Carbonate rock macrofauna collected by HOV Alvin during R/V Atlantis cruise AT50-24 at Sanak Seep Alaska from May 30 to June 6, 2024

Website: https://www.bco-dmo.org/dataset/984553
Data Type: Cruise Results
Version: 1
Version Date: 2025-09-19

Project
» Collaborative Research: Redefining the footprint of deep ocean methane seepage for benthic ecosystems (Methanosphere)

Contributors	Affiliation	Role
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Abstract
Quantitative counts of macrofauna (identified to major taxa) inhabiting authigenic carbonates were conducted at Sanak Seep in the Aleutian Islands (53.74853°N, 162.5889°W) at 2020 meters depth. Rock samples were collected by the HOV Alvin submersible during the R/V Atlantis AT50-24 cruise (Chief Scientist Lisa Levin) at the methane seep site between May 30 and June 4, 2024. Samples were collected using HOV Alvin using the manipulator and were placed in isolated biobox compartments. Samples were preserved and the analyzed at the University of California-San Diego Scripps.

Table of Contents

Coverage

Location: Aleutian Margin depth 2020m
Spatial Extent: **N**:53.7486567 **E**:-162.5860334 **S**:53.7480993 **W**:-162.5896971
Temporal Extent: 2024-05-30 - 2024-06-04

Methods & Sampling

Samples were collected with HOV Alvin using the manipulator. Samples were placed into individual compartments in a biobox on the Alvin basket. Before preserving, samples were kept cold and animals were

handpicked to sample tissue for stable isotope analyses (see related datasets for isotopic data, Pereira et al. 2025). The remaining sample was sieved through 0.3 mm mesh, separating the sample in two fractions (a fine fraction with the meiofauna, and a coarser one with the macrofauna), both preserved in 95% Ethanol.

Data Processing Description

In the laboratory, rock samples were washed in distilled water through a 0.3 mm sieve and sorted under the microscope. Animals in rock samples were primarily identified to major taxa, counted, and preserved in 95% ethanol.

BCO-DMO Processing Description

- Opened "Alaska BCO Entry.xlsx" in Excel
- Identified the fields on the "Final" sheet with decimals that were not showing in the preview. Used the format of "#.##############################" for columns "Latitude", "Longitude", and "Surface_Area". Applied format of "yyyy-mm-dd" to "Date_Recovered"
- Exported file as "Alaska BCO Entry_final.csv"
- Imported "Alaska BCO Entry_final.csv" into the BCO-DMO system
- Replaced all spaces with underscores and removed periods and parenthesis from parameters
- Adjusted taxa names in parameter names to accepted versions, upon request from submitter
- Exported file as "984553_v1_carbonate_macrofauna_sanak_seep.csv"

Scientific names in the data were checked using World Register of Marine Species (WoRMS) Taxon Match. All scientific names in the data are valid and accepted names as of 2025-09-19. A report of these matches is attached as a supplemental file.

[table of contents | back to top]

Data Files

File	
984553_v1_carbonate_macrofauna_sanak_seep.csv	(Comma Separated Values (.csv), 6.03 KB) MD5:60ba1000f6c352b288334da0f0cf8dfd
Primary data file for dataset ID 984553, version 1	

[table of contents | back to top]

Supplemental Files

File	
taxonomy_carbonate_macrofauna_sanak_seep.csv	(Comma Separated Values (.csv), 3.14 KB) MD5:ab044ee11e1fad90e5a8d350537d503c
Column "ScientificName" list of taxa referenced in primary dataset column, listed along with "LSID", "AphiaID_accepted", "ScientificName_accepted" results given by the WoRMs taxa matching tool	

[table of contents | back to top]

Related Datasets

IsRelatedTo

Pereira, O. S., Levin, L. A., Bravo, M. E. E. (2025) **C and N stable isotope data for invertebrates**

collected by HOV Alvin during R/V Atlantis cruise AT50-24 at Sanak Seep Alaska from May 16 to June 5, 2024. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2025-09-23 doi:10.26008/1912/bco-dmo.984699.1 [view at BCO-DMO]
Relationship Description: Data collected from same sampling event.

