonate slab has little tubeworms? on top.
7/29/2021	18	32	40.3	46.884982	-124.779031	152	two squat lobsters near worm tubes
7/29/2021	18	47	36.4	46.885005	-124.779073	143	Completed the two niskins here.
7/29/2021	18	48	22.3	46.885004	-124.779073	143	minor adjustment topside ROV
7/29/2021	18	50	7.7	46.885037	-124.779045	151	The temp probe is 11 inches long. Will take the temp at the sediment surface and then down into the seafloor .
7/29/2021	18	54	34.8	46.885036	-124.779036	151	Watch change

date	hr	min	sec	latitude	longitude	Z(m)	H1863 SE of Grays Canyon (Salmi) Description
7/29/2021	19	3	20.6	46.885008	-124.779028	152	after watch change, looking for bubble stream previous watch was seeing
7/29/2021	19	3	27.2	46.885008	-124.779028	152	big ling cod
7/29/2021	19	3	42.1	46.885006	-124.779027	152	just relocated bubbles
7/29/2021	19	5	16.9	46.885005	-124.779031	152	Measuring left bubble stream of the two we are seeing come from the sediment next to a large carbonate boulder
7/29/2021	19	6	9.7	46.885004	-124.779031	152	trying to gently land ROV
7/29/2021	19	10	59.2	46.885000	-124.779021	152	set down herc, going to read temp now
7/29/2021	19	20	24.8	46.885002	-124.779030	152	Temperature readings. Ambient
7/29/2021	19	20	38.2	46.885002	-124.779030	152	finished temp measurements, now setting up for gas tight
7/29/2021	19	22	36.2	46.885005	-124.779033	152	going to use red green GT7 first
7/29/2021	19	26	36.0	46.885004	-124.779032	152	see pure gas phase (not hydrate because of shallow depths) filling up funnel
7/29/2021	19	30	55.5	46.885004	-124.779035	152	funnel almost full
7/29/2021	19	32	27.5	46.885002	-124.779035	152	triggering GT
7/29/2021	19	38	14.9	46.885002	-124.779032	152	poking to see how deep sediment is, if coring possible
7/29/2021	19	40	8.9	46.885002	-124.779028	152	setting up to deploy marker here
7/29/2021	19	43	38.1	46.885004	-124.779028	152	Dropping PMEL marker 215 up on carbonate boulder near bubble plume
7/29/2021	19	47	10.5	46.885011	-124.779037	149	now will do Niskin 25 m down current
7/29/2021	19	49	49.0	46.885083	-124.779184	151	another lingcod
7/29/2021	19	50	54.1	46.885164	-124.779277	152	transited out of large carbonate mound area onto very murky soft sediment, being disturbed by large lingcod and rockfish below
7/29/2021	19	51	3.2	46.885173	-124.779276	152	also saw a crab and a red seastar
7/29/2021	19	51	44.9	46.885174	-124.779276	151	positioning niskins on clear side of vehicle, away from sediment stirred up by bottom fish
7/29/2021	19	54	11.9	46.885175	-124.779276	152	Heading back through bubble 4, 3, and two (targets dropped earlier in dive) to survey them more thoroughly. Planning to end up at bubble 5 orange mat marker for sampling
7/29/2021	19	55	4.7	46.885145	-124.779245	152	Another lingcod and one solo large carbonate rock with an anemone and sea star
7/29/2021	19	56	21.5	46.885122	-124.779146	152	huge white anemone
7/29/2021	19	56	53.6	46.885075	-124.779143	152	still over soft sediment area transiting to bubble 4 marker, occasional carbonate mound or large rock
7/29/2021	19	57	31.6	46.885054	-124.779120	152	moving southward toward marker
7/29/2021	19	57	45.6	46.885054	-124.779120	152	may be seeing bubble stream in sonar
7/29/2021	19	58	53.3	46.884999	-124.779095	152	Now some more carbonate rubble and a sea star, adjacent to a bubble stream. we think this is bubble 4 marker
7/29/2021	20	0	17.8	46.884997	-124.779098	152	now moving E about 9 m past bubbles 2 and 3 and then finally 5
7/29/2021	20	2	38.1	46.884994	-124.779101	151	just ran into the marker we dropped again
7/29/2021	20	4	46.1	46.884989	-124.779107	151	just heading toward orange mat now
7/29/2021	20	6	13.7	46.884974	-124.779039	152	just reset DVL
7/29/2021	20	6	54.9	46.885010	-124.779034	152	transiting now again over soft sediment with very low visibility and scattered carbonates
7/29/2021	20	7	26.6	46.885014	-124.779019	152	big lingcod passing
7/29/2021	20	7	52.0	46.885014	-124.779019	152	using norbit to look for bubble 5
7/29/2021	20	10	9.9	46.884994	-124.778976	153	pursuing signal on norbit, just located stream
7/29/2021	20	14	28.2	46.884994	-124.778979	153	Used poking stick and found only very thin sediment layer near microbial mat and bubbles. Planning now to look at WP1. Will try to get fully sample suite elsewhere

date	hr	min	sec	latitude	longitude	Z(m)	H1863 SE of Grays Canyon (Salmi) Description
7/29/2021	20	14	40.8	46.884993	-124.778979	152	correction WP2, which is 30 m away to the SW
7/29/2021	20	15	5.2	46.884994	-124.778983	151	another large white anemone and orange smaller anemone
7/29/2021	20	17	45.0	46.884894	-124.779089	152	seeing lots of large lingcod throughout
7/29/2021	20	18	0.9	46.884894	-124.779097	152	also a couple manmade lines on the seafloor
7/29/2021	20	18	59.4	46.884886	-124.779218	152	traveling along line in general direction of WP2 to try and make sure no floaty bit at the end
7/29/2021	20	19	39.1	46.884853	-124.779216	152	about 5 m from WP2, we're to the NE
7/29/2021	20	19	53.3	46.884853	-124.779238	152	also still seeing occasional rock fish
7/29/2021	20	22	4.7	46.884891	-124.779273	152	trying to locate bubbles in sonar,
7/29/2021	20	22	9.6	46.884891	-124.779273	152	just found a stream
7/29/2021	20	22	51.4	46.884895	-124.779273	152	now some bubbles under herc fwd right corner
7/29/2021	20	23	29.1	46.884895	-124.779279	152	bubbles seem to be rising from under a carbonate rock
7/29/2021	20	25	52.1	46.884893	-124.779282	152	very tiny squat lobsters next to bubble stream
7/29/2021	20	26	36.0	46.884893	-124.779282	152	going to try to slurp tiny squat lobsters adjacent to bubble stream
7/29/2021	20	26	53.1	46.884895	-124.779282	152	looks like there are very small bits of white and orange bacterial mat next to bubble stream
7/29/2021	20	37	49.1	46.884894	-124.779279	152	Done slurping, going to WP3. WP2 where we are is in the pit of the Salmi plume site depression
7/29/2021	20	38	10.4	46.884896	-124.779278	152	WP3 is 33 m to the S
7/29/2021	20	39	1.5	46.884862	-124.779305	152	now over soft sediment bottom with scattered carbonate rubble again, low obvious fauna
7/29/2021	20	39	42.4	46.884861	-124.779316	152	another bubble stream with small orange mat patch
7/29/2021	20	42	4.0	46.884840	-124.779333	152	seems like there are around 5 bubble streams in a curtain here
7/29/2021	20	42	41.5	46.884840	-124.779332	152	orange sea star and large orange holothurian near bubbles
7/29/2021	20	43	55.0	46.884842	-124.779333	152	large lingcod just came into frame
7/29/2021	20	45	35.3	46.884841	-124.779330	152	testing sediment depth
7/29/2021	20	46	6.4	46.884840	-124.779330	152	immediately hit carbonate
7/29/2021	20	48	32.0	46.884849	-124.779317	152	moving on to WP 3, will come back here if don't find better site
7/29/2021	20	51	8.6	46.884785	-124.779298	152	Zooms and footage of large carbonate mound covered in tube worms and bivalves. also more of the orange red sea stars and possibly a skate egg
7/29/2021	20	51	19.8	46.884785	-124.779298	152	at the base see a bubble stream and some mat
7/29/2021	20	52	52.9	46.884729	-124.779364	152	another carbonate mound with bivalves and small tube worms, some kelp caught on it
7/29/2021	20	53	54.2	46.884700	-124.779354	152	around 4 m NW of WP3 now
7/29/2021	20	54	21.8	46.884695	-124.779379	152	a very large sea cucumber
7/29/2021	20	55	41.9	46.884668	-124.779381	152	zooms on small sponges throughout seafloor, hard to see them because they are covered in sediment
7/29/2021	20	57	4.5	46.884653	-124.779378	152	looks like rhabdocalyptus, a type of boot sponge
7/29/2021	20	57	32.7	46.884653	-124.779377	152	very turbid but seeing two bubble streams in camera, waiting for sediment to settle
7/29/2021	21	1	37.3	46.884658	-124.779375	152	will see now if this is a corable area near this bubble stream with small orange mat
7/29/2021	21	2	34.8	46.884657	-124.779378	152	seems like, other than curtain stream and large fauna encrusted carbonates near it, generally this seep area is characterized by a thin layer of sediment over a layer of carbonate with small persistent bubble streams and very small patches of white and orange bacterial mat surrounding them
7/29/2021	21	3	17.8	46.884655	-124.779378	152	used poking stick, very shallow sediment

date	hr	min	sec	latitude	longitude	Z(m)	H1863 SE of Grays Canyon (Salmi) Description
7/29/2021	21	4	49.0	46.884656	-124.779377	152	heading to WP4 to the SE now, will be slightly shallower, on ridge surrounding this depression
7/29/2021	21	4	58.8	46.884658	-124.779378	151	about 103 m away at 151 heading
7/29/2021	21	5	10.5	46.884659	-124.779380	152	current depth is 152 m
7/29/2021	21	5	27.3	46.884652	-124.779373	152	two large lingcod
7/29/2021	21	6	52.3	46.884608	-124.779359	152	seeing large group of shrimp on seafloor
7/29/2021	21	8	0.5	46.884574	-124.779309	152	seeing crab and possible white sea star under carbonate rock
7/29/2021	21	9	2.1	46.884557	-124.779267	152	still seeing lots of very sediment covered boot sponges on rock and many lingcod on seafloor
7/29/2021	21	10	14.5	46.884494	-124.779227	152	currently no rocks on seafloor, very loose sediment with groups of red shrimp and occasional sea star, probably have been vermillion sea stars
7/29/2021	21	11	58.8	46.884368	-124.779133	151	saw another giant white anemone, probably plumose anemone
7/29/2021	21	12	5.1	46.884310	-124.779133	151	Metridium farciment
7/29/2021	21	12	20.9	46.884292	-124.779132	151	still seeing hundreds of shrimp in the frame at any given time
7/29/2021	21	13	39.3	46.884187	-124.779020	151	large skate, maybe rough tail
7/29/2021	21	15	7.0	46.884063	-124.778865	151	actually was probably longnose skate
7/29/2021	21	15	35.2	46.884051	-124.778846	150	large white sea star
7/29/2021	21	19	54.4	46.883876	-124.778732	151	now over some carbonate rocks near WP4 seeing quite a few large white sea stars, also some vermillion stars, and a large white plumose anemone
7/29/2021	21	20	25.6	46.883869	-124.778734	151	see a bubble stream here
7/29/2021	21	20	40.9	46.883865	-124.778738	151	possibly another about 4 m away
7/29/2021	21	21	15.4	46.883865	-124.778739	151	also a third stream to the left
7/29/2021	21	22	49.0	46.883846	-124.778755	151	going 4.5 m to NE where there may be another stream, seeing something in sonar
7/29/2021	21	23	21.5	46.883837	-124.778745	151	another two large plumose anemones clustered near a rock
7/29/2021	21	24	10.0	46.883836	-124.778712	151	Also a carnivorous sponge asbestopluma?
7/29/2021	21	24	50.8	46.883837	-124.778693	151	not seeing anything over to the NE besides large rock with anemones
7/29/2021	21	25	25.8	46.883837	-124.778692	151	seeing some very small patches of mat now next to waypoint 4 with holes that look like past seepage conduits
7/29/2021	21	26	54.0	46.883873	-124.778730	151	backing up toward bubbles we saw behind us, may be the ones we observed when we first got to this WP
7/29/2021	21	28	1.5	46.883847	-124.778723	151	Correction, plumose anemones are Metridium senile not farcimen
7/29/2021	21	29	3.5	46.883838	-124.778688	151	coring now near bubble holes and small mat we were just looking at
7/29/2021	21	38	49.9	46.883806	-124.778663	151	Moving further SE toward WP5 now
7/29/2021	21	39	13.3	46.883791	-124.778659	150	also previous anemone may actually have been farcimen
7/29/2021	21	39	27.6	46.883743	-124.778640	150	back over soft featureless sediment with thousands of shrimp
7/29/2021	21	41	10.6	46.883631	-124.778616	150	another very large orange sea cucumber
7/29/2021	21	42	55.5	46.883568	-124.778501	151	WP 5 is around 150 m water depth
7/29/2021	21	43	17.5	46.883564	-124.778506	151	very large white sea star next to very large orange sea cucumber on a rock
7/29/2021	21	44	51.9	46.883567	-124.778485	151	also a rock fish with white spots on top and another fish that is pink with brown speckles, may also be different rock fish
7/29/2021	21	45	3.2	46.883566	-124.778485	151	zooms on some shell hash

date	hr	min	sec	latitude	longitude	Z(m)	H1863 SE of Grays Canyon (Salmi) Description
7/29/2021	21	45	50.8	46.883542	-124.778494	151	seeing lots of these fish
7/29/2021	21	46	33.8	46.883536	-124.778498	151	now at WP 5 seeing small persistent bubble streams surrounded by carbonate boulders
7/29/2021	21	47	0.8	46.883535	-124.778492	151	eroded shells we saw may have been lucinids
7/29/2021	21	47	42.0	46.883536	-124.778491	151	zooms on bubble stream
7/29/2021	21	48	10.5	46.883538	-124.778498	151	seeing more of the squat lobsters we collected on the carbonates nearby
7/29/2021	22	1	51.2	46.883798	-124.778902	149	now planning to go around WP4 and approach from the NW for better visibility
7/29/2021	22	3	14.4	46.883967	-124.778777	147	approaching WP4 now from the north
7/29/2021	22	4	13.8	46.883920	-124.778789	150	seeing bubbles around 5 m out in norbit
7/29/2021	22	7	32.9	46.883871	-124.778721	151	back at WP4 bubble stream
7/29/2021	22	8	3.7	46.883868	-124.778723	151	planning to do gas tight sample
7/29/2021	22	10	19.0	46.883868	-124.778715	151	O2 here is ~27 uM and 7% saturation
7/29/2021	22	13	50.4	46.883855	-124.778716	151	now will use temperature probe over bubbles
7/29/2021	22	17	29.8	46.883872	-124.778701	151	still positioning for temp probe
7/29/2021	22	19	32.2	46.883849	-124.778702	151	just set down and located bubble source
7/29/2021	22	23	29.2	46.883848	-124.778704	151	Ambient temp
7/29/2021	22	30	50.2	46.883857	-124.778702	152	Waiting for gas tight to fill
7/29/2021	22	37	32.3	46.883848	-124.778706	152	starry rockfish was hanging out here as we waited, this is the one with the white dots
7/29/2021	22	44	46.1	46.883849	-124.778701	152	still filling gas tight
7/29/2021	22	50	36.9	46.883853	-124.778699	152	bivalves we see on carbonate behind gas tight and that we've been seeing earlier look like Acesta
7/29/2021	23	0	58.5	46.883849	-124.778708	152	GT successfully taken; moving onto organismal samples
7/29/2021	23	3	33.9	46.883853	-124.778701	152	Accidently flung sea star during scooping process; attempting to relocate now
7/29/2021	23	6	6.2	46.883850	-124.778737	152	Located original sea star; attempted to sample again
7/29/2021	23	7	12.7	46.883845	-124.778734	152	Waiting for visibility to improve before organismal sampling
7/29/2021	23	11	0.1	46.883854	-124.778744	152	Plan to use suction device to place sea stars in the scoop
7/29/2021	23	11	7.5	46.883853	-124.778746	152	Suction at 20%
7/29/2021	23	18	35.7	46.883855	-124.778747	152	Moving on to slurp bivalves
7/29/2021	23	29	40.5	46.883854	-124.778746	152	Bungee on the slurp gun has become unattached; currently using grab to try and retract slurp tool
7/29/2021	23	30	59.1	46.883854	-124.778745	152	Placing slurp attachment in front basket as we continue to traverse
7/29/2021	23	31	26.7	46.883854	-124.778747	152	Lingcod visible
7/29/2021	23	31	40.8	46.883854	-124.778746	152	Sampling for carbonate with grab tool
7/29/2021	23	33	9.4	46.883854	-124.778744	152	Slurp hose starting to retract by itself
7/29/2021	23	35	15.5	46.883857	-124.778746	152	Going to play around with slurp hose and then plan to collect last Niskin
7/29/2021	23	40	27.7	46.883855	-124.778746	143	Sampled last Niskin; returning to sea floor
7/29/2021	23	42	53.8	46.884029	-124.778737	151	Heading to WP2; located at a 344 bearing about 115 m NW
7/29/2021	23	43	46.6	46.884099	-124.778765	151	Krill scattered across the sea floor
7/29/2021	23	46	6.7	46.884285	-124.778847	150	Visibility remains low; currently traversing to WP2
7/29/2021	23	51	20.5	46.884573	-124.779117	151	Moving up into the water column to search for bubbles via Norbit
7/29/2021	23	51	50.4	46.884577	-124.779121	152	Large carbonate boulder with sponge
7/29/2021	23	53	12.4	46.884708	-124.778972	150	Ascended to ~5 m above the sea floor
7/29/2021	23	53	34.1	46.884784	-124.778985	148	Cleaning off vessel and continuing to ascend a few more meters to search for bubbles via sonar

date	hr	min	sec	latitude	longitude	Z(m)	H1863 SE of Grays Canyon (Salmi) Description
7/29/2021	23	54	10.1	46.884861	-124.779027	144	Holding at 10 m altitude
7/29/2021	23	56	7.1	46.884917	-124.779139	144	Moving W to WP2 in search of bubbles
7/29/2021	23	57	52.0	46.884922	-124.779140	154	Descending to sea floor to drop a weight
7/29/2021	23	58	51.0	46.884923	-124.779141	154	Thornyhead
7/29/2021	23	59	7.8	46.884923	-124.779142	153	Successfully dropped the weight
7/29/2021	23	59	51.6	46.884925	-124.779137	151	Current coming out of the south
7/30/2021	0	0	16.5	46.884922	-124.779137	151	14 m at 241 away from previous observed bubbles
7/30/2021	0	0	35.2	46.884922	-124.779140	148	Coming up a few meters to use sonar to find bubble stream as visibility is low
7/30/2021	0	3	45.9	46.884917	-124.779288	153	Carbonate slabs
7/30/2021	0	3	59.7	46.884916	-124.779284	153	Searching for bubble stream at WP2
7/30/2021	0	12	55.4	46.884848	-124.779305	153	going to attempt to slurp tubeworms
7/30/2021	0	15	51.8	46.884848	-124.779304	153	trying to grasp slurp appropriately
7/30/2021	0	28	38.3	46.884848	-124.779307	154	Parastichopus on carbonate slab
7/30/2021	0	29	48.0	46.884851	-124.779308	153	Heading to WP6 at 35 bearing; about 120 m away
7/30/2021	0	30	4.2	46.884850	-124.779311	153	Huge lingcod
7/30/2021	0	32	57.2	46.884951	-124.779359	153	Checking wind speeds
7/30/2021	0	33	30.4	46.885015	-124.779312	153	Traversing over more carbonate slabs
7/30/2021	0	34	7.0	46.885044	-124.779305	153	Large anemone
7/30/2021	0	35	31.3	46.885327	-124.779345	153	At 1.2 m altitude; traveling over flat sea floor covered in shrimp
7/30/2021	0	36	53.5	46.885407	-124.779398	152	Skate
7/30/2021	0	38	8.3	46.885519	-124.779420	152	56 m away from WP6
7/30/2021	0	40	47.3	46.885755	-124.779441	151	Another skate moving around the sea floor
7/30/2021	0	42	22.7	46.885818	-124.779444	151	Thornyhead on the sea floor amongst the shrimp
7/30/2021	0	43	57.5	46.885937	-124.779454	151	Potentially bubbles spotted on the Norbit; only 7 m from WP6
7/30/2021	0	44	48.6	46.885916	-124.779523	151	Searching for bubble stream
7/30/2021	0	45	26.8	46.885917	-124.779523	151	Coming up on bubble stream
7/30/2021	0	46	40.0	46.885921	-124.779541	151	Orange microbial mats and large anemones
7/30/2021	0	47	43.9	46.885936	-124.779546	151	Four anemones; three white and one reddish orange
7/30/2021	0	50	35.4	46.885915	-124.779602	151	Orange and gray microbial mat with shrimp and small eelpout
7/30/2021	0	51	43.8	46.885935	-124.779620	151	Heading to WP8 which is NE of current location
7/30/2021	0	52	6.3	46.885971	-124.779577	151	Vessel move 125 m at 012
7/30/2021	0	52	25.6	46.885978	-124.779560	151	Sea pens
7/30/2021	0	53	44.2	46.885991	-124.779536	151	Large sea star
7/30/2021	0	56	54.5	46.886217	-124.779404	150	Still heading towards WP8
7/30/2021	0	59	10.2	46.886483	-124.779417	151	Passed over a sea cucumber
7/30/2021	1	0	4.6	46.886546	-124.779324	151	Low visibility
7/30/2021	1	4	25.6	46.886831	-124.779362	152	Found bubbles SW of WP8
7/30/2021	1	5	43.1	46.886855	-124.779377	152	Continuing on to WP8
7/30/2021	1	5	56.4	46.886924	-124.779331	152	Large lingcod
7/30/2021	1	6	55.4	46.886950	-124.779307	152	Carbonate cobbles and Pteraster
7/30/2021	1	7	9.9	46.886950	-124.779308	152	Waiting for visibility to increase
7/30/2021	1	8	36.5	46.886973	-124.779304	152	Thornyhead
7/30/2021	1	8	45.8	46.886974	-124.779310	152	Carbonate slabs and cobbles
7/30/2021	1	9	11.1	46.886974	-124.779351	152	Metridium senile
7/30/2021	1	9	28.8	46.886984	-124.779345	152	Parastichopus
7/30/2021	1	10	36.6	46.886987	-124.779335	152	Bivalves on the carbonate cobbles
7/30/2021	1	10	43.8	46.886988	-124.779334	152	Small patch of kelp
7/30/2021	1	10	54.8	46.886987	-124.779335	152	Potential zoanthids coating one of the rocks

