Microzooplankton ingestion on low to high pCO2 acclimated E. huxleyi: Favella and Oxyrrhis as grazers (E Hux Response to pCO2 project)

Website: https://www.bco-dmo.org/dataset/661421
Data Type: experimental
Version:
Version Date: 2016-10-18

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
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

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Dataset Description

These data are unprocessed counts of the E. huxleyi cells ingested by each Favella or Oxyrrhis grazer.

Related Datasets:
Grazing experiments 2 and 3: cell volume
Grazing experiments 2 and 3: CN data
Grazing experiments 2 and 3: daily cell counts
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 10, after ~ 20 generations, E. huxleyi cells from the treatments were fed to starved Favella taraikaensis cells for 15, 30 and 45 minutes. During each sampling time point, 20 mls of experiment volume was removed, fixed with glutaraldehyde and stained with DAPI. This volume was filtered onto a 20 µm pore size polycarbonate filter with, which was then put on a slide with immersion oil and kept frozen until evaluation.

Expt. 3: On day 10, after ~ 20 generations, E. huxleyi cells from the treatments were fed to starved Oxyrrhis marina cells for 30, 60 and 90 minutes. During each sampling time point, 20 mls of experiment volume was removed, fixed with glutaraldehyde and stained with DAPI. This volume was filtered onto a 10 µm pore size polycarbonate filter with, which was then put on a slide with immersion oil and kept frozen until evaluation.

Slides were evaluated under 1000x oil immersion using an epi-fluorescent microscope under blue-light excitation. The first 100 microzooplankton on each slide were assessed for each replicate/treatment, and individual prey cell were counted in the grazer food vacuole.

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
- transformed table columns to rows
- nd (no data) was entered into all blank cells
- experiments 2 and 3 data were concatenated into one data set
- sorted data by experiment and treatment

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Data Files

File
expt2_3_ingestion_sort.csv (Comma Separated Values (.csv), 189.47 KB) MD5:c7a3b0319f5a2bae072aac70c12e1faa Primary data file for dataset ID 661421

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Parameters

Parameter	Description	Units
expt	experiment identification	unitless
grazer_analyzed	individual grazer identification	unitless
treatment_rep_min	pCO2 level (ambient; moderate; high); replicate (A; B; C); minutes allowed for ingestion replictate	unitless
cells_ingested	E. huxleyi cells counted inside each grazer	cells

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Fluorescence Microscope
Dataset-specific Description	epi-fluorescent microscope under blue-light excitation
Generic Instrument Description	Instruments that generate enlarged images of samples using the phenomena of fluorescence and phosphorescence instead of, or in addition to, reflection and absorption of visible light. Includes conventional and inverted instruments.

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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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