MOCNESS Biomass data associated with R/V Sally Ride cruise SR2407 in the Gulf of California in May 2024

Website: https://www.bco-dmo.org/dataset/996652
Data Type: Cruise Results
Version: 1
Version Date: 2026-04-10

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

Contributors	Affiliation	Role
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Abstract
In May 2024, the R/V Sally Ride cruises SR2407 was conducted in the Gulf of California. The MOCNESS tow nets were deployed during this cruise. This dataset presents biomass of size fractionated zooplankton samples were collected using a 1 m2 MOCNESS with 222 micrometer mesh. The biomass comes from a pair of day and night tows 0-1000 m in Guaymas Basin in the Gulf of California on May 4th and May 5th.

Table of Contents

Coverage

Location: Gulf of California Guaymas Basin and Carmen Basin
Spatial Extent: **N**:27.3642 **E**:-111.2403 **S**:27.2552 **W**:-111.3141
Temporal Extent: 2024-05-04 - 2024-05-05

Methods & Sampling

In May 2024, the R/V Sally Ride cruises SR2407 was conducted in the Gulf of California. The MOCNESS tow nets were deployed during this cruise. Biomass of size fractionated zooplankton samples were collected using a 1 m2 MOCNESS with 222 micrometer mesh. The biomass comes from a pair of day and night tows 0-1000 m in Guaymas Basin in the Gulf of California on May 4th and May 5th.

Biomass of zooplankton collected by MOCNESS net tows partitioned into 5 size fractions. On board a portion of the tow (split) was size fractionated into five size classes (200-500, 500-1000, 1000-2000, 2000-5000, >5000) then dried on a pre-weighed filter, rinsed with ammonium formate and frozen at -80. Upon return to land the filter was gently blotted then weighed on a microbalance to get wet weight. Each filter was then placed in a drying oven (~55C) for a minimum of 3 days and weighed again to obtain a dry mass measurement. To calculate biomass per m3 multiply by split and divide by volume filtered.

BCO-DMO Processing Description

- Loaded sheet 1 of "SR2406-2408 MOC biomass measurements.xlsx" as resource named using filename, with 2-row headers, treating "" and "nd" as missing values
- Renamed 13 fields to remove spaces and special characters: "Date, local" to Date_local, "N. Latitude" to N_Latitude, "W. Longitude" to W_Longitude, "Local Time" to Local_Time, "min depth (m)" to min_depth, "max depth (m)" to max_depth, "volume filtered (m3)" to volume_filtered, "Moc #" to Moc_num, "Net #" to Net_num, "filter #" to filter_num, "filter weight (g)" to filter_weight, "Wet weight (g)" to Wet_weight, "Dry weight(g)" to Dry_weight
- Combined Date_local (format %m-%d-%y) and Local_Time (format %H:%M) into new datetime field ISO_datetime_local with output format %Y-%m-%dT%H:%M
- Converted ISO_datetime_local from America/Denver timezone to UTC, creating new field ISO_datetime_UTC with output format %Y-%m-%dT%H:%M
- Reordered fields to: ISO_datetime_local, Date_local, Local_Time, ISO_datetime_UTC, N_Latitude, W_Longitude, min_depth, max_depth, volume_filtered, DN, Moc_num, Net_num, split, fraction, note, filter_num, filter_weight, Wet_weight, Dry_weight
- Converted N_Latitude from degrees-decimal_minutes to decimal degrees with North directional; converted W_Longitude from degrees-decimal_minutes to decimal degrees with West directional (resulting in negative values)
- Rounded N_Latitude and W_Longitude to 4 decimal places with trailing zeros preserved
- Converted Date_local to date type with output format %Y-%m-%d
- Exported file as "996652_v1_moc_biomass_sr2407.csv"

[table of contents | back to top]

Parameters

Parameter	Description	Units
ISO_datetime_local	Datetime of sample collection, local time	unitless
Date_local	Date of sample collection, local timezone	unitless
Local_Time	Time of sample collection, local timezone	unitless
ISO_datetime_UTC	Datetime of sample collection, UTC time	unitless
N_Latitude	Latitude of sample collection, positive is North	decimal degrees
W_Longitude	Longitude of sample collection, negative is West	decimal degrees
min_depth	Minimum depth of net	meters
max_depth	Maximum depth of net	meters
volume_filtered	Volume filtered by the net	m3
DN	Day or Night classification; D is day, N is night	unitless

Moc_num	Mocness number	unitless
Net_num	Net number	unitless
split	Proportion of the net preserved	unitless
fraction	Size class of the net fraction (200-500, 500-1000, 1000-2000, 2000-5000, >5000)	unitless
note	Notes on the sample	unitless
filter_num	Filter number	unitless
filter_weight	Mass of the filter	g
Wet_weight	Wet mass of the zooplankton (filter mass removed)	g
Dry_weight	Dry mass of the zooplankton (filter mass removed)	g

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	MOCNESS net system with 10 total nets and 222 mesh
Generic Instrument Name	MOCNESS
Dataset-specific Description	Samples were collected with a MOCNESS net system with 10 total nets and 222 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)

Dataset-specific Instrument Name	Mettler-Toledo XPR microbalance
Generic Instrument Name	scale or balance
Dataset-specific Description	Mass was measured with a Mettler-Toledo XPR microbalance.
Generic Instrument Description	Devices that determine the mass or weight of a sample.

[table of contents | back to top]

Deployments

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

[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]