Acartia tonsa body size data for transgenerational ocean warming and acidification experiments

Website: https://www.bco-dmo.org/dataset/906342
Data Type: experimental
Version: 1
Version Date: 2023-09-07

Project
» Collaborative Research: Response of marine copepods to warming temperature and ocean acidification (Copepod Response to Warming Temp and OA)

Contributors	Affiliation	Role
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Abstract
These data include body size measurements collected for Acartia tonsa during multigenerational exposure to ocean warming (OW), ocean acidification (OA), and combined ocean warming and acidification (OWA) including a benign ambient condition temperature and CO2 control (AM). These data were collected every third generation between F0 and F15 and at F25 for all treatments. Data was collected on C1 juveniles (C1), adult males (C6M), and adult females (C6F). Individual copepods were stained with non-acid lugol's solution, isolated in a drop of filtered seawater, and photographed using a Lumenera Infinity5-5 camera (Teledyne Lumenera, Ottawa, ON, CAN) attached to an inverted microscope (Olympus IX70, Olympus, Waltham, MA, USA) after the water droplet had been removed. Body size was measured as prosome length at C1 and C6 stages using Image-J (https://imagej.nih.gov/ij/).

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Dataset Description

These data are part of at multigenerational experiment of Arcatia tonsa exposure to ocean warming (OW), ocean acidification (OA), and combined ocean warming and acidification (OWA) including a benign ambient condition temperature and CO2 control (AM). These data were collected every third generation between F0 and F15 and at F25 for all treatments.

Methods & Sampling

Body size was measured as prosome length at C1 and C6 stages using Image-J (https://imagej.nih.gov/ij/) for individuals grown in 250 mL beakers alongside survivorship experiments. Ten individuals per replicate and treatment (i.e. 10 C1, 10 males, and 10 females) were preserved in non-acid Lugol's solution each generation for life-history trait measurements. Individuals were isolated in a drop of filtered seawater and photographed using a Lumenera Infinity5-5 camera (Teledyne Lumenera, Ottawa, ON, CAN) attached to an inverted microscope (Olympus IX70, Olympus, Waltham, MA, USA) after the water droplet had been removed.

Data Processing Description

Image-j, R v4.0.2

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Data Files

File
906342_v1_dam_bodysize.csv (Comma Separated Values (.csv), 55.97 KB) MD5:9a526400a3c61c5143124585318c6708 Primary data file for dataset 906342

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Related Publications

Dam, H. G., deMayo, J. A., Park, G., Norton, L., He, X., Finiguerra, M. B., Baumann, H., Brennan, R. S., & Pespeni, M. H. (2021). Rapid, but limited, zooplankton adaptation to simultaneous warming and acidification. Nature Climate Change, 11(9), 780–786. https://doi.org/10.1038/s41558-021-01131-5
Results

R Core Team (2020). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/
Software

Schneider, C. A., Rasband, W. S., & Eliceiri, K. W. (2012). NIH Image to ImageJ: 25 years of image analysis. Nature Methods, 9(7), 671–675. https://doi.org/10.1038/nmeth.2089
Software

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Related Datasets

HasPart

deMayo, J., Dam, H. G., Park, G., Norton, L., Finiguerra, M., Baumann, H., Brennan, R., Pespeni, M. (2023) **Acartia tonsa egg production rate and egg hatching success for transgenerational exposure to ocean warming and ocean acidification.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-09-07 http://lod.bco-dmo.org/id/dataset/906780 [view at BCO-DMO]
Relationship Description: Dataset is part of same experiment.

deMayo, J., Dam, H. G., Park, G., Norton, L., Finiguerra, M., Baumann, H., Brennan, R., Pespeni, M. (2023) **Acartia tonsa survival data for transgenerational ocean warming and acidification data.** Biological

and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-09-07 http://lod.bco-dmo.org/id/dataset/906222 [view at BCO-DMO]
Relationship Description: Dataset is part of same experiment.

IsPartOf

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deMayo, J., Dam, H. G., Park, G., Norton, L., Finiguerra, M., Baumann, H., Brennan, R., Pespeni, M. (2023) **Acartia tonsa development time for transgenerational experiment.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-09-07 http://lod.bco-dmo.org/id/dataset/906188 [view at BCO-DMO]
Relationship Description: Dataset is part of same experiment.

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Parameters

Parameter	Description	Units
Treatment	The treatment (AM, OW, OA, or OWA)	unitless
Length	The measured body length in mm.	millimeter (mm)
Temp	The temperature of the treatment	degrees Celsius(°C)
pH	The pH of the treatment.	unitless
Generation	The generation where the body size was measured.	unitless
Stage	The life stage (C1, C6F, or C6M) where the body size was measured.	unitless

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Instruments

Dataset-specific Instrument Name	Olympus SZH-ILLD stereo microscope
Generic Instrument Name	Microscope - Optical
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

Collaborative Research: Response of marine copepods to warming temperature and ocean acidification (Copepod Response to Warming Temp and OA)

Coverage: North western Atlantic ocean; Gulf of Maine, coastal and estuarine habitats

NSF Award Abstract:
Over time, our oceans are becoming both warmer and higher dissolved carbon dioxide. The latter condition is called ocean acidification. The consequences of these simultaneous changes for populations of marine

organisms are not well understood. For this project, the investigators will conduct a series of laboratory experiments to determine how two closely-related, common species of Acartia copepods will respond to the interactive effects of warming and acidification and also how well these species can adapt over multiple generations to changing ocean conditions. Since these copepods are key species in coastal food webs, results will have important implications for understanding and predicting how marine ecosystems may respond to future climate change. The investigators will share results from the research through traditional print media, case studies, and video mini lectures. The goal will be for educators of all levels to easily access material on climate change and ocean acidification to include in teaching curricula, in alignment with recommendations for universal design for learning. The project is a collaborative effort between an established professor at the University of Connecticut and an early-career female scientist at the University of Vermont. It will provide training and opportunities for collaborative, interdisciplinary research for two postdoctoral investigators, two graduate students and an undergraduate student.

The project's main goals are: 1) to test the simultaneous effects of temperature and carbon dioxide under current and future conditions on life history traits throughout the life cycle for two key copepod species, warm-adapted Acartia tonsa and cold-adapted Acartia hudsonica; 2) to test for adaptive capacity of both copepod species to a warmer and carbon-dioxide-enriched ocean; 3) to measure the genetic and maternally-induced changes across multiple generations of experimental selection in future conditions in both copepod species, and to identify the genes and pathways responding to selection. The investigators will use experiments encompassing current and projected temperature and carbon-dioxide conditions, will determine the roles of each variable and their interaction on traits that affect the fitness of both copepod species. They will also determine which life stages are most sensitive to individual or simultaneous stress conditions. Through multigenerational selection experiments, the investigators will identify and characterize the mechanisms of copepod evolutionary adaptation. Finally, they will measure genomic changes across the generations under all four experimental conditions to quantify the relative contributions of genetic and maternally-induced change in the physiological and life history traits of copepods in response to near-future climate conditions.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1559075
NSF Division of Ocean Sciences (NSF OCE)	OCE-1559180

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