date	hr	min	sec	latitude	longitude	Z(m)	H1863 SE of Grays Canyon (Salmi) Description
7/30/2021	1	12	22.7	46.887026	-124.779288	151	Anemone is potentially Stomphia
7/30/2021	1	12	50.6	46.887023	-124.779287	151	Thornyhead
7/30/2021	1	13	31.0	46.886974	-124.779285	150	Carbonate slabs with life scattered throughout from bivalves to parastichopus (sea cucumber)
7/30/2021	1	14	20.9	46.886976	-124.779284	146	Moving up in the water column to use Norbit to search for bubble streams
7/30/2021	1	17	35.3	46.886977	-124.779282	147	Heading towards depression located to the SE
7/30/2021	1	18	32.0	46.886981	-124.779218	152	Several pteraster and a large lingcod
7/30/2021	1	19	7.8	46.886954	-124.779193	152	Large carbonate boulder
7/30/2021	1	19	36.6	46.886953	-124.779186	152	Large white anemones on carbonate rock
7/30/2021	1	20	35.0	46.886949	-124.779165	152	Metridium senile
7/30/2021	1	21	28.7	46.886928	-124.779137	152	Many large white anemones (Metridium senile) and several small orange/red anemones scattered amongst carbonate rock
7/30/2021	1	22	54.2	46.886851	-124.778848	151	Traversing over flat sea floor with lots of shrimp
7/30/2021	1	23	49.8	46.886770	-124.778764	151	Thornyhead
7/30/2021	1	25	51.2	46.886620	-124.778539	150	Argus screen froze
7/30/2021	1	26	24.7	46.886618	-124.778505	150	Computer rebooting
7/30/2021	1	27	50.0	46.886584	-124.778389	150	white sea star
7/30/2021	1	32	37.1	46.886229	-124.777907	152	Large lingcod
7/30/2021	1	33	3.0	46.886221	-124.777864	152	Continuing to head SE towards the depression
7/30/2021	1	33	34.8	46.886220	-124.777858	152	Patch of shell harsh
7/30/2021	1	33	53.1	46.886220	-124.777855	152	Potentially a little bit of white bacterial mat scattered amongst the shell hash
7/30/2021	1	35	38.3	46.886221	-124.777745	152	Carbonate cobbles with bivalves and a crab
7/30/2021	1	36	13.7	46.886172	-124.777689	152	Small carbonate cobbles
7/30/2021	1	36	56.1	46.886160	-124.777651	153	Potentially a Stomphia and thornyhead on carbonate cobble
7/30/2021	1	37	9.9	46.886125	-124.777651	152	Line on the seafloor
7/30/2021	1	37	35.3	46.886124	-124.777677	152	More anemones and sea stars on carbonate rock
7/30/2021	1	37	59.0	46.886105	-124.777677	153	Large lingcod
7/30/2021	1	38	21.4	46.886056	-124.777605	152	Large carbonate slab
7/30/2021	1	38	45.5	46.886029	-124.777596	152	Rock face has likely been eroded by the current
7/30/2021	1	39	1.0	46.885999	-124.777588	153	Thornyhead
7/30/2021	1	39	35.8	46.885943	-124.777514	153	Lingcod
7/30/2021	1	40	37.4	46.885888	-124.777391	153	Metridium senile on carbonate cobble
7/30/2021	1	40	54.8	46.885885	-124.777331	152	More fishing line spotted
7/30/2021	1	42	1.4	46.885760	-124.777190	153	Fishing line with lingcod and sea stars scattered around it
7/30/2021	1	42	51.3	46.885641	-124.777087	154	Carbonate rock and some cobbles
7/30/2021	1	43	51.7	46.885546	-124.777024	154	Continuing to head SE
7/30/2021	1	44	50.6	46.885506	-124.776978	154	Large rock with lots of anemones, potentially Stomphia
7/30/2021	1	45	21.1	46.885472	-124.776922	154	Passed Rathbunaster on large rocks
7/30/2021	1	46	27.3	46.885436	-124.776942	154	Rockfish and large lingcod
7/30/2021	1	47	42.3	46.885428	-124.776808	154	Lots of Chimaera
7/30/2021	1	48	0.6	46.885390	-124.776808	154	Large anemone with long tentacles on the sea floor
7/30/2021	1	48	48.6	46.885384	-124.776682	154	Productive fish habitat; lots of chimaera and rockfish
7/30/2021	1	48	56.9	46.885383	-124.776673	154	No clear evidence of seeps
7/30/2021	1	49	48.7	46.885351	-124.776668	153	Hagfish
7/30/2021	1	51	8.7	46.885288	-124.776671	153	Large slabs providing ample community for fish, anemones, and sea stars
7/30/2021	1	52	52.1	46.885306	-124.776812	154	More rockfish, chimaera, and lingcod
7/30/2021	1	53	55.9	46.885291	-124.776701	154	Continuing to explore the area

date	hr	min	sec	latitude	longitude	Z(m)	H1863 SE of Grays Canyon (Salmi) Description
7/30/2021	1	55	5.9	46.885277	-124.776644	152	Cobbles and large slabs with Metridium senile
7/30/2021	1	56	22.3	46.885349	-124.776640	153	A sizable bubble stream found
7/30/2021	1	57	13.3	46.885345	-124.776633	153	Three bubble streams surrounded by carbonate cobbles
7/30/2021	1	58	12.4	46.885341	-124.776633	153	Orange microbial mat near the bubble stream
7/30/2021	1	58	26.0	46.885341	-124.776633	153	Small anemones on carbonate cobble
7/30/2021	1	59	3.7	46.885342	-124.776633	153	Another small stream of bubbles
7/30/2021	1	59	31.3	46.885341	-124.776633	153	Fishing line
7/30/2021	2	0	48.3	46.885343	-124.776631	152	Ready for recovery; repositioning argus
7/30/2021	2	1	45.8	46.885302	-124.776642	144	Deck all set for recovery
7/30/2021	2	2	20.2	46.885211	-124.776633	138	Argus beginning ascent
7/30/2021	2	4	41.6	46.885344	-124.776698	110	Ascending at 11 m/min; currently at 112 m
7/30/2021	2	5	54.4	46.885477	-124.776716	97	Estimated time to surface 9 min
7/30/2021	2	8	38.3	46.885687	-124.776659	69	Ctenophores in the water column in front of Herc
7/30/2021	2	9	1.1	46.885695	-124.776673	65	Ascending at ~11 m/min; currently at 65 m
7/30/2021	2	10	20.4	46.885720	-124.776785	52	All stop at 50 m
7/30/2021	2	10	41.0	46.885729	-124.776781	49	Recovery moving forward
7/30/2021	2	11	14.3	46.885740	-124.776759	44	Jellies in the water column
7/30/2021	2	14	28.0	46.886009	-124.776932	11	Lights off on Herc and Argus
7/30/2021	2	14	36.7	46.886010	-124.776939	9	Murky near the surface
7/30/2021	2	15	56.9	46.886311	-124.777190	8	Argus recovery on deck has begun and Herc is at the surface
7/30/2021	2	16	59.8	46.886270	-124.777439	8	Argus on deck
7/30/2021	2	23	56.1	46.884994	-124.779318	8	Herc coming out of the water
7/30/2021	2	24	26.7	46.884899	-124.779537	8	Herc has too much gas on it for a shallow dive

Table 18: H1864 Ridge SW of Grays Canyon Dive Log

date	hr	min	sec	latitude	longitude	Z(m)	H1864 Ridge SW of Grays Canyon Descriptions
7/30/2021	15	6	21.8	46.788738	-125.493914	31	marine snow and jellies in the water column
7/30/2021	15	11	31.6	46.788888	-125.494326	135	descending to waypoint 2 first
7/30/2021	15	21	23.1	46.789113	-125.494302	384	shrimp, ctenophores, marine snow, beginning to see some small lantern fish
7/30/2021	15	22	9.3	46.789117	-125.494344	402	odd fish swam by ~1min ago, should ID post dive
7/30/2021	15	24	3.2	46.789113	-125.494333	447	increase in marine snow and lantern fish
7/30/2021	15	34	55.4	46.789388	-125.494327	718	large red jelly
7/30/2021	15	35	37.6	46.789409	-125.494306	736	long pink siphonophore chain
7/30/2021	15	36	6.1	46.789404	-125.494287	748	squid
7/30/2021	15	44	1.6	46.789553	-125.494143	943	larvacean houses
7/30/2021	15	53	26.1	46.789608	-125.494138	1176	~500m off bottom
7/30/2021	16	6	39.8	46.789612	-125.494165	1504	100m to bottom
7/30/2021	16	6	48.5	46.789613	-125.494160	1508	Heading to waypoint 2 - the brightest flare in the quimera data this morning.
7/30/2021	16	9	12.2	46.789650	-125.494093	1567	The landing target should be at 1600 m. But we are a bit deeper and will climb up to it.
7/30/2021	16	12	44.3	46.789229	-125.493674	1609	bottom in sight
7/30/2021	16	13	18.6	46.789189	-125.493674	1606	blob sculpin as soon as we reached the bottom, there is also some scattered carbonate
7/30/2021	16	13	28.1	46.789189	-125.493671	1606	white balance and stills cam set up
7/30/2021	16	18	24.0	46.788926	-125.493694	1610	large white sea pen

date	hr	min	sec	latitude	longitude	Z(m)	H1864 Ridge SW of Grays Canyon Descriptions
7/30/2021	16	18	47.4	46.788928	-125.493695	1610	soft sediment bottom with some trails from invertebrates visible
7/30/2021	16	23	45.8	46.788921	-125.493687	1610	there is not enough disk space for stills cam, will pass this on to data to be fixed
7/30/2021	16	25	23.6	46.788935	-125.493688	1610	one large orange crab, a neptunia making snail trails in the sediment, marine snow still visible on seafloor
7/30/2021	16	25	39.3	46.788936	-125.493684	1609	Finished with housekeeping. Will head upslope now.
7/30/2021	16	26	7.6	46.788940	-125.493661	1609	there is some shell hash on the seafloor
7/30/2021	16	27	35.6	46.788960	-125.493499	1604	another neptunia leaving trails, approaching more rocky carbonate debris as we head up slope
7/30/2021	16	27	59.1	46.788962	-125.493495	1603	large scatter of carbonate on the face of the slope
7/30/2021	16	28	44.4	46.788967	-125.493496	1603	at the base of the slope there are 3 bundles of tube worms and anemones
7/30/2021	16	30	32.2	46.788946	-125.493502	1602	bright white colored rock, going to investigate and poke at it to see if it is hydrate
7/30/2021	16	32	56.9	46.788944	-125.493428	1603	preparing to land the ROV
7/30/2021	16	33	29.0	46.788943	-125.493427	1602	Investigating this white on the carbonate - just in case it is hydrate.
7/30/2021	16	37	48.6	46.788936	-125.493438	1603	Bob is at the helm. Looking at this white on the rock.
7/30/2021	16	40	44.0	46.788935	-125.493433	1603	white rock we were seeing were not hydrate, but crack open surfaces of carbonate
7/30/2021	16	41	9.3	46.788948	-125.493432	1603	closed captions failed
7/30/2021	16	42	7.5	46.788945	-125.493430	1602	continuing to waypoint 2
7/30/2021	16	42	47.1	46.788962	-125.493378	1600	approaching more large slabs and boulders of carbonate with a lot of tube worms
7/30/2021	16	43	10.9	46.788981	-125.493355	1600	tanner crab hiding under carbonate
7/30/2021	16	45	14.1	46.789013	-125.493304	1598	very large carbonate rock features with a slime star, sea cucumber, and neptunia egg stalk, a crab and tube worms
7/30/2021	16	46	28.2	46.789023	-125.493305	1597	large layered carbonate shelf with overhangs, mostly sedimented color with dark grey and white patches; tube worms are very common here, flytrap anemones appear to like to settle on top of the tube worm stalks
7/30/2021	16	48	40.8	46.789100	-125.493186	1598	very large open rocky area with carbonate rock boulders, shelves, and overhangs
7/30/2021	16	50	1.6	46.789126	-125.493182	1599	bubbles seen in a crack between large carbonate shelves
7/30/2021	16	51	15.4	46.789133	-125.493175	1599	First bubble stream with anemones and tubeworms. Nice strong stream. White mat.
7/30/2021	16	53	8.9	46.789118	-125.493177	1597	target is 5m away
7/30/2021	16	55	31.2	46.789056	-125.493174	1599	Massive bundles of tube worms settled in "Canyons" of carbonate, squat lobsters, bacterial mat
7/30/2021	16	56	50.1	46.789069	-125.493147	1597	very large healthy tube worm field
7/30/2021	16	58	28.8	46.789062	-125.493154	1597	slowly traveling to waypoint 3 and exploring
7/30/2021	16	59	31.9	46.789132	-125.493164	1595	Heading to WP 3 now after discovering bubbles and tubeworms, mat, squat lobsters.
7/30/2021	17	1	53.9	46.789269	-125.493097	1595	massive chunks of carbonate boulders, currently at 4.4 m altitude and the boulders extend even higher than the top of the vehicle
7/30/2021	17	2	13.6	46.789283	-125.493081	1595	2 more bushes of tube worms
7/30/2021	17	3	40.1	46.789303	-125.493063	1595	many visible carbonate shelves
7/30/2021	17	7	7.7	46.789398	-125.492834	1600	large white patches of bacterial mat surrounding large carbonate boulders, nearby there are clams in the

date	hr	min	sec	latitude	longitude	Z(m)	H1864 Ridge SW of Grays Canyon Descriptions
							sediment, testing to see if it is possible to collect a push core here
7/30/2021	17	8	45.1	46.789370	-125.492833	1601	bubbles in area near the large white bacterial mats and clams
7/30/2021	17	11	17.3	46.789384	-125.492840	1600	sediment is thick enough here to take a core
7/30/2021	17	12	26.6	46.789417	-125.492765	1600	1601m O2
7/30/2021	17	12	39.7	46.789417	-125.492768	1600	continuing to waypoint 3
7/30/2021	17	14	25.8	46.789456	-125.492761	1600	fine scale mora fish
7/30/2021	17	16	16.5	46.789641	-125.492874	1605	doppler reset
7/30/2021	17	17	6.3	46.789593	-125.492848	1605	2nd bubble site (bubbles2). White mat, deep sed underneath. Tubeworms
7/30/2021	17	18	22.5	46.789565	-125.492972	1604	at waypoint 3, there is a very large boulder, but no bubbles seen yet
7/30/2021	17	21	46.8	46.789433	-125.493053	1594	several bubble streams at waypoint 3
7/30/2021	17	22	3.6	46.789432	-125.493058	1596	going down to investigate bubbles
7/30/2021	17	24	15.4	46.789435	-125.493042	1597	bubble streams we just spotted turned off
7/30/2021	17	24	32.2	46.789415	-125.493042	1597	Bubbles here. (bubbles 3)
7/30/2021	17	24	46.9	46.789417	-125.493038	1596	investigating bubbles ~10m away that looks promising in Norbit sonar
7/30/2021	17	25	44.3	46.789467	-125.492881	1598	located another bubble stream where norbit indicated there would be one
7/30/2021	17	27	46.1	46.789415	-125.492811	1603	Bubbles 4. Coming out of a crack under a bright white area. Probably broken carbonate but we will check it out.
7/30/2021	17	28	27.3	46.789422	-125.492802	1603	the bubble stream is coming from a crack between large carbonate boulders, at the base of the bubbles there is bright white matter, we will investigate to see if it is hydrate
7/30/2021	17	29	8.5	46.789431	-125.492807	1603	there are also a lot of tube worms, and a Coryphaenoides
7/30/2021	17	32	14.5	46.789424	-125.492839	1603	possibly found hydrate
7/30/2021	17	35	10.3	46.789423	-125.492830	1603	Bubbles 4 with hydrate!! (we hope)!!
7/30/2021	17	35	59.3	46.789421	-125.492831	1603	Possibly found hydrate at the base of bubble site, the carbonate is bright white and when the substrate was poked, it began to bubble. Nearby there are tube worms, bubble streams, bacterial mat. Depth is 1603m, O2 is 4.40% or 18.76 umol/L, ambient temp is 2.59C
7/30/2021	17	36	33.2	46.789414	-125.492838	1603	positioning the ROV to sample hydrate
7/30/2021	17	36	38.6	46.789415	-125.492838	1603	Hydrate is next to the bubble stream emanating from a crack in this jumble of carbonate.
7/30/2021	17	37	8.7	46.789415	-125.492836	1603	There are tubeworms and white bac mat here.
7/30/2021	17	37	18.4	46.789415	-125.492836	1603	hydrate has a shaved ice like texture
7/30/2021	17	37	43.3	46.789415	-125.492838	1603	Going to break off a piece of the rock covering the carbonate to try to make sampling easier.
7/30/2021	17	38	27.7	46.789414	-125.492846	1603	T ambient here is 2.58 C
7/30/2021	17	40	23.2	46.789420	-125.492852	1603	Moving in with the hydrate sampler. This is a 2 arm operation so it tricky.
7/30/2021	17	41	24.8	46.789427	-125.492851	1603	Large bubbles with a hydrate coating in at least 2 separate spots here.
7/30/2021	17	44	48.8	46.789421	-125.492839	1603	retrieving dropped hydrate sampler
7/30/2021	17	44	55.4	46.789422	-125.492839	1603	Dropped the sampler. With the 2-armed operation this is difficult.
7/30/2021	17	45	35.2	46.789424	-125.492837	1603	The sampler is just below. Going in to retrieve it

date	hr	min	sec	latitude	longitude	Z(m)	H1864 Ridge SW of Grays Canyon Descriptions
7/30/2021	17	46	56.8	46.789425	-125.492824	1603	Successful transfer of hydrate sampler from the stbd to port arm.
7/30/2021	17	49	19.1	46.789424	-125.492840	1603	attempting to hand off the hydrate sampler to the magnum arm to get a better grip
7/30/2021	17	50	28.0	46.789425	-125.492844	1603	Setting up for the sample. The stbd arm will stabilize the sampler and port arm will do the sampling.
7/30/2021	17	53	29.5	46.789413	-125.492850	1603	repositioning the ROV
7/30/2021	17	55	57.9	46.789433	-125.492839	1602	ambient temp and depth (pressure) just about at the minimum for hydrate to remain stable
7/30/2021	17	58	50.7	46.789424	-125.492852	1602	landing the vehicle to sample
7/30/2021	17	59	40.4	46.789416	-125.492839	1603	Repositioning and going for the "nose" of this outcrop.
7/30/2021	18	0	11.5	46.789415	-125.492852	1603	attempting to sample from the tip of the rock rather than within the crack due to accessibility
7/30/2021	18	0	57.4	46.789415	-125.492858	1603	Looks like a thin carbonate layer on top of the hydrate. There are tubeworms hanging from the top of the structure and bubbles all about.
7/30/2021	18	2	42.2	46.789415	-125.492853	1603	waiting for visibility to improve
7/30/2021	18	3	21.2	46.789418	-125.492853	1603	Waiting for the haze to clear.
7/30/2021	18	4	38.6	46.789417	-125.492842	1603	We're about 8 m from bubbles4 nav target
7/30/2021	18	5	7.8	46.789416	-125.492841	1603	Magnum arm keeps drooping during sampling
7/30/2021	18	18	50.7	46.789424	-125.492880	1603	Still maneuvering to try to get this sample.
7/30/2021	18	23	21.4	46.789420	-125.492868	1603	We have the sampler in place. Are starting the sample now.
7/30/2021	18	25	31.8	46.789422	-125.492842	1603	Getting the hydrate sample now at the nose of this outcrop.
7/30/2021	18	30	6.1	46.789421	-125.492844	1603	We got the hydrate sample. Bubbles4 is the hydrate position.
7/30/2021	18	34	19.7	46.789424	-125.492835	1603	Having a bit of an issue getting out of this crevice.
7/30/2021	18	34	36.3	46.789431	-125.492835	1603	predator arm is stuck on itself
7/30/2021	18	37	41.4	46.789424	-125.492842	1603	preparing to collect a gas tight sample, waiting for visibility
7/30/2021	18	40	37.4	46.789430	-125.492847	1603	Next task will be to collect bubbles right next to where we sampled the hydrate.
7/30/2021	18	42	31.3	46.789425	-125.492848	1603	Tamara wants the hydrate to dissociate during ascent. It is sealed in a gastight receiving unit during ascent and that until will be hooked to the high vacuum extraction unit and subsampled in the full gas phase.
7/30/2021	18	45	28.6	46.789418	-125.492849	1603	We want a pure gas sample in there and no fluid. This is sample 084. The hydrate sample number was 083.
7/30/2021	18	47	0.8	46.789411	-125.492850	1603	GT17-1 gastight sample.
7/30/2021	18	48	38.0	46.789432	-125.492854	1603	GT Taken were the hydrate was sampled, Gas tight number 17-1 (white tape)
7/30/2021	18	49	54.6	46.789424	-125.492849	1603	Preparing to take another GT sample
7/30/2021	18	54	1.1	46.789428	-125.492842	1604	watch change
7/30/2021	19	3	29.3	46.789424	-125.492853	1603	waiting for dust to settle after watch change so that we can take a second gas tight sample at the same location as the previous GT and hydrate
7/30/2021	19	9	17.2	46.789423	-125.492849	1603	still waiting for viz to settle, can't figure out what is kicking it up
7/30/2021	19	12	3.9	46.789429	-125.492849	1603	may have cleared up enough and just saw bubbles, going to try to sample
7/30/2021	19	14	52.7	46.789429	-125.492858	1603	Taking another gastight just to the left of the nose - looks like the same spot where we took the hydrate sample,

date	hr	min	sec	latitude	longitude	Z(m)	H1864 Ridge SW of Grays Canyon Descriptions
7/30/2021	19	15	11.0	46.789428	-125.492857	1603	sampling from left most of 3 bubble streams
7/30/2021	19	16	44.1	46.789420	-125.492858	1603	waiting for GT funnel to fill
7/30/2021	19	27	24.1	46.789416	-125.492845	1597	Very vigorous flow at this position
7/30/2021	19	28	26.2	46.789409	-125.492852	1595	Moving towards bac mat nav target
7/30/2021	19	28	32.5	46.789409	-125.492854	1595	Leaving site to return to bacterial mat marker 4 m south
7/30/2021	19	29	6.4	46.789371	-125.492846	1597	just adjusted still camera settings and captured cool images of bubbles from above, bubble flow near sampling site was very vigorous
7/30/2021	19	30	3.2	46.789368	-125.492916	1596	Passed bacterial mat marker, still looking for it. Passing very large tube warms clumps on large carbonate platforms. same that were seen earlier to the S
7/30/2021	19	32	23.0	46.789520	-125.492941	1601	going to come back and clean off herc and then descend
7/30/2021	19	34	38.2	46.789441	-125.492873	1599	approaching bac mat marker from the north now
7/30/2021	19	36	7.8	46.789396	-125.492795	1599	located mat again
7/30/2021	19	38	52.0	46.789388	-125.492813	1600	settling on bacterial mat
7/30/2021	19	41	38.3	46.789390	-125.492816	1601	Going to start trying to core
7/30/2021	19	45	45.6	46.789382	-125.492807	1601	positioning for coring still
7/30/2021	19	51	36.5	46.789373	-125.492805	1601	first attempt shaken out, got tilted
7/30/2021	20	0	50.8	46.789378	-125.492819	1601	readjusting to sample acharax and clams
7/30/2021	20	12	5.9	46.789359	-125.492822	1601	seems slurp jars aren't aligning well again
7/30/2021	20	12	18.4	46.789360	-125.492822	1601	or maybe debris in slurp strainer
7/30/2021	20	31	50.7	46.789344	-125.492833	1602	repositioned to sample acharax clams from back of slot canyon feature
7/30/2021	20	36	58.2	46.789345	-125.492833	1602	have been scooping acharax, trying to avoid getting live clams too
7/30/2021	21	5	22.5	46.789351	-125.492859	1599	Looking for a good carbonate rock sample
7/30/2021	21	30	47.1	46.789430	-125.492859	1598	have been trying to locate bubble stream to deploy marker
7/30/2021	21	31	37.7	46.789429	-125.492873	1603	oxygen here is 5.10% or 22 uM
7/30/2021	21	36	18.4	46.789404	-125.492861	1603	deploying PMEL marker 256
7/30/2021	21	37	35.2	46.789403	-125.492868	1601	now going to take 25 m downstream Niskin
7/30/2021	21	38	46.2	46.789404	-125.492871	1602	Doesn't seem to be any obvious current
7/30/2021	21	42	12.9	46.789515	-125.492674	1602	tanner crab and orange actinoscyphia (?) anemone
7/30/2021	21	42	48.8	46.789543	-125.492672	1602	now over very steep sedimented terrain with some carbonate rubble and acharax
7/30/2021	21	43	49.4	46.789559	-125.492654	1601	herc pilot noting how useful upper herc brow lights have been in this terrain
7/30/2021	21	47	43.0	46.789544	-125.492619	1602	waiting on ship move to be able to position 1 m over seafloor for niskin
7/30/2021	21	53	3.0	46.789543	-125.492618	1593	taking out tether wraps
7/30/2021	21	55	14.0	46.789291	-125.492729	1589	now over flat sedimented bottom around 1590 m
7/30/2021	23	6	28.2	46.791405	-125.493857	343	Ascending at ~16.8 m/min; currently at 350 m and the estimated time to surface is 20 min
7/30/2021	23	30	1.3	46.793281	-125.495875	1	Argus on deck

