MOCNESS tow and sampling metadata from R/V Atlantis cruise AT50-04 in the Gulf of Mexico and Northwestern Atlantic in late October 2022

Website: https://www.bco-dmo.org/dataset/967487
Data Type: Cruise Results
Version: 1
Version Date: 2025-07-08

Project
» Collaborative Research: dispersal depth and the transport of deep-sea, methane-seep larvae around a biogeographic barrier (SALT)

Contributors	Affiliation	Role
Arellano, Shawn M.	Western Washington University (WWU)	Principal Investigator
Eggleston, David B.	North Carolina State University (NCSU)	Principal Investigator
Young, Craig M.	University of Oregon (OIMB)	Principal Investigator
He, Ruoying	North Carolina State University (NCSU)	Co-Principal Investigator
Plowman, Caitlin Q.	University of Oregon (OIMB)	Student
York, Amber D.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Metadata for MOCNESS (Multiple Opening and Closing Net Environmental Sampling System) tows for the AT50-04 cruise in the Gulf of Mexico and Northwestern Atlantic in late October 2022. Includes depths and environmental data for each net as well as what fraction of each sample was sorted at sea vs. preserved.

Table of Contents

Coverage

Location: Western Atlantic margin and Gulf of Mexico from Woods Hole to Gulfport, Mississippi, depth range 500 m-3300 m
Spatial Extent: **N**:38.048 **E**:-73.822 **S**:26.039 **W**:-91.508
Temporal Extent: 2022-10-13 - 2022-11-01

Dataset Description

See "Related Datasets" section for other logs and sample lists from this cruise. Data from this and other cruises in this project are listed under the SALT project page https://www.bco-dmo.org/project/820030.

SALT = Seep Animal Larval Transport.

Methods & Sampling

Used a MOCNESS (Multiple Opening and Closing Net Environmental Sampling System) with nine nets that each had a mesh size of 150 µm. Cod ends were rinsed with chilled, 0.2 µm filtered seawater and then fractionated. Depending on the density of the sample, one quarter to all of the sample was sorted for larvae at sea. The rest of the sample was preserved in 95% ethanol for later sorting in the lab.

Individual nets were used to sample discrete depth bins from 100 m above the bottom to the surface. Depth bins were either the full depth divided by the number of nets, or set to match previous samples from the SEEPC project. All tows were done at night, in full darkness.

BCO-DMO Processing Description

* Sheet 1 of submitted file "AT50-04 MOCNESS Metadata.xlsx" was imported into the BCO-DMO data system for this dataset. Values "NA" imported as missing data values. Table will appear as Data File: 967487_v1_at50-04_mocness-tow-metadata.csv (along with other download format options).

Missing Data Identifiers:
* In the BCO-DMO data system missing data identifiers are displayed according to the format of data you access. For example, in csv files it will be blank (null) values. In Matlab .mat files it will be NaN values. When viewing data online at BCO-DMO, the missing value will be shown as blank (null) values.

* Column names adjusted to conform to BCO-DMO naming conventions designed to support broad re-use by a variety of research tools and scripting languages. [Only numbers, letters, and underscores. Can not start with a number]

* Comment in excel file "All tows done at night, in full darkness" added to Methods & Sampling metadata section.

Problem Description

Had one site (Brine Pool) where the net triggering system failed and only a single integrated sample through the whole water column was obtained. We did not use all nine nets at each site.

[table of contents | back to top]

Related Datasets

IsRelatedTo

Young, C. M., Arellano, S. M., Eggleston, D. B., He, R. (2024) **AT50-04 Alvin Dive Summary.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-11-27 http://lod.bco-dmo.org/id/dataset/944734 [view at BCO-DMO]
Relationship Description: Related sampling logs and metadata collected during the same cruise as part of the same study.

Young, C. M., Arellano, S. M., Eggleston, D. B., He, R. (2024) **AT50-04 Larval Sample List.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-11-27 http://lod.bco-dmo.org/id/dataset/944748 [view at BCO-DMO]
Relationship Description: Related sampling logs and metadata collected during the same cruise as part of the same study.

Young, C. M., Arellano, S. M., Eggleston, D. B., He, R. (2024) **List of biological samples taken during the R/V Atlantis cruise AT50-04 in the Gulf of Mexico and Northwestern Atlantic in late October 2022.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-11-25 http://lod.bco-dmo.org/id/dataset/944426 [view at BCO-DMO]
Relationship Description: Related sampling logs and metadata collected during the same cruise as part of the same study.

Young, C. M., Arellano, S. M., Eggleston, D. B., He, R. (2025) **Larvae from Seafloor Larval Observatory (SLO) benthic traps with RNALater deployed during cruise TN391 (Jun 2021) and recovered on cruise AT50-04 (Oct 2022) in the Gulf of Mexico and Western Atlantic.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2025-07-07 http://lod.bco-dmo.org/id/dataset/966932 [view at BCO-DMO]
Relationship Description: Related sampling logs and metadata collected during the same cruise as part of the same study.

