Summary of larval samples taken during the R/V Endeavor cruise EN658 in the Gulf of Mexico and Northwestern Atlantic in Oct to Nov of 2020

Website: https://www.bco-dmo.org/dataset/966968
Version: 1
Version Date: 2025-07-07

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
Summary of larval samples collected on the EN658 cruise in the Gulf of Mexico and Northwestern Atlantic in Oct/Nov 2020. Larvae were picked out of plankton collected either with a hand net or with the SyPRID sampler on AUV Sentry.

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Coverage

Location: Narragansett, Rhode Island to Gulfport, Mississippi
Spatial Extent: **N**:38.051 **E**:-76.193 **S**:23.982 **W**:-91.508
Temporal Extent: 2020-10-10 - 2020-11-07

Methods & Sampling

Plankton samples were taken using 150 µm mesh nets. Samples were collected from 0-200 meters using a hand net attached to the ship's winch, or from less than 100 meters above bottom using the SyPRID sampler attached to AUV Sentry.

BCO-DMO Processing Description

* Sheet "Sample Data" of submitted file "EN658 Master Sample List.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:

966968_v1_en658-master-sample-list.csv (along with other download format options).

* Extended ASCII Apostrophe character in "A-B, couldn’t get a pic of it out" changed to non-extended ASCII charset for interoperability purposes '.

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]

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Parameters

Parameter	Description	Units
Site	Site name	unitless
Sample_ID	Sample identifier	unitless
Form_Morphotype_ID	A two letter code signifying the larval type and a number denoting morphotype (see supplemental files for more information)	unitless
Photo_ID	File name of any associated photo(s)	unitless
Notes	Comments/Notes	unitless
Num_Individuals	Number of individuals	count per individual

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Plankton Net
Dataset-specific Description	Small plankton net with 150 µm mesh
Generic Instrument Description	A Plankton Net is a generic term for a sampling net that is used to collect plankton. It is used only when detailed instrument documentation is not available.

Dataset-specific Instrument Name	
Generic Instrument Name	Sentry Precision Robotic Impeller Driven Sampler
Dataset-specific Description	SyPRID (Sentry's Precision Robotic Impeller-Driven) sampler with 150 µm mesh affixed the AUV Sentry
Generic Instrument Description	The SyPRID (Sentry Precision Robotic Impeller Driven) sampler is an innovative deep-rated (6000 m) plankton sampler that partners with the Sentry Autonomous Underwater Vehicle (AUV) to obtain paired, large-volume plankton samples at specified depths and survey lines to within 1.5 m of the seabed and with simultaneous collection of sensor data. SyPRID uses a perforated Ultra-High-Molecular-Weight (UHMW) plastic tube to support a fine mesh net within an outer carbon composite tube (tube-within-a-tube design), with an axial flow pump located aft of the capture filter. The pump facilitates flow through the system and minimizes the bow wave at the mouth opening. The cod end, a hollow truncated cone, is also made of UHMW plastic and is designed to 'soften' the landing of zooplankton on the capture surface. SyPRID attaches as a saddle-pack to the Sentry vehicle. Sentry itself is configured with a flight control system that enables autonomous survey paths to altitudes as low as 1.5 m. In its inaugural deployment at the Blake Ridge Seep (2160 m) on the US Atlantic Margin, SyPRID was operated for 6 h at an altitude of 5 m. It recovered plankton samples from that stratum in excellent condition and with greater larval numbers than recovered in a typical 'near-bottom' MOCNESS sample from comparable habitats and depths. The prototype SyPRID and its next generations will enable studies of plankton or other particulate distributions associated with patchy habitats, localized physico-chemical strata (e.g., above and below the thermocline), or discrete water masses at an unprecedented spatial resolution for a large volume system [1]. More information is available by contacting: Carl Kaiser Program Manager Applied Ocean Physics & Engineering NDSF AUV Operations Manager Office Phone: +1 508 289 3269 ckaiser@whoi.edu [1] Billings, A., Kaiser, C., Young, C. M., Hiebert, L. S., Cole, E., Wagner, J. K. S., & Van Dover, C. L. (2017). SyPRID sampler: A large-volume, high-resolution, autonomous, deep-ocean precision plankton sampling system. In Deep Sea Research Part II: Topical Studies in Oceanography (Vol. 137, pp. 297–306). Elsevier BV. https://doi.org/10.1016/j.dsr2.2016.05.007

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Deployments

EN658

Website	https://www.bco-dmo.org/deployment/893849
Platform	R/V Endeavor
Start Date	2020-10-22
End Date	2020-11-07
Description	See more information at R2R: https://www.rvdata.us/search/cruise/EN658 During this cruise, we had four dives with AUV Sentry to use the SyPRID plankton sampler. We also took 14 plankton samples from 0-200 m depth using a standard plankton net.

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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
NSF Division of Ocean Sciences (NSF OCE)	OCE-1851286
NSF Division of Ocean Sciences (NSF OCE)	OCE-1851421

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