Bottle data from R/V Atlantic Explorer cruise AE1910 during May 2019

Website: https://www.bco-dmo.org/dataset/774859
Data Type: Cruise Results
Version: 1
Version Date: 2019-08-29

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

Contributors	Affiliation	Role
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Abstract
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Coverage

Spatial Extent: **N**:32.571 **E**:-64.4947 **S**:32.1698 **W**:-64.7887
Temporal Extent: 2019-05-20 - 2019-05-23

Methods & Sampling

The CTD + 24 bottle sampling rosette was run using standard operating procedures. The bottles were fired on the up cast, 30 seconds after the unit was stopped.

Data Processing Description

Data were processed with provided config file (1377_27APR2019_McGreal.xmlcon). CTD data were binned by pressure and the bottle files extracted using SBEDataProcessing software.

BCO-DMO Processing:
- used awk script to re-format bottle files (moving avg and stdevs to columns);
- aggregated data from separate casts into one dataset;
- added lat and lon from file headers: NMEA Latitude, NMEA Longitude (converted to decimal degrees);
- added ISO date-time column.

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Data Files

File
AE1910_Bottles.csv (Comma Separated Values (.csv), 43.59 KB) MD5:c0124b5f84a4d631f6a227ab47ee00c8 Primary data file for dataset ID 774859

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Supplemental Files

File
AE1910 CTD XMLCON file filename: 1377_27APR2019_McGreal.xmlcon (Extensible Markup Language (.xml), 10.65 KB) MD5:d289c14a2d83029272fa75566134af73 AE1910 CTD XMLCON file

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Parameters

Parameter	Description	Units
cast	CTD cast number (based on file name)	unitless
latitude	NMEA Latitude from bottle file header; positive values = North	decimal degrees
longitude	NMEA Longitude from bottle file header; positive values = East	decimal degrees
Bottle	Bottle number	unitless
Year	Four digit year; format: YYYY	unitless
Month	One digit month (5 = May)	unitless
Day	Two digit day of month	unitless
Hours	Two digit hours portion of time	unitless
Minutes	Two digit minutes portion of time	unitless
Seconds	Two digit seconds portion of time	unitless

DepSM_avg	Depth average	meters (m)
DepSM_stdev	Depth standard deviation	meters (m)
AltM_avg	Altimeter average	meters (m)
AltM_stdev	Altimeter standard deviation	meters (m)
CStarTr0_avg	Beam transmission (WET Labs C-Star) average	reciprocal meters (1/m)
CStarTr0_stdev	Beam transmission (WET Labs C-Star) standard deviation	reciprocal meters (1/m)
C0S_m_avg	Conductivity average	siemens per meter (S/m)
C0S_m_stdev	Conductivity standard deviation	siemens per meter (S/m)
FlC_avg	Fluorescence (Chelsea Aqua 3) average	micrograms per liter (ug/L)
FlC_stdev	Fluorescence (Chelsea Aqua 3) standard deviation	micrograms per liter (ug/L)
Sbeox0_avg	Oxygen (SBE 43) average (Named "Sbeox0Mm/Kg in original CTD file; renamed to avoid confusion because units of measurement are actually umol/kg.)	micromoles per kilogram (umol/kg)
Sbeox0_stdev	Oxygen (SBE 43) standard deviation. (Named "Sbeox0Mm/Kg in original CTD file; renamed to avoid confusion because units of measurement are actually umol/kg.)	micromoles per kilogram (umol/kg)
Par_avg	PAR/Irradiance (Biospherical/Licor) average	umol photons m-2 s-1
Par_stdev	PAR/Irradiance (Biospherical/Licor) standard deviation	umol photons m-2 s-1
PrDE_avg	Pressure average	psi
PrDE_stdev	Pressure standard deviation	psi
Sal00_avg	Salinity average	PSU
Sal00_stdev	Salinity standard deviation	PSU

T090C_avg	Temperature average	ITS-90, degrees C
T090C_stdev	Temperature standard deviation	ITS-90, degrees C
Sigma_e00_avg	Density [sigma-theta] average	kilograms per cubic meter (kg/m^3)
Sigma_e00_stdev	Density [sigma-theta] standard deviation	kilograms per cubic meter (kg/m^3)
Scan_avg	Scan number average	unitless
Scan_stdev	Scan number standard deviation	unitless
ISO_DateTime_UTC	Date and time (UTC) formatted to ISO8601 standard; format: YYYY-mm-ddTHH:MM:SSZ	unitless

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Instruments

Dataset-specific Instrument Name	Sea-Bird SBE 9 11+ V 5.2
Generic Instrument Name	CTD Sea-Bird SBE 911plus
Generic Instrument Description	The Sea-Bird SBE 911 plus is a type of CTD instrument package for continuous measurement of conductivity, temperature and pressure. The SBE 911 plus includes the SBE 9plus Underwater Unit and the SBE 11plus Deck Unit (for real-time readout using conductive wire) for deployment from a vessel. The combination of the SBE 9 plus and SBE 11 plus is called a SBE 911 plus. The SBE 9 plus uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 plus and SBE 4). The SBE 9 plus CTD can be configured with up to eight auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorescence, light (PAR), light transmission, etc.). more information from Sea-Bird Electronics

Dataset-specific Instrument Name	
Generic Instrument Name	Niskin bottle
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

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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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