[table of contents | back to top]

Parameters

Parameter	Description	Units
Date	Date of samping	unitless
Basin	Basin (e.g. Gulf of Mexico)	unitless
Site	Site identifier	unitless
Tow_num	Deployment or cast number for this cruise	unitless
Net_num	Net number (identfier)	unitless
Target_Depths	Anticipated depth bins for each net	meters (m)
Actual_Depths	Actual depth bins for each net	meters (m)
Volume	volume of water sampled by each net	cubic meters (m^3)
Temp	Temperature	degrees Celsius
Conductivity	Conductivity	unknown
Salinity	Salinity	unknown
Fraction_Sorted	fraction of the total sample that was live-sorted at sea	unitless
Fraction_Preserved	fraction of the total sample that was preserved and not sorted	unitless
Notes	Notes	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	MOCNESS1
Dataset-specific Description	The 1-m2 MOCNESS was borrowed from the University of Miami and used with nine 150 µm mesh nets.
Generic Instrument Description	The Multiple Opening/Closing Net and Environmental Sensing System or MOCNESS is a family of net systems based on the Tucker Trawl principle. The MOCNESS-1 carries nine 1-m2 nets usually of 335 micrometer mesh and is intended for use with the macrozooplankton. All nets are black to reduce contrast with the background. A motor/toggle release assembly is mounted on the top portion of the frame and stainless steel cables with swaged fittings are used to attach the net bar to the toggle release. A stepping motor in a pressure compensated case filled with oil turns the escapement crankshaft of the toggle release which sequentially releases the nets to an open then closed position on command from the surface. -- from the MOCNESS Operations Manual (1999 + 2003).

[table of contents | back to top]

Deployments

AT50-04

Website	https://www.bco-dmo.org/deployment/944442
Platform	R/V Atlantic Explorer
Start Date	2022-10-13
End Date	2022-11-01

[table of contents | back to top]

Project Information

Collaborative Research: dispersal depth and the transport of deep-sea, methane-seep larvae around a biogeographic barrier (SALT)

Website: https://wp.wwu.edu/arellanolab/category/salt/

Coverage: Methane seeps on the shelf and slope of Louisiana, Mississippi, Florida, North Carolina, Virginia and Maryland

NSF Award Abstract:
Ever since hydrothermal vents and methane seeps were first discovered in the deep ocean more than 40 years ago, scientists have wondered how these isolated communities, fully dependent on underwater "islands" of toxic chemicals, are first colonized by organisms, and how the populations of these specialized animals are exchanged and maintained. These fundamental processes depend on the transport of babies (larvae) by the ocean currents, yet because the larvae are microscopic and diluted in the vastness of the ocean, it is very difficult to determine where and how they drift. This project uses an autonomous underwater vehicle to collect larvae from precise regions of the water column. Larval traps on the bottom and chemical analyses of larval

shells will also be used to determine the depths where larvae swim. These findings will provide realistic estimates for mathematical models that show how biology interacts with ocean currents to predict which methane seeps will be colonized by larvae originating at different depths. A detailed knowledge of larval dispersal is needed for conservation and management of the deep sea. Without such information, we cannot know the best placement of marine protected areas, nor can we facilitate the reestablishment of communities impacted by deep-sea mining, drilling, or other human activities. This project will provide hands-on at-sea training for college students to learn the rapidly vanishing skills needed for studies of larvae and embryos in their natural habitats. Learning opportunities will also be available to individuals of all ages through new, interactive exhibits on deep-sea biology and larval ecology produced for small museums and aquaria on the coasts of Oregon, Washington and North Carolina.

Reliable estimates of connectivity among metapopulations are increasingly important in marine conservation biology, ecology and phylogeography, yet biological parameters for biophysical models in the deep sea remain largely unavailable. The movements of deep-sea vent and seep larvae among islands of habitat suitable for chemosynthesis have been inferred from current patterns using numerical modeling, but virtually all such models have used untested assumptions about biological parameters that should have large impacts on the predictions. This project seeks to fill in the missing biological parameters while developing better models for predicting the dispersal patterns of methane seep animals living in the Gulf of Mexico and on the Western Atlantic Margin. Despite the existence of similar seeps at similar depths on two sides of the Florida peninsula, the Western Atlantic seeps support only a subset of the species found in the Gulf of Mexico. It is hypothesized that the ability of larvae to disperse through the relatively shallow waters of the Florida Straits depends on an interaction between the adult spawning depth and the dispersal depth of the larvae. Dispersal depth, in turn, will be influenced by larval flotation rates, swimming behaviors, feeding requirements, and ontogenetic migration patterns during the planktonic period. The recently developed SyPRID sampler deployed on AUV Sentry will be used to collect larvae from precise depth strata in the water column, including layers very near the ocean floor. Larval traps deployed on the bottom at three depths in each region will be used in conjunction with the plankton collections to determine what proportion of larvae are demersal. Comparisons of stable oxygen isotopes between larval and juvenile mollusk shells will provide information on the temperatures (and therefore depths) that larvae develop, and geochemical analyses of larval and juvenile shells will determine whether larval cohorts mix among depth strata. Ocean circulation and particle transport modeling incorporating realistic biological parameters will be used to predict the movements of larvae around the Florida Peninsula for various spawning depths and seasons.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1851383
NSF Division of Ocean Sciences (NSF OCE)	OCE-1851286
NSF Division of Ocean Sciences (NSF OCE)	OCE-1851421

[table of contents | back to top]