Masirah Island time series mesozooplankton abundance, Arabian Sea from 2007-2011

Website: https://www.bco-dmo.org/dataset/647964
Data Type: Cruise Results
Version:
Version Date: 2016-06-02

Project
» Costa Rica Dome FLUx and Zinc Experiments (CRD FLUZiE)
» Life Cycles of Diapausing Copepods in the Arabian Sea: cues for sinking at the end of the SW Monsoon (Arabian Sea Diapausing Copepods)

Programs
» Integrated Marine Biogeochemistry and Ecosystem Research -US (IMBER-US)
» Ocean Carbon and Biogeochemistry (OCB)
» U.S. Joint Global Ocean Flux Study (U.S. JGOFS)

Contributors	Affiliation	Role
Smith, Sharon L.	University of Miami Rosenstiel School of Marine and Atmospheric Science (UM-RSMAS)	Principal Investigator
al Hashmi, Khalid	Sultan Qaboos University	Scientist
Copley, Nancy	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

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Coverage

Spatial Extent: **Lat**:20.2167 **Lon**:58.75
Temporal Extent: 2007-04-01 - 2011-08-31

Methods & Sampling

Half-meter ring net. Collections of surface zooplankton were made daily (five days per week) at a station roughly 1.5 km east of the southwestern end of Masirah Island (20o 13'N, 58o 45'E) during intensive sampling periods (April-June of 2007 through 2011). At other times (May, late June, early August) samples were collected three times per week. Occasionally a vertical sample from bottom to surface, roughly 50-0 meters, was collected. The net was fitted with a 153um mesh net and a General Oceanics 2030R flowmeter. Boat speed was ~2 knots and each tow lasted five minutes. Local time at the time of sampling was between 8am and 10am. The sample was preserved in 5% neutral formalin. Sea surface temperature and a sample of surface phytoplankton were collected at the same time during intensive periods. Sampling was impossible at the height of the SW Monsoon (July) when breaking swell closes the mouths of all embayments on the southern side of

Masirah Island.

Laboratory analysis. Subsamples were removed with a calibrated pipette; two to four percent was analyzed immediately (generally the same day as collection) using a Zeiss Stemi2000 stereomicroscope. All Calanoides cf. carinatus and Eucalanidae were removed and kept for additional measurements at the University of Miami's Rosenstiel School of Marine and Atmospheric Science. A second subsample of four to seven percent was removed and sent to Dr. Irina Prusova at the Institute of Biology of the Southern Seas (IBSS) in Sevastapol, Russia, for full taxonomic analyses. Treatment of the samples at IBSS depended on the amount of plankton present in each sample. When the sample contained only a small amount of plankton, the entire subsample was analyzed for all species. In most cases, however, organisms smaller than ~1.5mm were identified and counted in smaller subsamples collected with a 1 or 2 ml Stempel pipette. Two replicate subsamples were withdrawn and counted and the data were averaged for calculation of abundance; generally 1 - 40 individuals per taxon were identified and sometimes more when a taxon was particularly abundant. Organisms ranging in size from ~1-2mm were counted in another part of the subsample collected with a 5ml Stempel pipette or by splitting the subsample into two or four equal parts. The entire subsample was then analyzed for abundance of organisms larger than 2mm, including copepods, euphausiids, amphipods, fish larvae, ostracods and any rare, large organisms. A total of 300 to 500 organisms per entire split were identified and counted. The identifications were performed with the aid of Leningrad Optic-Mechanics Company (LOMO) binocular microscopes using various magnifications depending on the sizes of the individuals being identified. Copepod species are listed in alphabetical order. All copepod adult stages, copepodite stages and nauplii found in each sample are listed. The taxonomic notations are: c1 = copepodite stage I of the species; c2 = copepodite stage II of the species; c3 = copepodite stage III of the species; c4 = copepodite stage IV of the species; c5 = copepodite stage V of the species; c = undetermined copepodite stage of the species; m = adult males of the species; f = adult females of the species. Total length of the copepods is the average length in mm measured microscopically for that taxon.

The remainder of the original sample was given to the Marine Science and Fisheries Department (College of Agriculture and Marine Science) of Sultan Qaboos University in Muscat, Oman, at the end of the intensive sampling season.

Data Processing Description

Microscopic counts of organisms in a subsample are converted to total numbers in the sample, then divided by the volume filtered to obtain numbers per cubic meter (reported data).

BCO-DMO Processing:
- final return character was removed from each record
- spaces were replaced with underscores
- trailing spaces were removed
- BCO-DMO compatible header was added to each file, replacing supplied header and to the toplevel file which calls all the individual files.

