Zooplankton displacement volumes from MOCNESS tows from R/V Endeavor EN484, EN487 in the Gulf of Maine, 2010 (Krill GoME project)

Website: https://www.bco-dmo.org/dataset/3874
Version:
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Project
» Biological and Physical Determinants of Euphausiid Aggregation, Behavior, and Interaction with Higher Predators at an Abrupt Topographical Feature in the Gulf of Maine (Krill GoME)

Contributors	Affiliation	Role
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Dataset Description

Zooplankton displacement volumes from MOCNESS net tows in the Gulf of Maine in 2010.

Methods & Sampling

A standard 1m^2 Multiple Opening/Closing Net and Environmental Sensing System (MOCNESS) was used to collect zooplankton in order to determine the taxonomic composition of the zooplankton in the study region and also to ground truth acoustic data collected with the HTI multi-frequency and Edgetech broadband systems. The MOCNESS has 9 nets with a 335 µm mesh size that can sample different regions of the water column. The underwater unit used was #169.

In addition to the standard temperature and conductivity probes the system also had a beta-type strobe-light unit for reducing avoidance of the nets by some zooplankton, notably krill, and possibly small fish. The strobe system has two units each with 12 LED sets (LUXEON Rebel LED) with peak output between 490-520 nm. Two of the 24 LED sets were working inconsistently at the start of the sampling. The LEDs are powered by the MOCNESS battery and their pulse width, amplitude, flash rate period, and on/off are controlled by the MOCNESS software. For EN484, the pulse width was 2 ms, the relative amplitude was 99%, and the flash interval was 100 ms. For EN487, the pulse width was 40 ms, the relative amplitude was 99%, and the flash interval was 1000 ms.

The MOCNESS was launched and recovered from the stern A-frame. Samples were brought into the wet lab for processing. Net 0 typically went form the surface to depth and nets 1-8 fished at discrete depths from depth to the surface. Nets 1-8 were preserved in buffered formalin. Often the net 0 samples were so large that they would have taken multiple jars so either the entirety or a large fraction was frozen in the -80C freezer, in the hopes that they might be useful.

Displacement Volume Measurement:

Samples were poured into a 1000 ml graduated cylinders and measured. Then the sample was poured through a 330 um sieve, allowed to drain, and the volume of water measured. The difference between the two volume measurements was the displacement volume. The displacement volume of each sample was divided by the volume filtered by the net (m^3) and the result is reported here in units of cc/m^3. Animals larger than 5 cc were measured individually and reported here.

Data Processing Description

Related information:

Wiebe, P.H., K.H. Burt, S.H. Boyd, and A.W. Morton, A multiple opening-closing net and environmental sensing system for sampling zooplankton, J. Mar. Res., 34, 312-326, 1976.

Wiebe, P.H., A.W. Morton, A.M. Bradley, J.E. Craddock, T.J. Cowles, V.A. Barber, R.H. Backus, and G.R. Flierl, New developments in the MOCNESS, an apparatus for sampling zooplankton and micronekton, Mar. Biol., 87, 313-323, 1985.

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Data Files

File
disp_vols_GoM.csv (Comma Separated Values (.csv), 12.38 KB) MD5:34f0e66d464e7efe6352b93d3fa12552 Primary data file for dataset ID 3874

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Parameters

Parameter	Description	Units
cruise_id	cruise identification	alphanumeric
date	local date of tow	yyyymmdd
tow	MOCNESS tow number	integer
site	location of tow	text
lat_start	latitude at start of cruise; north is positive	decimal degrees
lon_start	longitude at start of cruise; east is positive	decimal degrees

lat_end	latitude at end of cruise; north is positive	decimal degrees
lon_end	longitude at end of cruise; east is positive	decimal degrees
yrday_local	local day and decimal time; e.g. 326.5 for the 326th day of the year November 22 at 1200 hours (noon)	nd
time_local	local time	HHMM
day_night	whether cruise was taken in day or night	text
net	net number	integer
depth_range	depth range of sample	meters
depth_open	depth where net opened	meters
depth_close	depth where net closed	meters
depth_mid	mid-depth of sample	meters
depth_interval	depth interval	meters
vol_filt	volume filtered by net	cubic meters
strobe	whether strobe light was firing while the net was open	text
disp_vol_m3	displacement volume per cubic meter	cc/meter^3
comments_sample	comments pertaining to the sample	text
zoop_gt5cc_id	identification of animals > 5cc	text
disp_vol_lg	displacement volume of large animals	cc
dominants	dominant zooplankton in the sample. An asterisk (*) means this species was especially abundant.	text

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Hydroacoustic Technology Incorporated echosounder
Generic Instrument Description	The Hydroacoustic Technology Inc. (HTI) multi-frequency system is a towed digital split-beam/single-beam hydroacoustic system designed specifically to assess the abundance and distribution of fish and plankton. Digital signal processing hardware is combined with a MS Windows2000/XP -based user interface to produce results in real time. (http://www.htisonar.com/multi_frequency_echo_sounder.htm)

