Counts of colonists collected from colonization plates at the East Pacific Rise (EPR) deep-sea vents (1998-2017)

Website: https://www.bco-dmo.org/dataset/733173
Data Type: Cruise Results
Version: 2
Version Date: 2020-08-31

Project
» Effects of Disturbance and Larval Supply on Communities at Hydrothermal Vents (Larval supply at EPR vents)
» Trajectories in functional diversity after disturbance at vents on the East Pacific Rise (EPR Functional Diversity)

Contributors	Affiliation	Role
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Abstract
Counts of colonist species and morphogroups on post-eruption sandwiches (at P-vent) and pre-eruption blocks (at East Wall) near 9.8333 N on the East Pacific Rise (EPR). Recovery date (months since January 2006 eruption), deployment habitat zone (H=Hot, W=Warm, C=Cool), sample ID, and recovery temperature (deg C) are presented for each sample. Species and morphogroups were matched to equal or lowest level taxon in the World Register of Marine Species (WoRMS). These data are published in Mullineaux et al (2012).

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Coverage

Spatial Extent: **N**:9.8421 **E**:-104.2912 **S**:9.8387 **W**:-104.2919
Temporal Extent: 1998-05-15 - 2017-04-29

Dataset Description

Counts of colonist species and morphogroups on post-eruption sandwiches (at P-vent) and pre-eruption blocks (at East Wall) near 9°50'N on the East Pacific Rise (EPR). Recovery date (months since January 2006 eruption), deployment habitat zone (H=Hot, W=Warm, C=Cool), sample ID, and recovery temperature (deg C) are presented for each sample. Species and morphogroups were matched to equal or lowest level taxon in the World Register of Marine Species (WoRMS). Data were provided using Darwin Core terms to enable harvesting by the Ocean Biodiversity Information System (OBIS).

Data are also provided in a wide format [see Data Files section] with columns for each sample which indicate monthsSinceEruption - Zone - samplerID - temperatureRecovered, e.g., 9-H-2-26.7 indicates nine months post-eruption, in zone hot, sampler ID 2, recovered at 26.7 deg C. Values in each of these columns indicate counts of individuals identified to that dataProviderName for that sample. Zeroes denote absence.

Spatiotemporal metadata for the samples are provided in Dataset: Colonization sampler log https://www.bco-dmo.org/dataset/733210. These data are published in Mullineaux et al (2012). doi:10.1371/journal.pone.0050015.

Methods & Sampling

Colonists were collected on experimental surfaces (sandwiches) constructed from six 0.7-cm-thick Lexan plastic plates separated by 1 cm spacers, creating a lattice 10 cm on a side (Bayer et al, 2011; note in 1998 colonists were collected on basalt blocks). Sandwiches were deployed and recovered by the submersible Alvin or ROV Jason. Deployment durations were 4, 2, 11, 11, 43, 10, and 29 months respectively for the recoveries at 9, 11, 22, 33, 96, 106, and 135 months after an eruption that took place in January 2006. The thermal environment at the base of each sandwich was measured with the Alvin (or Jason) temperature probe on deployment and recovery for ca 1–2 min until a clear maximum value was obtained.

Species abundance was assessed on three replicate sandwiches for each treatment (e.g., from one habitat within a site at a particular recovery date). On recovery, each sandwich was placed in individual collection compartments for transport back to the ship. On board, sandwiches and their attached colonists were preserved in 80% ethanol, as were any individuals that had become detached in the compartment and were retained on a 63-µm sieve. In the laboratory, each surface was examined under a dissecting microscope and all metazoan colonists (including detached individuals >1 mm) were enumerated and identified to species if possible. Additional identifications based on genetic barcoding are in progress using support from other sources. Those data will be added in future.

Data Processing Description

Data cleaning and merging with taxonomic identifiers were performed with code available on GitHub: https://github.com/sbeaulieu/EPR-traits/blob/master/Pvent_data_cleaning_BCODMO.R

The *Laminatubus alvini group may include small Protis hydrothermica; thus, the lowest taxonomic match is at family rank.

