# Concentration of zooplankton, in particular copepods, from hypoxic waters collected by R/V Hugh R. Sharp cruises (HRS100524JP, HRS100819JP, HRS100920JP, HRS110525JP, HRS110719JP, HRS110922JP) in the Chesapeake Bay from 2010-2011 (DeZoZoo project)

**Website**: https://www.bco-dmo.org/dataset/564755
**Data Type**: Cruise Results
**Version**: first draft of final
**Version Date**: 2015-08-26

**Project**
» Hypoxia in Marine Ecosystems: Implications for Neritic Copepods (DeZoZoo)

| Contributors | Affiliation | Role |
|---|---|---|
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## Coverage

**Spatial Extent**: **N**:39.5371 **E**:-74.9864 **S**:37.4565 **W**:-76.6289
**Temporal Extent**: 2010-05-24 - 2011-12-21

## Dataset Description

These data represent a merging of electronic data collected from the MOCNESS sensor systems and the count data from the samples collected with the net tows. Some nets were used for zooplankton samples, while others were collected specifically to estimate bay anchovy concentrations. (See associated dataset: http://www.bco-dmo.org/dataset/563428.) These are contained on different sheets, and the count data was merged individually.

### Data Processing Description

Electronic data was post-processed by PI Pierson. Zooplankton sorting data was analyzed, processed, and quality controlled in PI Pierson's lab.

DMO adjustments: added column for official cruise name; replaced sal=50 (error) with sal=nd; changed C. canadensis in parenthesis to Coullana canadensis in the appropriate columns; used MOCNESS start lats and lons as best, according to PI instructions; removed MOCNESS-recorded times and used GPS times instead, which is much more accurate (according to PI instructions); changed decimal days for 1102 (HRS110719JP) to

HH:MM;

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## Data Files

| File |
|---|
| **zoop_DZZ_rs.csv** (Comma Separated Values (.csv), 223.72 KB)<br>MD5:5ed938ca77fccdd8ec6aa244d8c6e12c<br>Primary data file for dataset ID 564755 |

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## Parameters

| Parameter | Description | Units |
|---|---|---|
| cruiseid | official cruise name | text |
| cruise_informal | The Year and the cruise series. i.e. 1101 = the first cruise in 2011 | text |
| year | year | time |
| month_local | month | time |
| tow | MOCNESS trawl series number | text |
| day_local | day in local time | time |
| net | net number | text |
| gear | the sampling gear | text |
| time_local | local time of day | HH:MM |
| lat_best | the latitude when a MOCNESS tow starts; considered the best latitude by the PI | decimal degrees |
| lon_best | the longitude when a MOCNESS tow starts; considered the best longitude by the PI | decimal degrees |

| | | |
|---|---|---|
| yrday_local | day of year in local time | time |
| vol_filt | filtration volume, i.e the volume of water flowing through the net | cubic meters |
| temp | water temperature | degrees centrigrade |
| sal | water salinity | PSU |
| O2_mg_L | dissolved Oxygen | milligrams per liter |
| fluor | Chlorophyll a concentration from Wetlabs FLNTU | milligrams per cubic meter |
| turbidity | turbidity measured in Nephelometric Turbidity Unites (NTU) from Wetlabs FLNTU | NTU |
| PAR | Photosynthetically available radiation | microEinsteins per square meter per second |
| lat_end | the latitude when a MOCNESS tow ends | decimal degrees |
| lon_end | the longitude when a MOCNESS tow ends | decimal degrees |
| low_depth_best | the surface depth of a net trawl; considered the best depth by the PI | m |
| high_depth_best | the bottom depth of a net trawl; considered the best depth by the PI | m |
| angle | MOCNESS trawl angle | degrees |
| dist | the tow distance | kilometers |
| area_net | the net mouth opening area | meters square |
| site | sampling station: north or south | text |
| splits | the number of times the sample is split in half | number |
| dilution | the dilution volume of a split sample | ml |

| | | |
|---|---|---|
| subsample_size | the subsample volume from a diluted sample | ml |
| genus | the genus name | text |
| species | the species name | text |
| stage | the copepod stages: nauplii (N1-N6); copepodite (C1-C5); adult (Female or Male) | text |
| count_subsample | the counted numbers in a subsample | number |
| abund_m3 | number of individuals per cubic meter sampled | number |
| abund_m2 | integrated abundance; number of individuals in a square meter | number |

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## Instruments

| | |
|---|---|
| **Dataset-specific Instrument Name** | 1/4 Meter MOC |
| **Generic Instrument Name** | MOCNESS.25 |
| **Dataset-specific Description** | Had trouble communicating with the 1/4 m2 MOCNESS in the beginning of the first cruise. Picked up replacement parts and were able to get it working again with an underwater unit borrowed from BESS, the manufacturer of the MOCNESS system. (Subsequent analysis by BESS, Inc. showed that some damage to the underwater unit was caused when it was plugged into the sea cable with some charge still in the cable -- most likely from the Seabird deck unit still turned on.) -- from the Cruise Report |
| **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-1/4 carries nine 1/4-m2 nets usually of 64 micrometer mesh and is used to sample the larger micro-zooplankton. |

| | |
|---|---|
| **Dataset-specific Instrument Name** | Tucker Trawl |
| **Generic Instrument Name** | Tucker Trawl |
| **Dataset-specific Description** | 1 m2 Tucker Trawl fitted with 280 um mesh. |
| **Generic Instrument Description** | The original Tucker Trawl, a net with a rectangular mouth opening first built in 1951 by G.H. Tucker, was not an opening/closing system, but shortly thereafter it was modified so that it could be opened and closed. The original had a 183 cm by 183 cm flexible rectangular mouth opening 914 cm long net with 1.8 cm stretched mesh for the first 457 cm and 1.3 cm mesh for last 457 cm. 152 cm of coarse plankton or muslin netting lined the end of the net. Tucker designed the net to collect animals associated with the deep scattering layers, principally euphausiids, siphonophores, and midwater fish. (from Wiebe and Benfield, 2003). Currently used Tucker Trawls usually have 1-m2 openings and can have a single net or multiple nets on the frame. |

