Continuous MOCNESS data files from R/V Atlantic Explorer cruise AE1910 during May 2019

Website: https://www.bco-dmo.org/dataset/777838
Data Type: Cruise Results
Version: 1
Version Date: 2019-09-25

Project
» Collaborative Research: Diel physiological rhythms in a tropical oceanic copepod (Zooplankton Diel Rhythm)

Contributors	Affiliation	Role
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Abstract
Continuous MOCNESS data files from R/V Atlantic Explorer cruise AE1910 during May 2019.

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Coverage

Spatial Extent: **N**:32.40686 **E**:-64.03334 **S**:32.1474 **W**:-64.8013
Temporal Extent: 2019-05-20 - 2019-05-23

Methods & Sampling

The MOCNESS was oddly configured for this cruise. It was being powered by the new SIO system rather than the BESS instrumentation. All of the typical sensors had, however, been removed to support the use of a closing cod end system. Consequently the program did not calculate volume filtered (which you can calculate by multiplying flow counts by 5.8). Additionally there were some electronics errors (cast 5 and 6). These successfully captured organisms, but we flew the net blind.

Data Processing Description

Data Processing: Data from the net files was extracted using SBEDataProcessing software.

Problem Report: There were some electronics errors (cast 5 and 6). These successfully captured organisms, but we flew the net blind. For net 5 there is a net file, but for tow 6 even the net file was empty.

BCO-DMO Processing:

- added parameter names (using names from file header);
- converted to tsv files;
- aggregated data from separate tows into one dataset;
- added date/time from file header: NMEA UTC (Time) (and re-formatted to ISO8601 format).

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Data Files

File
AE1910_MOC_continuous.csv (Comma Separated Values (.csv), 61.71 MB) MD5:db969eb57eca3a5e86ebd4715778b37f Primary data file for dataset ID 777838

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Parameters

Parameter	Description	Units
tow	Tow number (based on file name)	unitless
date_start	Date UTC at start of tow (from file header); format: yyyy-mm-dd	unitless
time_start	Time UTC at start of tow (from file header); format: hh:mm:ss	unitless
ISO_DateTime_UTC_start	Date and time (UTC) at start of tow formatted ISO8601 standard: yyyy-mm-ddTHH:MM:SS	unitless
cruise	Cruise identifier	unitless
depSM	Depth	meters (m)
prDE	Pressure, Digiquartz	psi
latitude	Latitude; -99 = no data	decimal degrees
longitude	Longitude; -99 = no data	decimal degrees
timeM	Time elapsed	minutes
flag	Flag	unitless

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Instruments

Dataset-specific Instrument Name	MOCNESS
Generic Instrument Name	MOCNESS1
Dataset-specific Description	1 m MOCNESS, 150 micron 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).

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Deployments

AE1910

Website	https://www.bco-dmo.org/deployment/772516
Platform	R/V Atlantic Explorer
Report	http://datadocs.bco-dmo.org/docs/Zooplankton_Diel_Rhythm/data_docs/AE1910_Cruise_report_ZDR.pdf
Start Date	2019-05-20
End Date	2019-05-23
Description	Additional cruise data may be available from the Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/AE1910

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Project Information

Collaborative Research: Diel physiological rhythms in a tropical oceanic copepod (Zooplankton Diel Rhythm)

Coverage: Bermuda

NSF Award Abstract:
The daily vertical migration (DMV) of zooplankton and fish across hundreds of meters between shallow and deep waters is a predominant pattern in pelagic ecosystems. This migration has consequences for biogeochemical cycling as it moves a substantial portion of fixed carbon and nitrogen (an estimated 15 to 40 % of the total global organic export) from the surface directly to depth where it feeds the midwater food chain and sequesters nutrients away from atmospheric mixing. Estimates and predictions of these fluxes are, however, poorly understood at present. New observations have shown that one source of uncertainty is due to the assumption that metabolic rates and processes do not vary over the course of the day, except based on changes in temperature and oxygen availability. Rates are, however, also driven by differences in feeding,

swimming behavior, and underlying circadian cycles. The objective of this project is to improve the ability of scientists to understand and predict zooplankton contributions to the movement of carbon and nitrogen in the ocean by detailing daily changes in physiological processes of these organisms. By producing a set of respiration and excretion measurements over a daily time series, paired with simultaneously collected gene and protein expression patterns for an abundant vertically migratory species, the investigators will provide unprecedented and predictive insight into how changes in the environment affect the contribution of zooplankton to biogeochemical fluxes. The sampling design of the project will advance discovery and understanding by providing hands-on training opportunities to at least two undergraduate researchers. The project will broaden dissemination of the research via development of an educational module, focusing on rhythms in the ocean. The module will initially be piloted with the Bermuda Institute of Ocean Sciences (BIOS) summer camp students and then disseminated through the BIOS Explorer program, the Teacher Resources Page on the BIOS website, and published in a peer-reviewed educational journal.

This project will characterize the metabolic consequences of daily physiological rhythms and DVM for a model zooplankton species, the abundant subtropical copepod Pleuromamma xiphias. Flux processes (oxygen consumption, carbon dioxide production, production of ammonium and fecal pellet production) will be interrogated using directed experiments testing the effects of temperature, feeding and circadian cycle. Circadian cycling will further be examined using transcriptomic and proteomic profiling. These experiments will be related to field samples taken at 6-h intervals over the course of the diel migration using an integrated suite of molecular and organismal metrics. Combined organismal, transcriptomic and proteomic profiles will provide an understanding of which metabolic pathways and associated flux products vary in relation to particular environmental variables (food, light cycle, temperature). Diel variation in metabolic rates will also be assessed across seasons and species using other important migratory groups (pteropod, euphausiid, and another copepod). The metabolic data will then be contextualized with abundance estimates from archived depth-stratified tows to allow scaling to community-level patterns and will be used to improve calculations of zooplankton contribution to particulate organic carbon, nitrogen and respiratory active flux. The results of this study will both improve our flux estimates and provide predictive insight into how various environmental variables influence the underlying physiological pathways generating carbon and nitrogen flux.

Cruise reports are available from the completed cruises:
SD031019
AE1910
AE1918

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1829318
NSF Division of Ocean Sciences (NSF OCE)	OCE-1829378

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