Dataset-specific Instrument Name	MOCNESS
Generic Instrument Name	MOCNESS
Dataset-specific Description	1m^2 MOCNESS with 9 nets, 330 micron mesh.
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. There are currently 8 different sizes of MOCNESS in existence which are designed for capture of different size ranges of zooplankton and micro-nekton Each system is designated according to the size of the net mouth opening and in two cases, the number of nets it carries. The original MOCNESS (Wiebe et al, 1976) was a redesigned and improved version of a system described by Frost and McCrone (1974). (from MOCNESS manual)

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Deployments

EN484

Website	https://www.bco-dmo.org/deployment/58140
Platform	R/V Endeavor
Report	http://bcodata.whoi.edu/Krill_GoME/EN484_Cruise_Report_FINAL.pdf
Start Date	2010-09-22
End Date	2010-09-30
Description	Cruise EN484, Chief Scientist Gareth Lawson's September 2010 Krill cruise to the northern flank of Georges Bank and the southern portion of the Gulf of Maine region (42 North 67.5 West), is the first of two cruises in Fall 2010 doing the same work in the same study location. The cruise was scheduled to allow an examination of the impact of herring predation on euphausiid aggregations. The first cruise each year (two similar cruises are planned for 2011) is timed to begin one week after the NOAA Ship Delaware II will have commenced its herring survey. Real-time data collected during that survey will be used to define the exact survey grid for our project. During EN484, the first 2010 cruise, the herring were expected to be pre-spawning and therefore not feeding on euphausiids (the target species for this project). The second cruise each year is timed to begin in the last week of October (EN487 in 2010). At this time, herring and euphausiids will still be present in the study region, but the herring will be post-spawning and will have resumed feeding on euphausiids. Cruise information and original data are available from the NSF R2R data catalog.

EN487

Website	https://www.bco-dmo.org/deployment/58141
Platform	R/V Endeavor
Report	http://bcodata.whoi.edu/Krill_GoME/EN487_Cruise_Report_FINAL.pdf
Start Date	2010-10-27
End Date	2010-11-06
Description	Cruise EN487, Chief Scientist Gareth Lawson's October-November 2010 Krill cruise to the northern flank of Georges Bank and the southern portion of the Gulf of Maine region (42 North 67.5 West), is the second of two cruises completed for the Gulf of Maine Krill project in Fall 2010. The cruises were designed to conduct the same work in the same study location. The timing of the cruises was selected to allow an examination of the impact of herring predation on euphausiid aggregations. The first cruise (cruise EN484 in 2010) each year (two similar cruises are planned for 2011) is timed to begin one week after the NOAA Ship Delaware II will have commenced its herring survey. Real-time data collected during that survey will be used to define the exact survey grid for our project. During the first cruise, EN484, the herring were expected to be pre-spawning and therefore not feeding on euphausiids (the target species for this project). The second cruise each year (EN487 in 2010) is timed to begin in the last week of October. At this time, herring and euphausiids will still be present in the study region, but the herring will be post-spawning and will have resumed feeding on euphausiids. EN487 cruise track JPEG image from URI (vessel operator) Cruise information and original data are available from the NSF R2R data catalog.

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Project Information

Biological and Physical Determinants of Euphausiid Aggregation, Behavior, and Interaction with Higher Predators at an Abrupt Topographical Feature in the Gulf of Maine (Krill GoME)

Coverage: Gulf of Maine; Georges Bank

from the NSF award abstract:

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Distribution, Aggregation, and Ecological Importance of Euphausids in the Gulf of Maine Region

Zooplankton are key members of marine ecosystems, but the biological and physical factors governing their distribution and aggregation are not fully understood, especially at the continental shelf break and margins of the deep basins of the shelf. Euphausiids are an important group of crustacean zooplankton in North Atlantic pelagic food webs and represent an interesting model species for the study of zooplankton aggregation due to their strong swimming capabilities and active aggregative behaviors. This project will address the hypotheses that the formation and variability of euphausiid aggregations along the northern flank of Georges Bank and the southern portion of the Gulf of Maine during fall relate to the interaction of physical concentration mechanisms with local topography and with plasticity in diel vertical migration and active aggregative behaviors, and that this plasticity arises from variability in food availability and predation by herring. These hypotheses will be addressed through a field program employing a comprehensive array of sensors, including both conventional narrowband and recently-developed broadband acoustic systems to sample the euphausiids, and a variety of other acoustic, optical, net, and other sampling devices to quantify their physical and biological environment. These sensors will be used in an inventive combination of (1) coarse-scale grid surveys to characterize along- and across-slope variability in the distribution of euphausiids, their predators, other zooplankton, phytoplankton, and physical conditions (e.g., the flow field), and (2) fine-scale adaptive surveys used to track individual euphausiid aggregations and observe how their three-dimensional structure and vertical position vary with changing environmental conditions. Repeat surveys will be timed to capitalize on known or likely variations in the flow field, food availability, light levels, and predation.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0928801

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