Acartia tonsa prosome length measurements in 2019 during a common garden split-brood experiment several generations after copepod collection in Long Island Sound in summer and fall of 2019

Website: https://www.bco-dmo.org/dataset/955742
Data Type: experimental
Version: 1
Version Date: 2025-03-11

Project
» Linking eco-evolutionary dynamics of thermal adaptation and grazing in copepods from highly seasonal environments (evolutionary_copepods)

Contributors	Affiliation	Role
Dam, Hans G.	University of Connecticut (UConn)	Principal Investigator
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Abstract
Copepods with short generation times experience seasonal environmental variation across, rather than within, generations. This data includes body size measurements for both male and female individuals from seasonal collections of Acartia tonsa from Eastern Long Island Sound in Summer and Fall 2019. The body size measurements in this dataset were made during a common garden split-brood experiment with the 2019 collections, after several generations of common garden acclimation. The observed variation in size can therefore be attributed to the effects of both genetic variation and phenotypic plasticity. Data were collected by Dr. Matthew Sasaki at the University of Connecticut.

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Coverage

Location: Copepods were collected from Eastern Long Island Sound using surface plankton tows in the top three meters of water.
Spatial Extent: **Lat**:41.32074 **Lon**:-72.001655
Temporal Extent: 2019-06-30 - 2019-11-17

Methods & Sampling

Copepods were measured using an inverted compound microscope and attached digital camera. Body lengths were then measured using ImageJ.

Note: Duplicate rows in this dataset table are real measurements of separate individuals.

Data Processing Description

All raw data and code associated with these analyses are available from a
Dryad repository: https://doi.org/10.5061/dryad.9kd51c5dg

BCO-DMO Processing Description

* Data from submitted file "Sasaki Dam 2020 Size.csv" was imported into the BCO-DMO data system for this dataset. Values "NA" imported as missing data values. Table will appear as Data File: 955742_v1_a-tonsa-body-size.csv (along with other download format options).

Missing Data Identifiers:
* In the BCO-DMO data system missing data identifiers are displayed according to the format of data you access. For example, in csv files it will be blank (null) values. In Matlab .mat files it will be NaN values. When viewing data online at BCO-DMO, the missing value will be shown as blank (null) values.

* Date converted to ISO 8601 format
* Column "collection_temo" renamed "collection_temp" as per provided metadata for column description name.
* collection_date column was added using the collection_id as provided in related data table from same collection ids (dataset https://osprey.bco-dmo.org/dataset/955739)

* Organism LSIDs added from matches at the World Register of Marine Species (WoRMS) on 2025-03-11

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Data Files

File
955742_v1_a-tonsa-body-size.csv (Comma Separated Values (.csv), 20.91 KB) MD5:339d59d692674f426a790ee724b7b053 Primary data file for dataset ID 955742, version 1

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Related Publications

Rasband, W. S. (n.d.). ImageJ. U.S. National Institutes of Health. https://imagej.net/ij/
Software

Sasaki, M. C., & Dam, H. G. (2020). Genetic differentiation underlies seasonal variation in thermal tolerance, body size, and plasticity in a short-lived copepod. Ecology and Evolution, 10(21), 12200–12210. Portico. https://doi.org/10.1002/ece3.6851
Results

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Related Datasets

IsRelatedTo

Sasaki, M., &; Dam, H. (2021). Genetic differentiation underlies seasonal variation in thermal tolerance, body size, and plasticity in a short-lived copepod (Version 3) [Data set]. Dryad.

https://doi.org/10.5061/DRYAD.9KD51C5DG https://doi.org/10.5061/dryad.9kd51c5dg

Sasaki, M., Dam, H. G. (2025) **Upper thermal limits (LD50) for two common coastal copepods during thermal experiments with individuals collected from Long Island Sound between July 2017 and November 2019.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2025-03-11 doi:10.26008/1912/bco-dmo.955739.1 [view at BCO-DMO]
Relationship Description: These datasets utilized the same collections. Results for both datasets were published in Sasaki et al. (2020).

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Parameters

Parameter	Description	Units
collection_id	the culture ID. Refers to the time period copepods were collected	unitless
collection_date	collection date	unitless
collection_temp	the water temperature recorded at the time of collection	degrees Celsius
acclimation_temp	the temperature copepods were acclimated to during the split-brood phase of the common garden experiment. Refers to the temperature copepods were reared at.	degrees Celsius
sex	the sex of the individual measured ("m" indicates male, "f" indicates female)	unitless
length	the measured prosome length for each individual. millimeter.	millimeter (mm)

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Camera
Dataset-specific Description	Copepods were measured using an inverted compound microscope and attached digital camera.
Generic Instrument Description	All types of photographic equipment including stills, video, film and digital systems.

Dataset-specific Instrument Name	
Generic Instrument Name	Microscope - Optical
Dataset-specific Description	Copepods were measured using an inverted compound microscope and attached digital camera.
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

Linking eco-evolutionary dynamics of thermal adaptation and grazing in copepods from highly seasonal environments (evolutionary_copepods)

Coverage: Connecticut and Florida

NSF Award Abstract:

Many parts of the ocean are warming rapidly, but it is still unknown how this warming will affect marine food webs. Copepods, small crustaceans, are the most abundant animals in the ocean; consequently, they play crucial roles in plankton marine food webs and in the transfer of energy to fishes. Many species of copepods are able to choose between prey such as microscopic plants and single-celled animals. The choice affects how energy moves through marine food webs. Past work suggests that increasing temperature should favor herbivory over carnivory. This project is investigating whether this prediction holds in the face of genetic adaptation to warming in highly seasonal systems such as coastal temperate zones. Results from this study are contributing to understanding and predicting the response of marine ecosystems to future climate conditions, as well as for planning and implementing sustainable fisheries management plans. Other broader impacts include the development of learning modules for high school and college students. Hands-on science exhibits for K-6 students and public presentations at established lecture series focus on the role of copepods in marine food webs in coastal habitats.

Predicting responses of the oceanic biota to climate change is limited not only by an incomplete understanding of how warming affects ecological interactions and evolutionary dynamics individually, but also by how these two factors interact. Copepods are both grazers of phytoplankton and predators of microzooplankton in marine systems. Increasing temperatures may drive a large-scale shift in the diet of omnivorous copepods towards stronger herbivory, with significant consequences for the structure of marine food webs and the control of primary productivity. However, thermal adaptation may moderate or even nullify these shifts. This project examines the interactive role ecological and evolutionary dynamics plays in shaping grazing and individual fitness in a warming ocean. The main goals of the project are to: 1) quantify seasonal variation in thermal performance curves in dominant coastal copepod species; 2) determine whether observed seasonal variation in thermal performance is caused by genetic differentiation or phenotypic plasticity; 3) assess how temperature affects respiration and protein synthesis rates, selective feeding, and individual fitness; and 4) determine how changes in the thermal performance curve, via both genetic differentiation and phenotypic plasticity, affect the relationship between temperature and food preference. Selective feeding experiments are being paired with measurements of egg production and hatching success across a wide range of temperatures to measure thermal effects on feeding selectivity and individual fitness. Finally, genetic differentiation and phenotypic plasticity on temperature sensitivity is being investigated across populations from environments that differ in their thermal regime. The outcomes of this project contribute to the parameterization of models that forecast fisheries dynamics in response to climate change.

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-1947965

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