Table 19: H1865 N of Guide Canyon Dive Log

date	hr	min	sec	latitude	longitude	Z(m)	H1865 N of Guide Canyon Descriptions
7/31/2021	11	11	42.6	46.729255	-124.704642	9	Argus in water
7/31/2021	11	34	21.4	46.728747	-124.704144	149	Heading SE to Target 78

date	hr	min	sec	latitude	longitude	Z(m)	H1865 N of Guide Canyon Descriptions
7/31/2021	11	34	57.3	46.728759	-124.704128	149	Sizable group of fish between Herc and Argus
7/31/2021	11	37	16.4	46.728411	-124.704248	149	Large boulder ahead with Metridium senile
7/31/2021	11	37	49.7	46.728408	-124.704199	149	Sea pen and rockfish
7/31/2021	11	43	0.7	46.728327	-124.703981	148	Yellow tail rockfish in between Herc and Argus
7/31/2021	11	43	15.4	46.728345	-124.703964	148	Rathbunaster on sea floor
7/31/2021	11	44	41.1	46.728387	-124.703917	149	Heading SE towards waypoints
7/31/2021	11	46	5.4	46.728415	-124.703837	149	Traversing over flat sea floor with intermittent sea pens and shrimp
7/31/2021	11	47	44.4	46.728354	-124.703701	148	Potentially a yellow eye rockfish
7/31/2021	11	53	9.9	46.728137	-124.703035	149	Flat sea floor with anemones and various sea star species
7/31/2021	11	54	41.6	46.728147	-124.702904	149	Orange and white microbial mat with some shell hash
7/31/2021	11	55	17.0	46.728101	-124.702913	149	Chimaera
7/31/2021	11	56	9.6	46.728049	-124.703027	149	Several large sea stars and a boulder with an anemone
7/31/2021	11	56	41.9	46.727914	-124.703030	149	Rathbunaster
7/31/2021	11	57	3.6	46.727891	-124.703028	149	75 m away from shallower area north of WP7 and WP8
7/31/2021	11	57	18.6	46.727890	-124.703023	149	Large boulders with sea stars and anemones
7/31/2021	11	57	30.4	46.727853	-124.703004	149	Massive rathbunaster
7/31/2021	11	57	38.5	46.727828	-124.703004	149	Sole
7/31/2021	11	59	8.2	46.727760	-124.702974	150	Large slab with rathbunaster, octopus, and metridium senile
7/31/2021	11	59	16.5	46.727760	-124.702976	150	Encrusting sponge on the rock
7/31/2021	12	0	4.5	46.727738	-124.703038	150	Lots of metridium senile on the high surface of the rock slab
7/31/2021	12	1	18.3	46.727677	-124.703058	150	Sabellids on the rock face
7/31/2021	12	3	0.9	46.727384	-124.702862	149	Rathbunaster on the sea floor
7/31/2021	12	3	51.8	46.727271	-124.702794	149	Small sole
7/31/2021	12	4	44.1	46.727213	-124.702839	149	Salps in the water column in front of Herc
7/31/2021	12	7	8.6	46.727086	-124.702884	149	More vermillion stars
7/31/2021	12	7	53.0	46.727005	-124.702888	149	Yellow tail rockfish in the water column with stonyhead rockfish on the sea floor
7/31/2021	12	10	48.3	46.726783	-124.702707	149	Parastichopus
7/31/2021	12	13	18.8	46.726517	-124.702650	149	Rathbunaster and metridium senile on the sea floor
7/31/2021	12	14	24.9	46.726419	-124.702618	149	Thornyhead
7/31/2021	12	14	42.1	46.726415	-124.702618	149	More rubble on the sea floor
7/31/2021	12	15	32.2	46.726342	-124.702571	149	Parastichopus
7/31/2021	12	16	35.1	46.726273	-124.702562	150	Large colonial sponge
7/31/2021	12	17	36.4	46.726261	-124.702609	150	Thornyhead rockfish dispersed between the large orange sponge
7/31/2021	12	17	58.0	46.726258	-124.702610	149	Potentially a carbonate slab but sedimentation makes it difficult to tell
7/31/2021	12	21	0.9	46.726033	-124.702399	150	Thornyhead
7/31/2021	12	21	41.0	46.725974	-124.702411	150	Gray and orange microbial mat
7/31/2021	12	22	52.2	46.725894	-124.702392	150	Continuing to head towards WP7 and WP8
7/31/2021	12	23	39.5	46.725809	-124.702425	150	Small boulders covered in sedimentation; providing habitat for rockfish, sea stars, and anemones
7/31/2021	12	25	28.2	46.725645	-124.702413	150	More salps in the water column in front of Herc
7/31/2021	12	26	2.5	46.725644	-124.702426	150	Approached a rocky patch

date	hr	min	sec	latitude	longitude	Z(m)	H1865 N of Guide Canyon Descriptions
7/31/2021	12	27	38.5	46.725477	-124.702568	150	Small cobbles with a sea star and thornyhead rockfish
7/31/2021	12	30	2.1	46.725203	-124.702554	150	Sea pen
7/31/2021	12	30	19.1	46.725203	-124.702609	151	Gray microbial mat
7/31/2021	12	31	3.5	46.725206	-124.702628	151	Found a small stream of bubbles in the middle of the gray microbial mat
7/31/2021	12	31	32.3	46.725206	-124.702629	151	Bubble stream appears to have stopped near WP7
7/31/2021	12	31	40.1	46.725200	-124.702630	151	Heading NW to WP8
7/31/2021	12	32	18.6	46.725181	-124.702677	151	Gray and orange bacterial mats
7/31/2021	12	33	28.5	46.725226	-124.702668	150	Sole and thornyhead rockfish
7/31/2021	12	34	31.9	46.725274	-124.702869	151	Small sea pens
7/31/2021	12	36	16.5	46.725407	-124.702976	147	Ascending in the water column a bit in order to use the Norbit sonar to search for bubbles
7/31/2021	12	39	55.9	46.725381	-124.702909	142	Holding at 9 m altitude in search of bubble stream
7/31/2021	12	40	53.0	46.725380	-124.702909	142	Blue shark visible between Argus and Herc
7/31/2021	12	42	6.9	46.725378	-124.702909	146	No bubbles apparent via sonar at WP8; heading to WP7 to do push cores
7/31/2021	12	42	13.3	46.725368	-124.702910	148	Descending back to sea floor
7/31/2021	12	42	49.1	46.725286	-124.702981	151	Resetting the DVL
7/31/2021	12	43	54.1	46.725229	-124.702848	150	Heading SE to WP7
7/31/2021	12	44	19.2	46.725219	-124.702824	150	Thornyhead rockfish
7/31/2021	12	45	10.5	46.725208	-124.702732	151	Yelloweye rockfish
7/31/2021	12	45	43.9	46.725206	-124.702698	151	10 m away from WP7
7/31/2021	12	47	48.0	46.725157	-124.702624	151	Zooming in on microbial mat
7/31/2021	12	52	33.9	46.725154	-124.702624	151	Stopped in the bottom of quiver one had no bolt; stored in starboard biobox for safe keeping
7/31/2021	12	53	51.8	46.725154	-124.702624	151	Push core two appears to have been secured properly; moving forward with core in microbial mat
7/31/2021	12	55	39.9	46.725154	-124.702623	151	Push core too hard for core
7/31/2021	12	58	33.3	46.725153	-124.702625	151	Decided to forgo push cores in this area; heading to WP1-3 cluster which is SE of current location
7/31/2021	12	59	23.7	46.725153	-124.702624	151	Plan to head over highest spots of the survey area at 0.5 knots
7/31/2021	13	0	59.1	46.725154	-124.702608	151	Sole
7/31/2021	13	1	59.4	46.725078	-124.702532	150	Small to medium cobbles with sea stars, anemones, and rockyhead rockfish
7/31/2021	13	2	46.0	46.725008	-124.702457	151	Sole
7/31/2021	13	3	39.7	46.724950	-124.702394	150	Multiple species of sea stars on the sea floor
7/31/2021	13	6	54.0	46.724667	-124.701525	150	Sea pen
7/31/2021	13	9	11.3	46.724515	-124.701279	150	Yellow tail rockfish
7/31/2021	13	9	22.6	46.724515	-124.701181	150	Sole and sea pen on ocean floor
7/31/2021	13	13	19.3	46.724221	-124.700665	149	School of yellow tail rockfish both above and below Herc
7/31/2021	13	14	56.2	46.724153	-124.700257	149	Beginning to head on a gentle upslope
7/31/2021	13	19	31.4	46.723798	-124.699510	147	Yellow tail rockfish, thornyhead rockfish, and sea stars
7/31/2021	13	20	47.4	46.723790	-124.699284	147	Cobbles with feeding sea stars and anemones
7/31/2021	13	21	27.5	46.723789	-124.699178	147	Parastichopus
7/31/2021	13	23	22.8	46.723507	-124.698893	146	Rathbunaster on rock cobbles and thornyhead rockfish

date	hr	min	sec	latitude	longitude	Z(m)	H1865 N of Guide Canyon Descriptions
7/31/2021	13	25	36.9	46.723352	-124.698510	146	Thornyhead rockfish
7/31/2021	13	25	52.6	46.723341	-124.698501	146	Chimaera
7/31/2021	13	29	21.5	46.723031	-124.697841	146	Continuing to explore towards WP1-3
7/31/2021	13	30	10.7	46.723012	-124.697651	146	Still about 600 m away from desired destination
7/31/2021	13	30	19.0	46.723038	-124.697629	146	Increasing speed to 0.7 knots
7/31/2021	13	37	53.0	46.722347	-124.695945	144	Relatively flat sea surface with occasional rubble; organisms (sea stars, rockfish) sparsely dispersed
7/31/2021	13	40	31.9	46.721902	-124.695390	145	Sea pens and sea stars
7/31/2021	13	40	56.7	46.721895	-124.695270	145	Large salp in the water column in front of Herc
7/31/2021	13	44	20.4	46.721587	-124.694493	145	Medium-sized lingcod
7/31/2021	13	48	33.1	46.721113	-124.693387	146	Sea pen and boulder with a variety of organisms (sea stars, anemones)
7/31/2021	13	49	5.5	46.721058	-124.693391	146	Small sea pens
7/31/2021	13	49	33.9	46.721057	-124.693092	146	Gray bacterial mats
7/31/2021	13	50	3.7	46.721033	-124.692998	146	More shell hash and bacterial mats
7/31/2021	13	50	32.0	46.720939	-124.692876	145	Boulders covered in sedimentation and rathbunaster
7/31/2021	13	51	38.8	46.720832	-124.692707	145	Vermillion star
7/31/2021	13	52	0.6	46.720777	-124.692630	145	Large sole
7/31/2021	13	52	38.3	46.720772	-124.692327	145	Fish stirring up the sea floor as we pass
7/31/2021	13	53	25.3	46.720587	-124.692249	144	Sea pens scattered sparsely across the sea floor
7/31/2021	13	54	27.2	46.720486	-124.691985	144	Parastichopus
7/31/2021	13	54	50.8	46.720485	-124.691914	145	~100 m away from WP4
7/31/2021	13	58	30.6	46.720126	-124.690868	146	Sole
7/31/2021	13	58	55.8	46.720080	-124.690824	147	Sole and various sea stars
7/31/2021	13	59	23.7	46.720071	-124.690798	147	Vessel all stop
7/31/2021	14	0	0.1	46.720073	-124.690794	143	Ascending a few meters to use to the Norbit sonar to search for bubble streams
7/31/2021	14	0	34.7	46.720075	-124.690791	140	DVL reset
7/31/2021	14	1	59.0	46.720078	-124.690801	140	15 m away from WP2; potential bubbles were seen during mapping
7/31/2021	14	2	17.9	46.720079	-124.690802	140	Moving towards WP2 at same altitude in search of bubbles
7/31/2021	14	6	19.7	46.720100	-124.690845	140	Descending back to the sea floor to go investigate waypoints and determine if there are any signs of a seep
7/31/2021	14	8	2.1	46.720106	-124.690708	147	15 m away from WP2; heading E
7/31/2021	14	9	1.5	46.720109	-124.690640	148	Little divots in the sea floor
7/31/2021	14	9	22.4	46.720132	-124.690639	148	Carbonate cobble and shell hash
7/31/2021	14	10	19.7	46.720124	-124.690608	148	Small bubble stream located
7/31/2021	14	10	56.6	46.720116	-124.690598	148	Bubble stream has stopped after only allowing a few to escape
7/31/2021	14	12	55.6	46.720116	-124.690584	148	More rubble with rathbunaster, thornyhead, and a lingcod
7/31/2021	14	13	47.2	46.720092	-124.690383	147	Gray bacterial mat, patchy
7/31/2021	14	14	33.4	46.720035	-124.690190	147	Carbonate cobbles surrounded by small patches of bacterial mat
7/31/2021	14	15	2.7	46.720038	-124.690168	148	Bubble stream spotted
7/31/2021	14	16	3.3	46.720023	-124.690163	148	Carbonate cobbles, vermillion star, gray microbial mat, and shell hash
7/31/2021	14	16	52.8	46.720022	-124.690161	149	Bubble stream has stopped

date	hr	min	sec	latitude	longitude	Z(m)	H1865 N of Guide Canyon Descriptions
7/31/2021	14	17	17.0	46.720020	-124.690161	149	Chimaera
7/31/2021	14	19	18.0	46.720010	-124.690160	148	DVL rest
7/31/2021	14	19	42.5	46.719981	-124.690218	148	Shell hash prevalent on the ocean floor in between the carbonate cobbles
7/31/2021	14	20	13.4	46.719979	-124.690253	148	Lingcod
7/31/2021	14	20	51.7	46.719972	-124.690256	148	Gray bacterial mat patches
7/31/2021	14	21	26.9	46.719938	-124.690236	148	Chimaera seen throughout this site are likely Hydrolagus colliei
7/31/2021	14	22	39.1	46.719911	-124.690157	148	Parastichopus, vermillion stars, and shell hash scattered across carbonate cobbles
7/31/2021	14	23	38.2	46.719897	-124.690191	148	Large rockfish
7/31/2021	14	25	9.1	46.719818	-124.690191	148	Occasional lingcod dispersed between the carbonate cobble fields
7/31/2021	14	25	46.4	46.719800	-124.690186	148	Skate and more lingcod
7/31/2021	14	29	54.3	46.719717	-124.690096	148	Small patch of gray bacterial mat
7/31/2021	14	30	58.4	46.719687	-124.690113	148	Metridium senile on the sea floor
7/31/2021	14	31	43.2	46.719688	-124.690131	147	Checked WP1 and found no bubbles; ascending to use Norbit to search for bubbles
7/31/2021	14	32	56.3	46.719688	-124.690129	139	Delta depth increased too quickly; working to reduce
7/31/2021	14	33	42.8	46.719687	-124.690130	139	Decreased Norbit sonar range from 25 m to 15 m
7/31/2021	14	36	21.0	46.719687	-124.690130	139	Heading to waypoint; descending to survey along the sea floor
7/31/2021	14	38	12.0	46.719531	-124.690185	149	Carbonate cobbles
7/31/2021	14	39	41.7	46.719507	-124.690120	149	Carbonate slab with a encrusting organism and a crabs
7/31/2021	14	40	24.9	46.719470	-124.690234	149	Another chimaera hovering above the sea floor
7/31/2021	14	41	14.7	46.719434	-124.690279	149	Large boulder with sea cucumber, anemone, and sea stars
7/31/2021	14	41	44.5	46.719429	-124.690258	148	Occasional lingcod sighting
7/31/2021	14	42	48.1	46.719246	-124.690229	148	Thornyhead rockfish
7/31/2021	14	44	16.4	46.719032	-124.690212	149	Dungeness crab
7/31/2021	14	45	10.7	46.718982	-124.690188	149	Small patch of gray bacterial mat and some shell hash; unfortunately, no bubbles
7/31/2021	14	47	42.9	46.718904	-124.690201	149	Small school of yellow tail present above the carbonate cobbles
7/31/2021	14	47	59.7	46.718900	-124.690209	149	Rathbunaster
7/31/2021	14	49	3.1	46.718899	-124.690244	150	Gray/orange bacterial mat with shall hash scattered around it
7/31/2021	14	49	29.0	46.718898	-124.690197	149	Vessel all stop to allow for more exploration of the area
7/31/2021	14	50	21.0	46.718858	-124.690199	149	Rathbunaster, parastichopus, and two vermillion stars on a carbonate cobble
7/31/2021	14	50	55.8	46.718858	-124.690270	149	More gray bacterial mat patches interspersed between the carbonate cobbles
7/31/2021	14	51	16.5	46.718857	-124.690271	150	Bubble stream found right next to rathbunaster
7/31/2021	14	52	40.2	46.718858	-124.690272	150	Bubble stream has stopped
7/31/2021	14	54	30.5	46.718857	-124.690275	150	Heading to WP4
7/31/2021	15	0	20.7	46.718595	-124.690356	149	soft sediment bottom, not much fauna here
7/31/2021	15	0	25.5	46.718593	-124.690357	148	flatfish
7/31/2021	15	1	4.7	46.718558	-124.690366	149	vermillion sea star

date	hr	min	sec	latitude	longitude	Z(m)	H1865 N of Guide Canyon Descriptions
7/31/2021	15	1	29.5	46.718547	-124.690367	148	in flat sediment bottom there are some small depressions/ holes
7/31/2021	15	2	14.5	46.718541	-124.690370	149	siphonophore chain
7/31/2021	15	2	50.5	46.718513	-124.690371	149	white sea pen
7/31/2021	15	5	6.7	46.718309	-124.690363	149	Yellowtail rockfish
7/31/2021	15	6	14.1	46.718267	-124.690388	149	approaching a small patch of shell hash
7/31/2021	15	7	29.5	46.718169	-124.690429	149	flatfish, white sea stars resting in sediment, beginning to see a slight increase in marine snow
7/31/2021	15	8	2.0	46.718159	-124.690428	149	2 sea pens resting near a flat fish
7/31/2021	15	9	46.1	46.718022	-124.690418	149	occasional sea pen
7/31/2021	15	11	39.8	46.717948	-124.690433	147	right on top of waypoint 4, going to look around for bubbles
7/31/2021	15	13	40.9	46.717951	-124.690434	140	10m off the seafloor using norbit to find bubbles, there are krill and marine snow here in the water column
7/31/2021	15	16	14.7	46.717951	-124.690446	140	not seeing any signs of bubble streams in the sonar
7/31/2021	15	18	26.6	46.717948	-124.690454	140	heading north towards waypoint 1
7/31/2021	15	19	42.0	46.717945	-124.690464	150	returning to the seafloor to explore on the way to waypoint 1
7/31/2021	15	20	35.9	46.717941	-124.690468	149	continuing to see the same type of habitat
7/31/2021	15	23	14.8	46.718080	-124.690447	149	doppler reset
7/31/2021	15	24	31.7	46.718191	-124.690407	149	flatfish, large white sea star
7/31/2021	15	25	11.3	46.718201	-124.690425	149	thornyhead resting on the seafloor
7/31/2021	15	25	53.7	46.718226	-124.690361	149	~10 cm holes in seafloor, no bubbles seen coming from them
7/31/2021	15	27	20.8	46.718476	-124.690326	149	flatfish, possibly small bit of shell hash
7/31/2021	15	27	43.3	46.718488	-124.690323	148	school of yellowtail rockfish
7/31/2021	15	31	0.7	46.718599	-124.690304	148	no changes in habitat
7/31/2021	15	32	43.5	46.718631	-124.690318	149	very small patch of bacterial mat and shell hash, waiting to see if there are bubble streams
7/31/2021	15	34	52.4	46.718652	-124.690325	149	larger patch of shell hash (medium sized) also noticing an increase in krill
7/31/2021	15	36	22.0	46.718652	-124.690327	149	In this medium sized patch of shell hash, there are several small holes with microbial mat around them. There are currently no bubble streams. Fairly close to the bubbles 3 target. there are also deeper holes nearby
7/31/2021	15	37	57.0	46.718674	-124.690332	149	Medium patch of bacterial mat. within this patch there are small grey colored spots with white mat covering
7/31/2021	15	40	14.3	46.718685	-124.690316	149	On our way to waypoint 1, there have been a lot of patches with bacterial mat and holes in the sediment that would indicate bubble streams are present. We have not seen any bubbles on this watch. continuing to look
7/31/2021	15	43	36.9	46.718815	-124.690276	148	Seafloor is still soft sediment bottom with occasional patches of bacterial mat and shell hash. there have been small holes that look like the source of bubble streams, but no bubbles have been seen
7/31/2021	15	44	38.7	46.718810	-124.690271	148	approaching a rocky outcrop with a sunflower star, shell hash, anemones, and tiny bits of bacterial mat