[table of contents | back to top]

Parameters

Parameter	Description	Units
Alvin_Dive	Number of the Alvin dive from which the sample was collected	unitless
Date_Recovered	Date sample was collected	unitless
Site	Site name	unitless
Substrate_Type	Substrate of sample	unitless
Latitude	Latitude of sampling location, positive is North	decimal degrees
Longitude	Longitude of sampling location, negative is West	decimal degrees
Depth	Depth from which the sample was collected	meters
Sample_Number	Sample number	unitless
Surface_Area	Surface area	cm^2
Sample_ID	Alvin dive and sample number	unitless
Ampharetidae_sp_1	Number of individuals identified as Ampharetidae sp 1	unitless
Chrysopetalidae_sp_1	Number of individuals identified as Chrysopetalidae sp 1	unitless
Cirratulidae_sp_1	Number of individuals identified as Cirratulidae sp 1	unitless
Cirratulidae_sp_2	Number of individuals identified as Cirratulidae sp 2	unitless
Dorvilleidae_sp_1	Number of individuals identified as Dorvilleidae sp 1	unitless

Dorvilleidae_sp_2	Number of individuals identified as Dorvilleidae sp 2	unitless
Dorvilleidae_sp_3	Number of individuals identified as Dorvilleidae sp 3	unitless
Dorvilleidae_sp_4	Number of individuals identified as Dorvilleidae sp 4	unitless
Dorvilleidae_sp_5	Number of individuals identified as Dorvilleidae sp 5	unitless
Dorvilleidae_sp_6	Number of individuals identified as Dorvilleidae sp 6	unitless
Exogoninae_sp_1	Number of individuals identified as Exogoninae sp 1	unitless
Exogoninae_sp_2	Number of individuals identified as Exogoninae sp 2	unitless
Exogoninae_sp_3	Number of individuals identified as Exogoninae sp 3	unitless
Hesionidae_sp_1	Number of individuals identified as Hesionidae sp 1	unitless
Hesionidae_sp_2	Number of individuals identified as Hesionidae sp 2	unitless
Hesionidae_sp_3	Number of individuals identified as Hesionidae sp 3	unitless
Hesionidae_sp_4	Number of individuals identified as Hesionidae sp 4	unitless
Lacydoniidae_sp_1	Number of individuals identified as Lacydoniidae sp 1	unitless
Lacydoniidae_sp_2	Number of individuals identified as Lacydoniidae sp 2	unitless
Lumbrineridae_sp_1	Number of individuals identified as Lumbrineridae sp 1	unitless
Lumbrineridae_sp_2	Number of individuals identified as Lumbrineridae sp 2	unitless
Maldanidae_sp_1	Number of individuals identified as Maldanidae sp 1	unitless
Maldanidae_sp_2	Number of individuals identified as Maldanidae sp 2	unitless
Myzostomida_sp_1	Number of individuals identified as Myzostomida sp 1	unitless

Nereididae_sp_1	Number of individuals identified as Nereididae sp 1	unitless
Nereididae_sp_2	Number of individuals identified as Nereididae sp 2	unitless
Nereididae_sp_3_juv	Number of individuals identified as Nereididae sp 3 juv	unitless
Oenonidae_sp_1	Number of individuals identified as Oenonidae sp 1	unitless
Ophryotrocha_sp_1	Number of individuals identified as Ophryotrocha sp 1	unitless
Ophryotrocha_sp_2	Number of individuals identified as Ophryotrocha sp 2	unitless
Ophryotrocha_sp_3_uncertain	Number of individuals identified as Ophryotrocha sp 3 uncertain	unitless
Paraonidae_sp_1	Number of individuals identified as Paraonidae sp 1	unitless
Paraonidae_sp_2	Number of individuals identified as Paraonidae sp 2	unitless
Phyllodocidae_sp_1	Number of individuals identified as Phyllodocidae sp 1	unitless
Phyllodocidae_sp_2	Number of individuals identified as Phyllodocidae sp 2	unitless
Phyllodocidae_sp_3	Number of individuals identified as Phyllodocidae sp 3	unitless
Phyllodocidae_sp_4	Number of individuals identified as Phyllodocidae sp 4	unitless
Pilargidae_sp_1	Number of individuals identified as Pilargidae sp 1	unitless
Polynoidae_sp_1	Number of individuals identified as Polynoidae sp 1	unitless
Polynoidae_sp_2	Number of individuals identified as Polynoidae sp 2	unitless
Polynoidae_sp_3	Number of individuals identified as Polynoidae sp 3	unitless
Polynoidae_sp_4	Number of individuals identified as Polynoidae sp 4	unitless
Polynoidae_sp_5	Number of individuals identified as Polynoidae sp 5	unitless

