Zooplankton biomass and biovolume analysis from R/V Sally Ride cruise SR2408 in the Gulf of California in May 2024

Website: https://www.bco-dmo.org/dataset/996488
Data Type: Cruise Results
Version: 1
Version Date: 2026-04-21

Project
» Collaborative Research: Metabolic habitat barriers imposed on tropical diel vertical migrators (Metabolism in Diel Migrators)

Contributors	Affiliation	Role
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Abstract
Dataset provides the relationship between size and mass for multiple large taxonomic groups of zooplankton collected in the Gulf of California 2024.

Table of Contents

Coverage

Location: Gulf of California Guaymas Basin and Carmen Basin
Spatial Extent: **Lat**:26.37247 **Lon**:-110.75492
Temporal Extent: 2024-05-15

Methods & Sampling

Individuals used in the Biovolume to Biomass dataset were collected May 15, 2024 at 26°22.348 N, 110°45.295 W. They were frozen at sea then returned to the lab where they were imaged on a ZooSCAN following the methods described in Maas et al. 2021 to obtain size-related metrics. After imaging each individual was weighed on a Mettler-Toledo XPR microbalance then dried for a minimum of 3 days in a drying oven at 55C. They were then weighed again to obtain dry mass.

Data Processing Description

Images were processed using the ZooProcess software to obtain morphological measurements.

BCO-DMO Processing Description

- Loaded data from "SR2406-2408 Biovolume to Biomass.xlsx" (sheet 1) using two-row headers, treating "" and "nd" as missing values, with Excel floating point error adjustment and formatting preservation
- Renamed fields: WW_mg to WW, DW_mg to DW, Major_mm to Major, Minor_mm to Minor, Area_mm2 to Area, Volume_mm3 to Volume, ESD_mm to ESD
- Export file as 996488_v1_sr2408_biovolume_biomass.csv

[table of contents | back to top]

Related Publications

Maas, A. E., Gossner, H., Smith, M. J., & Blanco-Bercial, L. (2021). Use of optical imaging datasets to assess biogeochemical contributions of the mesozooplankton. Journal of Plankton Research, 43(3), 475–491. doi:10.1093/plankt/fbab037
Methods

[table of contents | back to top]

Parameters

Parameter	Description	Units
Type	broad taxonomic group	unitless
WW	wet weight	mg
DW	dry weight	mg
Major	major axis length	mm
Minor	minor axis length	mm
Area	area	mm^2
Volume	volume, calculated as an ellipse	mm^3
ESD	estimated spherical diameter	mm

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Mettler-Toledo XPR microbalance
Generic Instrument Name	scale or balance
Dataset-specific Description	After imaging each individual was weighed on a Mettler-Toledo XPR microbalance then dried for a minimum of 3 days in a drying oven at 55C. They were then weighed again to obtain dry mass.
Generic Instrument Description	Devices that determine the mass or weight of a sample.

Dataset-specific Instrument Name	ZooSCAN ver. 3 (Hydroptic)
Generic Instrument Name	ZooSCAN
Dataset-specific Description	They were frozen at sea then returned to the lab where they were imaged on a Zooscan following the methods described in Maas et al. 2021 to obtain size-related metrics.
Generic Instrument Description	Description excerpt from Hydroptic website http://www.hydroptic.com/index.php/public/Page/product_item/ZOOSCAN The ZooSCAN (CNRS patent) system makes use of scanner technology with custom lighting and a watertight scanning chamber into which liquid zooplankton samples can be placed. The scanner recovers a high-resolution, digitial image and the sample can be recovered without damage. These digital images can then be investigated by computer processing. While the resolution of the digitized zooplankton images is lower than the image obtained using a binocular microscope this technique has proved to be more than adequate for large sample sets. Identification of species is done by automatic comparison of the image (vignette) of each individual animal in the scanned image with a library data set which may be built by the investigator for each individual survey or imported from a previous survey. The latest machine learning algorithm allows high recognition levels even if we recommend complementary manual sorting to achieve a high number of taxonomic groups.

[table of contents | back to top]

Deployments

SR2406

Website	https://www.bco-dmo.org/deployment/996491
Platform	R/V Sally Ride
Start Date	2024-04-25
End Date	2024-05-01

SR2407

Website	https://www.bco-dmo.org/deployment/996668
Platform	R/V Sally Ride
Start Date	2024-05-02
End Date	2024-05-11
Description	Project: Metabolic habitat barriers imposed on tropical diel vertical migrators

SR2408

Website	https://www.bco-dmo.org/deployment/996670
Platform	R/V Sally Ride
Start Date	2024-05-11
End Date	2024-05-21
Description	Project: Metabolic habitat barriers imposed on tropical diel vertical migrators

[table of contents | back to top]

Project Information

Collaborative Research: Metabolic habitat barriers imposed on tropical diel vertical migrators (Metabolism in Diel Migrators)

Coverage: Guaymas Basin, Gulf of California, Mexico

NSF Award Abstract:
This project is seeking to define physiologically-accessible habitat for animals faced with changing ocean conditions. Many oceanic animals migrate daily from warm, oxygenated surface waters at night to deep, cold and hypoxic waters during the daytime, and these migrations play critical roles in oceanic ecology and biogeochemical cycles. Over their depth ranges, migrators face very different ecological and environmental demands that may lead to unique traits that in turn, influence how they respond to a warming ocean where oxygen minimum zones are also expanding. This study is combining ecological and physiological approaches during two expeditions to the Gulf of California. The investigators are measuring metabolic traits in a diverse suite of ocean animals that exhibit vertical migration to determine possible roles of oxygen and temperature in triggering changes in vertical and latitudinal distribution. They are also measuring species distributions in relation to environmental oxygen and temperature to determine ecologically-relevant thresholds of environmental tolerance. The project involves training and experiential learning for graduate and undergraduate students. In addition, engagement with educational experts and artists will generate media and lesson plans to support STEM education and Next Generation Science Standards. These activities leverage the Bermuda Institute of Ocean Sciences' Databytes and Mid-Atlantic Robotics IN Education (MARINE) programs, designed to improve ocean literacy and technological fluency and targeting students from groups traditionally underrepresented in science. Project products also include a new level for a video game that introduces the concepts of how oxygen minimum zones influence animal distribution.

Climate change is driving poleward shifts in the distributions of marine animals. These shifting edges of the range of species habitats are often interpreted as a manifestation of oxygen limitation that is presumed to occur at high water temperatures due to a mismatch between physiological oxygen supply and thermodynamically-driven oxygen demand. However, recent work by the investigators suggests that oxygen supply has evolved to meet demand regardless of temperature. These opposing views predict very different thermal thresholds for range expansion. In this study, the investigators are employing a relationship between metabolic traits to infer a unique temperature sensitivity in tropical diel vertical migrators and to map their metabolically-available habitat in the Eastern Pacific. Specifically, the investigators propose that oxygen supply does not limit metabolism in tropical migrators, even in the oxygen minimum zone. Instead, they contend that the active metabolic rate for tropical migrators is highly sensitive to temperature, and that this creates a barrier to range expansion where the aerobic scope for growth and reproduction is insufficient in cold waters. This

temperature sensitivity will also allow migrators to expand poleward to newly available habitat following modest warming, rather than simply being extirpated from their native tropical habitat by excess warming. This hypothesis, if supported, would transform our mechanistic understanding of species' responses to climate change, amend our predictions of range expansion, and modify our assessment of migrator contributions to oceanic biogeochemical cycles in a warmer future ocean.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2127299

[table of contents | back to top]