Summary of ROV Jason dives that occurred during R/V Thomas G. Thompson cruise TN391 (Woods Hole, Massachusetts to Gulfport, Mississippi) in May and June 2021

Website: https://www.bco-dmo.org/dataset/894001
Data Type: Cruise Results
Version: 1
Version Date: 2023-04-17

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

Contributors	Affiliation	Role
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Abstract
This dataset is a summary of ROV Jason dives that occurred during R/V Thomas G. Thompson cruise TN391 (Woods Hole, Massachusetts to Gulfport, Mississippi) in May and June 2021. This cruise was number three in a series of four cruises from the project titled "Collaborative Research: dispersal depth and the transport of deep-sea, methane-seep larvae around a biogeographic barrier", also called "SALT" for short.

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Coverage

Spatial Extent: **N**:38.0481 **E**:-73.8213 **S**:26.0338 **W**:-91.5081
Temporal Extent: 2021-05-28 - 2021-06-16

Methods & Sampling

ROV Jason dives were coordinated with AUV Sentry Dives utilizing the SyPRID plankton sampler. Dives were conducted during R/V Thomas G. Thompson cruise TN391 (Woods Hole, Massachusetts to Gulfport, Mississippi) in May and June 2021.

Data Processing Description

BCO-DMO Processing:
- removed 'N/A' as missing data value (appears as blank/empty in final csv);
- converted date-time field to ISO 8601 format;
- renamed fields to comply with BCO-DMO naming conventions.

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Related Datasets

IsRelatedTo

Arellano, S. M., Eggleston, D. B., Young, C. M., He, R. (2023) **Summary of AUV Sentry dives that occurred during R/V Thomas G. Thompson cruise TN391 (Woods Hole, Massachusetts to Gulfport, Mississippi) in May and June 2021.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-04-17 http://lod.bco-dmo.org/id/dataset/894034 [view at BCO-DMO]
Relationship Description: ROV Jason dives were coordinated with AUV Sentry Dives on the TN391 cruise.

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Parameters

Parameter	Description	Units
Lowering_Id	Dive ID number	unitless
Line_Area_Site	Name of the line, area, or site of sampling	unitless
Start_Ops_ISO_DateTime	Date and time at start of sampling operations; in ISO 8601 format	unitless
Beginning_Lat	Latitude at the beginning of the dive	degrees North
Beginning_Long	Longitude at the beginning of the dive	degrees East
Ending_Lat	Latitude at the end of the dive	degrees North
Ending_Long	Longitude at the end of the dive	degrees East
Max_Depth	Maximum dive depth	meters (m)

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Instruments

Dataset-specific Instrument Name	ROV Jason
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

TN391

Website	https://www.bco-dmo.org/deployment/893731
Platform	R/V Thomas G. Thompson
Start Date	2021-05-25
End Date	2021-06-20
Description	See more information at R2R: https://www.rvdata.us/search/cruise/TN391 During the TN391 cruise, we conducted 14 dives with the ROV Jason to collect animal specimens from the seafloor and to recover/redeploy Seep Larval Observatories (SLOs) from each sample site. We also had 12 dives with the AUV Sentry to use the SyPRID plankton sampler. Additionally, five CTD casts were conducted during the duration of the cruise.

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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.

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Funding

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

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