Individual egg production measurements from 10 copepod populations from 2017-07-15 to 2018-07-26 in coastal northwest Atlantic surface waters

Website: https://www.bco-dmo.org/dataset/817999
Data Type: experimental
Version: 0
Version Date: 2020-07-08

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

Contributors	Affiliation	Role
Dam, Hans G.	University of Connecticut (UConn)	Principal Investigator
Biddle, Mathew	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Individual egg production measurements from 10 copepod populations from 2017-07-15 to 2018-07-26 in coastal northwest Atlantic surface waters

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Coverage

Spatial Extent: **N**:46.27291 **E**:-64.575143 **S**:25.283653 **W**:-82.6674
Temporal Extent: 2017-07-15 - 2018-07-26

Dataset Description

Detailed methods are presented in Sasaki & Dam 2019 (DOI: 10.1111/gcb.14811). Copepods were collected from ten locations across the Northwest Atlantic (recorded in the Population column). Populations were maintained at the UConn Avery Point campus for three generations at 18oC, with a 12:12 light:dark cycle and a diet of Tetrasemis sp., Thalassiosira weissflogii, and Rhodomonas salina. F3 generation eggs were collected and split into two groups, which developed at either 18oC or 22oC. Egg production assays were performed at the temperature individuals developed at (recorded in the Temp column).

Methods & Sampling

Individual juvenile copepods were isolated to prevent fertilization before the assay began. Developmental stage was monitored each day, and male–female pairs were created within 3 days of individuals reaching maturity. During development and match making, copepods were fed ad libitum using the same mix of phytoplankton as the lab cultures. One day after pairing, adults were moved to petri dishes with fresh seawater and provided with 800 µg C/L of food mix (split evenly based on carbon content between Tetraselmis and Thalasiossira). Females were given 3 days to produce eggs, after which mate pairs were removed. The produced eggs were

then given an additional 3 days to hatch. After the hatching period, egg plates were preserved using non-acid Lugols solution. The number of eggs was then visually counted using a dissection microscope. Total egg production (recorded in the Total column) was calculated as the combined number of hatched and unhatched eggs. The number of eggs hatched is recorded in the Hatched column. Hatching success was calculated as the percentage of eggs that hatched (hatched/total eggs produced), and is recorded in the Hatching_Success column. The number of eggs per day was calculated by dividing the total number of eggs produced by the duration of the assay (recorded in the Eggs_per_day column).

Data Processing Description

Data was not processed before analyses. All analyses were performed with the raw data in R version 3.0.

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- added Latitude, Longitude, and Collection_Date columns

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Related Publications

Sasaki, M. C., & Dam, H. G. (2019). Integrating patterns of thermal tolerance and phenotypic plasticity with population genetics to improve understanding of vulnerability to warming in a widespread copepod. Global Change Biology, 25(12), 4147–4164. doi:10.1111/gcb.14811
General

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Parameters

Parameter	Description	Units
Individual	Individual number during experiment	unitless
Population	Population of origin	unitless
Temp	Temperature of treatment	degrees Celsius (C)
Total	Total number of eggs produced	unitless
Hatched	Number of eggs that hatched	unitless
Hatching_Success	Percentage of eggs that hatched	unitless
Eggs_per_day	Number of eggs laid per day	eggs per day
Collection_Date	Date of sample collection following ISO-8601 convention	unitless
Latitude	Latitude of sample collection location with positive values indicating North	decimal degrees
Longitude	Longitude of sample collection location with negative values indicating West	decimal degrees

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Instruments

Dataset-specific Instrument Name	plankton net
Generic Instrument Name	Plankton Net
Dataset-specific Description	Copepods were collected with a 250 micrometer mesh plankton net with a solid cod end.
Generic Instrument Description	A Plankton Net is a generic term for a sampling net that is used to collect plankton. It is used only when detailed instrument documentation is not available.

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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-1559180

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