

Grazing experiment 4: Carbonate chemistry data for low-high pCO₂ acclimated Rhodomonas sp. cultures, 2011-2016 (E Hux Response to pCO₂ project)

Website: <https://www.bco-dmo.org/dataset/668621>

Data Type: experimental

Version:

Version Date: 2016-12-06

Project

» [Planktonic interactions in a changing ocean: Biological responses of *Emiliana huxleyi* to elevated pCO₂ and their effects on microzooplankton](#) (E Hux Response to pCO₂)

Contributors	Affiliation	Role
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Dataset Description

Related Reference:

Kendall, K., Marine Microzooplankton are Indirectly Affected by Ocean Acidification Through Direct Effects on Their Phytoplankton Prey. (Masters Thesis) Western Washington University. <http://cedar.wwu.edu/wwuet/448/>

Methods & Sampling

The phytoplankton *Rhodomonas* sp. CCMP 755 was grown semi-continuously in atmosphere controlled chambers at three different CO₂ treatment concentrations; Ambient (400ppmv), Moderate (750ppmv), and High (1000ppmv). Cultures were diluted daily starting day 4 with pre-equilibrated media containing f/50 nutrients. Some of the culture removed was used to evaluate chemical parameters. Samples for pH were filtered through a GFF to remove cells and loose coccoliths both of which increase optical scatter. Samples were warmed to 25°C in a water bath and run within three hours of sampling. pH was analyzed spectrophotometrically with m-cresol dye on an Agilent 8453A UV-VIS Diode Array Spectrophotometer. Samples for total alkalinity were taken on growth days 5, 7 and 10. Alkalinity was measured by gran titration using a Titrando 888, and 0.1 N HCl titrant, in a temperature controlled titration vessel (+/- 5 ueq/kg). Other parameters were calculated with CO₂sys.

Data Processing Description

BCO-DMO Processing Notes:

- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- nd (no data) was entered into all blank cells

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Data Files

File
expt4_pCO2.csv (Comma Separated Values (.csv), 2.14 KB) MD5:f9a824d56ddbace19be86b6a10dbee41
Primary data file for dataset ID 668621

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Parameters

Parameter	Description	Units
treatment_rep	sample identifier: treatment replicate that names the sample and the day of semi-continuous culture	unitless
pH	pH: The measure of the acidity or basicity of an aqueous solution	unitless; pH scale
pCO2	Partial pressure of carbon dioxide in the water body by computation from pH and alkalinity	parts per million by volume (ppmv)
DIC	dissolved inorganic carbon	micromoles/kilogram (umol/kg)
total_alkalinity	total alkalinity of the culture material removed	micromoles/kilogram (umol/kg)

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Automatic titrator
Dataset-specific Description	Titrand 888
Generic Instrument Description	Instruments that incrementally add quantified aliquots of a reagent to a sample until the end-point of a chemical reaction is reached.

Dataset-specific Instrument Name	Agilent 8453A UV-VIS Diode Array Spectrophotometer
Generic Instrument Name	Spectrophotometer
Generic Instrument Description	An instrument used to measure the relative absorption of electromagnetic radiation of different wavelengths in the near infra-red, visible and ultraviolet wavebands by samples.

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Deployments

Lab_Olson_B

Website	https://www.bco-dmo.org/deployment/521277
Platform	WWU
Start Date	2011-03-31
End Date	2016-09-15
Description	laboratory experiments

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Project Information

Planktonic interactions in a changing ocean: Biological responses of *Emiliana huxleyi* to elevated pCO₂ and their effects on microzooplankton (E Hux Response to pCO₂)

Description from NSF award abstract:

The calcifying Haptophyte *Emiliana huxleyi* appears to be acutely sensitive to the rising concentration of ocean pCO₂. Documented responses by *E. huxleyi* to elevated pCO₂ include modifications to their calcification rate and cell size, malformation of coccoliths, elevated growth rates, increased organic carbon production, lowering of PIC:POC ratios, and elevated production of the active climate gas DMS. Changes in these parameters are mechanisms known to elicit alterations in grazing behavior by microzooplankton, the oceans dominant grazer functional group. The investigators hypothesize that modifications to the physiology and biochemistry of calcifying and non-calcifying Haptophyte *Emiliana huxleyi* in response to elevated pCO₂ will precipitate alterations in microzooplankton grazing dynamics. To test this hypothesis, they will conduct controlled laboratory experiments where several strains of *E. huxleyi* are grown at several CO₂ concentrations. After careful characterization of the biochemical and physiological responses of the *E. huxleyi* strains to elevated pCO₂, they will provide these strains as food to several ecologically-important microzooplankton and document grazing dynamics. *E. huxleyi* is an ideal organism for the study of phytoplankton and microzooplankton responses to rising anthropogenic CO₂, the effects of which in the marine environment are called ocean acidification; *E. huxleyi* is biogeochemically important, is well studied, numerous strains are in culture that exhibit variation in the parameters described above, and they are readily fed upon by ecologically important microzooplankton.

The implications of changes in microzooplankton grazing for carbon cycling, specifically CaCO₃ export, DMS production, nutrient regeneration in surface waters, and carbon transfer between trophic levels are profound, as this grazing, to a large degree, regulates all these processes. *E. huxleyi* is a model prey organism because it is one of the most biogeochemically influential global phytoplankton. It forms massive seasonal blooms, contributes significantly to marine inorganic and organic carbon cycles, is a large producer of the climatically active gas DMS, and is a source of organic matter for trophic levels both above and below itself. The planned controlled study will increase our knowledge of the mechanisms that drive patterns of change between trophic

levels, thus providing a wider array of tools necessary to understand the complex nature of ocean acidification field studies, where competing variables can confound precise interpretation.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0961229

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