Chlorophyll measurements from the MesoHux mesocosm experiment held in May 2017

Website: https://www.bco-dmo.org/dataset/748471
Data Type: experimental
Version: 1
Version Date: 2018-09-14

Project
» Quantifying competing loss rates of viral lysis and microzooplankton grazing on Emiliania huxleyi mortality (E huxleyi Mortality)

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Abstract
Chlorophyll measurements from the MesoHux mesocosm experiment held in May 2017.

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Coverage

Temporal Extent: 2017-05-12 - 2017-05-30

Dataset Description

Water samples for chlorophyll extraction were collected from the mesocosms via a 5 L Niskin. Chlorophyll samples were filtered in triplicate through a 25mm Glass Fiber Filter (GFF), and immediately extracted in 6 mL of ethanol for 12-18 hours in the dark at room temperature. After extraction, filters were removed from the sample, and the fluorescence of the sample was read on a Turner AU10. The sample was then acidified with 1 drop of 10% HCL and re-read on the same instrument. The fluorometer was calibrated prior to using with a chlorophyll standard purchased from Sigma.

Mesocosm treatments are as follows:
P-limited: N:P added in a 60:1 ratio during the first 3 days of the experiment, no shading
Redfield: N:P added in a 16:1 ratio during the first 3 days of the experiment, no shading
Shaded: N:P added in a 16:1 ratio during the first 3 days of the experiment, top shaded of the mesocosm added on May 20, 2017
Ambient: no nutrients added, no shading
Samples were taken from either 1m, 5m, or from sediment from settling cones. Samples were noted in the Sample Depth (m) column.

Data Processing Description

BCO-DMO Processing Notes:

- converted date from Mon, DD, YYYY to YYYY-MM-DD
- addead header "notes" for 4th column
- removed units and special characters from header
- aggregated chlorophyll and sizefracchla files

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Data Files

File
chloro.csv (Comma Separated Values (.csv), 51.84 KB) MD5:3b97ccf786c156dc58954edd25307387 Primary data file for dataset ID 748471

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Parameters

Parameter	Description	Units
filename	name of the file	unitless
Date	date of sample in YYYY-MM-DD format	unitless
Sample	identifier for the sample	unitless
Station	station identifier	unitless
notes	additional notes	unitless
Sample_Depth	depth of the sample	meters (m)
Volume_Filtered	volume filtered	mililiters (mL)
Extract_Volume	volume extracted	mililiters (mL)
Dilution_Factor	diltion factor	unitless
F_o	initial fluorescence reading	RFU
F_o_minus_blank	initial fluorescence reading	RFU
F_a	fluorescence after acidification	RFU
F_a_minus_blank	fluorescence after acidification	RFU
Total_chlorophyll	total chlorophyll	micrograms per liter (ug/L)
Chl_a	chlorophyll a	micrograms per liter (ug/L)
Pheo	Pheo	micrograms per liter (ug/L)

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Instruments

Dataset-specific Instrument Name	Turner AU10 fluorometer
Generic Instrument Name	Turner Designs Fluorometer 10-AU
Dataset-specific Description	After extraction, filters were removed from the sample, and the fluorescence of the sample was read on a Turner AU10.
Generic Instrument Description	The Turner Designs 10-AU Field Fluorometer is used to measure Chlorophyll fluorescence. The 10AU Fluorometer can be set up for continuous-flow monitoring or discrete sample analyses. A variety of compounds can be measured using application-specific optical filters available from the manufacturer. (read more from Turner Designs, turnerdesigns.com, Sunnyvale, CA, USA)

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Deployments

MesoHux_2017

Website	https://www.bco-dmo.org/deployment/752756
Platform	National Mesocosm Centre
Start Date	2017-05-01
End Date	2017-05-31
Description	Mesocosm experiments on bacteria and viruses.

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Project Information

Quantifying competing loss rates of viral lysis and microzooplankton grazing on Emiliania huxleyi mortality (E huxleyi Mortality)

Description from NSF award abstract:
Processes that either promote growth or cause mortality drive the abundance of all organisms. For microbes such as phytoplankton, that have a lifespan measured in hours to days, small changes in these processes can have significant impacts. Phytoplankton are the central currency in the flow of material and nutrients throughout the marine environment. Even small shifts in their growth and mortality rates will have large-scale implications for ecosystem structure and biogeochemical cycling. While factors that influence growth are often examined, less is known regarding the regulation of phytoplankton mortality. This project will focus on quantifying competing modes of mortality on the bloom-forming coccolithophore, *Emiliania huxleyi,* a globally important phytoplankton species that contributes significantly to ocean carbon and sulfur cycles. Mortality due to grazing by single-celled microzooplankton is the largest contributor to phytoplankton loss in the marine environment. However, *E. huxleyi* also has a well-characterized relationship with a virus that can result in mass mortality. Therefore, *E. huxleyi* serves as a good model organism for examining how mortality is partitioned between grazing by microzooplankton predators and lysis due to viral infection. Quantifying these mortality mechanisms will help to inform mathematical models for the accurate prediction of shifts in *E. huxleyi* population dynamics and ultimately, primary production and biogeochemical cycling. This work will involve collaboration with a high school science teacher in a school system with a large proportion of students from underrepresented groups, in the creation and implementation of short film clips that depict important ecological interactions. These film clips will then be incorporated into laboratory activities to communicate these concepts to students. Further, undergraduate students from underrepresented groups will be trained at both

Woods Hole Oceanographic Institute and Rutgers University, to perform laboratory research on mortality processes on phytoplankton. This research will also provide training and career development for a postdoctoral scientist.

Mortality mechanisms in phytoplankton have generally been studied independent from one another, however in nature, these processes act concurrently. The relative proportion that microzooplankton grazing and viral lysis contribute to overall *E. huxleyi* loss and how they may interact to shape bloom dynamics is largely unknown. Understanding the relative importance of these processes, as well as their interaction, is critical due to their contrasting influence on the structure and function of marine food webs and biogeochemical cycles. While grazing tends to channel phytoplankton biomass to higher trophic levels, viral lysis stimulates microbial loop activity and vertical particle export flux. This research will determine the effect of one mortality process on the other, as well as their net effect on *E. huxleyi* population dynamics and export in both laboratory and field mesocosm experiments. This integrated approach will provide a unique mechanistic perspective of multi-trophic microbial interactions, thereby increasing the potential for accurate predictions of *E. huxleyi* population dynamics and biogeochemical cycling. The outcomes of this research have the potential to yield broadly applicable insights into how microbial interactions can drive ecological and biogeochemical dynamics in the marine environment.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1459190

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