Artemia nauplii consumption by Americamysis bahia as a function of body length from a pilot laboratory experiment

Website: https://www.bco-dmo.org/dataset/986238
Data Type: experimental
Version: 1
Version Date: 2025-10-07

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
This pilot laboratory experiment focused on the effect of mysid length on consumption of Artemia nauplii over a fixed time interval. Experiments were conducted from November 3-6, 2023 using a species of mysid (Americamysis bahia) as the predatory mysid and 1-2 day old Artemia nauplii as the prey. Experiments were conducted at Chesapeake Biological Lab on a slowly rotating grazing wheel. Experimental containers held a single mysid in 250 ml of 14 ppt of artificial seawater (Instant Ocean). Experiments consisted of initial counts of 40 or 60 Artemia nauplii at water temperatures of 22 degrees C. Experiments lasted 4 hrs, after which Artemia nauplii were counted to determine the total number consumed by each mysid. The dataset contains the mysid length, as well as these counts.

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Coverage

Location: Chesapeake Biological Laboratory, Solomons, MD, USA
Temporal Extent: 2023-11-03 - 2023-11-06

Methods & Sampling

Adult *Americamysis bahia* (hereafter, mysids) were purchased and shipped from Biosystems, Inc (Fort Collins, CO). Mysids were shipped acclimated to 15 ppt water salinity. Upon arrival at Chesapeake Biological Laboratory, mysids were acclimated to the experimental conditions of water temperature = 22 degrees C, and salinity = 14 ppt. Mysids were held for a minimum of 3 days prior to experimentation, during which period they were fed 1 day old *Artemia* nauplii *ad libitum*.

Prior to experiments, mysids were fasted for 1 day to allow depuration of stomach contents and ensure mysids were actively searching for prey. During experiments, individual mysids were placed in a 1-L container with filtered, artificial seawater (Instant Ocean® Sea Salt, Blacksburg, VA) mixed to a concentration of 14 ppt. A total of 60 (Series 1) or 40 (Series 2) 1-day old *Artemia* nauplii were added to each container, sealed and placed on a slowly rotating, custom-made zooplankton grazing wheel. The wheel rotates very slowly around a central axis and is designed to keep plankton or zooplankton in suspension during grazing experiments. The experiment continued for 4 hours. Following each experiment, mysids placed in a petri dish and digitally measured for body length (rostrum to base of the telson) under light microscopy (CellSens imaging program, Evident Scientific). Containers were filtered using 40-micron nitex mesh and all remaining *Artemia* were enumerated.

Data Processing Description

Microsoft excel was used to record and organize data, associated metadata, and create the plot attached as supplemental file.

BCO-DMO Processing Description

- Imported "20231108_Mysidsizeexperiments_22C_1mysid_Americamysis.xlsx" sheet 2 into the BCO-DMO system
- Added "Series 1" and "Series 2" values to a new parameter "Series" to differentiate the sample numbers
- Removed spaces and special characters from the parameter names, in compliance with BCO-DMO standards
- Exported file as "986238_v1_mysid_consumption.csv"

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Data Files

File	
986238_v1_mysid_consumption.csv	(Comma Separated Values (.csv), 428 bytes) MD5:c1b63bd82e953aeecc46ff80445e16bb
Primary data file for dataset ID 986238, version 1	

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Supplemental Files

File	
Artemia_nauplii_consumption.jpg	(JPEG Image (.jpg), 21.72 KB) MD5:a84f44f07e0529e45b51d3e7456db4e6
A plot of Artemia nauplii consumption by Americamysis bahia as a function of body length	

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Related Publications

Fulton, R. S. (1982). Predatory feeding of two marine mysids. Marine Biology, 72(2), 183–191.

https://doi.org/10.1007/BF00396919
Methods

Winkler, G., & Greve, W. (2004). Trophodynamics of two interacting species of estuarine mysids, Praunus flexuosus and Neomysis integer, and their predation on the calanoid copepod Eurytemora affinis. Journal of Experimental Marine Biology and Ecology, 308(1), 127–146. https://doi.org/10.1016/j.jembe.2004.02.017
Methods

Winkler, G., Martineau, C., Dodson, J., Vincent, W., & Johnson, L. (2007). Trophic dynamics of two sympatric mysid species in an estuarine transition zone. Marine Ecology Progress Series, 332, 171–187. https://doi.org/10.3354/meps332171
Methods

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Parameters

Parameter	Description	Units
Series	Indicates the series during the sample was measured; Series 1 received 60 1-day old *Artemia* nauplii, while Series 2 received 40 1-day old *Artemia* nauplii	unitless
ID	Unique identifier given to each mysid	unitless
Mysid_length	Rostrum to base of telson; length of each mysid	mm
Initial_artemia_count	Starting number of *Artemia* nauplii in each chamber	unitless
Final_artemia_count	Ending number of *Artemia* nauplii in each chamber	unitless
Artemia_consumed	Calculated number of *Artemia* nauplii consumed during the experiment in each chamber	unitless

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Instruments

Dataset-specific Instrument Name	microscopy
Generic Instrument Name	Microscope - Optical
Dataset-specific Description	Mysids were placed in a petri dish and digitally measured under light microscopy (CellSens imaging program, Evident Scientific).
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".

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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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