

Catalog numbers, GenBank accession numbers, and key details for specimens collected during cruises AT37-13 (2017), AT42-03 (2018), and FK190106 (2019) and vouchered in the Scripps Institution of Oceanography Benthic Invertebrate Collection

Website: <https://www.bco-dmo.org/dataset/838088>

Data Type: Cruise Results

Version: 1

Version Date: 2021-01-26

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

This dataset includes catalog numbers, GenBank accession numbers, and key details for specimens collected during cruises AT37-13 (2017), AT42-03 (2018), and FK190106 (2019) and vouchered in the Scripps Institution of Oceanography Benthic Invertebrate Collection.

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Coverage

Spatial Extent: N:9.1193 E:-84.21491667 S:8.80167 W:-85.1893

Temporal Extent: 2017-05-21 - 2018-10-25

Dataset Description

This dataset includes catalog numbers, GenBank accession numbers, and key details for specimens

collected during cruises AT37-13 (2017), AT42-03 (2018), and FK190106 (2019) and vouchered in the Scripps Institution of Oceanography Benthic Invertebrate Collection.

The Scripps Institution of Oceanography Benthic Invertebrate Collection (SIO-BIC) specimen holdings are publicly available in DarwinCore format via GBIF, but please note that this version is updated infrequently: <https://www.gbif.org/dataset/a267b6a7-91f9-457c-889a-481e7aa920b6>

For the most up-to-date version of this dataset, please use the SIO-BIC searchable database: <https://sioapps.ucsd.edu/collections/bi/>. This database is updated at least weekly to reflect corrections, updated identifications, new GenBank accession numbers, and newly added specimens.

Acquisition Description

Samples were collected using the deep-sea submersibles HOV Alvin (cruise AT37-13 in 2017; cruise AT42-03 in 2018) or ROV SuBastian (cruise FK190106 in 2019). Sampling instruments used by the deep-sea submersibles include: manipulator arm, scoops, suction sampler (also known as a "slurp"; suctions material into an enclosed chamber), mussel pot (stainless steel pot with a twistable handle connected to a Kevlar bag insert; used for quantitative sampling of deep-sea mussel beds), and Bushmaster (hydraulic rods surrounding a fine mesh; original instrument developed at Penn State University for quantitative sampling of deep-sea tubeworms).

Live specimens were relaxed with an appropriate agent (e.g. 7% MgCl₂ in fresh water, menthol) and photographed. For genetic analysis, specimens were preserved whole or subsampled into 95% ethanol, RNAlater, and/or liquid nitrogen. Whole or partial specimens serving as morphological vouchers were fixed in 10% seawater formalin for at least 24 hours, then rinsed with fresh water and transferred to 50% ethanol for long-term archival. For certain taxa, e.g. echinoderms and crustaceans, vouchers were treated with 95% ethanol instead of formalin. Selected specimens were treated with paraformaldehyde, glutaraldehyde, or osmium tetroxide for histology and electron microscopy.

Processing Description

Data Processing:
Data were organized using FileMaker Pro 12.

BCO-DMO Processing:
- replaced commas with semi-colons throughout dataset.

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Related Datasets

Different Version

Seid, C. (2019). SIO Benthic Invertebrate Collection [Data set]. Scripps Institution of Oceanography. <https://doi.org/10.15468/4W9OC7> <https://doi.org/10.15468/4w9oc7>