Sipuncula_sp_1	Number of individuals identified as Sipuncula sp 1	unitless
Sphaerodoridae_sp_1	Number of individuals identified as Sphaerodoridae sp 1	unitless
Terebellidae_sp_1	Number of individuals identified as Terebellidae sp 1	unitless
Tanaidacea_sp_1	Number of individuals identified as Tanaidacea sp 1	unitless
Ammotheidae_sp_1	Number of individuals identified as Ammotheidae sp 1	unitless
Caprellidae_sp_1	Number of individuals identified as Caprellidae sp 1	unitless
Desmosomatidae_sp_1	Number of individuals identified as Desmosomatidae sp 1	unitless
Halacaridae_sp_1	Number of individuals identified as Halacaridae sp 1	unitless
Halacaridae_sp_2	Number of individuals identified as Halacaridae sp 2	unitless
Haploniscidae_sp_1	Number of individuals identified as Haploniscidae sp 1	unitless
Munnidae_sp_1	Number of individuals identified as Munnidae sp 1	unitless
Munnidae_sp_2	Number of individuals identified as Munnidae sp 2	unitless
Munnopsidae_sp_1	Number of individuals identified as Munnopsidae sp 1	unitless
Tanaidacea_sp_2	Number of individuals identified as Tanaidacea sp 2	unitless
Unciolidae_sp_1	Number of individuals identified as Unciolidae sp 1	unitless
Holothuroidea_sp_1	Number of individuals identified as Holothuroidea sp 1	unitless
Ophiuridae_sp_1	Number of individuals identified as Ophiuridae sp 1	unitless
Aplacophora_sp_1	Number of individuals identified as Aplacophora sp 1	unitless
Bathyacmaea_sp_1	Number of individuals identified as Bathyacmaea sp 1	unitless

Hyalogyrina_sp_1	Number of individuals identified as Hyalogyrina sp 1	unitless
Lepetodrilus_sp_1	Number of individuals identified as Lepetodrilus sp 1	unitless
Neolepetopsis_sp_1	Number of individuals identified as Neolepetopsis sp 1	unitless
Neptunea_sp_1	Number of individuals identified as Neptunea sp 1	unitless
Paralepetopsis_sp_1	Number of individuals identified as Paralepetopsis sp 1	unitless
Provanna_sp_1	Number of individuals identified as Provanna sp 1	unitless
Pyropelta_sp_1	Number of individuals identified as Pyropelta sp 1	unitless
Pyropelta_sp_2	Number of individuals identified as Pyropelta sp 2	unitless
Vesicomyidae_sp_1	Number of individuals identified as Vesicomyidae sp 1	unitless
Metridioidea_sp_1	Number of individuals identified as Metridioidea sp 1	unitless
Nemertea_sp_1	Number of individuals identified as Nemertea sp 1	unitless
Hymedesmia_sp_1	Number of individuals identified as Hymedesmia sp 1	unitless
Unknown_Egg_sp_1	Number of individuals identified as Unknown Egg sp 1	unitless
Total_Annelida	Number of individuals identified Annelida	unitless
Total_Arthropoda	Number of individuals identified Arthropoda	unitless
Total_Echinodermata	Number of individuals identified Echinodermata	unitless
Total_Mollusca	Number of individuals identified Mollusca	unitless
Total_Cnidaria	Number of individuals identified Cnidaria	unitless
Total_Nemertea	Number of individuals identified Nemertea	unitless

Total_Porifera	Number of individuals identified Porifera	unitless
Total_Other	Number of individuals identified as Other	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	HOV Alvin
Generic Instrument Name	HOV Alvin
Dataset-specific Description	Puschore, rocks, biotubes, and slurp samples were collected with HOV Alvin using the manipulator.
Generic Instrument Description	Human Occupied Vehicle (HOV) Alvin is part of the National Deep Submergence Facility (NDSF). Alvin enables in-situ data collection and observation by two scientists to depths reaching 6,500 meters, during dives lasting up to ten hours. Commissioned in 1964 as one of the world's first deep-ocean submersibles, Alvin has remained state-of-the-art as a result of numerous overhauls and upgrades made over its lifetime. The most recent upgrades, begun in 2011 and completed in 2021, saw the installation of a new, larger personnel sphere with a more ergonomic interior; improved visibility and overlapping fields of view; longer bottoms times; new lighting and high-definition imaging systems; improved sensors, data acquisition and download speed. It also doubled the science basket payload, and improved the command-and-control system allowing greater speed, range and maneuverability. With seven reversible thrusters, it can hover in the water, maneuver over rugged topography, or rest on the sea floor. It can collect data throughout the water column, produce a variety of maps and perform photographic surveys. Alvin also has two robotic arms that can manipulate instruments, obtain samples, and its basket can be reconfigured daily based on the needs of the upcoming dive. Alvin's depth rating of 6,500m gives researchers in-person access to 99% of the ocean floor. Alvin is a proven and reliable platform capable of diving for up to 30 days in a row before requiring a single scheduled maintenance day. Recent collaborations with autonomous vehicles such as Sentry have proven extremely beneficial, allowing PIs to visit promising sites to collect samples and data in person within hours of their being discovered, and UNOLs driven technological advances have improved the ability for scientific outreach and collaboration via telepresence Alvin is named for Allyn Vine, a WHOI engineer and geophysicist who helped pioneer deep submergence research and technology. (from https://www.whoi.edu/what-we-do/explore/underwater-vehicles/hov-alvin/, accessed 2022-09-09)

