

Macrofauna collected on colonization panels at Snail Vent Field on the Mariana Back-arc in 2014

Website: <https://www.bco-dmo.org/dataset/783880>

Data Type: Cruise Results

Version: 2

Version Date: 2020-02-11

Project

» [RAPID: Larval Abundance, Behavior and Dispersal at Deep-sea Hydrothermal Vents in the Southern Mariana Trough](#) (Mariana Back-arc Vents)

| Contributors | Affiliation | Role |
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Abstract

This dataset indicates organisms, identified to varying levels of taxonomic granularity, present on colonization surfaces deployed at deep-sea vents in the West Pacific.

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Coverage

Spatial Extent: Lat:12.9531 Lon:143.619

Temporal Extent: 2010-09-04 - 2014-11-30

Dataset Description

This dataset indicates organisms, identified to varying levels of taxonomic granularity, present on colonization surfaces deployed at deep-sea vents in the West Pacific. A .zip file of images is attached containing the .jpg files referenced by column "associatedMedia".

Samples were deployed during cruise YK10-11 on the YOKOSUKA, at 2010-09-04 during dive 1228 by the submersible Shinkai 6500. Samples were retrieved during cruise rr1413 on the RV Roger R Revelle, at [2014-11-30T08:00:00Z] during dive J2-797 by the ROV Jason II.

Location: Snail hydrothermal vent field on Mariana Back-arc (Latitude 12.9531, Longitude 143.6194, depth 2848m)

These data are also available through the OBIS USA Node at <https://www.sciencebase.gov/catalog/item/5de6cef7e4b02caea0eae92>

Methods & Sampling

Deployment of Colonization Substrate

Two sets of three colonization "sandwiches" were deployed at Snail Vent, a hydrothermal vent in the Mariana Back-arc, during cruise YK10-11 in 2010. "Sandwiches" consisted of six Lexan plastic settlement plates, each measuring 0.7cm by 10cm by 10cm, separated from each other by 1cm spacers. The sandwich sets were placed near the base of a hydrothermal vent by the submersible Shinkai 6500. For additional deployment metadata, please refer to: <http://www.marine-geo.org/tools/search/entry.php?id=YK10-11>, in particular the Bottom:Deployed Event Marker-Sandwiches and Sampler:Biological:ColonizationSubstrate. We want to thank Chief Scientist Shigeaki Kojima for this sample deployment.

Recovery of Colonization Substrate

The sandwiches were left for approximately 4 years, and recovered by the ROV Jason II in 2014 on cruise RR1413. Only one set of colonization sandwiches was retrieved, as the other set was buried and could not be recovered. The maximum temperature observed at the sandwiches during recovery was 17.36 deg C. Sandwiches were initially placed into a biobox onboard the ROV, then transferred to another biobox on an elevator for recovery. During this transfer, as well as during the recovery of the elevator at the surface, some specimens may have been lost.

Shipboard Sample Processing

Sandwiches were removed from the biobox into individual bags and the elevator biobox washings were siphoned into a jar. The bags and jar were filled with ammonium sulfate solution buffered with EDTA and sodium citrate. We want to thank Shawn Arellano for this sample recovery and shipboard sample processing.

Laboratory Sorting and Morphological Identification

Samples remained in the ammonium sulfate solution for 1 to 1.5 years. Samples were rinsed with TE buffer prior to placement in 95% ethanol. The sandwiches were manually disassembled, and each entire plate-inclusive of both sides and edges- was examined for all attached macrofauna under a dissecting microscope at 25x. Washings were passed over a 63 micron sieve, and also examined at 25x.

Macrofauna, including foraminifera, were sorted to lowest taxonomic level, tallied, and placed into separate vials. Ciliates were tallied, but not usually retained; some were placed into sorted vials. Morphological identification was limited due to the degradation of the sample. We consulted with international experts to identify many of the morphotypes. All morphotypes, except the ciliates, were photographed. Potentially, ciliates could be identified through metabarcoding of the sorted vials. All photographs were by Mary Toner, with the exception of barnacles by Hiromi Watanabe.

This dataset is complete for one of the three "sandwiches", and for the biobox washings.

Genetic Barcoding

A subset of eight individuals, representing eight morphotypes, was prepared for the Canadian Centre for DNA Barcoding. We used sterile techniques to provide snips of larger specimens. The five submitted in 2017 used the CCDB regular protocol for extraction, amplification, (with two primer sets, C_LepFoIF/C_LepFOIR and ZplankF1/ZplankR1) and sequencing for the Cytochrome Oxidase Subunit 1 - 5 prime region (COI). The three submitted in 2018 used the CCDB protocol for Next Generation Sequencing for COI. Results may be viewed in the Barcode of Life Data System (BOLD) Public Data Portal using the project search SNLBE. We also consulted with international experts on genetic sequences.

