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

Website: https://www.bco-dmo.org/dataset/747575
Data Type: Cruise Results
Version: 2
Version Date: 2021-02-17

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

Contributors	Affiliation	Role
Levin, Lisa A.	University of California-San Diego Scripps (UCSD-SIO)	Principal Investigator, Contact
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Abstract
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

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Coverage

Spatial Extent: **N**:9.1306 **E**:-84.2132 **S**:8.30702 **W**:-84.8415
Temporal Extent: 2017-06-21 - 2018-11-05

Dataset Description

Averages and standard deviation across species for all macrofauna found on each carbonate rock collected during AT37-13.

Methods & Sampling

Carbonate rocks were collected across seepage gradients at Mound 12 using HOV Alvin, and washed in miliQ water onboard. Before preserving, the sample was kept cold and animals were picked to sample tissue for isotope analysis. The tissue (aprox. 0.5 mg) was placed in pre weighted tin boats or combusted vials (500C overnight) and frozen at -70C. The remaining washed 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, tissue samples were oven dried (60C) overnight, weighed and acidified with 12.5-25 ul 1N H3PO4 to remove inorganic C.

Data Processing Description

Stable isotope measurements (d13C and d15N) were carried out using a Costech elemental analyzer coupled to a Micromass Iso-prime isotope ratio mass spectrometer (EA/IRMS) at Washington State University.

BCO-DMO Processing:

- modified parameter names;
- replaced "-" with "nd" (no data)
- replaced , with ; in substrate_number_and_dive column

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Data Files

File	
hard_substrate_isotopes.csv	(Comma Separated Values (.csv), 13.61 KB) MD5:6c68daee3562c747471d9a29cd433aa1
Primary data file for dataset ID 747575	

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Supplemental Files

File	
AT37-13_AT42-03_Raw_isotope_dataset filename: AT37-13_AT42-03_Raw_isotope_dataset_Feb16.xlsx	(Octet Stream, 71.87 KB) MD5:986a99b8028cc3dd0c144b5a52111f92
Raw isotope dataset that is the base for the statistical (average and standard deviation) Hard Substrate Isotope dataset v2 (https://www.bco-dmo.org/dataset/747575)	

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Related Datasets

Replaces Old Versions

Levin, L. A., Rouse, G. (2018) **[DEPRECATED] Averages and standard deviation of stable isotopes (d13C and d15N) across species for all macrofauna found on each substrate (carbonate rocks, woods, and bones) of the colonization experiment held in Mound 12.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2018-10-08 http://lod.bco-dmo.org/id/dataset/747645 [view at BCO-DMO]
Relationship Description: Dataset 747645 "AT37-13 Colonization Experiment Isotopes" has been replaced by dataset 747575 v2.

IsReferencedBy

Levin, L. A., Rouse, G., Pereira, O. S. (2021) **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.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 2) Version Date 2021-03-16 doi:10.26008/1912/bco-dmo.747699.2 [view at BCO-DMO]
Relationship Description: Isotopic dataset related to sampled hard substrates

IsRelatedTo

Pereira, O. S., Levin, L. A. (2025) **Carbonate rock species composition from samples collected by HOV Alvin during R/V Atlantis cruises AT37-13 and AT42-03 and ROV SuBastian during R/V Falkor cruise FK190106 at Pacific margin of Costa Rica from 2017 to 2019.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2025-07-03 doi:10.26008/1912/bco-dmo.960511.1 [view at BCO-DMO]
Relationship Description: Carbonate rock species composition from samples.

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Parameters

Parameter	Description	Units
Cruise	Cruise ID, either AT37-13 or AT42-03	unitless
Site	Site name	unitless
Experiment	description	units
Alvin_Dive_Sample_Number	Substrate number and Alivn dive from which the sample was collected	unitless
Habitat	Seepage activity (active or inactive)	unitless
d13C_avg	Average of carbon isotope signature of animals on that substrate	per mil
d15N_avg	Average of nitrogen isotope signature of animals on that substrate	per mil
d13C_sd	Average of nitrogen isotope signature of animals on that substrate	per mil
d15N_sd	Standard deviation of nitrogen isotope signature of animals on that substrate	per mil
Latitude	Latitude of sampling location	decimal degrees
Longitude	Longitude of sampling location	decimal degrees

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Instruments

Dataset-specific Instrument Name	Costech elemental analyzer
Generic Instrument Name	Elemental Analyzer
Dataset-specific Description	Stable isotopes measurements (d13C and d15N) were carried out using a Costech elemental analyzer coupled to a Micromass Iso-prime isotope ratio mass spectrometer (EA/IRMS) at Washington State University.
Generic Instrument Description	Instruments that quantify carbon, nitrogen and sometimes other elements by combusting the sample at very high temperature and assaying the resulting gaseous oxides. Usually used for samples including organic material.

Dataset-specific Instrument Name	Micromass Iso-prime isotope ratio mass spectrometer
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Dataset-specific Description	Stable isotopes measurements (d13C and d15N) were carried out using a Costech elemental analyzer coupled to a Micromass Iso-prime isotope ratio mass spectrometer (EA/IRMS) at Washington State University.
Generic Instrument Description	The Isotope-ratio Mass Spectrometer is a particular type of mass spectrometer used to measure the relative abundance of isotopes in a given sample (e.g. VG Prism II Isotope Ratio Mass-Spectrometer).

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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	HOV 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	HOV Alvin
Start Date	2018-10-17
End Date	2018-11-04

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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

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Funding

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

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