

Grazing experiment 4: Carbon and Nitrogen data for low-high pCO₂ acclimated Rhodomonas sp. cultures (E Hux Response to pCO₂ project)

Website: <https://www.bco-dmo.org/dataset/664351>

Data Type: experimental

Version:

Version Date: 2016-11-10

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:

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.wwu.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 particulate cellular carbon and nitrogen were taken by gently vacuum filtering 100 ml from each pCO₂ treatment replicate onto 21 mm muffled glass fiber filters. After filtration, filters were removed and placed in tin boats. Samples and controls (media blanks, filter blanks, and capsule blanks) were placed in a drying oven for 24 hours at 60 C, after which time they were removed and placed in a desiccator until analysis. Tin boats containing the filters and controls were folded into pellets and then combusted using a Micro Cube elemental analyzer interfaced to a PDZ Europa 20-20 isotope ratio mass spectrometer at the UC Davis Stable Isotope Facility.

This work took place at the Shannon Point Marine Center, Bellingham, Washington.

Data Processing Description

Picograms per cell for carbon and nitrogen were calculated based on standard curves and were then normalized to per cell based on cell counts for the sample day.

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_CN.csv (Comma Separated Values (.csv), 2.01 KB) MD5:45e49f3d6efac4afc8d7030e7069dd19
Primary data file for dataset ID 664351

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Parameters

Parameter	Description	Units
treatment_replicate	sample identifier: treatment replicate that names the sample and the day of semi-continuous culture or blank type	unitless
C_ug	carbon in sample	micrograms (ug)
C_adjusted	carbon minus the media blank	micrograms (ug)
N_ug	nitrogen in sample	micrograms (ug)
N_adjusted	nitrogen minus the media blank	micrograms (ug)
cell_count	cells per ml in the daily sample	cells/milliliter
ml_filtered	volume of sample filtered	milliliters
total_cells	total number of cell on the filter	cells
C_ug_cell	carbon per cell	micrograms/cell (ug/cell)
N_ug_cell	nitrogen per cell	micrograms/cell (ug/cell)
C_pg_cell	carbon per cell	picograms/cell (pg/cell)
N_pg_cell	nitrogen per cell	picograms/cell (pg/cell)
C_to_N	ratio of carbon to nitrogen	dimensionless

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Instruments

Dataset-specific Instrument Name	MICRO cube elemental analyzer
Generic Instrument Name	Elemental Analyzer
Dataset-specific Description	Measured carbon and nitrogen composition: Micro Cube elemental analyzer interfaced to a PDZ Europa 20-20 isotope ratio mass spectrometer at the UC Davis Stable Isotope Facility.
Generic Instrument Description	Instruments that quantify carbon, nitrogen and sometimes other elements by combusting the sample at very high temperature and assaying the resulting gaseous oxides. Usually used for samples including organic material.

Dataset-specific Instrument Name	PDZ Europa 20-20 isotope ratio mass spectrometer
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Dataset-specific Description	Measured carbon and nitrogen composition: Micro Cube elemental analyzer interfaced to a PDZ Europa 20-20 isotope ratio mass spectrometer at the UC Davis Stable Isotope Facility.
Generic Instrument Description	The Isotope-ratio Mass Spectrometer is a particular type of mass spectrometer used to measure the relative abundance of isotopes in a given sample (e.g. VG Prism II Isotope Ratio Mass-Spectrometer).

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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 *Emiliania 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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