Acartia tonsa mortality collected from a plankton net with associated CTD data from 5 day-trips in mid-Chesapeake Bay from August to October 2013 (CopesPopDynHypoZone project)

Website: https://www.bco-dmo.org/dataset/723568
Data Type: Cruise Results
Version:
Version Date: 2018-01-12

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

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Coverage

Spatial Extent: **N**:38.48245 **E**:-76.35638 **S**:38.45012 **W**:-76.43992
Temporal Extent: 2013-08-02 - 2013-10-04

Dataset Description

This dataset includes *Acartia tonsa* mortality from plankton net samples and associated CTD information.

Related Datasets:
Acartia tonsa mortality with CTD data: RV Sharp
Species composition with CTD data: 5 daytrips

Methods & Sampling

This mortality data was obtained from several ~8 hour small-boat cruises done about every other week from August to October. Vertical tow samples were taken from the mid-bay of the Chesapeake from several stations in a transect, corresponding to the mid-line transect sampled by the two, week-long cruises (stations M1-M3, cruises 1301/1302). More stations along the same transect were included in the collection of this data

set.

The plankton net was 0.5m in diameter and made of 64µm mesh, equipped to close with a mechanical messenger trigger, and was deployed from the winch arm of the R/V Parker.

A CTD cast was done at each station prior to sampling with the plankton net. Sampling depths were determined based on the location of the pycnocline; the aim was to capture zooplankton below and above the pycnocline. For sampling below the pycnocline, the net was deployed below the pycnocline, towed up to the pycnocline, triggered to close, and returned to the surface. Sampling above the pycnocline was done by standard vertical tow: deploy net to desired depth and winch to the surface.

Once brought on board, the nets were rinsed down with seawater to collect plankton in the codend. Codends were gently poured into 64µm sieves in a water bath of ambient seawater, then carefully poured into numbered glass jars for incubation; jar number, depth sampled, station, and cast number were entered into a log book.

Neutral red stain was added based on the volume in the jar- the desired concentration was 150µl per 100ml (for a stock solution of 0.1g Neutral Red powder per 10 ml DI water). The jars were returned to the water bath and incubated in the shade for 15-20 minutes (recorded in the log). After incubation, each sample was vacuum filtered onto a 64 µm mesh filter which was then transferred to a small petri dish. The dish was capped and labeled with the jar number of the sample, then wrapped in parafilm to seal. The samples were placed in a Ziploc bag labeled with the date and station and given a burst of Flash Freeze, then stored in a cooler with ice for the duration of the cruise.

After returning from each cruise, samples were immediately transferred to -20°C freezers. Samples were individually processed within a week after collection using the protocol developed by David Elliott:

The petri dish containing the sample was thawed at room temperature, then the mesh was submerged in filtered seawater and gently shaken to resuspend the sample. The sample was then transferred to a counting wheel where it was checked for density and subsampled if necessary.

The sample was then slightly acidified by adding 10% HCl drop-wise until the stained animals distinctly changed from pink to bright red. The sample was then tallied for live or dead status and general stage under dissecting microscope with darkfield illumination. Copepods which were bright red throughout their tissues were considered alive at the time of staining; copepods which had no stain, were cloudy white, or were only light pink were considered dead. Occasionally, photographs were taken of the acidified sample for secondary confirmation since the stain fades after 1 hour after acidification.

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

Data Processing Description

Niskin electronic data was post processed using a series of MATLAB scripts to read the raw and processed data, and SBE Data Processing software was used to calculate summary statistics for each bottle.

Live zooplankton samples were stained immediately after capture with Neutral Red vital stain, incubated at ambient collection temperature and salinity for dye uptake, then flash-frozen for later analysis. Samples were sorted under a stereo dissecting microscope within 1 week of collection, and general *Acartia tonsa* stages were classed as live or dead according to staining.

BCO-DMO Data Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- reduced decimal precision
- replaced commas with semicolons
- changed NaN to nd in Lateral_station column and in species column to sp. when associated with a genus name; changed to nd if no genus in record
- converted longitudes to negative degree (west)

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Data Files

File
Atonsa_mortality_daytrips.csv (Comma Separated Values (.csv), 24.90 KB) MD5:e59cea50b129dc09a3f555bba9e849f2 Primary data file for dataset ID 723568

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Parameters

Parameter	Description	Units
cruise	Chronological cruise number used to refer to each day-long cruise	unitless
date	Gergorian calendar date as recorded in the cruise log formatted as mm/dd/yyyy	unitless
time_EDT	Time of sampling in EDT as recorded in the cruise log formatted as hhmm	unitless
EDT_DOY	Day of year calculation using cruise log EDT time	decimal day
Station	Station ID as recorded in the day-cruise log	unitless
Lateral_station	Station ID as given in the Lateral Copepods week-long R/V Sharp cruises	unitless
Sample_num	Numeric sample identifier; unique to each cruise; not across all cruises	unitless
Low_depth	The lowest depth of the range sampled	meters
High_depth	The highest depth of the range sampled	meters
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
Alive	Number of organism stained in sample and therefore live	specimens