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- added latitude, longitude, and date, obtained from the sampling log dataset (Colonization sampler log, https://www.bco-dmo.org/dataset/733210)

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Data Files

File	
EPR_counts.csv Primary data file for dataset ID 733173	(Comma Separated Values (.csv), 477.15 KB) MD5:66fb32436343871b769592baff0c96b9
EPR colonizer counts. alternate format filename: Pvent_P-S_135_supptable1_submit_merged_wide_106.csv Wide format with columns for each sample indicate monthsSinceEruption - Zone - samplerID - temperatureRecovered, e.g., 9-H-2-26.7 indicates nine months post-eruption, in zone hot, sampler ID 2, recovered at 26.7 deg C. Values in each of these columns indicate counts of individuals identified to that dataProviderName for that sample. Zeroes denote absence.	(Comma Separated Values (.csv), 13.81 KB) MD5:224955b17472105a4d958b4aa29b0d46

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Related Publications

Bayer, S. R., Mullineaux, L. S., Waller, R. G., & Solow, A. R. (2010). Reproductive traits of pioneer gastropod species colonizing deep-sea hydrothermal vents after an eruption. Marine Biology, 158(1), 181–192. doi:10.1007/s00227-010-1550-1
Methods

Mullineaux, L. S., Le Bris, N., Mills, S. W., Henri, P., Bayer, S. R., Secrist, R. G., & Siu, N. (2012). Detecting the Influence of Initial Pioneers on Succession at Deep-Sea Vents. PLoS ONE, 7(12), e50015. doi:10.1371/journal.pone.0050015
Results
,
Methods

Mullineaux, L. S., Mills, S. W., Le Bris, N., Beaulieu, S. E., Sievert, S. M., & Dykman, L. N. (2020). Prolonged recovery time after eruptive disturbance of a deep-sea hydrothermal vent community. Proceedings of the Royal Society B: Biological Sciences, 287(1941), 20202070. doi:10.1098/rspb.2020.2070
Results

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Related Datasets

IsRelatedTo

Dykman, L., Beaulieu, S., Solow, A., Mills, S., Mullineaux, L. (2021) **Functional traits of colonists collected from colonization surfaces at the East Pacific Rise (EPR) deep-sea vents from 1998-2017.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-03-12 doi:10.26008/1912/bco-dmo.844993.1 [view at BCO-DMO]
Relationship Description: Data from the same settlement surfaces deployed at deep-sea hydrothermal vents.

Mullineaux, L. (2020) **Dates and locations of colonization sampler deployments and recoveries from East Pacific Rise (EPR) deep-sea vents, 1998-2017.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 3) Version Date 2020-08-24 doi:10.26008/1912/bco-dmo.733210.3 [view at BCO-DMO]
Relationship Description: Dates and locations of colonization sampler deployments and recoveries from East Pacific Rise (EPR) deep-sea vents, 1998-2017.

Different Version

Mullineaux L, Mills S, Beaulieu S (2021). Macrofauna collected on colonization surfaces at the East Pacific Rise 9 50 N hydrothermal vent field in 1998-2017. Version 1.1. United States Geological Survey. Sampling event dataset https://doi.org/10.15468/g5bwb9 accessed via GBIF.org

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Parameters

Parameter	Description	Units
dataProviderName	Name used by the data provider to identify the taxon or morphogroup; not necessarily a scientific name.	unitless
scientificName	Name from World Register of Marine Species (WORMS) at the lowest level that matches the data provider name. This corresponds to Darwin Core term http://rs.tdwg.org/dwc/terms/scientificName.; often the same as dataProviderName minus uncertainty additions such as sp./spp./unk A/etc.	unitless
scientificNameID	Machine-readable Life Science Identifier (LSID) containing the AphiaID from World Register of Marine Species at the lowest level that matches the data provider name. This corresponds to Darwin Core term http://rs.tdwg.org/dwc/terms/scientificNameID.	unitless
AphiaID	Numerical identifier from World Register of Marine Species at the lowest level that matches the data provider name.	unitless
eventID	Unique identifier for the sample as an Event. This corresponds to Darwin Core term http://rs.tdwg.org/dwc/terms/eventID.	unitless
decimalLatitude	sample collection latitude; north is positive	decimal degrees
decimalLongitude	sample collection longitude; east is positive	decimal degrees
eventDate	event date formatted as yyyy-mm-dd	unitless
monthsSinceEruption	The number of months since eruption	months
zone	Deployment habitat zone description: H=hot; W=warm; C=cool	unitless
samplerID	Identification number for each colonization sampler	unitless
temperatureRecovered	temperature at recovery	degrees Celsius
individualCount	The number of individuals recovered from settling plate. This corresponds to Darwin Core term http://rs.tdwg.org/dwc/terms/individualCount.	specimens

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	colonization substrata
Dataset-specific Description	Lexan plastic 6-plate settlement panel
Generic Instrument Description	Natural or artificial materials deployed in a marine or artificial environment for a given period to act as standardised, passive settlement sampling devices (e.g. settlement plates). They are used to determine the extent of colonization and/or the diversity of settled organisms.