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## Deployments

**HRS100524JP**

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/518664 |
| **Platform** | R/V Hugh R. Sharp |
| **Report** | http://dmoserv3.bco-dmo.org/data_docs/DeZoZoo/DeZoZoo_1001_CruiseReport_FINAL.pdf |
| **Start Date** | 2010-05-24 |
| **End Date** | 2010-06-01 |
| **Description** | Cruise in Main Channel of Chesapeake Bay |

**HRS100819JP**

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/518707 |
| **Platform** | R/V Hugh R. Sharp |
| **Start Date** | 2010-08-19 |
| **End Date** | 2010-08-26 |
| **Description** | Cruise in main channel of Chesapeake Bay to collect zooplankton samples. |

**HRS100920JP**

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|---|---|
| **Website** | https://www.bco-dmo.org/deployment/518709 |
| **Platform** | R/V Hugh R. Sharp |
| **Start Date** | 2010-09-21 |
| **End Date** | 2010-09-27 |
| **Description** | One of a series of cruises in the main channel of the Chesapeake Bay to collect gelatinous zooplankton. |

**HRS110525JP**

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/518711 |
| **Platform** | R/V Hugh R. Sharp |
| **Start Date** | 2011-05-24 |
| **End Date** | 2011-06-01 |
| **Description** | One of six week-long cruises in the main channel of Chesapeake Bay to collect gelatinous zooplankton. |

**HRS110719JP**

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/518842 |
| **Platform** | R/V Hugh R. Sharp |
| **Start Date** | 2011-07-19 |
| **End Date** | 2011-07-26 |
| **Description** | One of six week-long cruises in the main channel of the Chesapeake Bay to collect gelatinous zooplankton |

**HRS110922JP**

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/518904 |
| **Platform** | R/V Hugh R. Sharp |
| **Start Date** | 2011-09-21 |
| **End Date** | 2011-09-26 |
| **Description** | One of 6 week-long cruises in the main channel of the Chesapeake Bay, collecting gelatinous zooplankton. |

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## Project Information

**Hypoxia in Marine Ecosystems: Implications for Neritic Copepods (DeZoZoo)**

**Website**: http://www.planktoneer.com/research.html#HYPOX

**Coverage**: Chesapeake Bay

*Description from NSF award abstract:*
The occurrence of low-oxygen waters, often called "dead zones" in coastal ecosystems throughout the world is increasing. Despite these increases, the pelagic food-web consequences of low-oxygen waters remain poorly understood. Laboratory research has demonstrated that hypoxic water (< 2 mg l-1) can result in mortality, reduced fitness and lower egg production of planktonic copepods, a major link in food webs supporting pelagic fish. Observations in the sea indicate that hypoxic bottom waters usually have depressed abundances of copepods compared to normoxic waters (> 2 mg l-1). The gradient of declining oxygen concentration with respect to depth (oxycline) can be a critical interface in coastal pelagic ecosystems by altering the migratory behavior and depth distribution of copepods and their spatial coherence with potential predators and prey. This project will result in a mechanistic understanding of how behavior and fitness of copepods are affected by hypoxia. The PIs will compare bottom-up and top-down controls on the ecology of copepods in Chesapeake Bay waters experiencing seasonal hypoxia and those that are normoxic.

Specific objectives of this project are to:
1) analyze changes in migratory behavior and fine-scale (meter) distribution of copepods across the oxycline over hourly and diel time scales while simultaneously examining the distribution and abundance of their food (phytoplankton and microzooplankton) and predators (fish, gelatinous zooplankton);
2) estimate effects of hypoxia on the "fitness" of copepods using a suite of measurements (length/weight ratios, feeding, egg production, and egg hatching success) to develop condition indices of copepods captured at different times and depths in hypoxic and normoxic waters; and
3) evaluate effects of hypoxia on copepod mortality by hypoxia-induced, stage-specific copepod mortality in hypoxic bottom waters and by changes in top-down control of copepods from predation by fish and gelatinous zooplankton.

Oxyclines may be a barrier to vertical migration of copepods and thus disruptive to predator avoidance behavior. Faced with increased predation risk from fish and jellyfish, copepods may seek refuge in hypoxic waters for part of the day and/or make short-term vertical excursions between hypoxic and normoxic waters. By regulating vertical migrations, copepods may increase utilization of microzooplankton prey concentrated in the oxycline. Hypoxic waters may elevate consumption of copepods by jellyfish and depress consumption by pelagic fish. This project will evaluate copepod distribution and migration behavior, individual fitness and stage-specific mortality in hypoxic and normoxic waters. It will examine food-web consequences of increased or decreased spatial coherence of copepods and their predators and prey in regions with hypoxic bottom waters and will contribute to fundamental understanding of food-web processes in eutrophic coastal ecosystems.

Project acronym "DeZoZoo" = "Dead Zone Zooplankton"

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## Funding


| Funding Source | Award |
|---|---|
| NSF Division of Ocean Sciences (NSF OCE) | OCE-0961924 |


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