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Data Files

File
mesozoop_abund.csv (Comma Separated Values (.csv), 1.43 MB) MD5:e2f8eb8a79c966d7b4b84ce230862604 Primary data file for dataset ID 647964

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Parameters

Parameter	Description	Units
year	sampling year; formatted as YYYY	years
cruise_id	cruise identification	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
event	event number	unitless
sample	sample number; formatted as MMDDYY##	unitless
date	local date; formatted as m/d/yyyy	months days years
tow	Whether tow was a surface or vertical tow	unitless
species	species or taxonomic name	unitless
abundance	abundance	number/cubic meter
stage	Developmental stage: n=naupliar stages m=adult male f=adult female c=unidentified copepodite stage c1 to c5=copepodite stages CI-CV	unitless

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Microscope - Optical
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	
Generic Instrument Name	Ring Net
Dataset-specific Description	half meter ring net with a 153um mesh net and a General Oceanics 2030R flowmeter
Generic Instrument Description	A Ring Net is a generic plankton net, made by attaching a net of any mesh size to a metal ring of any diameter. There are 1 meter, .75 meter, .25 meter and .5 meter nets that are used regularly. The most common zooplankton ring net is 1 meter in diameter and of mesh size .333mm, also known as a 'meter net' (see Meter Net).

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Deployments

Nghza-07

Website	https://www.bco-dmo.org/deployment/647990
Platform	F/V Nghza
Start Date	2007-04-07
End Date	2007-05-26
Description	zooplankton sampling

Nghza-08

Website	https://www.bco-dmo.org/deployment/647994
Platform	F/V Nghza
Start Date	2008-05-07
End Date	2008-10-05
Description	zooplankton sampling

Nghza-09

Website	https://www.bco-dmo.org/deployment/647998
Platform	F/V Nghza
Start Date	2009-04-25
End Date	2009-10-08
Description	zooplankton sampling

Nghza-10

Website	https://www.bco-dmo.org/deployment/648002
Platform	F/V Nghza
Start Date	2010-05-21
End Date	2010-10-20
Description	zooplankton sampling

Nghza-11

Website	https://www.bco-dmo.org/deployment/648008
Platform	F/V Nghza
Start Date	2011-05-14
End Date	2011-12-08
Description	zooplankton sampling

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Project Information

Costa Rica Dome FLUx and Zinc Experiments (CRD FLUZiE)

Coverage: Costa Rica Dome, Eastern Tropical Pacific Ocean

Research was aimed at improved understanding of plankton dynamics, carbon and nutrient fluxes, and potential trace element limitation in the Costa Rica Dome region of the eastern tropical Pacific. The specific science objectives of the 2010 R/V Melville cruise (MV1008) were:
1) to assess grazing and trace metal/nutrient controls on primary production and phytoplankton standing stocks;
2) to quantify carbon and elemental fluxes and export rates from the euphotic zone; and
3) to measure microbial population, processes, stable isotope abundances associated with the OMZ and nitrite maxima.

Additional information about MV1008 can be found in the cruise report (PDF).

NOTE: The original proposal and award abstract are not relevant. The project was originally funded by NSF as experimental tests of phytoplankton controls in the Arabian Sea. Piracy concerns in the region led to the cancellation of the research cruise in 2009, and a Change of Scope request was approved to focus the project on related issues in the Costa Rica Dome (CRD).

Though this project is not formally affiliated with any large program, it aligns with IMBER's emphasis on community ecology and biogeochemistry, and the OCB focus on carbon-based measurements of production, grazing and export processes.

Life Cycles of Diapausing Copepods in the Arabian Sea: cues for sinking at the end of the SW Monsoon (Arabian Sea Diapausing Copepods)

Coverage: Arabian Sea

The infusion or transport of large-bodied copepods, whose life cycle includes diapauses (hibernation) at subsurface depths, into the upwelling area off Oman is fundamental to the success of the pelagic ecosystem in

the region. Changes in the SW Monsoon wind pattern or strength can alter timing and intensity of upwelling and mixing, presenting the possibility that primary productivity during upwelling (dominated by diatoms) and the large-bodied, diapausing copepods that ingest phytoplankton, may become de-coupled. When decoupling has happened in other ecosystems, populations crash forcing a food web reorganization, often with outcomes that are undesirable. In the case of Oman, the abundant myctophid fish, a key link to upper trophic level fish of commercial importance, may be at risk for a significant population decline because of changes in the timing of primary production.

Now that climate change may be altering the monsoon cycle of wind forcing in the Arabian Sea, there exists the possibility that the life cycle of diapausing C. carinatus may become mismatched with the appearance of their food supply occurring during the upwelling season. While ontogenetic migration is generally associated with high latitude environments, where the spring bloom of phytoplankton driven by the annual cycle of sunlight provides a spatially and temporally reliable food supply, there are no other copepods inhabiting the tropics and subtropics that have diapause at depth in their life cycle (except perhaps Subeucalanus crassus in the Arabian Sea). Understanding the cues that trigger downward migration of C. carinatus at the end of the upwelling season, and investigating whether S. crassus has a phenology similar to C. carinatus, are the goals of this project. An international archive of samples from the Arabian Sea extending back to 1992, as well as new samples, will be used in this study.

