Matrix of taxon by sample for hard substrates collected by HOV Alvin during R/V Atlantis cruise AT37-13 and AT42-03 in the Pacific margin of Costa Rica in 2017 and 2018.

Website: https://www.bco-dmo.org/dataset/747699
Data Type: Cruise Results
Version: 2
Version Date: 2021-03-16

Project
» Collaborative research: Quantifying the biological, chemical, and physical linkages between chemosynthetic communities and the surrounding deep sea (Costa Rica Seeps)

Contributors	Affiliation	Role
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Abstract
Matrix of taxon by sample for hard substrates collected by HOV Alvin during R/V Atlantis cruise AT37-13 and AT42-03 in the Pacific margin of Costa Rica in 2017 and 2018.

Table of Contents

Coverage

Spatial Extent: **N**:9.1306 **E**:-84.2132 **S**:8.30702 **W**:-84.84155
Temporal Extent: 2017-05-21 - 2018-11-05

Dataset Description

Matrix of taxon (columns) by sample (rows) for substrates collected during AT 37-13. Samples were collected with HOV Alvin.

Methods & Sampling

In situ carbonate rocks were taken at sites with different seepage activity in 2017 (AT37-13) and 2018 (AT42-03) using HOV Alvin. These were used as control samples for two experiments: (1) Carbonate rocks, woods, and bones deployed for 7.4 years were collected across seepage gradients at Mound 12 using HOV Alvin

(Colonization 7.4 years), and (2) Carbonate rocks were moved by the HOV to different seepage conditions with exposure for 17 months (Transplant 17 months).

All substrates were photographed intact upon recovery, and wrapped in aluminum foil to determine the surface area. Before preserving, the sample was kept cold and animals were picked to sample tissue for isotope analysis (see files “AT37-13 and AT42-03 Hard substrate isotopes” for isotopic data).

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 96% Ethanol. In the laboratory, the samples were washed in distilled water and sorted, and the animals were identified to the lowest level possible, counted and preserved in 96% Ethanol.

Data Processing Description

Substrates were sorted and the fauna was identified to the lowest taxonomic level possible. Annelida and Mollusca, the most abundant groups, were identified at the family level. Crustacea was identified at the order or infraorder level, Cnidaria was identified at the order level, and Echinodermata was identified at the class level. The least abundant groups, Nemertea, Platyhelminthes and Pycnogonida, were identified to phylum.

Note: Not all samples were used for density analyses, thus some do not have surface area values.

BCO-DMO Processing:

- Modified parameter names to comply with database requirements
- Added sampling latitude and longitude
- Changed , to ; to comply with database requirements

[table of contents | back to top]

Data Files

File	
hard_substrate_comm.csv	(Comma Separated Values (.csv), 18.84 KB) MD5:4d276902ef093659ea85c929de27a921
Primary data file for dataset ID 747699	

[table of contents | back to top]

Related Datasets

References

Levin, L. A., Rouse, G. (2017) **Preliminary log of samples collected during Alvin dives from R/V Atlantis cruise AT37-13 in the Costa Rica margin.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 12 Sept 2017) Version Date 2017-09-12 http://lod.bco-dmo.org/id/dataset/714584 [view at BCO-DMO]
Relationship Description: Sampling locations

Levin, L. A., Rouse, G. (2021) **Sampling locations of hard substrates and push cores collected during R/V Atlantis cruise AT37-13 and AT42-03 in the Pacific Ocean off Costa Rica in 2017 and 2018.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-02-19 doi:10.26008/1912/bco-dmo.840955.1 [view at BCO-DMO]
Relationship Description: Sampling locations

Levin, L. A., Rouse, G., Pereira, O. S. (2021) **Averages and standard deviation across species for all macrofauna found on each carbonate rock collected during R/V Atlantis cruise AT37-13 in the Pacific margin of Costa Rica from May to June 2017.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 2) Version Date 2021-02-17 doi:10.26008/1912/bco-

dmo.747575.2 [view at BCO-DMO]
Relationship Description: Isotopic dataset related to sampled hard substrates

Orphan, V. J., Cordes, E. E. (2017) **Carbonate chemistry sample inventory from R/V Atlantis AT37-13 at methane seeps in the Pacific Ocean off Costa Rica from May to June 2017 (Costa Rica Seeps project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). Version Date 2017-09-25 http://lod.bco-dmo.org/id/dataset/715893 [view at BCO-DMO]
Relationship Description: Sampling locations

[table of contents | back to top]

