Carbonate chemistry from Niskin bottle samples collected at Twanoh buoy in Hood Canal during R/V Clifford A. Barnes cruises CB1077 and CB1072 in 2017

Website: https://www.bco-dmo.org/dataset/826183
Data Type: Cruise Results
Version: 1
Version Date: 2020-11-10

Project
» Causes and consequences of hypoxia and pH impacts on zooplankton: Linking movement behavior to vertical distribution. (Zooplankton Swimming)

Contributors	Affiliation	Role
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Abstract
Carbonate chemistry from Niskin bottle samples collected at Twanoh buoy in Hood Canal during R/V Clifford A. Barnes cruises CB1077 and CB1072 in 2017.

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Coverage

Spatial Extent: **Lat**:47.38 **Lon**:-123.01
Temporal Extent: 2017-06-16 - 2018-07-16

Dataset Description

Hood Canal carbonate chemistry from Niskin bottle samples collected in 2017 at Twanoh buoy (47.38, -123.01).

Methods & Sampling

Water for carbonate chemistry data were collected and analyzed according to Dickson et al., (2007).

Data Processing Description

Carbonate chemistry samples were collected and analyzed according to Dickson et al., (2007). AT was measured by open-cell potentiometric titration and CT was measured by acidification and quantification using a CO_2 coulometer (UIC model CM5015) at the University of Washington's School of Oceanography. Certified Reference Materials were analyzed as an independent verification of instrument calibrations (Dickson et al. 2007). We calculated full carbonate parameters from AT and CT using the R package *seacarb* and constants from Lueker et al. (2000) and the total pH scale.

The pH data from CTD casts for each cruise should be corrected using an average offset to pH calculated from the five discrete AT and CT samples from that cruise.

BCO-DMO Processing:
- changed date formats to YYYY-MM-DD;
- renamed fields;
- added Latitude and Longitude columns.

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Data Files

File
carbonate_chemistry.csv (Comma Separated Values (.csv), 4.11 KB) MD5:dc202022cdbb4f2b700cb74d670b1d38 Primary data file for dataset ID 826183

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Parameters

Parameter	Description	Units
Date_Collected	Date collected (PDT); format: YYYY-MM-DD	unitless
Date_Run	Date run (PDT); format: YYYY-MM-DD	unitless
Cruise	Cruise ID	unitless
Station	Station number	unitless
Latitude	Latitude	degrees North
Longitude	Longitude	degrees East
Time_PDT	Time (PDT); format: hh:mm:ss	unitless
Depth	Depth	meters (m)
insitu_Temp	in situ temperature	degrees Celsius
Salinity	Salinity	PSU
DIC_umol_kg	Dissolved inorganic carbon	micromoles per kilogram (umol/kg)
AT	Total alkalinity	micromoles per kilogram (umol/kg)
Patm	Surface atmosphereic pressure	atmospheres (atm)
P	Hydrostatic pressure	bars
pH	pH	unitless
CO2	CO2	moles per kilogram (mol/kg)
fCO2	Fugacity	microatmospheres (uatm)
pCO2	Partial pressure	microatmospheres (uatm)
fCO2pot	Fugacity potential	microatmospheres (uatm)
pCO2pot	Partial pressure potential	microatmospheres (uatm)
fCO2insitu	Fugacity in situ	microatmospheres (uatm)
pCO2insitu	Partial pressure in situ	microatmospheres (uatm)
HCO3	HCO3	moles per kilogram (mol/kg)
CO3	CO3	moles per kilogram (mol/kg)
DIC_mol_kg	Dissolved inorganic carbon	moles per kilogram (mol/kg)
ALK	Total alkalinity	moles per kilogram (mol/kg)
OmegaAragonite	Aragonite saturation state	omega arg
OmegaCalcite	Calcite saturation state	omega cal

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Instruments

Dataset-specific Instrument Name	UIC model CM5015
Generic Instrument Name	CO2 Coulometer
Dataset-specific Description	AT was measured by open-cell potentiometric titration and CT was measured by acidification and quantification using a CO_2 coulometer (UIC model CM5015) at the University of Washington's School of Oceanography
Generic Instrument Description	A CO2 coulometer semi-automatically controls the sample handling and extraction of CO2 from seawater samples. Samples are acidified and the CO2 gas is bubbled into a titration cell where CO2 is converted to hydroxyethylcarbonic acid which is then automatically titrated with a coulometrically-generated base to a colorimetric endpoint.