Affiliated programs: The Netherlands Indian Ocean Programme, NIOP; US-GLOBEC

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Program Information

Integrated Marine Biogeochemistry and Ecosystem Research -US (IMBER-US)

Website: http://www.imber.info/

Coverage: global

The BCO-DMO database includes data from IMBER endorsed projects lead by US funded investigators. There is no dedicated US IMBER project or data management office. Those functions are provided by US-OCB and BCO-DMO respectively.

The information in this program description pertains to the Internationally coordinated IMBER research program. The projects contributing data to the BCO-DMO database are those funded by US NSF only. The full IMBER data catalog is hosted at the Global Change Master Directory (GCMD).

IMBER Data Portal: The IMBER project has chosen to create a metadata portal hosted by the NASA's Global Change Master Directory (GCMD). The GCMD IMBER data catalog provides an overview of all IMBER endorsed and related projects and links to datasets, and can be found at URL http://gcmd.nasa.gov/portals/imber/.

IMBER research will seek to identify the mechanisms by which marine life influences marine biogeochemical cycles, and how these, in turn, influence marine ecosystems. Central to the IMBER goal is the development of a predictive understanding of how marine biogeochemical cycles and ecosystems respond to complex forcings, such as large-scale climatic variations, changing physical dynamics, carbon cycle chemistry and nutrient fluxes, and the impacts of marine harvesting. Changes in marine biogeochemical cycles and ecosystems due to global change will also have consequences for the broader Earth System. An even greater challenge will be drawing together the natural and social science communities to study some of the key impacts and feedbacks between the marine and human systems.

To address the IMBER goal, four scientific themes, each including several issues, have been identified for the IMBER project: Theme 1 - Interactions between Biogeochemical Cycles and Marine Food Webs; Theme 2 - Sensitivity to Global Change: How will key marine biogeochemical cycles, ecosystems and their interactions, respond to global change?; Theme 3 - Feedback to the Earth System: What are the roles of the ocean biogeochemistry and ecosystems in regulating climate?; and Theme 4 - Responses of Society: What are the relationships between marine biogeochemical cycles, ecosystems, and the human system?

Ocean Carbon and Biogeochemistry (OCB)

Website: http://us-ocb.org/

Coverage: Global

The Ocean Carbon and Biogeochemistry (OCB) program focuses on the ocean's role as a component of the global Earth system, bringing together research in geochemistry, ocean physics, and ecology that inform on and advance our understanding of ocean biogeochemistry. The overall program goals are to promote, plan, and coordinate collaborative, multidisciplinary research opportunities within the U.S. research community and with international partners. Important OCB-related activities currently include: the Ocean Carbon and Climate Change (OCCC) and the North American Carbon Program (NACP); U.S. contributions to IMBER, SOLAS, CARBOOCEAN; and numerous U.S. single-investigator and medium-size research projects funded by U.S. federal agencies including NASA, NOAA, and NSF.

The scientific mission of OCB is to study the evolving role of the ocean in the global carbon cycle, in the face of environmental variability and change through studies of marine biogeochemical cycles and associated ecosystems.

The overarching OCB science themes include improved understanding and prediction of: 1) oceanic uptake and release of atmospheric CO2 and other greenhouse gases and 2) environmental sensitivities of biogeochemical cycles, marine ecosystems, and interactions between the two.

The OCB Research Priorities (updated January 2012) include: ocean acidification; terrestrial/coastal carbon fluxes and exchanges; climate sensitivities of and change in ecosystem structure and associated impacts on biogeochemical cycles; mesopelagic ecological and biogeochemical interactions; benthic-pelagic feedbacks on biogeochemical cycles; ocean carbon uptake and storage; and expanding low-oxygen conditions in the coastal and open oceans.

U.S. Joint Global Ocean Flux Study (U.S. JGOFS)

Website: http://usjgofs.whoi.edu/

Coverage: Global

The United States Joint Global Ocean Flux Study was a national component of international JGOFS and an integral part of global climate change research.

The U.S. launched the Joint Global Ocean Flux Study (JGOFS) in the late 1980s to study the ocean carbon cycle. An ambitious goal was set to understand the controls on the concentrations and fluxes of carbon and associated nutrients in the ocean. A new field of ocean biogeochemistry emerged with an emphasis on quality measurements of carbon system parameters and interdisciplinary field studies of the biological, chemical and physical process which control the ocean carbon cycle. As we studied ocean biogeochemistry, we learned that our simple views of carbon uptake and transport were severely limited, and a new "wave" of ocean science was born. U.S. JGOFS has been supported primarily by the U.S. National Science Foundation in collaboration with the National Oceanic and Atmospheric Administration, the National Aeronautics and Space Administration, the Department of Energy and the Office of Naval Research. U.S. JGOFS, ended in 2005 with the conclusion of the Synthesis and Modeling Project (SMP).

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0825598
NSF Division of Ocean Sciences (NSF OCE)	OCE-1259255
Fulbright Foundation (Fulbright)	unknown Fulbright
Sultan Qaboos University (Sultan Qaboos U.)	unknown Sultan Qaboos U.

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