Dataset-specific Instrument Name	Lexan plastic plates/sandwiches
Generic Instrument Name	Lexan plastic 6-plate settlement panel
Generic Instrument Description	An artificial colonization substrate, sometimes referred to as a "colonization sandwich", that is made of 6 Lexan plastic sheets separated from each other by spacers. It is used to determine the extent of colonization and/or the diversity of settled organisms in a marine or artificial environment.

Dataset-specific Instrument Name	Dissecting microscope
Generic Instrument Name	Microscope - Optical
Dataset-specific Description	Used to identify specimens found on the colonization plates.
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".

Dataset-specific Instrument Name	
Generic Instrument Name	ROV Jason
Generic Instrument Description	The Remotely Operated Vehicle (ROV) Jason is operated by the Deep Submergence Laboratory (DSL) at Woods Hole Oceanographic Institution (WHOI). WHOI engineers and scientists designed and built the ROV Jason to give scientists access to the seafloor that didn't require them leaving the deck of the ship. Jason is a two-body ROV system. A 10-kilometer (6-mile) fiber-optic cable delivers electrical power and commands from the ship through Medea and down to Jason, which then returns data and live video imagery. Medea serves as a shock absorber, buffering Jason from the movements of the ship, while providing lighting and a bird's eye view of the ROV during seafloor operations. During each dive (deployment of the ROV), Jason pilots and scientists work from a control room on the ship to monitor Jason's instruments and video while maneuvering the vehicle and optionally performing a variety of sampling activities. Jason is equipped with sonar imagers, water samplers, video and still cameras, and lighting gear. Jason's manipulator arms collect samples of rock, sediment, or marine life and place them in the vehicle's basket or on "elevator" platforms that float heavier loads to the surface. More information is available from the operator site at URL. https://ndsf.whoi.edu/jason/

Dataset-specific Instrument Name	temperature recorders (Hobo)
Generic Instrument Name	Temperature Logger
Dataset-specific Description	Used to track the in situ temperature during colonization at the vent zones.
Generic Instrument Description	Records temperature data over a period of time.

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Deployments

AT26-10

Website	https://www.bco-dmo.org/deployment/529031
Platform	R/V Atlantis
Report	http://dmoserv3.bco-dmo.org/data_docs/Microbe_Vent_Communities/AT26-10_Cruise_Report_v2_2015-07-09.pdf
Start Date	2013-12-29
End Date	2014-01-27
Description	Samples were collected by ROV Jason II at the 9N deep-sea hydrothermal vent field on the East Pacific Rise, Pacific Ocean

AT15-12

Website	https://www.bco-dmo.org/deployment/734057
Platform	R/V Atlantis
Report	http://datadocs.bco-dmo.org/docs/Larval_Supply_EPR_Vents/data_docs/AT15-12_LADDER-1_Cruise_Report_36250.pdf
Start Date	2006-10-24
End Date	2006-11-18
Description	Part of Ridge Interdisciplinary Global Experiments (Ridge2000).

AT15-14

Website	https://www.bco-dmo.org/deployment/734059
Platform	R/V Atlantis
Report	http://datadocs.bco-dmo.org/docs/Larval_Supply_EPR_Vents/data_docs/AT15-14_LADDER-2_Cruise_Report_39303.pdf
Start Date	2006-12-05
End Date	2007-01-05
Description	Part of Ridge Interdisciplinary Global Experiments (Ridge2000).

AT15-26

Website	https://www.bco-dmo.org/deployment/734071
Platform	R/V Atlantis
Report	http://datadocs.bco-dmo.org/docs/Larval_Supply_EPR_Vents/data_docs/AT15-26_LADDER-3_Cruise_Report_Feb4_36252.pdf
Start Date	2007-11-13
End Date	2007-12-03
Description	Part of Ridge Interdisciplinary Global Experiments (Ridge2000).

AT15-38

Website	https://www.bco-dmo.org/deployment/660807
Platform	R/V Atlantis
Start Date	2008-10-13
End Date	2008-11-05

AT3-19

Website	https://www.bco-dmo.org/deployment/820163
Platform	R/V Atlantis
Start Date	1998-05-10
End Date	1998-06-01

AT26-23

Website	https://www.bco-dmo.org/deployment/550442
Platform	R/V Atlantis
Start Date	2014-11-02
End Date	2014-11-21
Description	Study of in situ metabolism of microorganisms carrying out CO2-fixation at deep-sea hydrothermal vents.

