Species composition via MOCNESS and associated CTD information collected on R/V Hugh R. Sharp (HRS1316, HRS1317) in the Chesapeake Bay from August to September in 2013.

Website: https://www.bco-dmo.org/dataset/707094
Data Type: Cruise Results
Version: 1
Version Date: 2017-06-28

Project
» Copepod Population Dynamics in Hypoxic Coastal Waters: Physical and Behavioral Regulation of Resupply and Advective Losses (CopesPopDynHypoZone)

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Abstract
Species composition via MOCNESS and associated CTD information collected on R/V Hugh R. Sharp (HRS1316, HRS1317) in the Chesapeake Bay from August to September in 2013.

Table of Contents

Coverage

Spatial Extent: **N**:38.5761 **E**:-76.2741 **S**:38.3589 **W**:-76.5103
Temporal Extent: 2013-08-25 - 2013-09-17

Dataset Description

Species composition via MOCNESS and associated CTD information

Methods & Sampling

This abundance data was obtained from two week-long cruises (1301 in August and 1302 in September) during which MOCNESS samples were taken from the mid-bay of the Chesapeake from 9 stations in a box

formation; 3 stations in a northern transect across the bay (N1-N3), 3 in a midline transect (M1-M3), and 3 in a southern transect (S1-S3).

The MOCNESS had a 0.5 meter square opening for each of 5 nets, which were 200um mesh. It was deployed from the aft A-frame of the RV Sharp, along with an array of sensors connected to the MOCNESS frame, including Sea-Bird temperature, salinity, and dissolved oxygen (SBE 43) sensors, a WetLabs FLNTU to measure chlorophyll a fluorescence and turbidity, and a LiCor 4π PAR sensor.

A CTD cast was done at each station prior to sampling with the MOCNESS. Sampling depths were determined based on the location of the pycnocline; the aim was to capture zooplankton below, within, and above the pycnocline. A drogue net (net 0) without a codend was used to deploy the MOCNESS to within 3m of the bottom. On the upcast, nets were triggered to close electronically from the wet lab so that they captured a depth range representing one of the three areas of interest.

Once brought on board, the nets were rinsed down with filtered seawater (provided by the Hugh R. Sharp) to collect plankton in the codend. Codends were filtered onto 64um sieves, then the samples were transferred to glass jars labeled on the inside and outside with the cast number, date, time, net number, and depth sampled. Sieves with 64um mesh were selected to catch all life stages of the copepod Acartia tonsa since Acartia tonsa eggs are about 75um in diameter and all subsequent life stages are larger. Buffered formalin was added to preserve the sample in a 4% solution, and then the jars were stores in labeled boxes.

After returning from the cruises, samples were stored indoors in climate-controlled laboratory space. To process the samples, the contents of the jars were filtered onto 64um mesh (to avoid loss of organisms), resuspended, and a subsample taken with a stemple pipette was transferred to a counting wheel where it was checked for density and diluted if necessary, the goal being at least 200 individuals of Acartia tonsa present but less than 300.

The sample was then examined for species composition under dissecting microscope with darkfield illumination. All organisms were identified to lowest possible taxonomic level. When species composition analysis was complete, the processed aliquot was photographed for size measurements and stored in 4% buffered formalin solution in a glass vial. The unused portion of the sample was returned to the original glass jar and returned to storage.

Abundance data were entered into Excel spreadsheets and checked for transcription errors, then imported into MatLab for data analysis.

Data Processing Description

MOCNESS electronic data was post processed using a series of MATLAB scripts to read the raw and processed data, and to calculate summary statistics for each net. These are usually generated from the MOCNESS software in a ".TAB" file for each cruise, but the MOCNESS program does not use the incoming GPS data for calculation of time and instead used computer time. The MOCNESS scripts calculate time and location using GPS and also include the time from the computer.

Zooplankton samples were sorted under a stereo dissecting microscope within two years of collection. Sub samples were taken with a stempel pipet such that a minimum of 200 individuals were counted from each sample. Zooplankton were identified to lowest possible taxonomic level, to species where possible for copepods, and copepod adults were sexed.

