Grazing experiment 5: Cellular carbohydrate data for low-high pCO2 acclimated Rhodomonas sp. cultures, 2011-2016 (E Hux Response to pCO2 project)

Website: https://www.bco-dmo.org/dataset/669488
Data Type: experimental
Version:
Version Date: 2016-12-09

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 Reference:
Still, Kelly Ann, Microzooplankton grazing, growth and gross growth efficiency are affected by pCO_2 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 carbohydrate mass were taken by gravity filtering 30 ml of culture through muffled GF/F filters. Filters were wrapped in aluminum foil and stored at -80°C until analysis. Prior to analysis, filters were extracted in 1 ml of 95% H2SO4 and 1 ml of nanopure water in a sonication bath for 30 minutes and then 20 hours at room temperature. After extraction, samples were centrifuged at 10,000 rpm for 6 minutes. 1.6 ml of the extract was combined with 4 ml of concentrated H2SO4 and 0.8 ml of 10% phenol and allowed to react for 30 minutes. Samples were analyzed colorimetrically using a Spec20D+ spectrophotometer at 490 nm and compared with standards made from fructose.

Data Processing Description

Micrograms per ml for carbohydrate were calculated based on standard curves using fructose 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
expt5_carbo.csv (Comma Separated Values (.csv), 1.44 KB) MD5:6ec05720b9409738a4aab5915bbc7299 Primary data file for dataset ID 669488

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Parameters

Parameter	Description	Units
sample	sample ID that names the treatment replicate and the day of semi-continuous culture or standard concentration	unitless
nm490	485 nm wavelength value	unitless?
fructose_1_6ml	carbohydrate content in fructose	picograms (pg) per 1.6 ml extract
fructose_ml	carbohydrate content	per milliliter
cell_ml	cell concentration in the culture	cells/milliliter
vol_filt_ml	volume of culture filtered for sample	milliliters
cells_on_filter	total cells on the filter	cells
cells_per_ml_extract	cells per ml of extract	milliliters
fructose_ug_cell	carbohydrate as fructose	micrograms/cell
fructose_pg_cell	carbohydrate as fructose	picograms/cell

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Instruments

Dataset-specific Instrument Name	Spec20D+ spectrophotometer
Generic Instrument Name	Spectrophotometer
Generic Instrument Description	An instrument used to measure the relative absorption of electromagnetic radiation of different wavelengths in the near infra-red, visible and ultraviolet wavebands by samples.

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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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