AT37-12

Website	https://www.bco-dmo.org/deployment/734074
Platform	R/V Atlantis
Report	http://datadocs.bco-dmo.org/docs/Vent_O2_NO3_Roles/data_docs/AT37-12_Cruise_Report.pdf
Start Date	2017-04-24
End Date	2017-05-15

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Project Information

Effects of Disturbance and Larval Supply on Communities at Hydrothermal Vents (Larval supply at EPR vents)

Coverage: Near 9 50'N on East Pacific Rise: 10 N 107 W

NSF award abstract:
The long-term aim of this project is to understand the effects of disturbance on species occurrence and regional diversity in vent systems. The investigator is working toward that goal by conducting field studies on larval dispersal and colonization processes, and by collaborating with theoretical ecologists. The present project investigates a unique set of field observations gathered from decade-long monitoring of vents before and after a recent catastrophic eruption on the East Pacific Rise (EPR). The specific objectives are to determine whether succession is deterministic (or are there alternative stable states?), and whether disturbance at one vent field can influence community structure on a larger spatial scale. Answering these questions requires characterization of larval exchange between vents and of the effect of pioneer colonists on successional trajectory. The approach is to characterize species composition of larvae and colonists at three vent sites on the EPR: one that was disturbed by the eruption (9 degrees 50 minutes N) and two that remained undisturbed (9 degrees 47 minutes N and 9 degrees 30 minutes N). The investigators are running out of time to process the samples, because they degrade over time and the specimens are at risk of losing morphological detail which is critical for species identification. This award has modest funding to focus specifically on species identification and enumeration, without attempting to interface with models or population genetic analyses. These will come later.

The question of how vent communities persist despite living in patchy, ephemeral habitat has intrigued scientists since the discovery of vents in the late 1970s. A necessary synthesis of the influence of larval connectivity on metacommunity dynamics at the regional scale continues to elude us. This project works toward that synthesis by characterizing critical aspects of larval exchange and community succession at vents on the well-studied EPR. This study has general application to vent systems globally because it challenges the assumption that vent succession is deterministic, and it will contribute to our understanding of spatial scales of larval connectivity. The data on larval exchange and community resilience that will result from this study are precisely the kind needed for metapopulations modeling, for prediction of vent community response to anthropogenic events such as seafloor mining, and to inform management efforts at the Marianas Trench Marine National Monument.

Trajectories in functional diversity after disturbance at vents on the East Pacific Rise (EPR Functional Diversity)

Coverage: East Pacific Rise

NSF Award Abstract:
Hydrothermal vents support oases of life in the deep sea and are inhabited by unusual organisms that use chemical energy instead of photosynthesis as the basis of their food web. However, because the vents occur in geologically active areas of the seafloor, entire communities can be eradicated by catastrophic natural disturbances such as eruptions. The main objectives of this project are to quantify how quickly these communities recover from catastrophic disturbance and to determine what processes influence their resilience. The project focuses on both the structure (species diversity) and function (trait diversity) of the communities. The investigators will examine vents on an active segment of the East Pacific Rise where eruptive disturbance occurs on decadal time scales. These activities will create an unprecedented long-term (>14-year) quantitative time-series of colonist species composition and function. The application of trait-based analysis to the question of biological succession at vents has the potential to change the way we think about resilience in other patchy, transient and regionally-connected ecosystems. By considering how traits change over time, the researchers can untangle which species-level characteristics most influence abundance and distribution. The project objectives have broad significance with the growing potential for human-caused disturbances at deep-sea vents through deep-sea mining. Additional impacts include strengthening participation of under-represented minorities in marine science and contributing to international database development for functional traits of deep-sea vent species.

The unique, chemosynthesis-fueled fauna inhabiting deep-sea hydrothermal vents are subject to tectonic and eruptive disturbance that can eradicate entire communities. The main objectives of this project are to quantify how quickly these communities recover from catastrophic disturbance and to determine what processes influence their resilience. The focus is on vents on an active segment of the East Pacific Rise where eruptive disturbance occurs on decadal time scales. Field data on colonization and larval supply are used to characterize not only species succession but also the trajectory of functional diversity after a recent (2006) eruption. A new, promising approach to the colonization studies comes from incorporating trait-based analysis of functional diversity. Functional trait analysis is increasingly recognized in terrestrial and freshwater systems as a tool to holistically answer ecological questions, but trait analysis has not been often applied to marine systems. By considering how traits of incoming colonists change over time, the investigators can untangle which species-level factors most influence abundance and distribution. This project will create an unprecedented long-term (>14-year) quantitative time-series of colonist species composition and function. It includes multiple vent sites to encompass the full diversity of habitat conditions, and assesses both local processes and regional connectivity through larval supply. Field observations at individual sites contribute to broader questions when placed in the context of metacommunity theory. In this theoretical framework, field data such as this can be used to answer such questions as how the eradication of the vent community at a particular site affects the persistence of the metacommunity overall, and which vent sites contribute most to regional biodiversity.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1356738
NSF Division of Ocean Sciences (NSF OCE)	OCE-1829773

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