Dead	Number of organism unstained in sample and therefore dead	specimens
Percent_live	Percent of live organism out of total	unitless
Percent_dead	Percent of dead organism out of total	unitless
Photo_files	Filenames of photographs taken of acidified aliquot	unitless
Comments	Notes from the technician made during sampling and sample processing	unitless
Latitude	Station latitude	decimal degrees
Longitude	Station longitude	decimal degrees
Year	Year as recorded by CTD as yyyy	unitless
Month	Month as recorded by CTD as mm	unitless
CTD_Day	Day as recorded by CTD as dd	unitless
GMT_Hour	Hour as recorded by CTD; GMT time as hh	unitless
Minute	Minute as recorded by CTD as mm	unitless
Second	Second as recorded by CTD as ss	unitless
GMT_DOY	Day of year calculation using CTD recorded GMT time for each cast	decimal day
prSM	Pressure as recorded by CTD sensor for each cast	decibars
t090C	Temperature recorded by CTD sensor for each cast	degrees Celsius
c0S_m	Condictivity recorded by CTD sensor for each cast	microSiemens/meter (uS/m)
sbeox0V	Raw oxygen measurements as recorded by CTD sensors for each cast	volts
wetStar	Fluorescence measure as recorded by WETStar fluorometer on CTD for each cast	volts?

obs	Optical backscatter as recorded by CTD sensor for each cast	volts?
bat	Beam attenuation as recorded by SBE software	per meter
xmiss	Beam transmission as recorded by SBE software (percent)	unitless
sbeox0Mg_L	Dissolved oxygen calculated in SEB post-processing from oxygen data recorded by CTD sensors for each cast	milligrams/liter (mg/L)
sbeox0PS	Dissolved oxygen pressure saturation calculated in SEB post-processing from oxygen data recorded by CTD sensors for each cast	unitless
sigma_t00	Density recorded by CTD sensors for each cast	?
depSM	Depth bins; one bin per half meter and then averaged over the depth range of each net cast	meters
sal00	Salinity recorded by CTD sensor for each cast	Practical Salinity Units (PSU)
nbin	Number of measures per depth bin; averaged per net depth range	unitless
flag	Flag for abberant data	unitless

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Instruments

Dataset-specific Instrument Name	SBE 9plus
Generic Instrument Name	CTD - profiler
Dataset-specific Description	Used for sampling; There were twelve Niskin bottles on the SBE 32 Carousel Water Sampler, deployed from the starboard winch of the RV Sharp, along with the SBE 9plus unit which was attached to the rosette. Attached to an SBE 11plus V2 Deck Unit
Generic Instrument Description	The Conductivity, Temperature, Depth (CTD) unit is an integrated instrument package designed to measure the conductivity, temperature, and pressure (depth) of the water column. The instrument is lowered via cable through the water column. It permits scientists to observe the physical properties in real-time via a conducting cable, which is typically connected to a CTD to a deck unit and computer on a ship. The CTD is often configured with additional optional sensors including fluorometers, transmissometers and/or radiometers. It is often combined with a Rosette of water sampling bottles (e.g. Niskin, GO-FLO) for collecting discrete water samples during the cast. This term applies to profiling CTDs. For fixed CTDs, see https://www.bco-dmo.org/instrument/869934.

Dataset-specific Instrument Name	Dissecting microscope
Generic Instrument Name	Microscope - Optical
Dataset-specific Description	Used to count live and dead copepods.
Generic Instrument Description	Instruments that generate enlarged images of samples using the phenomena of reflection and absorption of visible light. Includes conventional and inverted instruments. Also called a "light microscope".

Dataset-specific Instrument Name	General Oceanics 1010x External Spring Water Sampler
Generic Instrument Name	Niskin bottle
Dataset-specific Description	Used for water sampling; 10 liter capacity.
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.

Dataset-specific Instrument Name	0.5m plankton net
Generic Instrument Name	Plankton Net
Dataset-specific Description	Used to collect live zooplankton. The plankton net was 0.5m in diameter and made of 64µm mesh, equipped to close with a mechanical messenger trigger, and was deployed from the winch arm of the R/V Parker.
Generic Instrument Description	A Plankton Net is a generic term for a sampling net that is used to collect plankton. It is used only when detailed instrument documentation is not available.

Dataset-specific Instrument Name	
Generic Instrument Name	Shipboard Incubator
Dataset-specific Description	Used to incubate zooplankton
Generic Instrument Description	A device mounted on a ship that holds water samples under conditions of controlled temperature or controlled temperature and illumination.

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Deployments

HPL_2013-08-02

Website	https://www.bco-dmo.org/deployment/723585
Platform	small boat: UMCES
Start Date	2013-08-02
End Date	2013-08-02
Description	Day trip to collect zooplankton

HPL_2013-08-16

Website	https://www.bco-dmo.org/deployment/723591
Platform	small boat: UMCES
Start Date	2013-08-16
End Date	2013-08-16
Description	Day trip to collect zooplankton.

HPL_2013-09-06

Website	https://www.bco-dmo.org/deployment/723594
Platform	small boat: UMCES
Start Date	2013-09-06
End Date	2013-09-06
Description	Day trip to collect zooplankton

HPL_2013-09-20

Website	https://www.bco-dmo.org/deployment/723602
Platform	small boat: UMCES
Start Date	2013-09-20
End Date	2013-09-20
Description	Day trip to collect zooplankton.

HPL_2013-10-04

Website	https://www.bco-dmo.org/deployment/723607
Platform	small boat: UMCES
Start Date	2013-10-04
End Date	2013-10-04
Description	Day trip to collect zooplankton.

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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.

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Funding

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

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