date	hr	min	sec	latitude	longitude	Z(m)	H1865 N of Guide Canyon Descriptions
7/31/2021	15	45	50.5	46.718800	-124.690196	148	approaching more boulders with rockfish, sea stars, and shell hash
7/31/2021	15	47	18.1	46.718807	-124.690161	149	another rocky outcrop with rockfish and sea stars, and a red sea cucumber with white faux spines
7/31/2021	15	47	26.3	46.718808	-124.690169	149	shell hash
7/31/2021	15	48	27.1	46.718821	-124.690216	150	bubble stream found in rocky outcrop
7/31/2021	15	51	45.1	46.718821	-124.690215	150	Near bubble stream there is shell hash, some bacterial mat. Depth is 150m O2 is 7.32% or 27.62 umol/L and temp is 7.16 C, there are 2 other streams here but they seem to turn off frequently. WE may be at the exact same site as previous watch, near their target
7/31/2021	15	54	5.1	46.718883	-124.690255	148	large white sea anemone
7/31/2021	15	54	34.7	46.718911	-124.690255	148	moving towards waypoints 5 and 6 that have not been explored yet
7/31/2021	15	55	36.0	46.718948	-124.690251	148	approaching a different rocky outcrop
7/31/2021	15	56	13.5	46.718952	-124.690238	149	in this outcrop there are some small patches of bacterial mat and some shell hash
7/31/2021	15	56	43.6	46.718965	-124.690188	149	there are a lot of little holes surrounded by bacterial mat, but none of them are bubbling at the moment,
7/31/2021	15	57	39.2	46.718984	-124.690220	149	back over a soft sediment bottom
7/31/2021	15	58	18.5	46.718999	-124.690190	149	2 yellow tail rockfish
7/31/2021	15	59	28.3	46.719058	-124.690180	148	large round boulder on seafloor,
7/31/2021	16	0	29.7	46.719109	-124.690170	148	Dungeness crab
7/31/2021	16	1	28.5	46.719210	-124.690140	148	heading to waypoint 5 ~400m away
7/31/2021	16	1	59.4	46.719349	-124.690121	148	flatfish
7/31/2021	16	3	10.7	46.719376	-124.690129	148	Area with rocky outcrops and rock debris. there are canary rockfish, shell hash, some small patches of bacterial mat
7/31/2021	16	6	28.4	46.719517	-124.690159	148	lingcod, still observing large scatters of rock, some rockfish, a large sea star
7/31/2021	16	7	42.8	46.719639	-124.690197	148	Sediment has flattened out. lingcod
7/31/2021	16	8	21.4	46.719673	-124.690205	147	back over soft bottom
7/31/2021	16	9	44.2	46.719822	-124.690241	147	vermillion sea stars
7/31/2021	16	10	44.5	46.719876	-124.690261	147	One round large white rock, only sedimented on the top. Boccaccio rockfish(?) sea stars
7/31/2021	16	12	35.6	46.720028	-124.690310	147	passing by several small holes surrounded by bacterial mat, some rocky material and shell hash, but no bubbles
7/31/2021	16	15	47.7	46.720283	-124.690389	147	hagfish
7/31/2021	16	16	0.6	46.720309	-124.690397	147	lingcod
7/31/2021	16	17	43.2	46.720457	-124.690443	147	seeing more shell hash here
7/31/2021	16	18	6.0	46.720504	-124.690445	147	some rock exposed, visible bacterial mat
7/31/2021	16	20	33.7	46.720650	-124.690400	146	seafloor is less flat now, moving alongside a lot of boulders covered in sediment with some shell hash nearby and bacterial mat
7/31/2021	16	22	24.7	46.720804	-124.690412	146	line of bacterial mate within a small crack of rock
7/31/2021	16	23	53.1	46.720943	-124.690458	145	Overall, we are observing mixed bottom sediment. Occasional stretches of flat soft sediment, followed by patches of rocky outcrops with shell hash, rockfish, bacterial mat

date	hr	min	sec	latitude	longitude	Z(m)	H1865 N of Guide Canyon Descriptions
7/31/2021	16	24	20.7	46.720996	-124.690458	145	lingcod
7/31/2021	16	25	19.0	46.721063	-124.690487	145	long sea whip
7/31/2021	16	27	34.9	46.721232	-124.690536	144	back over soft sediment
7/31/2021	16	27	54.1	46.721293	-124.690554	144	2 small patched of shells
7/31/2021	16	29	12.3	46.721362	-124.690576	144	white anemone
7/31/2021	16	30	14.2	46.721474	-124.690608	144	passing over some rocky crumble
7/31/2021	16	30	55.0	46.721505	-124.690626	143	seeing some large red sea cucumbers
7/31/2021	16	32	37.3	46.721656	-124.690641	144	Apostichopus leukothele is the ID for the red sea cucumbers we observed
7/31/2021	16	33	56.7	46.721719	-124.690734	144	another long sea whip, sea stars flipping over
7/31/2021	16	34	27.5	46.721748	-124.690737	144	large boulder with a large yellow eye rockfish
7/31/2021	16	37	36.6	46.722021	-124.690799	144	still passing over flat soft bottom with occasional rocky debris clusters and boulders
7/31/2021	16	38	22.6	46.722063	-124.690815	144	all of the sea stars we have seen in the last few min. have been pulling in their arms towards their bodies, curling into a "ball"
7/31/2021	16	40	40.4	46.722265	-124.690828	144	common fauna we are observing are Apostichopus leukothele (sea cucumber), sea stars,
7/31/2021	16	40	53.3	46.722305	-124.690823	144	haven't seen rockfish in a while
7/31/2021	16	43	10.9	46.722473	-124.690792	144	2 acorn worms in the sediment
7/31/2021	16	43	47.8	46.722538	-124.690786	144	passing by a small rocky ledge with some rockfish, sea stars, shell hash, and very faint bacterial mat
7/31/2021	16	44	19.0	46.722565	-124.690780	144	very large sea cucumbers
7/31/2021	16	44	49.8	46.722637	-124.690768	144	Small puff ball sponges covered in sediment (unsure of ID passed quickly).
7/31/2021	16	47	2.5	46.722799	-124.690785	144	strong bubble stream
7/31/2021	16	47	53.5	46.722782	-124.690788	144	bubbles that we saw have turned off
7/31/2021	16	49	39.7	46.722796	-124.690788	144	where the bubbles were found there is rocky crumble and shell hash, a lot of krill in the water column, patches of bacterial mat
7/31/2021	16	50	39.3	46.722788	-124.690844	143	continuing to waypoint 5
7/31/2021	16	51	10.3	46.722835	-124.690848	143	hundreds of krill swimming around herc cam
7/31/2021	16	52	0.8	46.722875	-124.690808	143	large rock boulder with shell hash nearby and some bacterial mat
7/31/2021	16	53	4.5	46.722926	-124.690822	143	passing over more rocky material with shell hash nearby
7/31/2021	16	53	54.3	46.722945	-124.690827	143	norbit indicated target ~15m out
7/31/2021	16	54	53.4	46.723017	-124.690840	143	at waypoint 5, flat sediment bottom with some shell hash, bacterial mat, vermillion sea stars, a very long armed sea star, and reduced sediment
7/31/2021	16	56	36.4	46.723076	-124.690896	144	At the waypoint, there is a large round boulder with bryozoans on it. in the middle of all of the rocky debris, there are patches of shell hash and bacterial mat, still seeing a lot of krill
7/31/2021	16	56	57.0	46.723086	-124.690896	144	hole in the seafloor
7/31/2021	16	59	5.2	46.723118	-124.690939	144	~40 cm long patch of white bacterial mat with holes
7/31/2021	16	59	38.2	46.723125	-124.690940	143	coming up in the water column to look for bubbles in the sonar
7/31/2021	17	1	10.9	46.723118	-124.690938	136	many fish in argus view
7/31/2021	17	1	34.9	46.723119	-124.690938	136	yellow tail rockfish

date	hr	min	sec	latitude	longitude	Z(m)	H1865 N of Guide Canyon Descriptions
7/31/2021	17	2	17.8	46.723116	-124.690937	136	not seeing any signs of bubble streams in the norbit sonar
7/31/2021	17	4	8.5	46.723119	-124.690919	135	heading to the base of the fault to explore
7/31/2021	17	5	37.9	46.723118	-124.690940	143	back in seafloor with a lot of patches of bacterial mat, shell hash
7/31/2021	17	6	32.1	46.723121	-124.690928	144	~6 rockfish here
7/31/2021	17	6	49.2	46.723122	-124.690919	143	another visible bacterial mat and hole
7/31/2021	17	7	13.5	46.723128	-124.690896	144	heading to target "oldPick3"
7/31/2021	17	8	3.9	46.723129	-124.690802	143	scatter of holes in the seafloor with visible mat around them
7/31/2021	17	8	17.0	46.723128	-124.690800	143	traveling up a higher fault block
7/31/2021	17	9	27.7	46.723111	-124.690778	142	at a large rocky feature, there is a slope of rock that has a hollow space underneath it where a rockfish hid
7/31/2021	17	10	16.8	46.723113	-124.690746	142	The seafloor is mixed sediment. it appears soft with some rocky crumble
7/31/2021	17	10	38.1	46.723119	-124.690708	142	moving up a gentle slope
7/31/2021	17	10	56.9	46.723096	-124.690704	142	large red sea cucumbers
7/31/2021	17	11	4.9	46.723094	-124.690704	142	orange anemone
7/31/2021	17	12	10.9	46.723092	-124.690706	142	moving 350 towards oldpick3
7/31/2021	17	13	29.0	46.723137	-124.690726	141	traveling along the edge of the fault towards next waypoint
7/31/2021	17	18	18.0	46.723329	-124.690881	142	traveling over flat sediment, similar fauna as previously noted
7/31/2021	17	18	49.5	46.723370	-124.690902	141	moving along side rocky outcrop, with small circles of bacterial mat around holes
7/31/2021	17	20	1.1	46.723421	-124.690910	140	appears we are traveling down slope
7/31/2021	17	20	55.9	46.723419	-124.690913	133	coming off bottom at oldpick3 to use sonar to see if there are any bubbles
7/31/2021	17	23	33.7	46.723419	-124.690910	133	possible target on norbit near waypoint 6
7/31/2021	17	24	31.5	46.723417	-124.690906	133	returning to the seafloor
7/31/2021	17	25	51.1	46.723409	-124.690942	142	back on seafloor, the visibility has decreased
7/31/2021	17	26	8.5	46.723408	-124.690943	143	two lingcod
7/31/2021	17	26	43.0	46.723406	-124.690990	143	near the ling cod there are a few small boulders, some shell hash and small patches of bacterial mat
7/31/2021	17	28	46.7	46.723405	-124.691010	144	in an area of soft sediment with shell hash and bacterial mat, there are multiple holes in the sediment that look like they could be bubble streams but there are no bubbles in sight
7/31/2021	17	29	22.4	46.723403	-124.691034	144	larger bacterial mat here
7/31/2021	17	30	11.2	46.723401	-124.691039	143	at this patch of bacterial mat, there are about 4/5 holes that appear to be inactive bubble streams
7/31/2021	17	31	25.1	46.723397	-124.691045	144	going to poke the sediment to see if it is thick enough for a pushcore
7/31/2021	17	32	51.9	46.723398	-124.691043	144	very hard bottom underneath the sediment, unable to core here
7/31/2021	17	37	29.5	46.723384	-124.691069	142	Heading back to an old site ~370 meters away from waypoint 6. heading is 170
7/31/2021	17	38	44.8	46.723347	-124.691075	143	going to travel fairly fast along the seafloor to site for possible sampling

date	hr	min	sec	latitude	longitude	Z(m)	H1865 N of Guide Canyon Descriptions
7/31/2021	17	42	15.9	46.723221	-124.691061	143	moving over a soft sediment bottom with some anoxic/reduced patches
7/31/2021	17	42	59.8	46.723191	-124.691042	143	flatfish, some shell hash
7/31/2021	17	43	24.2	46.723158	-124.691035	143	long sea pen in soft sediment near some shell hash
7/31/2021	17	43	45.8	46.723147	-124.691025	143	approaching patches of shell hash and bacterial mat, one lingcod
7/31/2021	17	45	48.3	46.722935	-124.690978	143	Large pile of fish netting, a couple of meters long
7/31/2021	17	46	30.3	46.722841	-124.690961	143	sea cucumber, flatfish
7/31/2021	17	49	10.3	46.722338	-124.690719	144	sea pen
7/31/2021	17	49	18.6	46.722330	-124.690717	144	flat sediment bottom
7/31/2021	17	49	41.0	46.722216	-124.690705	144	beginning to see a few more sea pens and flat fish
7/31/2021	17	50	47.3	46.722056	-124.690650	143	flat bottom with similar fauna as previously seen
7/31/2021	17	53	18.3	46.721665	-124.690479	144	still traveling over soft sediment bottom
7/31/2021	17	54	40.4	46.721488	-124.690426	143	no changes in habitat or fauna, flat bottom with sea stars etc., same as previously seen
7/31/2021	17	57	19.3	46.721128	-124.690263	144	passed by the first patch of shells and bacterial mat seen in a while
7/31/2021	17	57	49.3	46.721116	-124.690243	144	bottom is changing to mixed with some rock and shell hash
7/31/2021	17	58	44.6	46.720962	-124.690190	143	some sponges on rock, following along a fairly thick rocky wall/slope
7/31/2021	17	59	36.4	46.720784	-124.690337	145	beginning to see more shell hash and bacterial mat again
7/31/2021	17	59	46.6	46.720755	-124.690344	145	rathbunaster sea star
7/31/2021	18	0	47.0	46.720635	-124.690358	146	more large rock boulders and scattered bacterial mat
7/31/2021	18	2	23.6	46.720411	-124.690380	146	passing over rocky crumble
7/31/2021	18	3	7.3	46.720326	-124.690391	146	flatfish
7/31/2021	18	3	52.0	46.720187	-124.690402	147	rocky crumbles and bacterial mat
7/31/2021	18	4	0.1	46.720169	-124.690404	147	nearing our target
7/31/2021	18	4	32.6	46.720125	-124.690408	146	small boulder rock, flat fish
7/31/2021	18	4	39.7	46.720096	-124.690408	146	back over flat sediment bottom
7/31/2021	18	6	18.6	46.720049	-124.690267	147	scattered carbonate
7/31/2021	18	8	30.3	46.720038	-124.690256	147	We're at the bubble stream target identified on the first watch today.
7/31/2021	18	11	3.4	46.720039	-124.690255	138	Some very small patches of bacterial mat here and there. Some shell fragments. Not much of either one.
7/31/2021	18	16	49.7	46.720026	-124.690200	147	bubbles are coming out of a hole under the rock we are sampling from
7/31/2021	18	25	10.5	46.720016	-124.690231	147	kelp blade
7/31/2021	18	25	40.8	46.720012	-124.690249	147	Bubble steam site (no bubbles now). Niskins
7/31/2021	18	27	12.3	46.720017	-124.690352	147	Current here is to the W/SW toward old pick 5. Will do a niskin 1 m above the bottom there (25 m from previous niskins)
7/31/2021	18	27	39.0	46.720031	-124.690373	147	There were bubbles in the area of the niskin but they shut off, and were only a bubble or two.....
7/31/2021	18	28	48.7	46.720048	-124.690424	146	The current is 0.14 knots pushing us to the W/SW
7/31/2021	18	33	14.8	46.720039	-124.690542	147	heading back to "boulders" target
7/31/2021	18	34	50.2	46.720009	-124.690546	147	patch of bacterial mat with ~3 holes
7/31/2021	18	36	20.5	46.719748	-124.690418	147	traveling over soft bottom

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7/31/2021	18	37	12.2	46.719693	-124.690396	147	large boulders, white coloring underneath the sediment layer-- carbonate rock, anemones, rockfish
7/31/2021	18	40	53.3	46.719050	-124.690409	148	still moving over soft bottom, no new species seen, still observing occasional sea pens, flat fish
7/31/2021	18	46	21.8	46.718959	-124.690264	148	Small rock with a rockfish, some rocky crumble is covering the sea floor. shell hash
7/31/2021	18	47	55.4	46.718877	-124.690280	148	bacterial mat
7/31/2021	18	49	12.0	46.718858	-124.690250	149	no longer only soft bottom, now observing boulders of rock and carbonate crumble with bacterial mats and shell hash, rathbunasters, rockfish, sea cucumbers, sea stars
7/31/2021	18	50	58.7	46.718856	-124.690204	149	bubbles were found near bubbles 3 and boulders hypack targets
7/31/2021	18	52	10.3	46.718857	-124.690203	149	at the base of the bubble stream there is white bacterial mat and two small chunks of orange bacterial mat, the stream is fairly light
7/31/2021	18	52	10.3	46.718857	-124.690203	149	Small bubble stream with a smidge of orange mat surrounding the hole.
7/31/2021	18	53	46.7	46.718843	-124.690186	149	small squat lobsters near bubble stream
7/31/2021	18	54	12.4	46.718843	-124.690186	149	watch change
7/31/2021	18	57	39.5	46.718843	-124.690185	149	watch change
7/31/2021	19	1	57.0	46.718842	-124.690187	149	going to take gas tight sample here
7/31/2021	19	7	47.8	46.718843	-124.690186	149	some orange fish surrounding herc tether
7/31/2021	19	43	9.1	46.718843	-124.690186	149	still filling funnel
7/31/2021	19	43	16.0	46.718843	-124.690186	149	bubble stream has slowed down
7/31/2021	19	57	2.9	46.718843	-124.690182	149	bubbles seem to have stopped
7/31/2021	20	16	33.3	46.718843	-124.690184	149	The bubbles just started again after we triggered
7/31/2021	20	20	30.4	46.718842	-124.690185	149	stowing GT
7/31/2021	20	28	0.1	46.718829	-124.690201	149	Going to try for rock sample
7/31/2021	20	34	41.5	46.718830	-124.690202	149	going to try and get some bio off this rock we just took chunks of
7/31/2021	20	46	40.1	46.718837	-124.690205	149	repositioning for second cup coral
7/31/2021	20	52	33.5	46.718826	-124.690246	149	zooms on rock with various fauna including plumose anemones, rathbunaster, and red sea cucumbers, also many small squat lobsters
7/31/2021	20	53	9.7	46.718826	-124.690246	149	also starry rockfish and multiple lobsters, small translucent sea cucumbers on bottom
7/31/2021	20	54	9.7	46.718835	-124.690264	149	comments just now were from other side of boulder where cup corals were taken
7/31/2021	20	54	22.6	46.718835	-124.690264	149	now on that side going to poke sediment to see if corable
7/31/2021	21	6	5.3	46.718846	-124.690292	148	passing over bubble stream
7/31/2021	21	6	27.2	46.718845	-124.690293	149	two bubble streams, going to try to gas tight
7/31/2021	21	11	12.0	46.718839	-124.690294	149	prepping for GT sampling
7/31/2021	21	16	53.3	46.718840	-124.690292	149	bubbles turned on and off, going to continue and abandon this
7/31/2021	21	19	59.1	46.718919	-124.690423	148	following current NW for niskin 25 m away
7/31/2021	21	22	9.8	46.719000	-124.690534	148	starting to see some sea pens and a microbial mat
7/31/2021	21	22	23.7	46.719001	-124.690534	148	very small mat
7/31/2021	21	24	41.4	46.719042	-124.690512	148	seeing plumose anemone and rathbunaster on a carbonate rock

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7/31/2021	21	25	18.6	46.719020	-124.690480	148	planning to move toward waypoint 4 and pass by " hole w mat" targets dropped earlier in dive to check for bubbles
7/31/2021	21	27	38.1	46.718825	-124.690453	148	have been passing over very flat sediment without much fauna, some holes, sea pens, occasional shrimp
7/31/2021	21	29	32.3	46.718714	-124.690409	148	at holes w mat target, no holes, no mat
7/31/2021	21	29	52.8	46.718704	-124.690361	149	flat fish
7/31/2021	21	30	18.7	46.718698	-124.690350	149	mostly just some light pink/white sea pens interspersed
7/31/2021	21	30	32.8	46.718696	-124.690348	148	now seeing some mat
7/31/2021	21	43	9.8	46.718711	-124.690368	149	Not going to WP4, heading back N now past WP1 to look for bubbles
7/31/2021	21	49	38.4	46.719493	-124.690388	148	still passing over flat sediment with very little fauna moving toward WP1, now around 20 m from it to the SW
7/31/2021	21	51	16.2	46.719575	-124.690293	148	zooms on a carbonate rock with vermillion sea star, large white sea star, and some zoanthids
7/31/2021	21	51	49.7	46.719556	-124.690290	148	now seeing some plumose anemones
7/31/2021	21	52	8.1	46.719573	-124.690252	148	a very large rockfish, maybe starry
7/31/2021	21	52	33.7	46.719676	-124.690248	148	a few more vermillion sea stars on the sediment and the occasional flat fish and shrimp
7/31/2021	21	52	48.9	46.719692	-124.690248	148	At WP1 now
7/31/2021	21	53	41.3	46.719710	-124.690263	148	seeing some shell hash here, not sure what species
7/31/2021	21	54	20.1	46.719734	-124.690273	148	another few rock fish with white and brown lines/spots on top
7/31/2021	21	58	13.3	46.719883	-124.690190	148	Now seeing carbonate rocks with small bacterial mats indicating potential past seepage. also seeing more vermillion sea stars, gastropods, rockfish, brachiopod/bivalve organisms, shell hash, small lingcod, crabs, and same general fauna as at boulder near GT sampling
7/31/2021	21	59	46.1	46.719897	-124.690323	146	moving ship further northward, none of the past bubbles observed here seem to be active
7/31/2021	22	2	18.9	46.720024	-124.690430	147	zoom on rock with weird pink anemone
7/31/2021	22	2	43.4	46.720031	-124.690430	147	still passing over flat sediment with occasional flat fish, some sea pens
7/31/2021	22	2	59.0	46.720036	-124.690432	147	now some small bacterial mat patches again
7/31/2021	22	4	5.5	46.720063	-124.690532	147	approaching carbonate rubble with various rockfish, white large rockfish, vermillion sea stars, clam hash, small mat
7/31/2021	22	5	45.7	46.720139	-124.690612	148	depth here is 147, oxygen 6.25%, 23.78 uM
7/31/2021	22	6	2.6	46.720149	-124.690642	147	also occasional small goby-like fish
7/31/2021	22	6	28.3	46.720158	-124.690654	147	previous carbonates where we saw white mat but no active bubbling was over oldPick5 marker
7/31/2021	22	6	42.7	46.720161	-124.690654	147	now we're near WP2 but not seeing anything
7/31/2021	22	7	57.8	46.720211	-124.690647	147	also not seeing anything at oldPick4
7/31/2021	22	12	23.4	46.720192	-124.690610	147	back around WP2 slightly S of oldPIck4 trying to find bubbles
7/31/2021	22	13	41.4	46.720173	-124.690606	147	zooms on some small patches of white and orange mat

date	hr	min	sec	latitude	longitude	Z(m)	H1865 N of Guide Canyon Descriptions
7/31/2021	22	15	2.5	46.720131	-124.690573	147	seeing signal in sonar that could be something, or maybe rock, but going to look, near WP2
7/31/2021	22	15	49.3	46.720126	-124.690500	148	in this area near WP2, seeing carbonate rubble again with starry rockfish and the brown and white spotted ones, also sea cucumbers, unknown bivalve/brachiopod organisms, small white patches,
7/31/2021	22	17	14.0	46.720127	-124.690423	147	zooms on large smooth rock
7/31/2021	22	17	29.9	46.720127	-124.690423	147	may be seeing some tube worms throughout this site as well
7/31/2021	22	18	19.6	46.720136	-124.690391	147	going to move N toward WP3
7/31/2021	22	19	12.0	46.720197	-124.690331	147	another little mat
7/31/2021	22	20	25.0	46.720319	-124.690409	147	Still passing over rock rubble, not necessarily carbonate. some of these rocks seem to be from elsewhere
7/31/2021	22	21	25.1	46.720362	-124.690473	147	about 1/2 way between WP2 and WP3
7/31/2021	22	21	40.8	46.720366	-124.690468	147	piece of kelp
7/31/2021	22	23	25.8	46.720501	-124.690440	147	still flying over occasional large boulder harboring same fauna as throughout dive (especially some large white sea stars) and rockfish, otherwise flat sediment without much fauna
7/31/2021	22	24	35.7	46.720528	-124.690329	147	have been monitoring in sonars throughout exploration, but only seeing rocks, no bubbles
7/31/2021	22	25	28.5	46.720517	-124.690308	147	seeing a few small white holes with bacterial mat again, no bubbles, some shell hash scattered
7/31/2021	22	26	0.6	46.720518	-124.690293	147	some lingcod
7/31/2021	22	28	59.9	46.720611	-124.690277	147	still passing over large carbonate ground with some shell hash, lingcod, starry rockfish, previous bivalve/brachiopods, small mat around holes
7/31/2021	22	29	18.3	46.720607	-124.690277	147	also some pink/red sea cucumbers
7/31/2021	22	29	55.6	46.720606	-124.690320	147	an orange anemone
7/31/2021	22	31	39.9	46.720590	-124.690376	147	also some occasional very sedimented small boot sponges on rocks
7/31/2021	22	37	51.7	46.720666	-124.690111	146	Still near rocks with same fauna. Not that all the ground we have been covering was previously visited in earlier watches. have been going N through N-S oriented shallow valley feature
7/31/2021	22	38	23.6	46.720674	-124.690083	144	now moving off the E to ground we haven't covered yet, seeing if there is anything interesting
7/31/2021	22	39	0.0	46.720744	-124.690082	143	big crab
7/31/2021	22	39	30.2	46.720741	-124.690077	144	may be mating crabs
7/31/2021	22	40	51.8	46.720740	-124.690066	144	May be seeing some stick swiftia?
7/31/2021	22	41	5.7	46.720740	-124.690060	144	some of the rockfish we may have been seeing are probably canary rockfish

