MOCNESS and environmental data from R/V Endeavor cruise EN723 on the US NE Shelf Break in October 2024

Website: https://www.bco-dmo.org/dataset/1005642
Data Type: Cruise Results
Version: 1
Version Date: 2026-10-06

Project
» Collaborative Research: an autonomous profiling vehicle for concurrent acoustic, visual and environmental measurements in the mesopelagic ocean (VAMPIRE creation)

Contributors	Affiliation	Role
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Abstract
In October 2024, the R/V Endeavor cruise EN723 was conducted on the US NE Shelf Break. The MOCNESS tow nets were deployed from October 22-26th. Files from MOCNESS net tows were produced by LVpki software and include additional environmental data from the onboard CTD. This dataset includes environmental sensor data—pressure, in situ temperature, potential temperature (θ), salinity, potential density anomaly (σ), and dissolved oxygen concentration (ml L^{-1})—alongside MOCNESS net data (net angle, volume filtered, and trip information) and associated calibration parameters. Raw environmental data are provided in .hex files with corresponding .xmlcon configuration files, while processed .pro files contain synchronized net and environmental data.

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Coverage

Location: Atlantis Canyon, East area
Spatial Extent: **N**:39.9939 **E**:-70.1771 **S**:39.8693 **W**:-70.2484
Temporal Extent: 2024-10-22 - 2024-10-27

Methods & Sampling

In October 2024, the R/V Endeavor cruise EN723 was conducted on the US NE Shelf Break. The MOCNESS tow nets with 222 micron mesh were deployed from October 22-26th. MOCNESS sampling protocols included

targeted vertical day night pairs whose depths were adapted to seafloor depth and canyon topography.

After collection different samples were preserved in formalin for later Zooscan analysis or dried as five size fractionated biomass (200, 500, 1000, 2000, 5000) samples.

The location of the cruise focused on part of the Atlantis Canyon, East area. The canyon has a strong bent mid-way, and in the upper part there is a bowl, and a very low sill closing this bowl form the exit to the bent. The tows were associated with some deployments with a lander that was placed to the NW of the bowl, at about 644 m depth. Other tows focused on canyons themselves.

Data Processing Description

Environmental data was processed by the LVpki software aboard ship.

BCO-DMO Curation Notes

This section documents curation actions performed prior to publication review with the submitter, and additional information relevant to understanding and reusing this dataset. It distinguishes changes made to the submitted (meta)data from unresolved issues and/or enhancements that improve future reuse and interoperability.

CURATION ACTIONS PERFORMED ON DATA
- Loaded five tab-delimited MOCNESS profile files: MOCNESS_40A.PRO, MOCNESS_41A.PRO, MOCNESS_42A.PRO, MOCNESS_43A.PRO, MOCNESS_44A.PRO and applied header list (time, pres, echo, temp, theta, sal, sigma, angle, flow, hzvel, vtvel, vol, net, fluor, ptran, oxygen, IrC, Irrad, lat, lon, GPSTIME, CTDDEPTH(M), voln2, RSP) to each file, skipped rows 1-7
- Values recorded as "", "nd", "-99.0", -9999.0". "-99.0000", "-9999.0000", "-99.00000", "-99" or 9999 were set as missing-value indicators and set to blank cells.
- Added ISO_DateTime column derived from the decimal day-of-year time values (year = 2024, January 1 = day 1 converted to ISO 8601 format, UTC timzone).
- Concatenated the five resources into a single table, used filename as tow identifier
- Renamed columns: CTDDEPTH(M) to CTDDEPTH_M
- Saved as 1005642_v1_mocness.csv
- Added raw data (.hex, .xmlcon & .pro files) as supplemental files

CURATION ACTIONS PERFORMED ON METADATA
- Standard metadata entry and text formatting steps were performed.

ISSUES POTENTIALLY IMPACTING REUSE
- NA

Problem Description

Lat/Long was not connected at the start of M42 so data is missing for the first few minutes of the tow. It was connected eventually.

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Data Files

File	
1005642_v1_mocness.csv	(Comma Separated Values (.csv), 6.16 MB) MD5:33b858f1d346bddbbcaa783d6e00d490
Primary data file for dataset ID 1005642, version 1	

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Supplemental Files

File	
MOCNESS_EN723.zip	(ZIP Archive (ZIP), 13.33 MB) MD5:a9119e81fe060a19f172a60f42d9f0a2
MOCNESS-mounted raw Sea-Bird CTD data (.hex, .xmlcon) and processed MOCNESS net and environmental (CTD) data (.pro).	

