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 Emiliania huxleyi to elevated pCO2 and their effects on microzooplankton (E Hux Response to pCO2)

Contributors	Affiliation	Role
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Dataset Description

These data are unprocessed Emiliania 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 Emiliania 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 RSImage 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 RSImage software under 400X magnification on an Olympus CHA microscope.

Since E. huxleyi cells are rough spheres, the volume of the spherical was calculated using: $V(\mu m^3) = 4/3\ \pi r^3$. The radius was calculated as: r(µm)=square root of (A/π). 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

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Data Files

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

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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

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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".

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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 Emiliania huxleyi to elevated pCO2 and their effects on microzooplankton (E Hux Response to pCO2)

Description from NSF award abstract:
The calcifying Haptophyte *Emiliania 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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