Table 20: H1866 Astoria Canyon N Rim Dive Log

date	hr	min	sec	latitude	longitude	Z(m)	H1866 Astoria Canyon N Rim Descriptions
8/1/2021	15	11	40.8	46.244757	-124.611650	122	marine snow and jellies in the water column
8/1/2021	15	14	39.1	46.244701	-124.611505	198	thousands of krill in argus cam

date	hr	min	sec	latitude	longitude	Z(m)	H1866 Astoria Canyon N Rim Descriptions
8/1/2021	15	20	35.4	46.244956	-124.611346	362	large amount of marine snow is still visible in argus cam
8/1/2021	15	21	20.8	46.244964	-124.611330	382	ctenophores
8/1/2021	15	22	15.1	46.244981	-124.611314	406	Eusergestes similis, midwater shrimp
8/1/2021	15	31	34.8	46.244982	-124.611312	655	continuing to see thick marine snow in the water column, ctenophores
8/1/2021	15	32	44.0	46.245017	-124.611313	687	crown jellies
8/1/2021	15	36	44.2	46.244974	-124.611535	780	Lampocteis cruentiventer, lobate ctenophore
8/1/2021	15	36	54.0	46.244974	-124.611532	780	bottom in sight
8/1/2021	15	37	46.8	46.244973	-124.611543	779	seafloor is a soft sediment bottom with a scatter of hundreds of sea stars
8/1/2021	15	44	24.9	46.244992	-124.611621	781	just finished white balance and setting up the stills cam
8/1/2021	15	45	44.8	46.244897	-124.611595	781	sea stars may be vermillion sea stars and zoroasterid, there are also some thornyhead, sole, and a lot of marine snow in the water column
8/1/2021	15	47	43.9	46.244859	-124.611576	781	norbit indicated there may be a bubble stream ahead
8/1/2021	15	48	27.4	46.244843	-124.611628	781	approaching a patch of sand with anoxic sediment and a large bacterial mat
8/1/2021	15	49	16.6	46.244870	-124.611659	781	another very large patch of bacterial mat
8/1/2021	15	50	35.7	46.244811	-124.611690	782	moving along a slope
8/1/2021	15	51	59.4	46.244776	-124.611681	781	Very strong bubble stream coming from a valley like crease in the seafloor. The sediment all around the stream is black with bacterial mat on top
8/1/2021	15	52	9.9	46.244774	-124.611680	781	waiting for sediment to clear view
8/1/2021	15	52	12.8	46.244774	-124.611680	781	Bubbles 1. Area of reduced seds and mat. In a bit of a hole
8/1/2021	15	55	4.7	46.244768	-124.611698	782	grenadier fish
8/1/2021	15	56	41.4	46.244754	-124.611705	781	backing off from the hole to wait for sediment to clear the area
8/1/2021	15	58	32.7	46.244756	-124.611702	780	poralia jelly
8/1/2021	15	58	53.4	46.244757	-124.611703	780	doppler reset
8/1/2021	15	59	30.9	46.244769	-124.611713	781	relocated the strong bubble stream
8/1/2021	16	2	1.3	46.244813	-124.611719	781	sablefish
8/1/2021	16	2	49.6	46.244810	-124.611722	782	there appears to be a lot of reduced/anoxic sediment patches scattered in the area
8/1/2021	16	4	49.6	46.244803	-124.611730	783	approaching bubble stream
8/1/2021	16	5	15.9	46.244796	-124.611729	783	hole around the bubble stream is slightly raised
8/1/2021	16	7	42.3	46.244791	-124.611715	783	moving to waypoint 2, waypoint 1 had a very strong bubble stream at ~783m depth
8/1/2021	16	7	59.4	46.244792	-124.611714	783	Bubble 1. In a slight depression coming out of a hole. Strong stream. Some bac mat. Very small amount of shell hash.
8/1/2021	16	8	47.8	46.244767	-124.611698	781	Bubbles 1 is in a "hole" according to Bob.
8/1/2021	16	9	26.7	46.244735	-124.611624	780	en route to waypoint 2, flying over flat sediment bottom covered in sea stars, continuing to see a lot of marine snow in the water column
8/1/2021	16	13	22.7	46.244716	-124.611447	781	on seafloor still observing sea stars, there are also sea cucumbers here, and an occasional flatfish and poralia jelly
8/1/2021	16	14	42.2	46.244702	-124.611441	781	many white patches on the seafloor, could be bacterial mat or just a disturbance of the sediment, thornyhead
8/1/2021	16	16	41.8	46.244617	-124.611304	780	siphonophore moving along seafloor
8/1/2021	16	18	11.1	46.244461	-124.611055	777	hagfish, thornyhead are increasing on soft sediment bottom with hundreds of sea stars

date	hr	min	sec	latitude	longitude	Z(m)	H1866 Astoria Canyon N Rim Descriptions
8/1/2021	16	20	59.3	46.244277	-124.610802	779	flatfish
8/1/2021	16	21	36.8	46.244260	-124.610781	779	Seastars, sea cucumbers, thorny heads, white patches on the seafloor likely light colored sediment exhumed by burrowing organisms.
8/1/2021	16	22	4.8	46.244254	-124.610767	779	The pale patches in the sediment may exhumed by burrowing organisms in this area
8/1/2021	16	22	49.3	46.244212	-124.610712	780	eel pouts
8/1/2021	16	23	37.6	46.244181	-124.610630	779	slowly moving up slope
8/1/2021	16	24	56.4	46.244190	-124.610569	776	bacterial mat on the side of the slope we are traveling up, there are no bubbles visible, a flat fish nearby
8/1/2021	16	25	58.0	46.244104	-124.610526	776	two more large patches of bacterial mat
8/1/2021	16	26	28.0	46.244098	-124.610536	776	seaking tech issue
8/1/2021	16	27	56.8	46.244071	-124.610491	776	within the white mat there is a lot of grey/black sediment, sea stars are resting on top of the mat as well as in the soft sediment outside of the mat
8/1/2021	16	28	36.8	46.244030	-124.610468	775	~20m from target
8/1/2021	16	28	50.4	46.244060	-124.610401	774	Large patch of bacterial mat, with smaller patches in the area. Many larger patches of mat scattered about.
8/1/2021	16	29	42.9	46.244105	-124.610380	774	very large depression in the seafloor with a lot of dark sediment indicative of sulfur
8/1/2021	16	33	26.2	46.244104	-124.610389	775	Bubbles 2 hypack target placed here. Large bubble stream near waypoint 2. The base of the hole of the bubble stream is black. There is bacterial mat here. but they are present in small white patches, there are a lot of small white dots that look like they may be small snails
8/1/2021	16	33	40.9	46.244103	-124.610389	775	Looks like tiny gastropods. Small patches of white bac mat on snails(?)
8/1/2021	16	34	59.1	46.244102	-124.610379	775	bubble stream near waypoint 2 (bubbles 2) is very strong currently
8/1/2021	16	35	46.9	46.244104	-124.610373	775	Bubbles 2 site. Tiny gastropods (?). Hairy mat, some on biota(?) In a depression. Strong flow.
8/1/2021	16	36	34.0	46.244110	-124.610383	774	in this bubble stream, the sea stars are not laying on the dark sediment or bacterial mat
8/1/2021	16	38	12.1	46.244144	-124.610384	773	First clam shell seen. not a living clam
8/1/2021	16	39	13.6	46.244133	-124.610309	774	large flatfish,
8/1/2021	16	39	26.5	46.244134	-124.610302	774	This is an area about 20 m long. Bubbles 2. Large area. Strong flow but slightly intermittent.
8/1/2021	16	40	45.2	46.244135	-124.610282	774	sablefish and tanner crab resting underneath it
8/1/2021	16	42	45.5	46.244131	-124.610150	773	sablefish and a hagfish
8/1/2021	16	46	40.5	46.244104	-124.609971	775	Approaching another bacterial mat with sea stars and hagfish around the edges. there are a few holes in the bacterial mat with bubble streams, ~5+ different small streams, one of the streams is causing a black cloud of sediment to push out with the bubbles
8/1/2021	16	47	7.0	46.244109	-124.609995	775	It is hard to count exactly how many streams are here, there are multiple and coming from the sediment all over
8/1/2021	16	48	29.7	46.244102	-124.609981	775	there are a few small clams here, no tiny gastropods found at this site like there was at the previous
8/1/2021	16	49	9.9	46.244112	-124.610001	775	Lots of bubble streams here. Bubbles 3. 4+ separate orifices. None (few) of the small gastropods here but some clams.

date	hr	min	sec	latitude	longitude	Z(m)	H1866 Astoria Canyon N Rim Descriptions
8/1/2021	16	50	7.4	46.244105	-124.609983	775	unlike most bubble streams we have seen, there is no bacterial mat at the base or surrounding the holes of the bubble streams
8/1/2021	16	51	37.3	46.244114	-124.610010	775	continuing to WP2 ~12m away
8/1/2021	16	52	29.2	46.244086	-124.609901	775	doppler reset
8/1/2021	16	53	35.6	46.244076	-124.609873	775	Still traveling over a soft sediment bottom covered in sea stars. There are hagfish, thornyhead, eel pouts, and large patches of white and grey bacterial mats
8/1/2021	16	54	6.8	46.244067	-124.609862	775	Heading to waypoint 4
8/1/2021	16	54	26.7	46.244046	-124.609859	774	~220m away from waypoint 4
8/1/2021	16	55	2.6	46.244001	-124.609806	775	sole
8/1/2021	16	55	47.3	46.243992	-124.609814	775	continuing to see occasional sablefish
8/1/2021	16	56	38.2	46.243956	-124.609772	775	seeing an increase in number of hagfish
8/1/2021	16	57	41.5	46.243935	-124.609749	775	correction increase in sea cucumbers Pannychia moseleyi
8/1/2021	17	0	52.6	46.243755	-124.609556	775	no changes in habitat, still moving over soft sediment bottom with sea stars, sea cucumbers (Pannychia moseleyi), sablefish, eel pouts, thornyhead, flat fish, and thick marine snow in the water column
8/1/2021	17	1	23.2	46.243754	-124.609543	775	Hagfish most likely E. stoutii
8/1/2021	17	6	59.5	46.243408	-124.608915	777	another flatfish, still observing same type of habitat
8/1/2021	17	7	37.2	46.243353	-124.608863	777	!120m away from waypoint4
8/1/2021	17	8	3.3	46.243350	-124.608858	777	Rathbunaster sea star, first seen
8/1/2021	17	9	54.1	46.243198	-124.608661	777	cluster of sea cucumbers
8/1/2021	17	10	0.0	46.243197	-124.608658	777	flat fish
8/1/2021	17	15	48.4	46.242978	-124.608178	771	O2 is low here 0.59 umol/L
8/1/2021	17	18	20.0	46.242804	-124.607863	770	approaching waypoint 4, there was a large depression with dark/anoxic sediment ~ 20m away from the target
8/1/2021	17	18	39.5	46.242796	-124.607839	770	Norbit sonar may be indicating a bubble stream
8/1/2021	17	20	3.0	46.242802	-124.607820	770	small black hole with black sediment surround it releasing black clouds of smoke
8/1/2021	17	23	17.5	46.242809	-124.607756	771	At waypoint 4, there is a large depression in the seafloor with dark black sediment and thousands of small white gastropods, in this depression there are bubbles, not that strong of a stream. sea stars are not resting within the black and white sediment, but along the edges
8/1/2021	17	25	39.5	46.242778	-124.607693	772	heading to waypoint 5
8/1/2021	17	25	53.3	46.242786	-124.607693	772	Bubbles 4. Line of bubbles along the base of this mound with gastropods and bac mat. Not as vigorous as previous streams.
8/1/2021	17	26	20.0	46.242787	-124.607684	771	~140m from waypoint 5
8/1/2021	17	27	33.3	46.242776	-124.607576	772	Back to traveling over soft bottom sediment with sea stars scattered throughout. continuing to see thornyhead, eelpouts, hagfish
8/1/2021	17	28	55.6	46.242716	-124.607511	773	possible target in sonar ~30m ahead
8/1/2021	17	31	48.7	46.242615	-124.607325	776	approaching discolored patch on seafloor, appears to be black sediment underneath a lot of white gastropods, may be thin bacterial mat as well
8/1/2021	17	32	32.8	46.242571	-124.607226	778	there is some shell hash within this patch
8/1/2021	17	33	8.9	46.242562	-124.607200	778	bubbles found here, ~ 106m to waypoint 5
8/1/2021	17	35	25.0	46.242575	-124.607230	778	There are bubbles coming out of multiple spots in the seafloor. They aren't very strong streams, but seem to be fairly consistent
8/1/2021	17	37	51.4	46.242522	-124.607157	780	exploring another patch of black and white mixed sediment

date	hr	min	sec	latitude	longitude	Z(m)	H1866 Astoria Canyon N Rim Descriptions
8/1/2021	17	39	7.7	46.242522	-124.607141	780	diffuse flow of bubbles is coming out of the seafloor where the massive amounts of small gastropods are clustered
8/1/2021	17	40	9.9	46.242515	-124.607098	780	beginning to see larger shell hash
8/1/2021	17	40	48.2	46.242508	-124.607074	779	correction
8/1/2021	17	41	36.1	46.242489	-124.607064	779	poralia jelly
8/1/2021	17	42	52.1	46.242503	-124.607070	777	pilots changing positions
8/1/2021	17	44	57.3	46.242535	-124.607071	779	heart shaped line of bacterial mat around sediment in the seafloor
8/1/2021	17	45	28.4	46.242539	-124.606998	780	increase in amount of jellies floating by
8/1/2021	17	46	25.5	46.242541	-124.606986	780	Bubbles 5. Some white bac mat here. Large diffuse area
8/1/2021	17	47	13.5	46.242531	-124.606983	780	cluster of purple/red poralia jellies ~6 and possibly one yellow larvacean house
8/1/2021	17	47	57.5	46.242488	-124.606965	780	seafloor is now mostly covered in the black sediment with thousands of tiny gastropods
8/1/2021	17	49	5.4	46.242459	-124.606958	781	small circular patches of bacterial mat
8/1/2021	17	50	31.1	46.242413	-124.606912	781	continuing to waypoint 5
8/1/2021	17	51	6.5	46.242413	-124.606785	781	back to soft sediment bottom but now there aren't as many sea stars as previously seen
8/1/2021	17	51	35.8	46.242411	-124.606751	781	continuing to see eel pouts, thornyhead, and flat fish, occasional jelly
8/1/2021	17	53	22.9	46.242362	-124.606567	782	hagfish, continuing to observe thick marine snow
8/1/2021	17	54	14.7	46.242345	-124.606535	782	Beginning to see a return of scattered sea stars
8/1/2021	17	54	45.0	46.242322	-124.606421	781	~50m from waypoint 5
8/1/2021	17	55	31.3	46.242314	-124.606384	781	Shortly after sea stars reappeared, the large patches of black sediment with tiny white gastropods reappeared.
8/1/2021	17	56	22.4	46.242310	-124.606352	781	negative O2 readings here
8/1/2021	17	56	25.6	46.242310	-124.606301	781	Bacterial mat "circles". Lots and lots of patches of these tiny gastropods.
8/1/2021	18	0	3.4	46.242329	-124.606057	781	Very large depression in the seafloor, almost crater like covered in the black sediment with small white gastropods, there is a very strong stream (bubbles 6) with organic material covered in bacterial mat resting at its base.
8/1/2021	18	2	38.3	46.242324	-124.606035	781	Bubbles 6. Steady stream coming out of dark area at bottom of large pit in the seafloor. Lots of gastropods.
8/1/2021	18	5	50.4	46.242339	-124.606040	780	going to take a sweep for photos
8/1/2021	18	6	21.1	46.242342	-124.606012	780	photos for model taken with still cam are in folder "H1866-3"
8/1/2021	18	9	16.9	46.242337	-124.606045	779	end photos for 3D model
8/1/2021	18	9	43.5	46.242328	-124.606086	778	Just did a video survey - in 3D. Chris is going to work up the data. Photogrammetry (sp?)
8/1/2021	18	11	19.7	46.242274	-124.606027	779	large sable fish swimming across the pit
8/1/2021	18	11	42.1	46.242298	-124.605999	779	heading to pass over waypoint 5
8/1/2021	18	15	34.9	46.242242	-124.605968	780	Nearing waypoint 5 there are many large patches of bacterial mat and dark black sediment underneath with small white gastropods.
8/1/2021	18	16	19.6	46.242239	-124.605964	781	More undulating topography. Bright bac mat here. More tiny gastropods.
8/1/2021	18	16	56.0	46.242239	-124.605968	781	bubble streams are coming out from all over the seafloor within this patch (bubbles 7) as though they are diffusing out of the sediment
8/1/2021	18	18	55.0	46.242236	-124.605969	780	going to investigate a possible large pit

date	hr	min	sec	latitude	longitude	Z(m)	H1866 Astoria Canyon N Rim Descriptions
8/1/2021	18	19	13.7	46.242252	-124.605970	779	Bubbles 7. Diffuse flows here and there coming out of this mounded feature. On the mound.
8/1/2021	18	19	17.1	46.242253	-124.605965	779	large bundle of fishing line
8/1/2021	18	21	35.8	46.242226	-124.605947	780	moving on to waypoint 6
8/1/2021	18	25	2.3	46.242163	-124.605768	782	possibly a Stephanomia amphytridis siphonophore chain
8/1/2021	18	26	59.7	46.242142	-124.605692	782	Traveling over same type of habitat on the way to waypoint 6. flat sediment bottom covered in clusters of sea stars, occasional, thornyhead, hagfish, and a few small circular bacterial patches
8/1/2021	18	27	58.0	46.242107	-124.605624	782	O2 is still absent/ negative readings
8/1/2021	18	34	11.2	46.241937	-124.605077	782	Overall, what we have observed on this dive is a soft sediment bottom covered in clusters of sea stars with some hagfish, eel pouts, thornyhead, flatfish, sablefish. When the sonar indicated that there may be bubble streams, we would begin to see large patches of black sediment covered in small white gastropods. within some of these patches there were strong bubble
8/1/2021	18	34	51.9	46.241935	-124.605075	782	Here there is a large patch of white bacterial mat on top of black sediment. this is the first time we have seen such thick mat
8/1/2021	18	37	14.7	46.241835	-124.604764	782	shell hash, possibly first we've seen on this dive, they all appear to be opened, but there may be some burrowed beneath that are living
8/1/2021	18	38	26.8	46.241801	-124.604675	781	seeing a decrease in sea stars on the soft sediment
8/1/2021	18	38	45.3	46.241757	-124.604673	782	interesting returns on Norbit, going to explore
8/1/2021	18	39	34.9	46.241727	-124.604636	781	in direction of the promising returns from the sonar, there are more large patches of black sediment with small white gastropods, following behind these patches, there is another collapsed pit
8/1/2021	18	40	56.1	46.241717	-124.604624	781	in the pit there is a large stipe of bull kelp, there also seems to be sediment covered tubes that could be sponges or tube worms
8/1/2021	18	41	29.5	46.241718	-124.604624	782	there are bubbles in front of the cylindrical sediment covered objects and behind the large kelp stipe
8/1/2021	18	44	25.8	46.241717	-124.604620	782	tubular objects appear to be sponges
8/1/2021	18	45	10.2	46.241717	-124.604644	781	sponge tube shaped organisms are at site "bubbles 8"
8/1/2021	18	47	56.8	46.241709	-124.604582	782	Bubbles 8. 2 small weak streams in the bottom of a small pit near kelp.
8/1/2021	18	48	8.9	46.241706	-124.604581	782	there is another pit just behind the first pit seen at "bubble 8" with the bull kelp and there are bubbles within that pit too
8/1/2021	18	49	39.9	46.241699	-124.604557	781	heading to waypoint 7
8/1/2021	18	49	58.2	46.241690	-124.604553	781	correction heading to waypoint 8
8/1/2021	18	51	55.8	46.241563	-124.604492	780	there is a good amount of drift kelp here
8/1/2021	18	53	54.6	46.241539	-124.604312	780	watch change
8/1/2021	18	54	43.5	46.241475	-124.604290	780	Continuing to travel over soft sediment bottom with scatter of sea stars. The clusters of sea stars are a lot smaller. continuing to see hagfish, eel pouts and thornyhead
8/1/2021	19	0	54.6	46.241124	-124.604056	780	transiting SE toward WP8 from WP6
8/1/2021	19	1	20.1	46.241056	-124.604028	780	still seeing flat brown sediment with light brown holes, lots of pink seastars, occasional sablefish and hagfish
8/1/2021	19	3	33.9	46.240854	-124.603893	779	lots of hagfish here, more than 20 in frame
8/1/2021	19	5	21.9	46.240637	-124.603795	779	correction not hagfish, huge number of gray sea cucumbers
8/1/2021	19	5	44.8	46.240639	-124.603774	778	still hundreds of sea cucumbers