BCO-DMO Data Processing Notes:

- replaced blank cells with nd
- reformatted column names to comply with BCO-DMO standards
- reformated dates to YYYY/MM/DD

[table of contents | back to top]

Data Files

File
MOC.csv(Comma Separated Values (.csv), 2.10 MB) MD5:c71095d4e5e1d0f354dbe826a489767d Primary data file for dataset ID 707094

[table of contents | back to top]

Parameters

Parameter	Description	Units
cruise	Designation cruise 1301 or 1302; a week-long plankton survey in August and September respectively.	unitless
MOC	Number ID of each MOCNESS cast as recorded by the MOCNESS software	unitless
NET	Number ID of each net used during a MOCNESS cast as recorded by the MOCNESS software	unitless
year	Year as recorded by the MOCNESS software; YYYY	unitless
month_GMT	GMT month as recorded by MOCNESS software; MM	unitless
day_GMT	GMT day as recorded by MOCNESS software; DD	unitless
DOY_day_GMT	Numeric day of year calculated from year, month, and day as recorded by MOCNESS software	decimal day
hour_GMT	GMT hour as recorded by MOCNESS software	hours
minute_GMT	GMT minute as recorded by MOCNESS software	minutes
second_GMT	GMT second as recorded by MOCNESS software	seconds
DOY_GMT	Day of year calculation using MOCNESS recorded GMT time	decimal day
lat	Average latitude traveled during collection for each net	decimal degrees
lon	Average longitude traveled during collection for each net	decimal degrees
vol	Volume filtered by each net during each cast, as recorded by MOCNESS software	cubic meters
temp	Water temperature recorded by MOCNESS sensors during each cast	degrees Celsius
salt	Salinity recorded by MOCNESS sensors during each cast	Practical Salinity Units (PSU)
Ox	Oxygen level recorded by MOCNESS sensors during each cast	milligrams per liter
fluor	Fluorescence recorded by MOCNESS sensors during each cast	milligrams per meter cubed
turb	Turbidity recorded by MOCNESS sensors during each cast	Nephelometric Turbidity Units (NTU)
PAR	Photosynthetically active radiation recorded by MOCNESS sensors during each cast	Watts/meters squared
startLat	Latitude at the time the net opened	decimal degrees
endLat	Latitude at the time the same net closed	decimal degrees
startLon	Longitude at the time the net opened	decimal degrees
endLon	Longitude at the time the net closed	decimal degrees
upDepth	Upper limit of depth traversed while the net was open	meters
lowDepth1	Lower limit of the depth traversed while the net was open	meters

angle	The angle of the tow line for the MOCNESS, with vertical being 0 and horizontal being 90	degrees
distance	Horizontal distance the ship traveled while the net was open	meters
openArea	The open area of the net face- calculated from the size of the net opening when held vertically and the angle of the tow line	meters squared
idx	Unique numeric ID for each row of data	unitless
cruise2	Designation cruise 1301 or 1302; a week-long plankton survey in August and September respectively	unitless
date_EDT	Gergorian claendar date as recorded in the cruise log; YYYY/MM/DD	unitless
station	Station ID as recorded in the cruise log	unitless
time_EDT	Time in EDT as recorded in the cruise log; HH:MM	unitless
DOY_EDT	Day of year calculation using cruise log EDT time	decimal day
gear	Description of collection gear used. For this data set, only the MOCNESS was used	unitless
mesh_size	Size of pores in mesh of MOCENSS nets	microns
cast_num	Number ID of each MOCNESS cast as recorded in cruise log	unitless
net	Number ID of each net used during a MOCNESS cast as recorded in cruise log	unitless
lowDepth2	Lower limit of the depth traversed by a single net as recorded in cruise log	meters
high_depth	Upper limit of the depth traversed by a single net as recorded in cruise log	meters
splits	Number of times the sample gathered by the specific cast and net was split into two equal portions via plankton splitter	count
dilution	Amount of water added to sample to reach the desired concentration of >= 200 Acartia/subsample	milliliters
subsample_size	Amount of sample (in diluted state, if applicable) examined for species composition	milliliters
genus	Genus or least specific identifier of organism in sample	unitless
species	Species or most specific identifier of organism in sample	unitless
stage	Life stage of organism in sample	unitless
count	Total number of organism found in subsample	number of organism/subsample
num_per_m3	Concentration of organism per cubic meter calculated from dilutions, splits, and Volume_Filtered data	number of organism/cubic meter
volume_filtered	Volume filtered by each net during each cast, as recorded by MOCNESS software, augmented by record in operator log where necessary	cubic meters
abundM3	Concentration of organism per cubic meter calculated from dilutions, splits, and Vol data	number of organism/cubic meter
abundM2	Abundance of organism per meter squared calculated from AbundM3 and total depth traversed by net	number of organism/ meter squared
CTD_number	Number ID of each CTD cast corresponding to each MOCNESS tow	unitless
CTD_DOY_GMT	Numeric day of year calculated from year, month, and day as recorded by CTD	decimal day

