

Cell size measurements of low-high pCO₂ acclimated *E. huxleyi* (E Hux Response to pCO₂ project)

Website: <https://www.bco-dmo.org/dataset/661464>

Data Type: experimental

Version:

Version Date: 2016-10-11

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
Olson, M Brady	Western Washington University (WWU)	Principal Investigator
Love, Brooke	Western Washington University (WWU)	Co-Principal Investigator
Strom, Suzanne	Western Washington University (WWU)	Co-Principal Investigator
Kendall, Kasey	Western Washington University (WWU)	Student
Copley, Nancy	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Table of Contents

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

Dataset Description

These data are unprocessed *Emiliana huxleyi* cell volumes.

Related Datasets:

[Grazing experiments 2 and 3: CN data](#)

[Grazing experiments 2 and 3: daily cell counts](#)

[Grazing experiments 2 and 3: ingestion](#)

[Grazing experiments 2 and 3: pCO₂](#)

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 *Emiliana huxleyi* CCMP 2668 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.

Expt. 2: On day 8, after ~16 generations, *E. huxleyi* cells from the treatments were mounted live on a microscope slide and 200 cells from each treatment were imaged using RSIImage software under 400X

magnification on an Olympus CHA microscope.

Expt. 3: On day 10, after ~ 20 generations, *E. huxleyi* cells from the treatments were mounted live on a microscope slide and 195-204 cells from each treatment were imaged using RSIImage software under 400X magnification on an Olympus CHA microscope.

Since *E. huxleyi* cells are rough spheres, the volume of the spherical was calculated using: $V(\mu\text{m}^3) = 4/3 \pi r^3$. The radius was calculated as: $r(\mu\text{m}) = \text{square root of } (A/\pi)$. The area, A, was determined from the 2-D images using ImageJ software.

Data Processing Description

BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date
- column names reformatted to comply with BCO-DMO standards
- added column 'expt' for experiment number
- experiments 2 and 3 data were concatenated into one data set

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

Data Files

File
expt2_3_cell_vol.csv (Comma Separated Values (.csv), 39.73 KB) MD5:659408c55c934540fc7bee69479fd8b6
Primary data file for dataset ID 661464

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

Parameters

Parameter	Description	Units
expt	experiment identification	unitless
treatment_cell_number	pCO2 level (ambient; moderate; high) and cell id number	unitless
cell_area_um	area of the cell	micrometers ²
cell_radius_um	radius of the cell	micrometers
cell_volume_um	volume of the cell	micrometers ³

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

Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Microscope - Optical
Dataset-specific Description	Olympus CHA microscope
Generic Instrument Description	Instruments that generate enlarged images of samples using the phenomena of reflection and absorption of visible light. Includes conventional and inverted instruments. Also called a "light microscope".

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

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

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

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.

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

Funding

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

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