Problem Report

One set of colonization "sandwiches" could not be recovered, as it was buried by a partial collapse of surrounding rock.

Some specimens may have been lost during a transfer of samples between bioboxes at the seafloor, as well as upon recovery at the surface. As such, our counts cannot be used for quantitative analysis of hydrothermal macrofauna.

Data Processing Description

Data Processing

Identification information and counts were stored in tables, including manual assignment to WoRMS AphialDs.

These tables were cleaned, organized, and joined in R (v. 3.4.1, "Single Candle") using R Studio (v. 1.0.153), then manually verified. We used the R packages wrorms, taxize, tidyr, dplyr, and tibble.

The ultimate cleaned table was formatted specifically for upload to the Ocean Biogeographic Information System (OBIS). (See "Related Publications" section for alternate versions of this dataset.)

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Data Files

| File |
|---|
| Macrofauna images associated with dataset 783880 filename: 783880_images.zip (ZIP Archive (ZIP), 160.08 MB) MD5:4f46822772ebc3f03fce6cd3f354e61 Macrofauna images associated with dataset 783880; refer to column "associatedMedia" in dataset for the image corresponding to each occurrenceID. |
| macrofauna_2014.csv (Comma Separated Values (.csv), 8.29 KB) MD5:b57aad1e937139144ddaee1e61d7c3b2 Primary data file for dataset ID 783880 |

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Related Datasets

Different Version

Toner, M., Beaulieu, S., Mills, S. (2019). Macrofauna collected on colonization panels at Snail Vent Field on the Mariana Back-arc in 2014. Ocean Biogeographic Information System USA Node.
<https://www.sciencebase.gov/catalog/item/5de6cef7e4b02caea0eaae92>

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Parameters

| Parameter | Description | Units |
|------------------|--|-------|
| occurrenceID | A globally unique, persistent identifier for the occurrence. | none |
| kingdom | The full scientific name of the kingdom in which the taxon is classified. | none |
| phylum | The full scientific name of the phylum in which the taxon is classified. | none |
| scientificName | The full scientific name to the lowest taxonomic rank that can be determined. | none |
| scientificNameID | WoRMS identifier for the nomenclatural (not taxonomic) details of a scientific name. | none |
| taxonRank | The taxonomic rank of the most specific name in the scientificName. | none |

| | | |
|-------------------------|--|-----------------|
| identificationRemarks | Comments/notes about the identification. | none |
| identificationQualifier | A controlled value to express the determiner's doubts about the Identification. | none |
| occurrenceStatus | A statement about the presence or absence of a Taxon at a Location. | none |
| basisOfRecord | The specific nature of the data record, using the standard label of one of the Darwin Core classes. | none |
| eventDate | The date-time during which an Event occurred. For occurrences, this is the date-time when the event was recorded. | none |
| decimalLongitude | The geographic longitude (in decimal degrees) of the geographic center of a Location. | decimal degrees |
| decimalLatitude | The geographic latitude (in decimal degrees) of the geographic center of a Location. | decimal degrees |
| maximumDepthInMeters | Depth below the local surface in meters. | meters |
| minimumDepthInMeters | Depth below the local surface in meters. | meters |
| waterBody | The name from the Getty Thesaurus of Geographic Names of the water body in which the Location occurs. | none |
| locality | The specific description of the place. | none |
| countryCode | The ISO-3166 standard code for the country in which the Location occurs. | none |
| identifiedBy | A list (concatenated and separated with space vertical bar space ()) of names of people who assigned the Taxon to the subject. | none |
| associatedMedia | File name of media associated with the Occurrence. See "Data Files" section of metadata for .zip file of images. | none |
| associatedSequences | Genetic sequence information associated with the Occurrence. We provide a full URL path; the sequence identifier at the end of the URL, starting with SNLBE, is persistent | none |

| | | |
|--------------|--|-------------|
| total_sorted | The total number of specimens of this taxon that have been sorted and morphologically identified; as specimens from some colonization panels have yet to be sorted and identified, this is not an absolute count | individuals |
|--------------|--|-------------|

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Instruments

| | |
|---|--|
| Dataset-specific Instrument Name | colonization "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 |
| 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. |

