MOCNESS net data from R/V Atlantic Explorer cruise AE1918 in July 2019

Website: https://www.bco-dmo.org/dataset/781508
Data Type: Cruise Results
Version: 1
Version Date: 2019-11-13

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

Contributors	Affiliation	Role
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Abstract
AE1918 was a cruise of opportunity on which two oceanographic sampling activities were conducted: a CTD cast and a MOCNESS net tow. These are the net data from the MOCNESS tow.

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Coverage

Spatial Extent: **Lat**:32.333 **Lon**:-64.553
Temporal Extent: 2019-07-25

Dataset Description

AE1918 was a cruise of opportunity on which two oceanographic sampling activities were conducted: a CTD cast and a MOCNESS net tow. These are the net data from the MOCNESS tow.

Acquisition Description

Standard MOCNESS procedure. It was observed filtered volumes to be too high (and speeds too high), so flowmeter was "recalibrated" using deployments and files reanalyzed. It is likely that, since the flowmeter was too new, after several recent deployments has finally "broken-in" and now goes faster. Flow calibration was done by running the LVpki software for several profiles looking at average CF values.

Refer to the cruise report for more information. See also: the xmlcon and hdr files under Supplemental Files.

Processing Description

Data Processing: Data from the net files was extracted using SBEDataProcessing software. See Supplemental Files for raw data.

Problem Report: The mentioned problem with flow counts.

BCO-DMO Processing:
- added date/time and tow information from file header;
- added ISO-DateTime field;
- removed columns containing no data (Fluor, Trans, Oxy)

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Parameters

Parameter	Description	Units
tow	Tow number	unitless
date_start	Date at start of tow (from file header); format: yyyy-mm-dd	unitless
time_start	Time at start of tow (from file header); format: hh:mm:ss	unitless
ISO_DateTime_UTC_start	Date and time at start of tow formatted ISO8601 standard: yyyy-mm-ddTHH:MM:SS	unitless
cruise	Cruise identifier	unitless
Date	Date; format: yymmdd	unitless
Time	Time; format: hhmmss	unitless
TC	Trip count	unitless
FC	Flow count	counts
NewVol	Corrected volume filtered (re-calculated post-cruise because the originally recorded values were incorrect; incorrect column has been removed from dataset)	cubic meters (m^3)
Pres	Pressure	decibars (dbar)
Temp	Temperature	degrees Celsius
Cond	Conductivity	PSU
Salinity	Salinity	PSU
Angle	Angle of the net	degrees

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Instruments

Dataset-specific Instrument Name	MOCNESS
Generic Instrument Name	MOCNESS1
Dataset-specific Description	Seabird 9/11 unit attached to a 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

AE1918

Website	https://www.bco-dmo.org/deployment/781440
Platform	R/V Atlantic Explorer
Report	http://datadocs.bco-dmo.org/docs/Zooplankton_Diel_Rhythm/data_docs/AE1918_Cruise_Report.pdf
Start Date	2019-07-25
End Date	2019-07-25

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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:SD031019AE1910AE1918

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Funding

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