Dataset-specific Instrument Name	Niskin bottles
Generic Instrument Name	Niskin bottle
Dataset-specific Description	Water for carbonate chemistry data were collected with Niskin bottles.
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

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Deployments

CB1077

Website	https://www.bco-dmo.org/deployment/735746
Platform	R/V Clifford A. Barnes
Start Date	2017-08-15
End Date	2017-08-22
Description	Cruise plan: August_cruise_plan.pdf

CB1072

Website	https://www.bco-dmo.org/deployment/735748
Platform	R/V Clifford A. Barnes
Start Date	2017-06-13
End Date	2017-06-20
Description	Cruise Plan: June_cruise_plan.pdf

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Project Information

Causes and consequences of hypoxia and pH impacts on zooplankton: Linking movement behavior to vertical distribution. (Zooplankton Swimming)

Coverage: Puget Sound, WA

NSF Award Abstract:
Low oxygen (hypoxia) and low pH are known to have profound physiological effects on zooplankton, the microscopic animals of the sea. It is likely that many individual zooplankton change vertical mirgration behaviors to reduce or avoid these stresses. However, avoidance responses and their consequences for zooplankton distributions, and for interactions of zooplankton with their predators and prey, are poorly understood. This study will provide information on small-scale behavioral responses of zooplankton to oxygen and pH using video systems deployed in the field in a seasonally hypoxic estuary. The results will deepen our understanding of how zooplankton respond to low oxygen and pH conditions in ways that could profoundly affect marine ecosystems and fisheries through changes in their populations and distributions. This project will train graduate students and will engage K-12 students and teachers in under-served coastal communities by developing ocean technology-based citizen-scientist activities and curricular materials in plankton ecology, ocean change, construction and use of biological sensors, and quantitative analysis of environmental data.

Individual directional motility is a primary mechanism underlying spatio-temporal patterns in zooplankton population distributions. Motility is used by most zooplankton species to select among water column positions that differ in biotic and abiotic variables such as prey, predators, light, oxygen concentration, and pH. Species-specific movement responses to de-oxygenation and acidification are likely mechanisms through which short-term, localized impacts of these stressful conditions on individual zooplankton will be magnified or suppressed as they propagate up to population, community, and ecosystem-level dynamics. This study will quantify responses by key zooplankton species to oxygen and pH using in situ video systems to measure changes in individual behavior in hypoxic, low- pH versus well-oxygenated, high-pH regions of a seasonally hypoxic estuary. Distributions and movements of zooplankton will be quantified using three approaches: 1) an imaging system deployed in situ on a profiling mooring over two summers in a hypoxic region, 2) imagers deployed on Lagrangian drifters to sample simultaneously throughout the water column, and 3) vertically-stratified pumps and net tows to verify species identification and video-based abundance estimates. These field observations will be combined with laboratory analysis of zooplankton movements in oxygen and pH gradients, and with spatially-explicit models to predict how behavioral mechanisms lead to large-scale impacts of environmental stresses.

The following deployments were conducted in 2017 and 2018:
CB1077: https://www.bco-dmo.org/deployment/735746
CB1072: https://www.bco-dmo.org/deployment/735748
Zoocam_ORCA_Twanoh_2017: https://www.bco-dmo.org/deployment/735762
RC0008: https://www.bco-dmo.org/deployment/775288
Mooring ORCA_Hoodsport; NANOOS-APL4: https://www.bco-dmo.org/deployment/775291

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1657992

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