date	hr	min	sec	latitude	longitude	Z(m)	H1866 Astoria Canyon N Rim Descriptions
8/1/2021	19	9	26.7	46.240225	-124.603540	777	now speeding up to move a bit faster toward WP8, few sea cucumbers again, but still seeing them occasionally
8/1/2021	19	12	22.8	46.240133	-124.603497	776	now seeing a lot of large gray sea cucumbers again, still seeing hundreds of sea stars
8/1/2021	19	13	19.2	46.240067	-124.603492	775	occasional flat fish and thornyhead
8/1/2021	19	14	58.0	46.240045	-124.603378	771	Getting porch caught in sediment, will need to "car wash" as we move now
8/1/2021	19	18	34.8	46.239919	-124.603334	765	cleaning out scoop
8/1/2021	19	19	24.8	46.239918	-124.603338	765	Anne seeing signal in norbit
8/1/2021	19	20	30.7	46.239861	-124.603360	764	still cleaning off vehicle, near WP8 now
8/1/2021	19	22	4.6	46.239939	-124.603458	761	40 m away from WP8 to the NW
8/1/2021	19	27	34.1	46.239775	-124.603207	758	still trying to get mud off
8/1/2021	19	30	53.7	46.239761	-124.602968	764	now at WP8, not seeing any change in landscape or fauna
8/1/2021	19	31	23.5	46.239785	-124.602971	765	somissus jelly
8/1/2021	19	31	30.5	46.239785	-124.603003	765	also some poralia
8/1/2021	19	36	9.8	46.239688	-124.602947	766	going to circle the area around WP8 for a little
8/1/2021	19	42	52.7	46.239650	-124.602955	761	doing ballast adjustment on vehicle
8/1/2021	19	44	9.1	46.239715	-124.602830	766	coming back down to seafloor, will go a little S of WP8, then approach again from the east,
8/1/2021	19	46	40.6	46.239797	-124.602808	768	seeing a few snakehead eel pouts
8/1/2021	19	47	48.5	46.239801	-124.602873	767	sablefish
8/1/2021	19	48	20.6	46.239800	-124.602925	766	leaving WP8 now, moving NE toward WP7
8/1/2021	19	49	53.7	46.239906	-124.602869	767	same flat soft sediment with lighter holes/spots, abundant sea stars, occasional thornyhead, sablefish, and eelpout between WP7 and 8
8/1/2021	19	50	37.6	46.239914	-124.602812	767	also occasional flatfish
8/1/2021	19	50	51.5	46.239949	-124.602806	767	hagfish
8/1/2021	19	52	16.6	46.239977	-124.602794	767	around 5 m S of WP7 right now, not seeing any change in landscape or fauna, no signals in norbit
8/1/2021	19	53	44.4	46.239974	-124.602803	766	heading out a bit in each direction from WP7 to survey, heading west now
8/1/2021	19	55	14.2	46.239954	-124.602978	765	seeing a small school of sablefish, also seems to be a bubble stream in norbit
8/1/2021	19	55	59.8	46.239963	-124.603056	766	now seeing some mat and dark spots, also small white gastropods
8/1/2021	19	57	8.6	46.239991	-124.603073	766	found seep area and persistent bubble stream ~20 m west of WP7
8/1/2021	19	59	20.2	46.239930	-124.603101	766	sediment are compromising visibility in this seep area
8/1/2021	20	0	10.1	46.239931	-124.603121	764	These sablefish are very large, also large flat fish. zooms show that white is just gastropod, maybe some mat too but not obvious where
8/1/2021	20	1	40.1	46.239945	-124.603089	766	seep area extended about 12 m SW of bubbles 9 marker where we first started seeing seep signs
8/1/2021	20	2	5.1	46.239950	-124.603090	766	now seeing a different bubble stream, also quite large and persistent
8/1/2021	20	3	13.0	46.239988	-124.603006	765	actually probably same bubble stream
8/1/2021	20	3	56.5	46.239977	-124.603051	765	fish still clouding visibility
8/1/2021	20	6	54.4	46.239993	-124.603042	764	seeing small potential bubble stream signal around 8 m to the NE of bubbles 9 marker
8/1/2021	20	8	14.9	46.240028	-124.602954	765	seeing white, gray, black patches of gastropods and potential mat now with bubble stream in center
8/1/2021	20	8	45.5	46.240035	-124.602958	766	definitely some white mat, and sablefish surrounding this seep area

date	hr	min	sec	latitude	longitude	Z(m)	H1866 Astoria Canyon N Rim Descriptions
8/1/2021	20	12	36.3	46.240046	-124.602941	763	now moving to the NE to see how far out this seep patch extends
8/1/2021	20	13	38.4	46.240088	-124.602927	763	extends ~6 m to the NE of bubbles 10 marker
8/1/2021	20	15	49.2	46.240072	-124.602912	759	seeing a signal in norbit but appears to maybe be bubbles 10
8/1/2021	20	17	2.6	46.240085	-124.602893	754	seeing another signal ~35 m away to the N of bubbles 10
8/1/2021	20	18	18.9	46.240138	-124.602897	764	before checking out that bubble stream, going to look at WP7 a little
8/1/2021	20	20	22.6	46.240061	-124.602809	766	beyond seep areas in this region, background area looks the same as previously (mostly sea stars), but still seeing higher density of sablefish (~10-20 in the frame most of the time)
8/1/2021	20	22	22.0	46.239876	-124.602556	768	now moving SW of WP7, nothing here either
8/1/2021	20	22	43.9	46.239950	-124.602542	768	resetting DVL
8/1/2021	20	23	20.7	46.239989	-124.602621	770	now coming back in to WP7 from the E
8/1/2021	20	25	31.7	46.240063	-124.602794	766	now going to head N toward the signal we saw earlier
8/1/2021	20	27	19.6	46.240211	-124.602878	764	now seeing some mat, gastropod, and reduced sediment habitat
8/1/2021	20	29	49.5	46.240188	-124.602840	761	bacterial mat was ~22 m from WP7 to the north
8/1/2021	20	33	5.0	46.240258	-124.602794	761	now moving to the N of this bacterial mat patch
8/1/2021	20	33	24.9	46.240267	-124.602794	763	still seeing some small patches and still seeing a lot of sablefish
8/1/2021	20	34	24.5	46.240282	-124.602830	762	around 100 m between current location and bubbles 9 marker
8/1/2021	20	34	40.9	46.240322	-124.602796	762	still seeing some mat patches here
8/1/2021	20	35	48.8	46.240339	-124.602786	763	zooms show mostly gastropods, little white dots of mat
8/1/2021	20	36	35.7	46.240377	-124.602776	762	running out of seep habitat around now
8/1/2021	20	37	7.7	46.240382	-124.602753	762	now some more mat patches
8/1/2021	20	37	29.1	46.240407	-124.602792	762	when I say mat here its actually more just seep habitat patch, most of this "mat" is gastropod
8/1/2021	20	37	39.2	46.240404	-124.602792	762	found a bubble stream here
8/1/2021	20	38	13.1	46.240404	-124.602775	761	currently 43 m N of WP7
8/1/2021	20	39	45.8	46.240449	-124.602755	762	still following seep area currently NE, toward WP13 which is 245 m away
8/1/2021	20	41	7.0	46.240476	-124.602750	760	now not seeing seep habitat ahead of us anymore
8/1/2021	20	41	46.4	46.240440	-124.602749	757	putting in ship move distance of WP3 at 0.3 knot speed
8/1/2021	20	42	31.4	46.240443	-124.602761	760	seep habitat right here again
8/1/2021	20	42	57.6	46.240464	-124.602741	760	between here and WP13 we are following a ridge feature upslope
8/1/2021	20	44	42.5	46.240544	-124.602615	759	still some seep habitat off to the left
8/1/2021	20	45	21.8	46.240582	-124.602594	758	seep habitat ahead of us again
8/1/2021	20	46	16.7	46.240577	-124.602551	758	bubble stream here, seep habitat is still mostly reduced sediment with many small gastropods and small dots of white mat
8/1/2021	20	46	25.5	46.240577	-124.602551	758	also seeing a larger patch of white mat here
8/1/2021	20	47	3.5	46.240554	-124.602535	757	mat here is ~half a meter in diameter
8/1/2021	20	48	39.5	46.240629	-124.602509	756	another bubble stream and huge hydrate ledge, two layers of hydrate here
8/1/2021	20	52	57.9	46.240621	-124.602489	755	observing hydrate as we wait for ship to catch up and to position argus
8/1/2021	20	56	4.9	46.240640	-124.602526	758	also flatfish and sablefish around this hydrate
8/1/2021	21	2	4.6	46.240642	-124.602533	758	this hydrate site is 72 m from WP7 (heading 196 toward WP7) and 216 m from WP13 (heading 040 toward WP13)

date	hr	min	sec	latitude	longitude	Z(m)	H1866 Astoria Canyon N Rim Descriptions
8/1/2021	21	3	38.9	46.240624	-124.602516	757	seep habitat surrounding these two large hydrate slabs is same reduced sediment with many gastropods and some white mat
8/1/2021	21	5	38.7	46.240646	-124.602478	756	trying to prep secondary manipulator for two arm hydrate sampling operation
8/1/2021	21	6	17.8	46.240642	-124.602476	756	earlier saw a sablefish with thornyhead in its mouth
8/1/2021	21	8	27.8	46.240629	-124.602472	756	magnum arm is positioned now, will try to land with magnum in place and then situate hydrate sampler in it
8/1/2021	21	22	21.3	46.240648	-124.602522	757	pushing hydrate sampler in a little first
8/1/2021	21	23	39.1	46.240651	-124.602520	757	closing magnum jaws now
8/1/2021	21	26	31.6	46.240651	-124.602515	757	now see hydrate sampler end is now touching hydrate, view in bubble cam is good
8/1/2021	21	26	51.0	46.240651	-124.602515	757	may not be able to turn hydrate from here
8/1/2021	21	32	21.6	46.240654	-124.602518	757	readjusted position again, now hopefully have better angle on hydrate sampler
8/1/2021	21	34	53.6	46.240652	-124.602515	757	Positioned with kraft manipulator on T handle of hydrate sampler. now will count turns
8/1/2021	21	35	26.8	46.240653	-124.602512	757	1 turn
8/1/2021	21	35	55.8	46.240652	-124.602512	757	2 turns
8/1/2021	21	36	26.2	46.240652	-124.602517	757	3 turns
8/1/2021	21	36	50.8	46.240653	-124.602519	757	4 turns
8/1/2021	21	37	18.8	46.240648	-124.602520	757	5 turns
8/1/2021	21	37	45.9	46.240645	-124.602513	757	6 turns
8/1/2021	21	38	12.6	46.240646	-124.602513	757	7 turns
8/1/2021	21	38	34.7	46.240646	-124.602510	757	8 turns
8/1/2021	21	39	20.0	46.240632	-124.602510	757	just slipped loose from hydrate coring
8/1/2021	21	39	28.3	46.240632	-124.602510	757	not sure what happened
8/1/2021	21	40	29.3	46.240633	-124.602500	757	looks like surface below us that we were seated on collapsed
8/1/2021	21	41	2.1	46.240633	-124.602500	757	are going to look at the whole we made to see how far in we think that it really cored
8/1/2021	21	43	46.9	46.240642	-124.602505	757	zoomed on hole we drilled, doesn't look like it was very deep, maybe only a few mm. Positioning now to try to sample again
8/1/2021	21	46	49.7	46.240653	-124.602517	757	repositioned, sampler touching hydrate again, but may not be a good angle for kraft
8/1/2021	21	47	33.3	46.240654	-124.602515	757	going to take the gas tight sample now to get a bit more room
8/1/2021	21	50	3.2	46.240651	-124.602514	757	trying to get proper grip on gas tight
8/1/2021	21	59	26.9	46.240643	-124.602509	757	Repositioning kraft arm now on hydrate
8/1/2021	22	0	5.9	46.240643	-124.602514	757	9 turns
8/1/2021	22	0	30.6	46.240643	-124.602515	757	10 turns
8/1/2021	22	0	40.7	46.240644	-124.602519	757	11 turns
8/1/2021	22	0	48.5	46.240645	-124.602520	757	12 turns
8/1/2021	22	1	2.9	46.240646	-124.602520	757	13 turns
8/1/2021	22	1	12.4	46.240650	-124.602521	757	14 turns
8/1/2021	22	12	32.0	46.240654	-124.602513	757	just released sampler from kraft
8/1/2021	22	14	49.8	46.240652	-124.602512	757	trying to get hydrate sample into receiver now
8/1/2021	22	17	15.7	46.240648	-124.602515	757	seems like it's sealed in the received, going to give a tap
8/1/2021	22	37	5.2	46.240665	-124.602472	758	noting strong current, zooms on white mat chunks
8/1/2021	22	42	59.7	46.240665	-124.602469	758	trying to core but hit hydrate and now trying to shake it out

date	hr	min	sec	latitude	longitude	Z(m)	H1866 Astoria Canyon N Rim Descriptions
8/1/2021	22	52	10.0	46.240691	-124.602459	758	will not core
8/1/2021	23	1	13.1	46.240685	-124.602464	758	Attempting to scoop some biological samples (sea stars)
8/1/2021	23	6	25.9	46.240687	-124.602465	758	Sable fish encroaching on the outside of our sampling field
8/1/2021	23	12	46.8	46.240683	-124.602464	758	Collecting sea stars with the scoop is picking up excess sediment; avoiding the slurp as we don't want a sea star getting caught in the tubing
8/1/2021	23	18	24.2	46.240678	-124.602452	758	Sable fish and scooping is resulting in low visibility
8/1/2021	23	34	16.3	46.240681	-124.602455	758	Moving back towards hydrate to place a marker
8/1/2021	23	35	48.1	46.240567	-124.602428	757	303 degrees and 6 m away from target
8/1/2021	23	37	41.9	46.240568	-124.602472	758	Low visibility
8/1/2021	23	39	47.9	46.240637	-124.602484	756	Found our way back to the hydrate and bubble stream
8/1/2021	23	42	28.0	46.240653	-124.602480	756	Aim to place Marker 209 adjacent to the hydrate and bubble stream so scientists can locate this site at a future date
8/1/2021	23	43	30.9	46.240641	-124.602484	756	Using the bubble cam to help coordinate the placement of the marker
8/1/2021	23	44	20.0	46.240646	-124.602479	756	Marker 209 successfully placed
8/1/2021	23	49	14.1	46.240603	-124.602461	755	Moving on to Niskin sampling
8/1/2021	23	50	27.5	46.240635	-124.602482	754	Moved slightly SE of target; attempting to reposition before taking Niskin
8/1/2021	23	53	14.1	46.240642	-124.602495	755	Strong current
8/1/2021	23	55	31.9	46.240651	-124.602490	752	Coming up 10 m to sample third Niskin
8/1/2021	23	57	32.1	46.240650	-124.602493	749	Current coming out of the NW
8/1/2021	23	57	52.4	46.240647	-124.602492	749	Moving SE 25 m to sample the fourth Niskin
8/2/2021	0	9	37.2	46.240431	-124.602332	759	Heading to target placed previously named "bacterial mat-bigger
8/2/2021	0	11	52.0	46.240480	-124.602528	760	The goal is to collect push cores from bacterial mat from two separate sites.
8/2/2021	0	12	46.8	46.240481	-124.602553	759	large school of sablefish
8/2/2021	0	16	10.0	46.240577	-124.602661	761	observing patch of white and black sediment for bacterial mat
8/2/2021	0	25	46.9	46.240587	-124.602667	761	Shaking the core clean and starting the process again
8/2/2021	0	28	4.5	46.240526	-124.602640	758	Moving 7 m E where we previously observed the bacterial mat
8/2/2021	0	29	38.8	46.240568	-124.602525	759	Relocated to another patch of gastropods
8/2/2021	0	37	43.7	46.240330	-124.602765	763	Aiming to sample bacterial mat intermixed with gastropods; sable fish are unfortunately stirring up the sediment
8/2/2021	0	38	7.5	46.240322	-124.602780	763	Turbidity is high likely because sable fish are using Herc's light to hunt
8/2/2021	0	39	44.4	46.240299	-124.602736	763	Checking gauges
8/2/2021	0	41	18.0	46.240295	-124.602738	763	Turned lights off on Herc in order to hopefully encourage sable fish to move on
8/2/2021	0	42	58.9	46.240303	-124.602739	763	Lights turned back on and sable fish school is unfortunately still stirring up the sediment
8/2/2021	0	43	14.0	46.240260	-124.602737	763	Repositioning to observed bacterial mat located SW
8/2/2021	0	45	52.4	46.240210	-124.602872	765	Black bacterial mat, gastropods, and sea stars on the seafloor
8/2/2021	0	56	23.3	46.240209	-124.602870	765	Heading to WP5 with the goal of taking a background core along the way
8/2/2021	0	57	56.0	46.240341	-124.602758	762	Ascending slightly in the water column to shake off residual sediment on Herc

date	hr	min	sec	latitude	longitude	Z(m)	H1866 Astoria Canyon N Rim Descriptions
8/2/2021	1	2	16.2	46.240537	-124.603141	773	Vessel all stop; looking to continue a bit more NW before taking background core
8/2/2021	1	9	21.9	46.240539	-124.603178	774	Successfully took background core, now heading to WP5 which is located NW
8/2/2021	1	10	9.8	46.240525	-124.603187	774	Herc was slightly stuck in the mud and is currently working to free itself
8/2/2021	1	11	28.9	46.240471	-124.603232	767	DVL reset
8/2/2021	1	11	53.2	46.240470	-124.603227	766	Vessel all stop as Herc is working to reposition
8/2/2021	1	13	1.2	46.240472	-124.603183	764	Potentially issues with the axial thruster
8/2/2021	1	13	53.0	46.240461	-124.603338	767	Troubleshooting; moving the vessel and argus back 15 m
8/2/2021	1	15	28.1	46.240719	-124.603488	776	There was potentially a fish obstructing the axial thruster; however, the issue now seems resolved
8/2/2021	1	17	2.2	46.240752	-124.603583	778	About 240 m away from WP5
8/2/2021	1	21	2.5	46.240864	-124.603763	781	Sea stars and sea cucumbers scattered on the seafloor
8/2/2021	1	23	33.9	46.240943	-124.603821	781	Increasing vessel speed to 0.5 kts
8/2/2021	1	25	19.8	46.241006	-124.603856	781	Sable eating thornyhead rockfish; fight broke out between 2-3 individuals who were attempting to steal the rockfish
8/2/2021	1	27	34.1	46.241255	-124.604267	782	DVL reset
8/2/2021	1	28	1.9	46.241261	-124.604291	782	Multiple hagfish on the seafloor interspersed between sea stars
8/2/2021	1	31	35.2	46.241609	-124.604692	782	Thornyheads, sablefish, and hagfish
8/2/2021	1	33	49.5	46.241624	-124.604663	784	At a bacterial mat with gastropods slightly SW of WP6
8/2/2021	1	34	18.1	46.241624	-124.604662	784	Sole
8/2/2021	1	41	29.9	46.241620	-124.604662	784	Attempting to take final core but waiting on visibility to increase
8/2/2021	1	44	59.7	46.241624	-124.604662	783	Sablefish slammed into basket
8/2/2021	1	53	5.7	46.241633	-124.604673	782	Heading to bubble8 which is 10 m away from our current location
8/2/2021	1	54	55.1	46.241688	-124.604486	782	Waiting for turbidity to decrease before Niskin sampling
8/2/2021	1	55	52.8	46.241693	-124.604456	780	Waiting on vessel to complete its move as the Herc and Argus are currently being dragged
8/2/2021	2	4	39.8	46.241694	-124.604510	782	Seafloor is covered in sablefish
8/2/2021	2	11	57.4	46.241708	-124.604525	774	Before recovery, repositioning gastight to a safer location (i.e., the biobox)
8/2/2021	2	16	54.0	46.241703	-124.604536	773	Funnel broke on GT sampler in the process of repositioning it for recovery
8/2/2021	2	22	5.7	46.241196	-124.604436	727	Ascending at 14 m/min; currently at 730 m with a 50 min ETA to the surface
8/2/2021	2	27	12.2	46.241480	-124.604136	646	Ascending at 16 m/min; currently at 650 m with an estimate 40 min until the surface
8/2/2021	2	46	15.8	46.241502	-124.604318	380	Ascending at 12 m/min with an estimated 30 min until the surface
8/2/2021	3	2	41.9	46.242365	-124.604548	201	Ascending at ~13 m/min; ETA to surface is 15 min
8/2/2021	3	10	5.2	46.243029	-124.604556	107	Gastight appears to be leaking
8/2/2021	3	11	41.6	46.243055	-124.604641	91	Plan to keep arm on in bypass for recovery as it is currently holding the gastight in place in the basket
8/2/2021	3	21	32.0	46.243796	-124.604872	1	Argus on deck; Herc at the surface

