Seawater conditions monitored and recorded during two separate laboratory experiments in 2017 to acclimate krill to dissolved oxygen (DO) or pH conditions.

Website: https://www.bco-dmo.org/dataset/842922
Data Type: experimental
Version: 1
Version Date: 2021-03-02

Project
» Consequences of hypoxia on food web linkages in a pelagic marine ecosystem (PelagicHypoxia)

Contributors	Affiliation	Role
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Abstract
Seawater conditions monitored and recorded during two separate laboratory experiments in 2017 to acclimate krill to dissolved oxygen (DO) or pH conditions.

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Coverage

Temporal Extent: 2017-07-24 - 2017-10-02

Methods & Sampling

Two separate experiments were conducted to test the effects of acclimation to different pH or dissolved oxygen (DO) conditions on adult female *Euphausia pacifica.* System indicates the system that generated controlled seawater conditions with many individual krill held within one experimental system. Responses measured after the ten day acclimation (ETS activity, AARS activity, and respiration rate) are given in the Krill Physiology dataset along with the corresponding system name.

Acclimation of krill to different oxygen levels in the laboratory was done at the NOAA Mukilteo Research Station in flow-through experimental systems with independent temperature, pH, and oxygen control. Nine systems of generating controlled seawater were used, three per treatment. Target dissolved oxygen levels were 3, 5, and 9 mg DO L-1; temperature was maintained at 12 °C and pH at ~7.82. During the oxygen experiment, temperature, pH, and dissolved oxygen were monitored continuously using Omega thermistors, Honeywell Durafet III probes, and Vernier optical dissolved oxygen probes, respectively. Temperature, pH, and oxygen concentration were recorded in each system every 6 seconds, but were binned into 10 min averages.

Experimental acclimation to pH was conducted at the FHL Ocean Acidification Environmental Laboratory, using a flow-through system with pH controlled by CO2 bubbling. Target pH levels were 8.0, 7.5, and 7.2: three flow-

through systems were used, one per pH treatment. Temperature was set to 12 °C and oxygen was maintained at ambient levels through bubbling, but not monitored. Temperature and pH were monitored and logged every 10 min with a Honeywell Durafet III electrode. Temperature failed to record in system 104A but this system shared a cooling unit with system 104B and was therefore likely similar.

Data Processing Description

BCO-DMO processing notes:

- Converted pacific daylight date and time to ISO_DateTime, in UTC timezone.
- Adjusted parameter names to comply with database requirements.

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Data Files

File
experiment_conditions.csv (Comma Separated Values (.csv), 2.19 MB) MD5:58fd878907e24291b9b804ab303b6b36 Primary data file for dataset ID 842922

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Related Datasets

IsRelatedTo

McLaskey, A. K., Keister, J. E. (2021) **Physiological observations of Euphausia pacifica after a ten-day acclimation to dissolved oxygen (DO) and pH conditions in two separate laboratory experiments.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-02-11 doi:10.26008/1912/bco-dmo.840572.1 [view at BCO-DMO]
Relationship Description: Experimental conditions (pH and dissolved oxygen) during experiments.

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Parameters

Parameter	Description	Units
Experiment	Experiment type: pH or DO experiment	unitless
ISO_DateTime_UTC	Sampling date and time in ISO format (yyyy-mm-ddThh:mm), UTC timezone	unitless
System	The system that generated controlled seawater conditions and represents the experimental replicates. Many individual krill were held within one experimental system. For the pH experiment 3 systems were used, only one per treatment condition (104A, 104B, 105A); for the DO experiment nine systems were used with three per treatment condition (M1, M2, M3, M4, M5, M9, M10, M11, M12)	units
Temperature	water temperature	degrees Celsius (°C)
pH	pH on the total scale	unitless
DO	Dissolved oxygen	milligrams per liter (mg/L)

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Instruments

Dataset-specific Instrument Name	Vernier optical dissolved oxygen probes
Generic Instrument Name	Oxygen Sensor
Dataset-specific Description	Vernier optical dissolved oxygen probes
Generic Instrument Description	An electronic device that measures the proportion of oxygen (O2) in the gas or liquid being analyzed

Dataset-specific Instrument Name	Honeywell Durafet III pH probes
Generic Instrument Name	pH Sensor
Dataset-specific Description	Honeywell Durafet III pH probes
Generic Instrument Description	An instrument that measures the hydrogen ion activity in solutions. The overall concentration of hydrogen ions is inversely related to its pH. The pH scale ranges from 0 to 14 and indicates whether acidic (more H+) or basic (less H+).

Dataset-specific Instrument Name	Omega thermistors
Generic Instrument Name	Thermistor
Generic Instrument Description	A thermistor is a type of resistor whose resistance varies significantly with temperature, more so than in standard resistors. The word is a portmanteau of thermal and resistor. Thermistors are widely used as inrush current limiters, temperature sensors, self-resetting overcurrent protectors, and self-regulating heating elements. Thermistors differ from resistance temperature detectors (RTD) in that the material used in a thermistor is generally a ceramic or polymer, while RTDs use pure metals. The temperature response is also different; RTDs are useful over larger temperature ranges, while thermistors typically achieve a higher precision within a limited temperature range, typically 90C to 130C.

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Project Information

Consequences of hypoxia on food web linkages in a pelagic marine ecosystem (PelagicHypoxia)

Coverage: Puget Sound, WA (47 N, 123 W)

Description from NSF award abstract:
Low dissolved oxygen (hypoxia) is one of the most pronounced, pervasive, and significant disturbances in marine ecosystems. Yet, our understanding of the ecological impacts of hypoxia on pelagic food webs is incomplete because of our limited knowledge of how organism responses to hypoxia affect critical ecosystem processes. In pelagic food webs, distribution shifts of mesozooplankton and their predators may affect predator-prey overlap and dictate energy flow up food webs. Similarly, hypoxia may induce shifts in zooplankton community composition towards species that impede energy flow to planktivorous fish. However, compensatory responses by species and communities might negate these effects, maintaining trophic coupling and sustaining productivity of upper trophic level species. The PIs propose to answer the question "Does hypoxia affect energy flow from mesozooplankton to pelagic fish?" They approach this question with a nested framework of hypotheses that considers two sets of processes alternatively responsible for either changes or maintenance of pelagic ecosystem energy flows. They will conduct their study in the Hood Canal, WA. Unlike most hypoxia-impacted estuaries, hypoxic regions of Hood Canal are in close proximity to sites that are not affected. This makes it logistically easier to conduct a comparative study and reduces the number of potential confounding factors when comparing areas that are far apart.

Improved understanding of how hypoxia impacts marine ecosystems will benefit the practical application of ecosystem-based management (EBM) in coastal and estuarine ecosystems. Effective application of EBM requires that the impacts of human activities are well understood and that ecological effects can be tracked using indicators. This project will contribute to both of these needs. The PIs will share their findings on local and national levels with Federal, State, Tribal, and County biologists. To increase exposure of science to underrepresented groups, the PIs also will provide Native American youth with opportunities to participate in field collections and laboratory processing through summer internships. The PIs will collaborate with the NSF-funded Pacific Northwest Louis Stokes Alliance for Minority Participation and tribes from the Hood Canal region to recruit and mentor students for potential careers in marine science. This project will support several undergraduate researchers, two Ph.D. students, a post-doc, and two early-career scientists.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1154648

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