CTD_temperature	Water temperature recorded by CTD sensors during each cast; binned into 0.5m depths and then averaged over the depth range of the MOCNESS net	degrees Celsius
CTD_salinity	Salinity recorded by CTD sensors during each cast; binned into 0.5m depths and then averaged over the depth range of the MOCNESS net	PSU
CTD_sigma_t	Density recorded by CTD sensors during each cast; binned into 0.5m depths and then averaged over the depth range of the MOCNESS net	milligrams per liter
CTD_Ox__mgperL	Dissolved oxygen recorded by CTD sensors during each cast; binned into 0.5m depths and then averaged over the depth range of the MOCNESS net	milligrams per liter
CTD_fluorescence	Fluorescence recorded by CTD sensors during each cast; binned into 0.5m depths and then averaged over the depth range of the MOCNESS net	milligrams per meter cubed
CTD_depth	Depth recorded by CTD sensors during each cast; binned into 0.5m depths and then averaged over the depth range of the MOCNESS net	meters
comments	Comments from sample counter regarding sample processing	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	CTD MOCNESS
Generic Instrument Name	CTD MOCNESS
Dataset-specific Description	Used for water sampling
Generic Instrument 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)

[table of contents | back to top]

Deployments

HRS1316

Website	https://www.bco-dmo.org/deployment/707119
Platform	R/V Hugh R. Sharp
Report	http://ezid.cdlib.org/id/doi:10.7284/902881
Start Date	2013-08-25
End Date	2013-09-01
Description	R/V Hugh R Sharp 1316. Mid-bay of Chesapeake Bay, 38°N 76°W.

HRS1317

Website	https://www.bco-dmo.org/deployment/707274
Platform	R/V Hugh R. Sharp
Report	http://ezid.cdlib.org/id/doi:10.7284/902882
Start Date	2013-09-12
End Date	2013-09-17
Description	R/V Hugh R Sharp 1317. Mid-bay of Chesapeake Bay, 38°N 76°W.

[table of contents | back to top]

Project Information

Copepod Population Dynamics in Hypoxic Coastal Waters: Physical and Behavioral Regulation of Resupply and Advective Losses (CopesPopDynHypoZone)

Coverage: hypoxic zone of Chesapeake Bay

Description from NSF award abstract:
The PIs will develop a mechanistic understanding of how circulation interacts with hypoxia-induced behavioral and physiological changes to affect the population dynamics of coastal zooplankton. They will do this by assessing two potentially contrasting mechanisms influencing the dynamics of the copepod *Acartia tonsa* in the hypoxic zone of Chesapeake Bay. The first hypothesis is that maintenance of copepod populations in the hypoxic region requires replenishment by advection (immigration) of animals through wind-driven lateral transport processes. The second, counteractive, hypothesis is that bottom water hypoxia alters the vertical distribution of *A. tonsa*, thereby making them more susceptible to advective losses from the region (emigration) via surface water transport in the estuarine circulation. They will take advantage of a current NSF-funded physical oceanography research program in Chesapeake Bay that will comprehensively measure and model axial and lateral water exchanges in the mid-Bay region.

The present study will use the physical oceanography study site as a Controlled Volume (CV) in which the oceanographic exchanges of water and the driving mechanisms for those exchanges will be well defined. The PIs will conduct high-resolution spatial and temporal sampling of zooplankton and combine the data with measurements of copepod behavior, mortality and egg production in the hypoxic region. They will use an improved Individual-Based Model of the life history of *A. tonsa* coupled with the circulation to explore the combined effects of advection, behavior, egg production, and mortality on population dynamics. In addition to increasing our knowledge of the impacts of bottom water hypoxia on copepod populations in Chesapeake Bay, the study will improve our general understanding of the regulation of zooplankton populations by physical and biological processes and the impacts of hypoxia on secondary production and food webs in coastal waters.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1259691

[table of contents | back to top]