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Deployments

RR1413

| | |
|--------------------|---|
| Website | https://www.bco-dmo.org/deployment/562242 |
| Platform | R/V Roger Revelle |
| Report | http://dmoserv3.who.edu/data_docs/Moyer/SRoF-Ironman-2014-CruiseReport-withdivelogs.pdf |
| Start Date | 2014-11-29 |
| End Date | 2014-12-21 |
| Description | The "Submarine Ring of Fire 2014 - Ironman" Expedition was a cooperative venture with two science parties with overlapping interests and goals. Craig Moyer from Western Washington University led a group funded by the National Science Foundation to conduct research on iron-oxidizing bacteria at hydrothermal vents. Bill Chadwick led a NOAA/PMEL group funded by the NOAA Ocean Exploration and Research Program and focused on the chemical and biological impacts of hydrothermal vent emissions from active submarine volcanoes in the Mariana arc. Additional cruise information and original data are available from the NSF R2R data catalog. |

YK10-11

| | |
|--------------------|--|
| Website | https://www.bco-dmo.org/deployment/783909 |
| Platform | R/V Yokosuka |
| Report | http://www.godac.jamstec.go.jp/catalog/data/doc_catalog/media/YK10-11_all.pdf |
| Start Date | 2010-09-03 |
| End Date | 2010-09-15 |
| Description | For more cruise information, visit http://www.godac.jamstec.go.jp/darwin/cruise/yokosuka/yk10-11/e and http://www.marine-geo.org/tools/search/entry.php?id=YK10-11 . |

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Project Information

RAPID: Larval Abundance, Behavior and Dispersal at Deep-sea Hydrothermal Vents in the Southern Mariana Trough (Mariana Back-arc Vents)

Coverage: Southern Mariana Trough

NSF Award Abstract:

Summary: Since the discovery of deep-sea hydrothermal vents over thirty years ago, scientists have been perplexed by the question: How are these vent sites colonized and, more specifically, How are the faunal populations established and maintained at these very discrete and often ephemeral habitats. For animals that are sessile or have limited mobility as adults, dispersal to these habitats occurs early in the life cycle, as planktonic larvae in the water column. Due to the difficulties in sampling deep-sea larvae, including low abundances (dilute concentrations), we have very few quantitative estimates of larval dispersal between or larval supply to hydrothermal vents. We also have little to no knowledge of the behavior of vent larvae. The PIs will use large-volume plankton pumps to collect larvae near vents in the southern Mariana Trough in a collaborative effort to quantify larval abundance, behavior, and dispersal in this little-studied region. The collaboration combines the PI's strengths in the collection and morphological identification of larvae and quantifying and modeling dispersal between deep-sea vents, and those of Japanese partners in rearing larvae of hydrothermal vent fauna, molecular genetic identification of larvae, and population genetics of vent fauna.

Intellectual merit: The southern Mariana Trough is a very interesting region in which to study dispersal of vent-endemic fauna, due to the proximity of vents in the back-arc spreading center to vents along the Mariana Arc. These two tectonic settings create different habitat conditions and support vent communities with different species composition. Vent sites the PIs will visit, in the axis and just off-axis of the back-arc spreading center are as close as 25 km to vents on the arc, yet 600 km south of the other known vents in the back-arc. In addition to the new information on larval abundance, diversity, behavior, and dispersal that will be gained for this little-studied region of the world's ridge system, this project has direct relevance to the integration and synthesis goals of the U.S. Ridge 2000 Program. The PI's lab group has conducted previous work at the Ridge 2000 East Pacific Rise (EPR) Integrated Studies Site (ISS). They will be making a direct comparison of the larval abundance and diversity at the EPR ISS to this very different setting along the global 'baseball seam' of oceanic spreading centers. No other such comparison has been possible due to the lack of sampling effort for larvae with large-volume pumps. Also, they are proposing the first experiments with live vent larvae (to the best of our knowledge - with the exception of brachyuran megalopae at 1 atm) to estimate swimming and sinking rates that are important for adding behavioral information to models of larval dispersal.

Broader Impacts: The project involves reciprocal training and cultural exchange - the PIs will learn field and laboratory research techniques from the Japanese PIs, and they will learn from the U.S. PIs. The project will also benefit the career development of a junior researcher (Beaulieu). The proposed activity broadens the participation of both U.S. and Japanese women scientists in sea-going, oceanographic research. The PIs will broadcast the cruise activities in a web log posted by the international InterRidge Program Office, and they anticipate at least three scientific publications will emerge. New species will be added to the online photographic identification guide for vent larvae and included in the second edition of the printed guide.

Additional cruise data and information are available from MGDS: <http://www.marine-geo.org/tools/search/entry.php?id=YK10-11>

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Funding

| Funding Source | Award |
|--|-----------------------------|
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1155756 |
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1028862 |

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