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Parameters

Parameter	Description	Units
Tow_ID	Tow name and identifier	unitless
time	Decimal day of year (2024), UTC; Jan 1 00:00 UTC = 1.0. Referred to as Julian day.	day
iso_datetime	sampling date time in iso format (UTC timezone)	unitless
pres	pressure	db
echo	altimeter	m
temp	temperature	Celsius
theta	potential temperature	Celsius
sal	salinity	psu
sigma	potential density anomaly	kg/m3
angle	net angle	degrees
flow	measured flow counts	none
hzvel	net horizontal velocity	m/min
vtvel	net vertical velocit	m/min
vol	volume filtered	m3

net	net number	none
fluor	fluorescence	rfu
ptran	percent transmission	%
oxygen	oxygen	ml/L
IrC	Irradiance Temperature	Celsius
Irrad	Irradiance	W/m2
lat	latitude	decimal
lon	longitude	decimal
GPSTIME	GPS time	GPS time
CTDDEPTH_M	depth	m
voln2	volume filtered from second flow meter	m3
RSP	Net response indicator	none

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	CTD MOCNESS
Dataset-specific Description	The CTD part of the MOCNESS includes 1) a pressure (depth) sensor which is a thermally isolated titanium strain gauge with a standard range of 0-5000 decibars full scale, 2) A Sea Bird temperature sensor whose frequency output is measured and sent to the surface for logging and conversion to temperature by the software in the MOCNESS computer (The system allows better than 1 milli-degree resolution at 10 Hz sampling rate), and 3) A Sea Bird conductivity sensor whose output frequency is measured and sent to the surface for logging and conversion to conductivity by the software in the computer (The system allows better than 1 micro mho/cm at 10 Hz sampling rate). The data rate depends on the speed of the computer and the quality of the cable. With a good cable, the system can operate at 2400 baud, sampling all variables at 2 times per second. One sample every 4 seconds is the default, although the hardware can operate much faster. (From The MOCNESS Manual)
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Dataset-specific Instrument Name	MOCNESS system equipped with SIO electronics
Generic Instrument Name	MOCNESS
Dataset-specific Description	Instrument Description: Environmental data was collected by a MOCNESS system equipped with SIO electronics (seabird 9 aboard, with connection through seabird 11 deck box). Sensors included Temperature, Pressure, Conductivity, Oxygen and a Fluorometer. Net itself was a 1-m2 MOCNESS equipped with 10 nets with 222 micron mesh.
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. There are currently 8 different sizes of MOCNESS in existence which are designed for capture of different size ranges of zooplankton and micro-nekton Each system is designated according to the size of the net mouth opening and in two cases, the number of nets it carries. The original MOCNESS (Wiebe et al, 1976) was a redesigned and improved version of a system described by Frost and McCrone (1974). (from MOCNESS manual)

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Deployments

EN723

Website	https://www.bco-dmo.org/deployment/1006698
Platform	R/V Endeavor
Start Date	2024-10-20
End Date	2024-10-28

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Project Information

Collaborative Research: an autonomous profiling vehicle for concurrent acoustic, visual and environmental measurements in the mesopelagic ocean (VAMPIRE creation)

Coverage: North Atlantic

NSF award abstract:
The mesopelagic region of the ocean, between 200 and 1500 meters deep, is home to a complex mixture of physical processes, biological environments and animal communities that interact over a range of temporal and spatial scales. The mesopelagic remains poorly sampled due to the inherent limitations and asynchrony of measurements collected with ship-based instruments, acoustic surveys, remotely operated and towed vehicle systems. This project will develop a novel autonomous robotic instrument to collect physical, visual and acoustic data that will provide concurrent environmental, abundance, taxonomy and size structure data for animals ranging from 100 microns to 10 centimeters in size. The suite of sensors, coupled with a non-disruptive propulsion system and the operational flexibility of the new system will address critical knowledge gaps in our understanding of the ecology of the ocean's midwater zone. The vehicle will be tested on several cruises in the North Atlantic. The researchers will leverage the ongoing Bermuda Atlantic Time Series (BATS) datasets for cross-comparison and validation. This project will also create research opportunities for undergraduate and graduate students at the University of Rhode Island, Stony Brook University and the Bermuda Institute of Ocean Sciences (BIOS). Public outreach will be facilitated through a partnership with the William M. Davies, Jr. Career and Technical High School, the Rhode Island Teacher-At-Sea program and the BIOS Mid-Atlantic Robotics IN Education (MARINE) program. These activities will develop activities to support STEM education and Next Generation Science Standards.

The proposed instrument will be a stealthy vertical profiling vehicle. The sensor suite will consist of steerable multiple-frequency (38/70/200 kHz) broadband acoustics, stereo low light imaging, an Underwater Vision Profiler (UVP6), and environmental sensors for temperature, salinity, oxygen, chlorophyll, turbidity, beam attenuation and photosynthetically active radiation (PAR). Vertical propulsion will be achieved by an internal pumped volume ballasting system, which will create minimal disturbance around the vehicle to reduce avoidance behaviors known to bias observations from net tows and thruster-powered vehicles. Low light cameras will enable taxonomic documentation and size discrimination of larger organisms and gelatinous animals not quantitatively captured in net tows. The concurrent acoustics and environmental data will provide more complete habitat information than is possible with shipboard systems alone. With these capabilities the instrument will occupy an unfilled niche for sensing in the mesopelagic.

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-2123560
NSF Division of Ocean Sciences (NSF OCE)	OCE-2123545
NSF Division of Ocean Sciences (NSF OCE)	OCE-2123648

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