Table 21: H1867 Astoria Canyon N Rim (2nd dive) Dive Log

date	hr	min	sec	latitude	longitude	Z(m)	H1867 Astoria Canyon N Rim Descriptions
8/3/2021	15	29	45.3	46.239615	-124.604751	2	having to recover argus, standby
8/3/2021	15	31	28.3	46.239627	-124.604819	3	both vehicles in water, going down
8/3/2021	15	38	45.4	46.239661	-124.604741	172	thousands of krill in the water column, ~167m
8/3/2021	15	39	0.8	46.239665	-124.604751	179	krill are gone now
8/3/2021	15	41	12.4	46.239865	-124.604783	244	a lot of marine snow in the water column, slightly impacting visibility
8/3/2021	15	44	55.7	46.240156	-124.604262	343	ground fault, turned off the sexton computer
8/3/2021	15	46	10.5	46.240176	-124.603983	377	Still cam causing ground fault, after powered back on. will not be used for this dive
8/3/2021	15	46	51.7	46.240200	-124.603859	396	very high amount of marine snow in the water column
8/3/2021	15	47	54.2	46.240254	-124.603706	425	ctenophores and jellies
8/3/2021	15	49	59.3	46.240337	-124.603385	484	shrimp, larvacean houses
8/3/2021	15	50	31.0	46.240364	-124.603334	499	siphonophore chain
8/3/2021	15	53	12.0	46.240383	-124.603255	574	small squid
8/3/2021	15	59	44.8	46.240355	-124.603247	745	Heading down the hydrate and bubbles13 nav target where we found hydrate on the previous dive.
8/3/2021	16	1	7.9	46.240452	-124.602860	759	bottom in sight
8/3/2021	16	3	20.4	46.240601	-124.602545	758	seafloor is the same as the previous dive
8/3/2021	16	3	53.0	46.240598	-124.602540	758	ROV and video housekeeping
8/3/2021	16	4	17.7	46.240598	-124.602531	758	juvenile fish floating by, possibly an eelpout
8/3/2021	16	5	49.9	46.240594	-124.602533	758	repowered the sexton
8/3/2021	16	8	51.8	46.240594	-124.602530	758	stills cam set up and appears to be operating without causing a ground fault
8/3/2021	16	10	26.0	46.240613	-124.602524	758	located seafloor marker next to the large ledge of hydrate
8/3/2021	16	11	35.2	46.240617	-124.602520	757	Magnum arm is drooping, attempting to solve the issue
8/3/2021	16	14	39.1	46.240634	-124.602533	757	Magnum arm is working
8/3/2021	16	16	44.2	46.240641	-124.602525	757	bubble stream seen between two slabs of hydrate
8/3/2021	16	20	10.4	46.240636	-124.602514	758	there are several bubble streams here
8/3/2021	16	20	34.5	46.240636	-124.602534	758	grafana connection issues
8/3/2021	16	22	41.5	46.240656	-124.602517	758	collecting GT 17-1
8/3/2021	16	22	48.1	46.240656	-124.602517	758	Crack in the seafloor between the 2 hydrate ledges with several bubble streams. Sampling one with gastights (2).
8/3/2021	16	25	50.1	46.240639	-124.602520	758	Gastight #127 in the crack between the 2 hydrate ledges.
8/3/2021	16	32	41.7	46.240644	-124.602514	758	preparing to collect the second duplicate GT sample, get 10
8/3/2021	16	40	26.7	46.240640	-124.602511	758	Tambient is 4.54. Taking a temp reading in the spot where we took the 2 gastight samples (Samp 127 GT17-1 and Samp 128 GT10).
8/3/2021	16	46	26.4	46.240643	-124.602517	758	T background is 4.53 (background). When push the temp probe in hit the hydrate.
8/3/2021	16	47	10.9	46.240637	-124.602521	758	Temp readings at site of gas tight samples and hydrate. Ambient
8/3/2021	16	47	19.3	46.240637	-124.602520	758	Temperature when push the probe in as far as we can (and probably hit the hydrate slab below) it does raise to 4.9C
8/3/2021	16	48	55.1	46.240637	-124.602528	758	Preparing the vehicle to collect a hydrate sample
8/3/2021	16	52	58.0	46.240643	-124.602512	758	collecting hydrate from larger slab of the two slabs found at seafloor marker 209
8/3/2021	16	53	3.7	46.240642	-124.602512	758	sablefish

date	hr	min	sec	latitude	longitude	Z(m)	H1867 Astoria Canyon N Rim Descriptions
8/3/2021	16	53	21.7	46.240641	-124.602517	758	hagfish underneath the hydrate slab we are collecting from
8/3/2021	16	54	27.5	46.240639	-124.602527	758	Hydrate piece is about 1 m across.
8/3/2021	16	54	30.3	46.240639	-124.602528	758	hydrate slab is about 1m in length
8/3/2021	17	8	37.3	46.240639	-124.602518	758	Still attempting hydrate sample, have to reposition to get closer to the hydrate. Sablefish continue to swim by, occasional thornyhead
8/3/2021	17	22	11.7	46.240648	-124.602507	758	still placing the hydrate sampler
8/3/2021	17	26	35.1	46.240645	-124.602509	758	scraping the surface of the hydrate to clear off sediment before collection
8/3/2021	17	37	15.2	46.240642	-124.602508	758	unscrewing the hydrate sampler to attempt to collect again, the sampler tip was sliding on the hydrate and may not have collected much
8/3/2021	17	51	59.9	46.240647	-124.602511	758	did 18 complete turns
8/3/2021	17	56	14.0	46.240624	-124.602478	756	trying to get a larvacean house off the hydrate receiver
8/3/2021	18	0	53.5	46.240629	-124.602481	757	DBL reset
8/3/2021	18	1	17.1	46.240620	-124.602501	758	many sable fish swimming around where we collected hydrate
8/3/2021	18	1	22.6	46.240618	-124.602505	758	We got a sample of the hydrate. Sample #129.
8/3/2021	18	1	36.4	46.240618	-124.602505	757	going to sample gastropods from the sediment
8/3/2021	18	4	3.7	46.240616	-124.602524	758	waiting for sediment to clear
8/3/2021	18	11	21.1	46.240603	-124.602536	757	leaving the site because the sablefish are stirring up the sediment
8/3/2021	18	11	46.6	46.240608	-124.602555	757	heading up slope to waypoints 13 and 14
8/3/2021	18	13	42.8	46.240655	-124.602565	756	large school of sable fish that mixed up the sediment
8/3/2021	18	16	18.2	46.240893	-124.602396	756	Traveling over flat soft sediment bottom covered in sea stars over to waypoints 13 and 14. there are still many sablefish and thick marine snow in the water column
8/3/2021	18	18	37.1	46.241031	-124.602301	756	~175 meters until we reach waypoints 13 and 14
8/3/2021	18	20	13.1	46.241163	-124.602162	753	flat fish, neptunia snail
8/3/2021	18	20	44.3	46.241191	-124.602130	752	eel pout, flat fish
8/3/2021	18	21	24.3	46.241263	-124.602044	750	Beginning to travel up slope. acorn worm
8/3/2021	18	21	54.9	46.241339	-124.601892	748	thornyhead, another eel pout
8/3/2021	18	23	41.1	46.241509	-124.601778	745	hagfish
8/3/2021	18	26	21.1	46.241782	-124.601508	736	no changes in habitat, continuing to see flat sediment bottom with sea stars, sablefish, hagfish, and eel pouts
8/3/2021	18	28	0.1	46.241984	-124.601225	731	approaching wall with many mushroom corals
8/3/2021	18	28	35.6	46.241969	-124.601152	729	we are now climbing up the canyon wall with a lot of mushroom corals, a tanner crab, thornyhead
8/3/2021	18	29	34.5	46.241933	-124.601129	730	on the flat side next to the wall there are patches of anoxic sediment with a lot of shell hash and very small gastropods
8/3/2021	18	30	28.8	46.241936	-124.601124	730	dover sole
8/3/2021	18	31	6.7	46.241944	-124.600993	728	moving back over the same type of soft sediment with scatter of sea stars
8/3/2021	18	32	18.5	46.241988	-124.600968	728	reapproaching the steep wall with many mushroom corals and a deep sea sole
8/3/2021	18	33	20.0	46.242048	-124.600945	724	topography is more rugged and sloped, moving up the canyon wall, there is an increase of thornyhead here and a decrease in sea stars

date	hr	min	sec	latitude	longitude	Z(m)	H1867 Astoria Canyon N Rim Descriptions
8/3/2021	18	34	51.6	46.242102	-124.600924	725	to the port side of the large rock ridge there is a large patch of anoxic sediment with a lot of small gastropods and a large slab of hydrate coming from the face of the rock wall, bubbles are also visible
8/3/2021	18	38	21.5	46.242101	-124.600917	725	slight shimmering, possibly from disturbing the hydrate
8/3/2021	18	40	29.7	46.242104	-124.600950	724	going to grab substrate from this area near the hydrate about 20 meters away from waypoint 13
8/3/2021	18	40	55.2	46.242103	-124.600950	724	Hydrate, gastropods, bubbles. Z=725m
8/3/2021	18	43	35.1	46.242128	-124.600949	724	when going to grab a rock sample, there is more hydrate under the ledge
8/3/2021	18	44	2.5	46.242125	-124.600949	724	More hydrate under this ledge. It is all around on this small ridge.
8/3/2021	18	44	51.0	46.242119	-124.600943	724	when attempting to grab rock, only hydrate was coming off and crumbling
8/3/2021	18	46	11.3	46.242125	-124.600943	725	possibly found a large mound of hydrate, when we tried to sample a rock from the ledge, it was all hydrate
8/3/2021	18	46	15.0	46.242126	-124.600943	725	This whole small ridge is just a hydrate mound. Bubbles here as well.
8/3/2021	18	48	5.9	46.242114	-124.600917	724	continuing to waypoint 13
8/3/2021	18	50	4.1	46.242113	-124.600817	722	returning to rocky outcrop with mushroom corals, and a large thornyhead
8/3/2021	18	51	24.9	46.242107	-124.600809	722	possible patch of bacterial mat on top of carbonate rock with many holes
8/3/2021	18	51	41.4	46.242110	-124.600809	722	sablefish disturbed the sediment
8/3/2021	18	51	58.1	46.242113	-124.600796	721	watch change
8/3/2021	18	53	7.4	46.242125	-124.600769	720	moving on to waypoint 13, ~4m away
8/3/2021	19	3	47.4	46.242074	-124.600703	723	Just did watch change, planning to explore WP13, NP12, and WP14. Then will return to first hydrate site to do photomosaic/mapping/adjust marker. After that planning to go back to bubbles 3 marker near WP3
8/3/2021	19	4	5.8	46.242068	-124.600704	723	now moving toward NP12, marker from second survey night
8/3/2021	19	6	12.3	46.242146	-124.600678	717	over large mound, looks like carbonate but possibly was hydrate, small school of sablefish hovering around it
8/3/2021	19	7	5.1	46.242170	-124.600685	718	no, this is carbonate probably, not looking previous hydrate mound
8/3/2021	19	7	47.0	46.242172	-124.600707	715	visibility is currently very bad at NP12 due to sablefish stirring up sediment
8/3/2021	19	8	16.4	46.242176	-124.600708	714	current depth is 714 m, oxygen is 0.7%/2.74 uM
8/3/2021	19	8	30.9	46.242177	-124.600703	714	heading NE toward WP14
8/3/2021	19	10	39.4	46.242234	-124.600639	712	looking at large carbonate mound surrounded by many sablefish with a few anemones and a dover sole on it
8/3/2021	19	11	1.5	46.242238	-124.600649	712	not anemones, actually likely heteropolypus
8/3/2021	19	15	22.9	46.242247	-124.600638	711	planning and putting in ship move for ~70 m of descent
8/3/2021	19	17	35.2	46.242295	-124.600666	711	viz stirred up again
8/3/2021	19	18	28.1	46.242318	-124.600590	710	zooms on filamentous mat on carbonate
8/3/2021	19	19	38.5	46.242357	-124.600634	709	planning to pick up yellow and white filamentous covered carbonate, white is mat, not sure what yellow is
8/3/2021	19	21	19.7	46.242375	-124.600650	707	zooms on cool crack with mat, gastropods (small white), sole and sablefish

date	hr	min	sec	latitude	longitude	Z(m)	H1867 Astoria Canyon N Rim Descriptions
8/3/2021	19	28	18.5	46.242369	-124.600641	703	Seeing very interesting white orange and yellow mat on carbonate wall, poking now
8/3/2021	19	29	41.1	46.242361	-124.600639	706	leaving carbonate wall now to look for scoop which fell off porch
8/3/2021	19	30	58.8	46.242352	-124.600639	709	recovered scoop
8/3/2021	19	31	35.4	46.242365	-124.600616	706	seeing bubbles now
8/3/2021	19	35	29.7	46.242363	-124.600648	701	Lost connection to still cam. Got it back. Have to put in exposure settings back in before we can take pictures of the yellow and white mats.
8/3/2021	19	35	46.3	46.242363	-124.600643	701	more zooms on cool wall, may have some hydrate here
8/3/2021	19	35	54.7	46.242356	-124.600640	701	definitely hydrate
8/3/2021	19	36	59.4	46.242360	-124.600623	701	Some hydrate layers mixed into the rock exposures. Yellow and white mats seems to frame it.
8/3/2021	19	38	33.6	46.242364	-124.600629	700	currently at depth of 700 along the wall
8/3/2021	19	38	59.1	46.242364	-124.600628	698	moving higher up again still a lot of mat and hydrate
8/3/2021	19	40	31.4	46.242362	-124.600673	694	now seeing huge school of sablefish again
8/3/2021	19	41	33.2	46.242374	-124.600643	693	looking under ledge and zooming on encrusting fauna
8/3/2021	19	44	18.2	46.242377	-124.600652	693	zooms on brittle stars, squat lobster, translucent bivalves, cup corals, anemones
8/3/2021	19	44	58.1	46.242377	-124.600646	693	translucent organisms may be glass scallops
8/3/2021	19	47	18.8	46.242377	-124.600651	693	translucent bivalves probably delectopecten
8/3/2021	19	47	49.4	46.242376	-124.600651	693	getting ready to slurp some of the fauna just mentioned
8/3/2021	19	56	41.8	46.242373	-124.600640	691	looks we got a few cup coral and delectopecten-like organisms
8/3/2021	20	4	45.7	46.242393	-124.600583	679	Have been moving up along wall. Now seems like we are along the top of this, lots of huge heterochone sponges here
8/3/2021	20	6	49.3	46.242383	-124.600487	679	very cool sponge imagery just now of huge heterochones
8/3/2021	20	8	22.8	46.242366	-124.600410	697	now just about at WP14, 22 m over seafloor around 696 m
8/3/2021	20	8	53.0	46.242361	-124.600405	700	just stopped seeing huge heterchones but saw them all along the wall for a while
8/3/2021	20	9	12.4	46.242357	-124.600382	703	now seeing the same encrusting fauna as previously sampled on carbonate apparently covered in dense white mat patches or maybe hydrate
8/3/2021	20	11	16.2	46.242334	-124.600540	713	just saw some shell hash
8/3/2021	20	11	52.1	46.242278	-124.600556	716	on seafloor now, with large carbonate boulders and slabs with heteropolyupus on them, looking for typical seep fauna
8/3/2021	20	12	4.7	46.242278	-124.600556	717	also still seeing many sable fish and some thornyheads
8/3/2021	20	12	15.2	46.242272	-124.600557	717	Still seeing shell hash. visibility not great because of fish
8/3/2021	20	13	26.6	46.242172	-124.600594	721	Still over carbonate ledges, now seeing those pink sea stars typical of Astoria canyon again.
8/3/2021	20	13	53.9	46.242177	-124.600581	723	as we followed wall down we ended up having to move S, currently about 20 m to the SE of WP14
8/3/2021	20	14	1.4	46.242181	-124.600554	723	going to survey seafloor here a little bit
8/3/2021	20	15	11.5	46.242242	-124.600382	725	moving northward again along seafloor, but can't see much with fish stirring up viz
8/3/2021	20	16	7.7	46.242232	-124.600392	725	planning to head over to bubbles 3 WP now, knowing that we have to transit over and around pinnacle feature and this will take a while

date	hr	min	sec	latitude	longitude	Z(m)	H1867 Astoria Canyon N Rim Descriptions
8/3/2021	20	16	35.8	46.242231	-124.600392	723	for a second lost all viz
8/3/2021	20	16	40.9	46.242232	-124.600393	723	slowly getting it back
8/3/2021	20	16	52.7	46.242254	-124.600393	721	we are rising straight up to get viz back
8/3/2021	20	17	15.2	46.242254	-124.600398	721	some mud on our porch, buried it a bit during the low viz
8/3/2021	20	20	3.4	46.242293	-124.600351	721	still trying to get out of zero viz. we are 3 m above seafloor at 721 m depth
8/3/2021	20	20	27.0	46.242294	-124.600349	718	heading NE and rising to move upward along contour
8/3/2021	20	22	39.6	46.242348	-124.600529	703	can see again now, 28 m over seafloor at 701 m near WP14 in x space
8/3/2021	20	23	12.0	46.242313	-124.600555	701	heading W over pinnacle feature now, transiting toward WP3
8/3/2021	20	23	24.7	46.242305	-124.600588	701	still some sablefish following us
8/3/2021	20	24	24.1	46.242283	-124.600848	705	moving ship 50 m W at 0.3 kt
8/3/2021	20	25	51.3	46.242249	-124.600831	705	still up in water column, trying to clean off porch and secure scoop as transiting
8/3/2021	20	27	54.1	46.242275	-124.601029	712	still cleaning while transiting
8/3/2021	20	30	51.2	46.241960	-124.601164	718	stepping another 50 m to the west
8/3/2021	20	31	30.0	46.242033	-124.601375	723	we started around 750 m away from WP2/WP3 area when we left the pinnacle area
8/3/2021	20	33	16.2	46.242185	-124.601466	736	pulling norbit laptop up on front row screens so we can use it to help ROV navigate in low viz.
8/3/2021	20	33	40.3	46.242189	-124.601442	737	heading down to seabed now, porch is clean
8/3/2021	20	35	48.8	46.242242	-124.601680	741	by pinnacle earlier, meant more of ridge. true pinnacle will come up later on during transit, there is a ~60 m wide feature that rises up dramatically from the seafloor
8/3/2021	20	36	15.0	46.242355	-124.601808	742	moving ROV's and ship at heading 281
8/3/2021	20	36	53.7	46.242378	-124.601860	757	moving another 50 m at 280
8/3/2021	20	37	7.2	46.242378	-124.601860	764	blowing up more dirt from under herc as we descend
8/3/2021	20	38	8.6	46.242429	-124.602068	776	just getting to seafloor now, no viz on bottom because of sablefish
8/3/2021	20	39	15.7	46.242376	-124.602293	776	considering just transiting quickly in blue water for now while bottom viz is bad to try and get to target faster for sampling
8/3/2021	20	39	36.6	46.242374	-124.602313	778	doing 1 large step 150 m heading 289 at 0.7 knots
8/3/2021	20	41	14.7	46.242469	-124.602464	780	sort of on bottom right now seeing sablefish stir up sediment over flat bottom with abundant pink sea stars
8/3/2021	20	42	40.7	46.242525	-124.602587	782	noting that contours of pinnacle don't seem to match bathy colors underlying, maybe not all bathy data is fully loaded in our current hypack map
8/3/2021	20	43	15.3	46.242585	-124.602587	782	Still heading downslope toward center of shallow large depression where we will complete our 150 m ship move. Still little to no seafloor viz and sablefish stirring
8/3/2021	20	47	9.8	46.242670	-124.603526	783	Still over background sediment with sea stars. Area we are in now is flatter. occasional thornyhead, gray sea cucumber, sablefish, sole, hagfish
8/3/2021	20	48	13.4	46.242691	-124.603606	783	putting in a ship move 150 bearing 280
8/3/2021	20	49	6.2	46.242812	-124.603803	783	large crab
8/3/2021	20	51	9.8	46.242929	-124.604564	781	plumose anemone somehow growing on something, also maybe small kelp fall
8/3/2021	20	53	40.6	46.243008	-124.605294	781	depth here is 781 m, oxygen still near 0

date	hr	min	sec	latitude	longitude	Z(m)	H1867 Astoria Canyon N Rim Descriptions
8/3/2021	20	56	20.4	46.243100	-124.606036	780	putting in move 100 at 280, also beginning to pass over pinnacle and does not appear to be real, must be artifact from bathy somehow
8/3/2021	20	58	17.1	46.243177	-124.606581	778	still over flat bottom with same fauna
8/3/2021	20	58	41.9	46.243213	-124.606631	778	starting to see large seep habitat area
8/3/2021	20	59	31.6	46.243225	-124.606632	776	planning to core here
8/3/2021	20	59	54.5	46.243229	-124.606626	776	this is one of the larger mat patches we've seen, many meters long and wide
8/3/2021	21	6	11.0	46.243230	-124.606656	778	still getting situated for core
8/3/2021	21	8	55.6	46.243236	-124.606657	779	second attempt at first core
8/3/2021	21	12	21.6	46.243234	-124.606656	779	trying to do core a third time
8/3/2021	21	16	8.7	46.243229	-124.606658	777	failed core again, readjusting to dense white patch a couple meters ahead if possible
8/3/2021	21	18	7.4	46.243234	-124.606736	778	Abandoning this coring attempt because visibility is too bad. seems current may have switched out direction and blown out cores we shook out
8/3/2021	21	19	11.5	46.243234	-124.606724	778	actually going to try one more time
8/3/2021	21	27	27.5	46.243279	-124.606765	766	abandoning second core
8/3/2021	21	28	22.5	46.243356	-124.606777	772	moving ship 260 at bearing 292, trying to get to bubbles 3 as quickly as we can (0.7 kt) now to make up for coring time
8/3/2021	21	32	0.7	46.243437	-124.607369	773	Back over flat sediment with abundant sea stars. still seeing many sablefish and the occasional thornyhead
8/3/2021	21	32	9.5	46.243437	-124.607369	773	doing 1 knot now on DP still
8/3/2021	21	36	36.4	46.243796	-124.608391	774	Still transiting, still same sediment and fauna
8/3/2021	21	38	34.0	46.243958	-124.608966	775	ship move done, waiting for argus and herc to catch up
8/3/2021	21	41	51.1	46.244077	-124.609805	774	stepping ship 20 m N, we are approaching bubbles 3 now
8/3/2021	21	42	23.3	46.244079	-124.609856	774	seeing seep habitat come into view now
8/3/2021	21	42	41.7	46.244078	-124.609883	774	going to look for clams and good mat patch
8/3/2021	21	44	27.9	46.244100	-124.609944	774	moving a little further N
8/3/2021	21	44	41.9	46.244101	-124.609944	774	currently sitting over bubbles3 but not seeing any bubbles
8/3/2021	21	54	47.4	46.244149	-124.609917	775	retrying second core in this patch
8/3/2021	22	8	6.4	46.244152	-124.609920	775	think we got some gastropods just now, maybe some white mat too
8/3/2021	22	14	34.4	46.244086	-124.609976	774	moving 25 m away and cleaning off vehicle, will then try to take background core
8/3/2021	22	16	14.0	46.244157	-124.609980	773	current seems to be blowing to the N
8/3/2021	22	27	44.8	46.244131	-124.609901	775	a few bubbles upon landing
8/3/2021	22	28	28.8	46.244142	-124.609907	775	zooms on clams
8/3/2021	22	28	54.9	46.244148	-124.609908	775	clams appear to be skirting the edge of the bacterial mat
8/3/2021	22	36	31.6	46.244123	-124.609904	775	Heading to WP1 now, putting in ship move 150 bearing 297 at 1 knot
8/3/2021	22	42	6.6	46.244430	-124.610505	774	During transit to WP1, passing over typical background sediment. Flat sediment with small light dots, abundant sea stars, and some sablefish
8/3/2021	22	45	49.8	46.244772	-124.611539	780	coming up on WP1 now, going to look for bubbles for fun
8/3/2021	22	46	22.2	46.244795	-124.611565	780	going to go look at bubbles 1 marker and see if there are still bubbles there
8/3/2021	22	47	48.6	46.244855	-124.611697	781	seeing seep area and some white mat now
8/3/2021	22	50	6.2	46.244767	-124.611734	782	seeing seep area with large depression, as noted yesterday

