

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

Website: <https://www.bco-dmo.org/dataset/668638>

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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Table of Contents

- [Dataset Description](#)
 - [Methods & Sampling](#)
 - [Data Processing Description](#)
- [Data Files](#)
- [Parameters](#)
- [Instruments](#)
- [Deployments](#)
- [Project Information](#)
- [Funding](#)

Dataset Description

Related Reference:

Still, Kelly Ann, Microzooplankton grazing, growth and gross growth efficiency are affected by pCO₂ induced changes in phytoplankton biology. (Masters Thesis) Western Washington University. <http://cedar.wvu.edu/cgi/viewcontent.cgi?article=1490&context=wwuet>

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 carbohydrate mass were taken by gravity filtering 30 ml of culture through muffled GF/F filters. Filters were wrapped in aluminum foil and stored at -80°C until analysis. Prior to analysis, filters were extracted in 1 ml of 95% H₂SO₄ and 1 ml of nanopure water in a sonication bath for 30 minutes and then 20 hours at room temperature. After extraction samples were centrifuged at 10,000 rpm for 6 minutes. 1.6 mls of the extract was combined with 4 mls of concentrated H₂SO₄ and 0.8 mls of 10% phenol and allowed to react for 30 minutes. Samples were analyzed colorimetrically using a Spec20D+ spectrophotometer at 485 nm and compared with standards made from fructose.

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

[[table of contents](#) | [back to top](#)]

Data Files

File
expt4_carbo.csv (Comma Separated Values (.csv), 2.96 KB) MD5:2daa3162221b7ebb5d96fa2a9adfe206
Primary data file for dataset ID 668638

[[table of contents](#) | [back to top](#)]

Parameters

Parameter	Description	Units
treatment_replicate_experiment_day	sample identifier: the treatment replicate and the day of semi-continuous culture or standard concentration	unitless
val_at_485nm	485 nm wavelength value	unitless?
fruc_ug_1_6_ml	carbohydrate content in fructose	picograms (pg) per 1.6 ml extract
fruc_ug_ml	carbohydrate content	per milliliter
cell_ml_culture	cell concentration in the culture	cells/milliliter
vol_filt	volume of culture filtered for sample	milliliters
cell_filter	total cells on the filter	cells
cell_ml_extract	cells per ml of extract	milliliters
fruc_ug_cell	carbohydrate as fructose	micrograms/cell
fruc_pg_cell	carbohydrate as fructose	picograms/cell

[[table of contents](#) | [back to top](#)]

Instruments

Dataset-specific Instrument Name	Spec20D+ 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.

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

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.

Funding

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

[[table of contents](#) | [back to top](#)]