Weekly epi-benthic sled mysid survey observations from Chesapeake Biological Laboratory pier, Solomons, MD, USA, Jun 2022 to Sep 2024

Website: https://www.bco-dmo.org/dataset/996508
Data Type: Other Field Results
Version: 1
Version Date: 2026-04-09

Project
» Planktonic Omnivores and Stable Isotopes: Developing, Validating and Field-testing a Multi-species Functional Response Model (MSFR)

Contributors	Affiliation	Role
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Abstract
Data from weekly mysid survey that focused on tracking in-situ mysid numbers in shallow water habitat over time. All data was collected in Solomons, MD at the Chesapeake Biological Laboratory's research pier using an epi-benthic sled with 500um mesh from June to September 2022-2024 on a weekly basis (except where noted in comment field). Individual transect pulls were conducted in the same location, direction and distance and designated as shallow vs. deeper shallow habitat. This dataset includes collection metadata, station description, and total count of mysids collected.

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Coverage

Location: Chesapeake Biological Laboratory, Solomons, MD, USA
Spatial Extent: **Lat**:38.3180861 **Lon**:-76.45303333
Temporal Extent: 2022-06-16 - 2024-09-05

Methods & Sampling

All sampling was done in Solomons, MD at the Chesapeake Biological Laboratory's research pier using an epi-benthic sled from May to September 2022-2024 on a weekly basis (except where noted in comment field).

Individual transect pulls were conducted in the same location, direction and distance and designated as shallow vs. deeper shallow habitat.

Samples were collected using a hand-pulled epi-benthic sled with 500 µm mesh size net. Once collected, the contents of the net was hand-picked of all mysids and counted.

Animals collected: Mysidae, non-speciated

BCO-DMO Processing Description

- Loaded data from "CBL Pier Mysid Survey Data_BCODMO.xlsx" (sheet 1, Excel format) with header row 1; treated empty strings and "nd" as missing values
- Combined DATE (format %m-%d-%y) and TIME (format %H:%M) fields into new DATETIME field with output format %Y-%m-%dT%H:%M and type datetime
- Deleted fields: DATE, TIME, MONTH, DAY, YEAR
- Reordered fields to: DATETIME, LAT, LONG, STATION, SEASON, TRANSECT, HABITAT, TOTAL_N, COMMENTS
- Exported file as 996508_v1_cbl_pier_mysid_survey.csv

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Parameters

Parameter	Description	Units
DATETIME	Date and time of collection	unitless
LAT	Latitude of collection, positive is North	decimal degrees
LONG	Longitude of collection, negative is West	decimal degrees
STATION	Station where samples were collected; St0, tow length = 34.8 m; St1, tow length = 26.1 m; St2, tow length = 30.7 m; St3, tow length = 38 m	unitless
SEASON	Season of collection as Spring or Summer; Spring=April, May, June; Summer=July, August, September	unitless
TRANSECT	Structured or Unstructured tows; Structured=tows with structure (i.e, pilings) surrounding tow; Unstructured=tows with no structure surrounding tow	unitless
HABITAT	Depth of sample collection as 'Deep' or 'Shallow' water depths; Shallow depths approx. 1m, Deep depths approx. 2-3m	unitless
TOTAL_N	Total mysids collected per tow	unitless
COMMENTS	Comments about the collection process	unitless

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Instruments

Dataset-specific Instrument Name	Epi-benthic sled
Generic Instrument Name	Epibenthic Sled
Dataset-specific Description	Methods Description: Samples were collected using a hand-pulled epi-benthic sled with 500um mesh size net. Once collected, the contents of the net was hand-picked of all mysids and counted. Instrument Description: Epi-benthic sled used was custom design from Chesapeake Biological Laboratory's facilities department. Net size was 500um mesh.
Generic Instrument Description	An epibenthic sled is a semi-quantitative bottom-sampling device designed to trawl just above the bottom at the sediment water interface (the epibenthic zone). The sled consists of a rectangular steel frame with a mesh net (often more than one) attached to it. Towed along the ocean floor, its weight scrapes into the benthos, collecting any organisms on the surface or in the first few centimeters of sediment. It also collects the organisms in the water column just above the benthos. Descriptions from WHOI and Census of Marine Life.

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Project Information

Planktonic Omnivores and Stable Isotopes: Developing, Validating and Field-testing a Multi-species Functional Response Model (MSFR)

Coverage: Chesapeake Bay

NSF Award Abstract:

Diagrams of food webs are typically drawn as boxes that show linkages between predators and prey. While these are useful models of how energy is transferred along a food chain, real food webs are more complex. Predator diets are often variable making it difficult to establish predator-prey links in marine communities. This project is investigating prey switching in a key member of coastal food webs, the shrimp-like mysid, Neomysis americana. Prey switching affects community structure and an organism’s resilience to environmental perturbation, but it is not easy to quantify. This project is using a combination of laboratory experiments and field sampling to develop a food web model that predicts mysid feeding patterns in the environment. This realistic and predictive food web model uses traditional gut analysis and analytical techniques that follow carbon and nitrogen as it is incorporated into the bodies of the mysids. In addition, mysid food preferences are being determined in the laboratory across a full range of diet possibilities. The calibrated gut analysis and chemical marker data in combination with feeding experiments are incorporated into the model, which then predicts mysid feeding on mixed diets under different environmental conditions. These predictions are validated against field data. Broader impacts include benefits to society for a better understanding of how coastal food webs work. Doctoral students and undergraduate students are being trained in experimental and field research. Increasing diversity in STEM fields is occurring through a partnership with two community colleges (College of Southern Maryland, Chesapeake College) to recruit summer interns for research experiences. Outreach activities include the development of educational materials for grade-appropriate hands-on laboratory experiments and training opportunities for middle and high school teacher groups in the use of these materials in their classrooms.

This project is developing and field-testing a generalizable approach to understand and predict complex predator-prey relationships in marine food webs. The research plan involves building and validating a multispecies functional response (MSFR) model for an omnivorous consumer, the mysid Neomysis americana. These models predict diet for consumers that feed on multiple types of prey under differing prey concentrations and identify conditions under which prey switching occurs in the environment. Recent and

time-integrated diet tracking with gut contents, bulk stable isotope (SI) and compound-specific amino acid stable isotope (AA-CSI) analysis are validated in the lab and used to reconstruct diet of Neomysis in the field. The proposed research is testing specific hypotheses about Neomysis' consumption rates and prey preferences and the effectiveness of integrating SI and AA-CSI into MSFR models. Laboratory experiments are determining prey-specific functional response curves by Neomysis under varying prey concentrations and environmental (temperature) conditions using grazing experiments. Experimental results are incorporated into a temperature-dependent MSFR model for a 5-compartment simplified food web (Neomysis, adult copepod, copepod nauplii, phytoplankton, detritus). A complementary element of the project is the experimental determination of bulk SI (ð¿13C and ð¿15N) and AA-CSI (ð¿15N) equilibration rates and trophic enrichment factors for Neomysis and each prey type. The predator-prey dynamics of Neomysis in the environment are being modeled using the lab-validated MSFR approach and field data, including prey concentrations, gut contents, and prey and Neomysis SI and AA-CSI data.

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.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2023349

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