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Parameters

Parameter	Description	Units

catalogNumber	permanent identifying code for a vouchered specimen at SIO-BIC	unitless
phylum	phylum	unitless
class	class	unitless
order	order	unitless
family	family	unitless
genus	genus	unitless
species	species	unitless
identifiedBy	person(s) responsible for the most recent identification of this specimen	unitless
typeStatus	status of this specimen as a name-bearing type for this species, e.g. holotype	unitless
individualCount	number of individuals represented by this lot	unitless
sex	sex(es) of the individual(s) in this lot	unitless
lifeStage	developmental life stage, e.g. larva	unitless
genBankAccessionNumber	NCBI GenBank accession number(s) for DNA sequence(s) derived from this lot	unitless
materialPreserved	physical material available, e.g. whole or tissue	unitless
voucherTreatment	initial chemical treatment of the morphological voucher, e.g. formalin	unitless
voucherPreservative	long-term preservative of the morphological voucher, e.g. ethanol	unitless
otherCodes	identifying codes, other than SIO-BIC catalog number; may include temporary field codes and catalog numbers from other institutions	unitless
diveNumber	submersible dive number; may be followed by a sampling event code or deployment number	unitless
locality	name or description of collection location	unitless
country	country of collection	unitless
ocean	ocean of collection	unitless
lat_start	latitude of collection; south is negative; if collection occurred between two points, this point represents the start point	decimal degrees
lon_start	longitude of collection; west is negative; if collection occurred between two points, this point represents the start point	decimal degrees
lat_end	latitude of collection; south is negative; if collection occurred between two points, this point represents the end point	decimal degrees
lon_end	longitude of collection; west is negative; if collection occurred between two points, this point represents the end point	decimal degrees
depth_start	depth of collection; if collection occurred between two depths, this point represents the minimum depth	meters (m)
depth_end	depth of collection; if collection occurred between two depths, this point represents the maximum depth	meters (m)
collectionDate	date of collection; format ISO8601 (YYYY-MM-DD); in local time (UTC-6)	unitless
submersible	name of submersible	unitless

ship	name of support ship	unitless
collectedBy	person(s) who participated in the submersible dive or preserved the specimen	unitless
collectionEventRemarks	further details about the submersible dive and sampling event	unitless

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Alvin Slurp Sampler
Generic Instrument Description	Small and large capacity vacuum pump samplers. May have single or multiple chambers. See http://www.whoi.edu/main/alvin/subsystems/optional-scientific-samplers

Dataset-specific Instrument Name	
Generic Instrument Name	Bushmaster
Generic Instrument Description	Bushmaster samplers are original instruments created at Penn State to collect hydrothermal vent and methane seep communities. Hydraulic rods are attached to a very fine mesh that is deployed over the tubeworm patch of interest to collect the tubeworms and associated community. Once the assemblage is enclosed, the net is cinched closed using the submersible or ROV manipulator. This allows for quantitative collections of tubeworm communities.

Dataset-specific Instrument Name	
Generic Instrument Name	Mussel Pot
Generic Instrument Description	The mussel pot is a 12-quart aluminium-clad stainless steel pot with a twistable handle connected to a Kevlar bag insert. It is used to sample mussel beds and associated communities. The pot is deployed over the select mussel patch using the submersible or ROV manipulator, then collects the enclosed assemblage by cinching the Kevlar bag closed by turning the handle. This method allows for quantitative analysis of deep-sea mussel bed communities.

Dataset-specific Instrument Name	
Generic Instrument Name	ROV SuBastian
Generic Instrument Description	ROV SuBastian is operated from the research vessel Falkor. The ROV is outfitted with a suite of sensors and scientific equipment to support scientific data and sample collection, as well as interactive research, experimentation, and technology development. More information available at https://schmidtoccean.org/technology/robotic-platforms/4500-m-remotely-op...

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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

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

FK190106

Website	https://www.bco-dmo.org/deployment/806648
Platform	R/V Falkor
Start Date	2019-01-06
End Date	2019-01-27
Description	More cruise information is available from Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/FK190106 (DOI: 10.7284/908271)

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_Alvin_Dives

Website	https://www.bco-dmo.org/deployment/777904
Platform	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. Warren, 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](https://doi.org/10.1098/rspb.2012.0205)

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

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1635219
NSF Division of Ocean Sciences (NSF OCE)	OCE-1634172
NSF Division of Ocean Sciences (NSF OCE)	OCE-1634559
NSF Division of Ocean Sciences (NSF OCE)	OCE-1634002

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