

List of plankton samples collected with the SyPRID sampler on AUV Sentry during R/V Thomas G. Thompson cruise TN391 in the western Atlantic margin and Gulf of Mexico in 2021

Website: <https://www.bco-dmo.org/dataset/994779>

Data Type: Cruise Results

Version: 1

Version Date: 2026-03-16

Project

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

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Abstract

List of plankton samples collected with the SyPRID sampler on AUV Sentry during the TN391 cruise to methane seeps in the Gulf of Mexico and Northwestern Atlantic during May and June 2021. Samples were collected between the Western Atlantic margin and Gulf of Mexico from Woods Hole to Gulfport, Mississippi, depth range 500 m-3300 m.

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Coverage

Location: Gulf of Mexico, Northwestern Atlantic

Spatial Extent: N:39.04834 E:-73.8202 S:26.02124 W:-91.5051

Temporal Extent: 2021-05-26 - 2021-06-17

Dataset Description

See the "Related Datasets" section for additional scientific sample lists, dive summaries, and related datasets

from this cruise. Samples from this cruise include: benthic invertebrate samples collected by ROV Jason, plankton samples collected with the SyPRID sampler on Sentry, and water samples collected with niskin bottles on the CTD carousel.

Methods & Sampling

Plankton samples were collecting using the SyPRID (Sentry's Precision Robotic Impeller-Driven) sampler with 150 µm mesh affixed to AUV sentry.

BCO-DMO Processing Description

Data submission included three separate sample lists supplied as separate sheets in the same excel file TN-391 Master Sample List.xlsx (each became a BCO-DMO dataset, see "Related Datasets").

Data File:

- Loaded data from "TN-391 Master Sample List.xlsx" (sheet: "SyPRID"), using row 2 as header, skipping row 1, treating empty strings as missing values
- Renamed 14 columns to meet BCO-DMO naming conventions: "Dive #" to "Dive_num", "Lat (ddeg)" to "Lat", "Lon (ddeg)" to "Lon", "timestamp START (UTC)" to "timestamp_START_UTC", "timestamp END (UTC)" to "timestamp_END_UTC", "Volume sampled (L)" to "Volume_sampled", "# of larvae" to "num_of_larvae", "larvae / L" to "larvae_per_L", "# of morphotypes" to "num_of_morphotypes", "# of NEW morphotypes" to "num_of_NEW_morphotypes", "# of containers" to "num_of_containers", "Recipient of Sample" to "Recipient_of_Sample", and "Zooka(Port or Stbd)" to "Zooka_Port_or_Stbd"
- Appended "Z" suffix to all non-empty values in timestamp_START_UTC and timestamp_END_UTC to make values datetime with timezone included (ISO 8601 format).
- Set field types: timestamp_START_UTC and timestamp_END_UTC as datetime (%Y-%m-%dT%H:%M:%SZ), Duration as time (%H:%M:%S), Lat and Lon as number, larvae_per_L as number, Volume_sampled as integer, num_of_larvae/num_of_morphotypes/num_of_NEW_morphotypes/num_of_containers as integer, and Container, Depth, Dive_num, Preservation, Recipient_of_Sample, Site, Zooka_Port_or_Stbd as string
- Output written to 994779_v1_tn391-plankton-sample-list.csv

Metadata:

- Parameter (column) descriptions filled in from metadata provided for this data submission, and additional details filled in from context from Standard Jason Data products (see related methods reference about "Renav"). Definitions from related dive summary dataset also used to fill in definitions (see "Related Datasets").

Problem Description

Plankton samples from the Florida Keys site were collected using a 150 µm mesh hand net on the ship's winch instead of SyPRID on Sentry. Hand net sample data is combined with SyPRID sample data for comparative purposes.

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Related Publications

National Deep Submergence Facility (2026). Data Deliverables Summary for AUV Sentry. Accessed March 19th, 2026 from <https://nds.f.whoi.edu/data/sentry-auv-delivered-data-summary/> [sentry_data_deliverables_2026 Methods](#)

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Related Datasets

IsRelatedTo

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Parameters

Parameter	Description	Units
Dive_num	Dive number (dive id)	unitless
Site	Site name	unitless
Zooka_Port_or_Stbd	One of two sampling tubes (port or starboard) on the SyPRID sampler	unitless
timestamp_START_UTC	Starting timestamp (datetime) in UTC time zone.	unitless
timestamp_END_UTC	Ending timestamp (datetime) in UTC time zone.	unitless
Lat	Latitude	decimal degrees
Lon	Longitude	decimal degrees
Depth	Depth (nominal target depth)	meters (m)
Duration	Sample duration (elapsed hours and minutes in format hh:mm)	hours and minutes elapsed
Volume_sampled	Volume sampled	liters (L)
num_of_larvae	Number of larvae in sample	count (larvae)
larvae_per_L	Larval concentration (number per liter)	number per liter (#/L)
num_of_morphotypes	The number of unique larval morphotypes in the sample	count (unique larval morphotype)
num_of_NEW_morphotypes	The number of unique larval morphotypes not seen in previously collected samples on the same cruise	count (new unique larval morphotype)
Preservation	Preservation method	unitless

Container	Type of container	unitless
num_of_containers	Number of containers	count (containers)
Recipient_of_Sample	Recipient of the sample (either WWU or OIMB)	unitless

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	AUV Sentry
Dataset-specific Description	AUV Sentry with SyPRID attached.
Generic Instrument Description	<p>The autonomous underwater vehicle (AUV) Sentry is a fully autonomous underwater vehicle capable of exploring the ocean down to 6,000 meters (19,685 feet) depth. Sentry builds on the success of its predecessor the ABE, with improved speed, range, and maneuverability. Sentry's hydrodynamic shape also allows faster ascents and descents. Sentry carries a superior science sensor suite and an increased science payload enabling it to be used for both mid-water and near-seabed oceanographic investigations. Sentry produces bathymetric, sidescan, subbottom, and magnetic maps of the seafloor and is capable of taking digital bottom photographs in a variety of deep-sea terrains such as mid-ocean ridges, deep-sea vents, and cold seeps at ocean margins. Sentry is uniquely able to operate in extreme terrain, including volcano caldera and scarps. Sentry's navigation system uses a doppler velocity log and inertial navigation system, aided by acoustic navigation systems (USBL or LBL). The USBL system also provides acoustic communications, which can be used to obtain the vehicle state and sensor status as well as to retask the vehicle while on the bottom. In addition its standard sensors, Sentry has carried a variety of science-supplied sensors, including the Nakamura redox potential probe, ACFR 3-D imaging system, and the Tethys in-situ mass spectrometer. Sentry can be used to locate and quantify hydrothermal fluxes. Sentry is also capable of a much wider range of oceanographic applications due to its superior sensing suite, increased speed and endurance, improved navigation, and acoustic communications. Sentry can be used as a stand alone vehicle or in tandem with Alvin or an ROV to increase the efficiency of deep-submergence investigations. More information is available from the operator site at URL: https://ndsf.whoi.edu/sentry/</p>

Dataset-specific Instrument Name	SyPRID
Generic Instrument Name	AUV Sentry Precision Robotic Impeller Driven Sampler
Generic Instrument Description	<p>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</p>

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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.wvu.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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