Daily cell count data for low to high pCO2 acclimated E. huxleyi (E Hux Response to pCO2 project)

Website: https://www.bco-dmo.org/dataset/661405
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

Related Datasets:
Grazing experiments 2 and 3: cell volume
Grazing experiments 2 and 3: CN data
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. Each morning of dilution the cultures were gently mixed prior to a small sample being taken for cell counts. Cells were counted live on a BD FACSCalibur flow cytometer and were quantified based on side scatter and red fluorescence parameters. Prior to counting, a measured volume of 2µm yellow-green latex bead solution (Flow Check intermediate intensity level 1 fluorescence in nanopure water) was added to each sample of E. huxleyi. The bead solution was counted manually with epi-fluorescence microscopy using UV light. Cell concentration was determined by the ratio between cells and beads counted. The dilution volume was then calculated to achieve a cell density that would remain close to or under 100,000 cells per ml during the next

day of growth.

Data Processing Description

The known bead solution standard was used to determine the actual volume that was analyzed in the flow cytometer for each sample. The events per ml was then calculated.

BCO-DMO Processing:
- added conventional header with dataset name, PI name, version date
- column names reformatted to comply with BCO-DMO standards
- transformed table columns to rows

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Data Files

File
expt2_3_cell_counts_nm.csv (Comma Separated Values (.csv), 3.03 KB) MD5:a8a7753066a5b0ec49abb5f90cba4192 Primary data file for dataset ID 661405

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Parameters

Parameter	Description	Units
treatment	pCO2 level (ambient; moderate; high) and replicate (A; B; C)	unitless
culture_day	days the cells have been in culture: count day for the morning cell count or count day post-dilution for the predicted cell count after dilution	days
cell_count	cells counted	cells/milliliter

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Flow Cytometer
Dataset-specific Description	BD FACSCalibur flow cytometer
Generic Instrument Description	Flow cytometers (FC or FCM) are automated instruments that quantitate properties of single cells, one cell at a time. They can measure cell size, cell granularity, the amounts of cell components such as total DNA, newly synthesized DNA, gene expression as the amount messenger RNA for a particular gene, amounts of specific surface receptors, amounts of intracellular proteins, or transient signalling events in living cells. (from: http://www.bio.umass.edu/micro/immunology/facs542/facswhat.htm)

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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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