Parameters

Parameter	Description	Units
Cruise_ID	Cruise ID: AT37-13 or AT42-03	unitless
Site	Site name	unitless
Alvin_Dive	Number of the Alivn dive from which the sample was collected	unitless
Latitude	Latitude of sampling location	decimal degrees
Longitude	Longitude of sampling location	decimal degrees
Substrate	Alvin dive and substrate of sample	unitless
Habitat	Habitat description	unitless
Experiment	Experiment type	unitless
Surface_Area	Surface area	unitless
Oligochaeta	Number of individuals identified from taxon	unitless
Siboglinidae	Number of individuals identified from taxon	unitless
Serpulidae	Number of individuals identified from taxon	unitless
Polynoidae	Number of individuals identified from taxon	unitless
Hesionidae	Number of individuals identified from taxon	unitless
Amphinomidae	Number of individuals identified from taxon	unitless
Ampharetidae	Number of individuals identified from taxon	unitless
Sabellidae	Number of individuals identified from taxon	unitless
Dorvilleidae	Number of individuals identified from taxon	unitless
Lumbrineridae	Number of individuals identified from taxon	unitless
Phyllodocidae	Number of individuals identified from taxon	unitless
Chrysopetallidae	Number of individuals identified from taxon	unitless
Cirratulidae	Number of individuals identified from taxon	unitless
Trichobranchidae	Number of individuals identified from taxon	unitless
Paraonidae	Number of individuals identified from taxon	unitless
Lacydoniidae	Number of individuals identified from taxon	unitless
Maldanidae	Number of individuals identified from taxon	unitless
Magelonidae	Number of individuals identified from taxon	unitless
Flabelligeridae	Number of individuals identified from taxon	unitless
Syllidae	Number of individuals identified from taxon	unitless
Spionidae	Number of individuals identified from taxon	unitless
Cossuridae	Number of individuals identified from taxon	unitless

Pisionidae	Number of individuals identified from taxon	unitless
Nereididae	Number of individuals identified from taxon	unitless
Capitellidae	Number of individuals identified from taxon	unitless
Orbiniidae	Number of individuals identified from taxon	unitless
Pilargiidae	Number of individuals identified from taxon	unitless
Terebellidae	Number of individuals identified from taxon	unitless
Onuphidae	Number of individuals identified from taxon	unitless
Eunicidae	Number of individuals identified from taxon	unitless
Chaetopteridae	Number of individuals identified from taxon	unitless
Sigalionidae	Number of individuals identified from taxon	unitless
Opheliidae	Number of individuals identified from taxon	unitless
Arenicolidae	Number of individuals identified from taxon	unitless
Goniadidae	Number of individuals identified from taxon	unitless
Nephtyidae	Number of individuals identified from taxon	unitless
Actiniaria	Number of individuals identified from taxon	unitless
Hydroidolina	Number of individuals identified from taxon	unitless
Alcyonacea	Number of individuals identified from taxon	unitless
Trombidiformes	Number of individuals identified from taxon	unitless
Amphipoda	Number of individuals identified from taxon	unitless
Anomura	Number of individuals identified from taxon	unitless
Brachyura	Number of individuals identified from taxon	unitless
Cumacea	Number of individuals identified from taxon	unitless
Isopoda	Number of individuals identified from taxon	unitless
Tanaidacea	Number of individuals identified from taxon	unitless
Ostracoda	Number of individuals identified from taxon	unitless
Caridea	Number of individuals identified from taxon	unitless
Sessilia	Number of individuals identified from taxon	unitless
Mysidacea	Number of individuals identified from taxon	unitless
Asteroidea	Number of individuals identified from taxon	unitless
Ophiuroidea	Number of individuals identified from taxon	unitless
Holothuroidea	Number of individuals identified from taxon	unitless
Aplacophora	Number of individuals identified from taxon	unitless
Nuculanidae	Number of individuals identified from taxon	unitless
Juvenile	Number of individuals identified from taxon	unitless
Xylophagaidae	Number of individuals identified from taxon	unitless
Cuspidariidae	Number of individuals identified from taxon	unitless
Mytilidae	Number of individuals identified from taxon	unitless
Teredinidae	Number of individuals identified from taxon	unitless
Vesicomyidae	Number of individuals identified from taxon	unitless
Solemyidae	Number of individuals identified from taxon	unitless
Pyramidellidae	Number of individuals identified from taxon	unitless

Eucyclidae	Number of individuals identified from taxon	unitless
Seguenziidae	Number of individuals identified from taxon	unitless
Skeneidae	Number of individuals identified from taxon	unitless
Cataegidae	Number of individuals identified from taxon	unitless
Hyalogyniridae	Number of individuals identified from taxon	unitless
Provannidae	Number of individuals identified from taxon	unitless
Lepetodrilidae	Number of individuals identified from taxon	unitless
Cocculinidae	Number of individuals identified from taxon	unitless
Neolepetopsidae	Number of individuals identified from taxon	unitless
Pyropeltidae	Number of individuals identified from taxon	unitless
Polyplacophora	Number of individuals identified from taxon	unitless
Nemertea	Number of individuals identified from taxon	unitless
Platyhelminthes	Number of individuals identified from taxon	unitless
Pycnogonida	Number of individuals identified from taxon	unitless

[table of contents | back to top]

Deployments

AT37-13

Website	https://www.bco-dmo.org/deployment/714567
Platform	R/V Atlantis
Start Date	2017-05-20
End Date	2017-06-11
Description	More cruise information is available from Rolling Deck to Repository (R2R): * https://www.rvdata.us/search/cruise/AT37-13 * https://doi.org/10.7284/907684

AT37-13_Alvin_Dives

Website	https://www.bco-dmo.org/deployment/715760
Platform	Alvin
Start Date	2017-05-21
End Date	2017-06-08
Description	Collections of seep organisms in sediments and on rocks.