date	hr	min	sec	latitude	longitude	Z(m)	H1867 Astoria Canyon N Rim Descriptions
8/3/2021	22	50	16.1	46.244763	-124.611738	782	going to follow this depression and look for bubbles
8/3/2021	22	51	31.5	46.244777	-124.611723	781	seeing bubbles now, not as strong as previously seen
8/3/2021	22	59	17.0	46.244787	-124.611725	782	Beginning the mapping process by bringing the vehicle up to 25 m
8/3/2021	23	1	56.1	46.244721	-124.611349	757	Next hour will be spent mapping this region with the Norbit sonar located in a down facing manner of the Herc
8/3/2021	23	3	3.2	46.244823	-124.611299	753	Ascending to 30 m to accommodate a larger area of survey
8/3/2021	23	4	16.8	46.244756	-124.611393	751	DVL reset
8/3/2021	23	12	55.0	46.244903	-124.611731	753	Heading at bearing 120 for the survey line which should cover all seeps discovered at this site
8/3/2021	23	13	7.6	46.244904	-124.611731	754	Still camera stopped
8/3/2021	23	17	31.1	46.244896	-124.611681	753	Currently having issues with Auto XY on Herc; cycling to DVL to hopefully resolve the issue
8/3/2021	23	18	53.6	46.244854	-124.611581	752	Herc doesn't like taking step, in the process of troubleshooting
8/3/2021	23	20	18.0	46.244779	-124.611407	752	Reduced step to 300 m at that seemed to resolve the issue
8/3/2021	23	21	19.6	46.244757	-124.611421	751	Returning back to original start point (near WP1) to begin the survey again
8/3/2021	23	26	5.9	46.244867	-124.611662	753	DVL reset
8/3/2021	23	27	49.2	46.244911	-124.611801	754	Beginning the survey again NW of WP1 at bearing 120
8/3/2021	23	30	56.3	46.244854	-124.611661	753	Step forward function on Herc not functioning properly
8/3/2021	23	35	15.3	46.244643	-124.610933	749	Drifting slightly to the left so completing a starboard shift to compensate
8/3/2021	23	42	13.5	46.244097	-124.609802	746	Currently passing over WP3 on our survey
8/3/2021	23	57	3.5	46.242974	-124.607162	747	Herc is now passing NE of WP4 as we continue our survey using the Norbit sonar
8/4/2021	0	4	49.5	46.242462	-124.605854	752	maybe seeing bubbles 6 or 7 from the other day in water column
8/4/2021	0	5	27.1	46.242409	-124.605705	752	another seep in water column now, still near bubbles 6 and 7
8/4/2021	0	7	29.0	46.242282	-124.605236	753	swath width currently is 160 m
8/4/2021	0	9	18.3	46.242212	-124.605020	754	noting that flying slightly north of sites to get better backscatter angle
8/4/2021	0	9	56.2	46.242151	-124.604815	753	using 150 degrees on norbit currently
8/4/2021	0	11	42.7	46.242059	-124.604538	753	started drifting slightly left, lateraling right again slightly
8/4/2021	0	13	34.3	46.241901	-124.604241	753	seeps off to the right now again, near bubbles 8
8/4/2021	0	21	44.2	46.241300	-124.602905	748	Drifting to the left; moving laterally to starboard to correct
8/4/2021	0	26	45.1	46.240641	-124.602194	729	Survey passing NE of Marker 209
8/4/2021	0	30	19.7	46.240425	-124.601789	740	Lots of marine snow in the water column
8/4/2021	0	31	34.8	46.240249	-124.601642	744	Finish Norbit sonar survey and are now heading back to Marker 209 to complete final dive objectives
8/4/2021	0	35	9.4	46.240408	-124.601705	771	Descending back to the seafloor
8/4/2021	0	36	11.5	46.240473	-124.601887	769	Argus and Herc pilots are switching for training purposes
8/4/2021	0	37	32.1	46.240489	-124.602040	765	Sea pen and sea stars on the seafloor
8/4/2021	0	40	28.5	46.240746	-124.602555	757	Currently 12 m NW of Marker 209
8/4/2021	0	46	58.8	46.240612	-124.602471	757	Repositioning Marker 209 to previous location as it was accidently moved away from the sampling site today
8/4/2021	0	47	15.0	46.240614	-124.602480	757	Strong current

date	hr	min	sec	latitude	longitude	Z(m)	H1867 Astoria Canyon N Rim Descriptions
8/4/2021	0	51	49.6	46.240641	-124.602476	757	Successfully moved Marker 209 back near hydrate
8/4/2021	0	53	30.5	46.240607	-124.602491	758	Next goal is to take a 3D photo of the hydrate site
8/4/2021	0	55	48.2	46.240611	-124.602417	756	Going to pass over hydrate sampling site at 2-3 m with Norbit in order to get scale
8/4/2021	0	59	2.2	46.240634	-124.602460	757	Starting 3D photomosaic process
8/4/2021	0	59	37.8	46.240634	-124.602458	757	Playing around with the lighting
8/4/2021	1	2	32.1	46.240677	-124.602466	757	Backing up slightly to counter-act the current
8/4/2021	1	5	19.8	46.240610	-124.602478	758	Finishing 3D photo capture; planning to pass hydrate site on the starboard side in order to get more detail via the Norbit sonar
8/4/2021	1	8	51.6	46.240622	-124.602414	757	Mapping NE from current location with plans to cover WP13 and WP14
8/4/2021	1	12	52.1	46.240880	-124.602112	737	Currently mapping 20 m above the seafloor
8/4/2021	1	16	11.9	46.241084	-124.601895	732	Ascending to 25 m for better mapping coverage
8/4/2021	1	21	2.2	46.241161	-124.601754	732	Waiting for vessel move before continuing survey
8/4/2021	1	24	41.0	46.241057	-124.601667	731	Ascended to 30 m and backed up on survey line to cover gap
8/4/2021	1	29	20.4	46.241096	-124.601662	731	Moving NE to survey WP13 and WP14; looking to stay on the east side of the ridge
8/4/2021	1	34	40.2	46.241585	-124.601167	720	Vessel and Herc all stop; repositioning the vessel so that Argus is tugging less on Herc
8/4/2021	1	41	54.2	46.241654	-124.601142	718	Continuing NE at a 34 heading
8/4/2021	1	48	56.4	46.242108	-124.600638	701	E side of the slope is decreasing so we are repositioning above the slope
8/4/2021	1	51	25.7	46.242238	-124.600592	697	Recently passed by WP13 but heading towards WP14
8/4/2021	1	52	54.0	46.242174	-124.600598	699	Heading parallel with the wall in order to capture the final seep near WP14
8/4/2021	1	53	57.0	46.242145	-124.600553	701	Correction heading to NP12
8/4/2021	1	56	9.0	46.242197	-124.600743	693	Staying in current orientation and beginning the recovery process
8/4/2021	2	6	13.9	46.241905	-124.600380	589	Ascending at 11 m/min with an estimate time to surface of 52 min
8/4/2021	2	12	10.1	46.241747	-124.600553	517	Ascending at 14 m/min with an estimate time to surface of 36 min
8/4/2021	2	34	26.6	46.242243	-124.600722	201	Ascending at 17 m/min
8/4/2021	2	43	39.2	46.242988	-124.600783	54	All stop 50 m
8/4/2021	2	43	52.5	46.242993	-124.600782	52	Recovery a go
8/4/2021	2	48	17.9	46.244081	-124.601046	8	Argus on deck
8/4/2021	2	49	20.7	46.244128	-124.601061	8	Current relatively strong at the surface

Table 22: H1868 Ridge SW of Grays Canyon (2nd dive) Dive Log

date	hr	min	sec	latitude	longitude	Z(m)	H1868 Ridge SW of Grays Canyon Descriptions
8/4/2021	11	2	42.0	46.789333	-125.492801	35	Descending now
8/4/2021	11	3	22.6	46.789339	-125.492865	46	Jellyfish in the water column at 45 m
8/4/2021	11	4	23.0	46.789358	-125.492886	59	Estimated time to bottom (~1700 m) is about one hour
8/4/2021	11	18	29.1	46.789545	-125.493173	448	Vertical velocity is ~28 m/min
8/4/2021	11	37	10.6	46.789264	-125.492906	980	Marine snow and ctenophores in the water column

date	hr	min	sec	latitude	longitude	Z(m)	H1868 Ridge SW of Grays Canyon Descriptions
8/4/2021	12	0	49.2	46.789491	-125.492407	1579	Rearranging the vehicle orientation so Argus is above Herc for the duration of the dive
8/4/2021	12	8	22.1	46.789625	-125.492529	1592	Heading SW to Marker 256 where bubble stream was previously observed
8/4/2021	12	13	23.3	46.789457	-125.492812	1597	Came to Marker 256, however, bubble stream is apparent so we are turning on Norbit sonar
8/4/2021	12	16	2.0	46.789419	-125.492853	1600	Strong bubble stream found near the marker; plan to take a Gastight from this site
8/4/2021	12	30	1.0	46.789416	-125.492887	1602	GT taken successfully
8/4/2021	12	32	22.4	46.789429	-125.492880	1602	Heading S to NP2
8/4/2021	12	34	9.8	46.789501	-125.493009	1597	Passing through large canyon-like environment with massive outcrops and boulders
8/4/2021	12	40	0.6	46.789420	-125.493096	1598	Working to reposition Herc and Argus before traversing towards NP2
8/4/2021	12	41	9.0	46.789391	-125.493139	1597	Massive slabs of carbonate forming cliff-like topography
8/4/2021	12	44	18.5	46.789141	-125.492984	1593	Field of tubeworms visible
8/4/2021	12	45	59.3	46.789085	-125.493135	1597	Found bubble stream located at WP2
8/4/2021	12	48	21.7	46.788844	-125.493180	1596	Gregarious feather duster worms visible on the carbonate boulders
8/4/2021	12	49	15.5	46.788854	-125.493221	1596	Carbonate slabs with bushes of tube worms dispersed throughout
8/4/2021	12	49	33.7	46.788826	-125.493225	1596	DVL reset
8/4/2021	12	50	6.0	46.788816	-125.493184	1596	Gauge check
8/4/2021	12	51	2.3	46.788692	-125.493255	1597	*DVL reset* = meant to say switched to DVL
8/4/2021	12	51	14.7	46.788671	-125.493268	1597	Large decapods on the seafloor
8/4/2021	12	52	35.7	46.788697	-125.493233	1597	Rathbunaster
8/4/2021	12	53	9.2	46.788592	-125.493139	1597	Anemone located within the tube worm bush
8/4/2021	12	54	26.2	46.788478	-125.493030	1595	Carbonate cobbles and slabs located at the top of this canyon; large crabs and tube worm bushes also plentiful
8/4/2021	12	54	41.5	46.788463	-125.493029	1595	Large patch of shell hash
8/4/2021	12	56	10.1	46.788420	-125.493025	1595	~50 cm crab missing left claw; located near shell hash and tube worm bush
8/4/2021	13	0	13.0	46.788124	-125.493171	1602	Grenadier
8/4/2021	13	1	56.5	46.788105	-125.493173	1599	Have left canyon-like environment and are now traveling over a flat sedimented seafloor towards NP2
8/4/2021	13	2	27.7	46.788125	-125.493149	1598	Sea star
8/4/2021	13	5	37.9	46.787979	-125.493281	1602	Heading to NP3; 200 m to the NW
8/4/2021	13	9	57.8	46.788012	-125.493443	1605	Passing over more tube worms and shell hash
8/4/2021	13	11	16.1	46.788070	-125.493387	1598	Neogastropod egg towers are several tube worm clusters
8/4/2021	13	11	57.7	46.788070	-125.493406	1599	Heading towards NP3 about ~9 m above the seafloor
8/4/2021	13	18	56.4	46.788311	-125.493740	1598	No bubble streams were encountered at NP2; therefore, we decided to continue exploration NW to NP3
8/4/2021	13	30	54.8	46.789079	-125.494461	1607	Still heading towards NP3 at about ~15 m above the seafloor
8/4/2021	13	41	7.7	46.789458	-125.494935	1641	Currently descending over NP3

date	hr	min	sec	latitude	longitude	Z(m)	H1868 Ridge SW of Grays Canyon Descriptions
8/4/2021	13	42	17.0	46.789445	-125.494973	1651	Descending on a sedimented sea bottom
8/4/2021	13	42	26.9	46.789446	-125.494972	1651	Heading due north to NP3
8/4/2021	13	44	36.7	46.789429	-125.495049	1652	Intermittent shell hash
8/4/2021	13	45	10.7	46.789496	-125.495101	1652	Large fish in the water column
8/4/2021	13	50	10.4	46.789590	-125.495282	1655	Large Grenadier
8/4/2021	13	52	59.8	46.789702	-125.495013	1653	Shell hash, anemones, and crabs on the seafloor
8/4/2021	13	55	7.0	46.789807	-125.495073	1651	Beginning to climb as we explore NE
8/4/2021	13	58	38.6	46.789733	-125.494891	1652	Potentially a Giant Grenadier
8/4/2021	13	59	46.7	46.789799	-125.494776	1652	More crabs
8/4/2021	14	0	12.5	46.789795	-125.494792	1652	Likely a pacific grenadier
8/4/2021	14	1	40.8	46.789818	-125.494785	1651	Sabellidae on a carbonate boulder
8/4/2021	14	2	40.2	46.789899	-125.494731	1648	Large sediment cloud likely due to an rock falling downslope
8/4/2021	14	5	25.0	46.789915	-125.494512	1643	Flytrap anemone and little carbonate exposures
8/4/2021	14	6	53.1	46.789918	-125.494453	1639	Carbonate outcrops with more sabellidae
8/4/2021	14	8	43.1	46.790073	-125.494406	1629	Beginning to ascend up a slope covered in carbonate slabs
8/4/2021	14	9	0.4	46.790094	-125.494408	1628	Another grenadier
8/4/2021	14	9	36.3	46.790160	-125.494353	1624	A big red jelly
8/4/2021	14	12	8.9	46.790354	-125.494117	1614	Shell hash, crabs, sea stars, and carbonate slabs
8/4/2021	14	12	35.1	46.790364	-125.493994	1612	Small patch of bacterial mat
8/4/2021	14	13	13.2	46.790285	-125.494006	1612	Lots of crabs and whelk egg towers
8/4/2021	14	13	41.8	46.790285	-125.493913	1612	Another Grenadier
8/4/2021	14	14	55.3	46.790220	-125.493813	1616	Bacterial mat with a bit of shell hash
8/4/2021	14	15	24.1	46.790246	-125.493833	1616	Archarax shells
8/4/2021	14	21	5.5	46.790451	-125.493564	1603	Carbonate cobbles with interspersed crabs and flytrap anemones
8/4/2021	14	26	10.3	46.790628	-125.493085	1594	Heading NE where previous pictures were taken with the end goal of reaching WP4
8/4/2021	14	27	16.7	46.790650	-125.493036	1597	Carbonate cobbles
8/4/2021	14	30	57.0	46.790762	-125.492879	1588	Large carbonate boulders
8/4/2021	14	33	5.7	46.790754	-125.492807	1587	Reached an area with large carbonate slabs and boulders covered in a thin layer of sedimentation
8/4/2021	14	33	18.3	46.790751	-125.492751	1588	More tube worm bushes and whelk egg towers present
8/4/2021	14	34	35.1	46.790733	-125.492718	1587	Massive buildup of carbonate likely due to tens of thousands of years of methane seepage
8/4/2021	14	35	3.3	46.790731	-125.492682	1586	More tube worm bushes between the carbonate boulders
8/4/2021	14	36	1.3	46.790744	-125.492711	1585	Medium patch of shell hash
8/4/2021	14	37	9.1	46.790800	-125.492647	1582	Octopus located on starboard
8/4/2021	14	39	5.1	46.790776	-125.492563	1581	Bacterial mat covering the carbonate rocks
8/4/2021	14	40	22.4	46.790912	-125.492548	1578	High abundance of tube worms
8/4/2021	14	40	52.9	46.790951	-125.492560	1577	Large fracture filled with tube worms and crabs
8/4/2021	14	42	14.0	46.791049	-125.492536	1574	Zooming into clams to determine if they are alive
8/4/2021	14	43	2.6	46.790970	-125.492624	1576	Live clams surrounded by tube worms and sabellids
8/4/2021	14	45	46.9	46.791043	-125.492593	1576	Attempting to reach down into the crevice with the slurp gun to collect clams
8/4/2021	14	53	8.9	46.791092	-125.492537	1572	Large clusters of tube worms
8/4/2021	14	54	52.2	46.791234	-125.492346	1567	Traversed over a patch of flat sediment, but now approaching carbonate slabs

date	hr	min	sec	latitude	longitude	Z(m)	H1868 Ridge SW of Grays Canyon Descriptions
8/4/2021	14	57	18.9	46.791294	-125.492287	1564	bundles of tube worms and a tanner crab within the crevice of a rocky feature
8/4/2021	14	58	9.0	46.791326	-125.492284	1562	approaching a large patch of tube worms, crabs and anemones in between rocky carbonate
8/4/2021	14	58	17.0	46.791391	-125.492311	1562	grenadier
8/4/2021	14	58	34.5	46.791402	-125.492292	1561	bathypathes black coral
8/4/2021	15	3	32.7	46.791410	-125.492221	1557	traveling over soft sediment bottom with some shell hash patches
8/4/2021	15	5	5.6	46.791435	-125.492225	1558	heading to waypoint 4
8/4/2021	15	7	16.4	46.791458	-125.492205	1557	carbonate crumble in soft sediment, visible snail trails in the sediment, some holes
8/4/2021	15	9	10.5	46.791468	-125.492166	1555	little to no fauna here
8/4/2021	15	11	53.6	46.791647	-125.492004	1548	beginning to see more patches of white/grey mat, tanner crab, fine scale mora
8/4/2021	15	17	17.3	46.791909	-125.491809	1539	carbonate rubble patch with ophiuroids, and a gastropod
8/4/2021	15	18	26.0	46.792037	-125.491753	1536	tube dwelling ceranthids (anemones) scattered in the soft sediment
8/4/2021	15	18	47.7	46.792038	-125.491754	1536	another tanner crab
8/4/2021	15	21	0.8	46.792078	-125.491780	1535	moving on to an old pic, TN265
8/4/2021	15	22	17.2	46.792075	-125.491776	1536	small mound of bacterial mat
8/4/2021	15	24	33.7	46.792188	-125.491855	1534	beginning to approach shallow ridge feature with shell hash and tube worms, anemones, tanner crabs, large neptunia
8/4/2021	15	25	52.4	46.792391	-125.491696	1527	large white sea star
8/4/2021	15	28	27.1	46.792621	-125.491986	1526	bathypathes black coral
8/4/2021	15	29	31.8	46.792699	-125.492061	1525	blob sculpin
8/4/2021	15	31	48.1	46.792791	-125.492116	1525	small bundle of tube worms
8/4/2021	15	32	42.1	46.792905	-125.492154	1523	continuing to move over soft sediment with tanner crabs and tube dwelling cerianthids
8/4/2021	15	33	5.8	46.792965	-125.492269	1524	shell hash in the sea floor with some sea pens
8/4/2021	15	33	52.7	46.793016	-125.492240	1523	patch of rocky debris, and slabs of carbonates with tube worms anemones, tanner crabs, shell hash
8/4/2021	15	35	6.4	46.793040	-125.492226	1522	when there are rocky crumble and carbonate slabs, tube worms are more present
8/4/2021	15	36	18.0	46.793280	-125.492410	1521	tanner crab and grenadier fish
8/4/2021	15	38	3.1	46.793402	-125.492448	1520	another black coral, different species
8/4/2021	15	38	15.2	46.793402	-125.492422	1519	close up of a fine scale mora
8/4/2021	15	38	52.5	46.793490	-125.492421	1520	over a large patch of carbonate crumble with shell hash, tube worms, anemones, another blob sculpin
8/4/2021	15	43	13.1	46.793718	-125.492799	1525	No changes in habitat. overall we are traveling over soft sediment with some shell hash, and patches of rocky carbonate crumble that host anemones, tube worms, occasional blob sculpin,
8/4/2021	15	43	21.8	46.793721	-125.492799	1525	zoom on octopus
8/4/2021	15	44	46.8	46.793815	-125.492871	1525	skate
8/4/2021	15	44	60.0	46.793824	-125.492879	1525	grenadier
8/4/2021	15	45	38.3	46.793833	-125.492923	1526	another black coral, possibly lillipathes
8/4/2021	15	47	0.3	46.794057	-125.493264	1536	cluster of sea pens
8/4/2021	15	48	6.3	46.794206	-125.493412	1538	a lot of small white patches on the seafloor here
8/4/2021	15	49	24.4	46.794303	-125.493456	1540	poralia jelly

date	hr	min	sec	latitude	longitude	Z(m)	H1868 Ridge SW of Grays Canyon Descriptions
8/4/2021	15	49	48.1	46.794295	-125.493490	1540	at waypoint 4
8/4/2021	15	50	52.1	46.794295	-125.493504	1542	Waypoint 4 appears to be a soft sediment bottom sea floor with very little fauna. there are tube dwelling cerianthids, a few shells, a tanner crab
8/4/2021	15	55	53.8	46.794251	-125.493594	1542	heading north west towards NP4
8/4/2021	15	59	15.5	46.794343	-125.493707	1545	continuing to explore, not observing changes in habitat
8/4/2021	16	0	25.3	46.794399	-125.493807	1548	sea pens, grenadier fish, flytrap anemones, some shell hash over soft sediment
8/4/2021	16	2	43.5	46.794500	-125.493938	1550	there is nothing visible near NP4 in the sonar
8/4/2021	16	4	1.3	46.794532	-125.493950	1551	we are going to head back to waypoint 3 to explore upslope and map using norbit on the way
8/4/2021	16	4	14.0	46.794533	-125.493953	1551	turning on norbit
8/4/2021	16	6	17.8	46.794518	-125.494071	1544	setting up to map our way to waypoint 3
8/4/2021	16	8	0.1	46.794497	-125.494066	1524	mapping ~30m above the seafloor
8/4/2021	16	11	58.2	46.794497	-125.493897	1521	Norbit mapping starts now
8/4/2021	16	13	23.5	46.794486	-125.493873	1521	total area mapped will be along ~850m
8/4/2021	16	22	40.8	46.793925	-125.493785	1517	Mapping transit will take ~an hour
8/4/2021	16	24	35.6	46.793687	-125.493753	1516	Solmissus sp. jelly
8/4/2021	16	34	14.4	46.792480	-125.493544	1526	marine snow in the water column while mapping the sea floor, occasional ctenophores and jellies
8/4/2021	16	42	57.1	46.791256	-125.493361	1552	norbit may be missing a few points
8/4/2021	16	51	32.2	46.790104	-125.493186	1595	in norbit map data we can see a collapsed slope
8/4/2021	17	1	9.3	46.788897	-125.492896	1565	stopping norbit mapping and heading back to the bubble streams to sample
8/4/2021	17	5	29.6	46.788451	-125.492852	1564	returning to the seafloor
8/4/2021	17	8	11.8	46.788454	-125.492841	1591	back to the seafloor, heading back to the bubble stream
8/4/2021	17	9	54.4	46.788581	-125.493034	1595	looking for bubble stream to take a GT sample
8/4/2021	17	10	10.4	46.788581	-125.493034	1595	seeing a lot of tube worms and shell hash, carbonate plates, shell hash
8/4/2021	17	11	32.1	46.788653	-125.493061	1594	octopus
8/4/2021	17	13	4.0	46.788816	-125.493121	1596	poralia jelly
8/4/2021	17	15	49.2	46.788947	-125.493176	1597	approaching boulders and carbonate slabs with bubbles of tubeworms
8/4/2021	17	18	19.4	46.789064	-125.493137	1599	found multiple streams
8/4/2021	17	20	1.4	46.789070	-125.493121	1599	going to capture bubbles from a stream about 0.2m off the seafloor
8/4/2021	17	26	24.0	46.789055	-125.493161	1599	Gas tight taken was 18-2
8/4/2021	17	35	39.6	46.789044	-125.493188	1561	preparing for recovery
8/4/2021	17	35	54.8	46.789046	-125.493179	1560	Could still see the bubbles beneath the ROV even at the 40 m Niskin sample.
8/4/2021	17	40	40.6	46.788371	-125.493088	1549	dropped one Alvin weight
8/4/2021	17	51	46.8	46.788727	-125.493016	1354	Solmissus sp. jelly
8/4/2021	18	12	54.1	46.790568	-125.493557	948	larvacean house
8/4/2021	18	18	53.5	46.791054	-125.494055	829	marine snow, larvaceans and jellies in the water column during rise to the surface