Dataset-specific Instrument Name	Wild Heerbrugg Stereomicroscope M5A
Generic Instrument Name	Microscope - Optical
Dataset-specific Description	Animals in rock samples were primarily identified to major taxa, counted, and preserved in 95% ethanol.
Generic Instrument Description	Instruments that generate enlarged images of samples using the phenomena of reflection and absorption of visible light. Includes conventional and inverted instruments. Also called a "light microscope".

[table of contents | back to top]

Deployments

AT50-24

Website	https://www.bco-dmo.org/deployment/984569
Platform	R/V Atlantis
Start Date	2024-05-16
End Date	2024-06-07
Description	See more information from R2R: https://www.rvdata.us/search/cruise/AT50-24

[table of contents | back to top]

Project Information

Collaborative Research: Redefining the footprint of deep ocean methane seepage for benthic ecosystems (Methanosphere)

Coverage: Gulf of Alaska and Southern California Bight

NSF Award Abstract:
This research examines the role of deep-sea organisms in determining the fate and footprint of methane, a potent greenhouse gas, on Pacific continental margins. The investigators are evaluating the deep ocean methanosphere defined by the microbial communities that consume methane and the animals that directly feed on or form symbioses with methane-consuming microbes. They are also investigating animal communities that gain energy indirectly from methane, as well as those that take advantage of carbonate rocks, the physical manifestation of methane consumption in seafloor sediments. The study of methane seeps in the deep waters of both Alaska (4400-5500 meters) and Southern California (450-1040 meters) is enabling comparisons of the methanosphere under different food-limitation and oxygen regimes. By applying diverse chemical, isotopic, microscopy, and genetic-based analyses to seep microbes and fauna, this study is advancing understanding of the contribution of methane to deep-sea biodiversity and ecosystem function, information that can inform management and conservation actions in US waters. In addition to training for graduate and undergraduate students at their home institutions, the investigators are collaborating with the Alaska Native Science and Engineering Program (ANSEP). They are recruiting Alaskan undergraduates to participate in the research, contributing to ANSEP's online resources that promote interaction between scientists and middle and high school students, and participating in ANSEP's annual residential Career Exploration in Marine Science programs to engage middle school students in learning about deep-sea ecosystems and the variety of career pathways available in marine related fields.

Microbial production and consumption of methane is dynamic and widespread along continental margins, and some animals within deep-sea methane seeps rely on the oxidation and sequestration of methane for nutrition. At the same time, understanding of methane-dependent processes and symbioses in the deep-sea environment is still rudimentary. The goals of this study are to 1) examine the diversity of animals involved in methane-based symbioses and heterotrophic consumption of methane-oxidizing microbes and how these symbioses extend the periphery of seeps, contributing to non-seep, continental slope food webs; and 2) determine whether carbonates on the seep periphery sustain active methanotrophic microbial assemblages, providing a localized food source or chemical fuel for thiotrophic symbioses, via anaerobic oxidation of methane, or free-living, sulfide-oxidizing bacteria consumed by animals. The investigators are addressing these goals by surveying, sampling, and characterizing microbes, water, sediments, carbonates and animals at a deep seep site on the Aleutian Margin and a shallow site off Southern California. Shipboard experiments and laboratory analyses are using molecular, isotopic, geochemical, and radiotracer tools to understand transfer of methane-sourced carbon from aerobic methanotrophs under multiple oxygen levels, pressures, and photosynthetic food inputs. This approach offers a wide lens by which to examine the methane seep footprint, allow reinterpretation of past observations, and identify new scientific areas for future study. Improved characterization of the deep continental margin methanosphere informs climate science, biodiversity conservation, and resource management.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2048720

[table of contents | back to top]