AT42-03

Website	https://www.bco-dmo.org/deployment/777903
Platform	R/V Atlantis
Start Date	2018-10-17
End Date	2018-11-06
Description	More cruise information is available from Rolling Deck to Repository (R2R): * https://www.rvdata.us/search/cruise/AT42-03 * https://doi.org/10.7284/908473

AT42-03_Alvin_Dives

Website	https://www.bco-dmo.org/deployment/777904
Platform	Alvin
Start Date	2018-10-17
End Date	2018-11-04

[table of contents | back to top]

Project Information

Collaborative research: Quantifying the biological, chemical, and physical linkages between chemosynthetic communities and the surrounding deep sea (Costa Rica Seeps)

Coverage: Costa Rica Pacific Margin

NSF abstract:
If life were to disappear from the deep sea, would we notice? We only have a cursory understanding of this vast region and the connectivity among its communities and the rest of the oceans, and yet the ecosystems of the deep sea have been implicated in the larger function of the global marine ecosystems. We now rely on the deep ocean for food, energy, novel drugs and materials, and for its role in the global cycling of carbon, as well as for supporting services such as habitat creation, nutrient replenishment for shallow waters, and the maintenance of biodiversity. Cold seeps, active areas of the seafloor where methane and other chemicals are released, are key features along the continental margins worldwide. To characterize how methane seep communities interact with the surrounding ecosystems and vice versa, we will study methane seeps off the Pacific coast of Costa Rica in 2017 and 2018. It is the sphere of influence around the seep, both along the seafloor and up into the water column, that we seek to better understand. We will map the structure and the chemistry surrounding these habitats using a novel 3-dimensional framework, combining typical transects with vertical characterizations of the water column just above the seafloor. This will include measurements of methane flux into the water column and changes in the overlying carbonate chemistry and oxygen levels that are critical to our understanding of the effect of warming, oxygen loss and ocean acidification in this region. Within this framework, we will collect seep organisms in sediments and on rocks (including all sizes from microbes to large animals), and transplant some of these from within the area of seep influence to the background deep sea, and vice-versa. Together, these studies will help us to measure the size of the seep sphere of influence, and also demonstrate the role of these seeps within the deep sea and the greater, global, marine ecosystem. We will share this information with a group of teachers during a series of workshops in the San Diego area, at an exhibit at the Birch Aquarium, and through the work of an artist who has worked extensively with marine organisms in extreme environments.

Chemosynthetic ecosystems are inextricably linked to the broader world-ocean biome and global biogeochemical cycles in ways that we are just beginning to understand. This research will identify the form, extent, and nature of the physical, chemical, and biological linkages between methane seeps and the surrounding deep-sea ecosystem. The proposed research builds critical understanding of the structural and functional processes that underpin the ecosystem services provided by chemosynthetic ecosystems. We target a critical continental margin, Costa Rica, where methane fates and dynamics loom large and play out in an setting that reflects many oceanographic stressors. We will use quantitative sampling and manipulative studies within a 3-dimensional oceanographic framework. We will ask what are the shapes of the diversity and density functions for organisms of different size classes and trophic position over the transition from the seep habitat through the ecotone to the background deep sea? Further, we will ask how do depth, dissolved oxygen concentrations, pH and carbonate ion availability, relative rates of fluid flux, and substrate (biogenic, authigenic carbonate, sediments) alter these linkages and interactions with the surrounding deep sea? Evidence for distinct transitional communities and biotic patterns in density and alpha and beta diversity will be quantified and placed in a global biogeographic context. All of these investigations will occur across biological size spectra: for microorganisms (archaea, bacteria, microeukaryotes), the macrofauna, and the megafauna that form biogenic habitats. Our research results will be interpreted in the context of potential effects of global ocean change in the equatorial Pacific to determine how the linkages with the surrounding deep sea will be altered as anthropogenic impacts proceed in the future.

Related publications:
Levin, L.A., V.J. Orphan, G.W. Rouse, W. Ussler, A. E. Rathburn, G. S. Cook, S. Goffredi, E. Perez, A. Waren, B. Grupe, G. Chadwick, B. Strickrott. (2012). A hydrothermal seep on the Costa Rica margin: Middle ground in a continuum of reducing ecosystems. *Proc. Royal Soc. B.* 279: 2580-88 doi: 10.1098/rspb.2012.0205

Sahling, H., Masson, D. G., Ranero, C. R., Hühnerbach, V., Weinrebe, W., Klaucke, I., & Suess, E. (2008). Fluid seepage at the continental margin offshore Costa Rica and southern Nicaragua. *Geochemistry, Geophysics, Geosystems* 9: doi: 10.1029/2008GC001978

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1634172

[table of contents | back to top]