Data from an experiment that measured the occurrence of feeding among 8 Prorocentrum minimum strains on fluorescently labeled bacteria or the cryptophyte Teleaulax amphioxeia

Website: https://www.bco-dmo.org/dataset/750823
Data Type: experimental
Version: 1
Version Date: 2018-12-06

Project
» Exploring the physiological and ecological basis of mixotrophy in marine food webs (Mixo Foodwebs)

Contributors	Affiliation	Role
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Abstract
This dataset contains data from an experiment that measured the occurrence of feeding among 8 Prorocentrum minimum strains on fluorescently labeled bacteria or the cryptophyte Teleaulax amphioxeia.

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Coverage

Temporal Extent: 2016-10 - 2016-10

Dataset Description

This dataset contains data from an experiment that measured the occurrence of feeding among 8 Prorocentrum minimum strains on fluorescently labeled bacteria or the cryptophyte Teleaulax amphioxeia.

Methods & Sampling

Prorocentrum minimum culturing: All cultures were maintained routinely in F/2-Si in 32 PSU seawater, at 18C and 14:10 light:dark cycle at 50 uE (u = micro). All cultures were transferred once every two weeks.

At each time point, 2 ml of cells were removed from experimental culture flasks and preserved with gluteraldehyde (1% final concentration) and stored at 4C until used to make microscopy slides. To make slides, 1 ml of preserved sample was filtered onto a black 2 um nucleopore polycarbonate filter, and then mounted on a glass microscope slide with fluorescence grade immersion oil. Slides were then counted using fluorescence microscopy and stored at -20C.

Culturing and experimental methods can be found in Johnson 2015.

Data Processing Description

BCO-DMO Processing:
- modified parameter names;
- filled empty cells with "nd" (no data);
- combined data from two spreadsheets into one.

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Data Files

File
Pmin_strain_feeding_2.csv (Comma Separated Values (.csv), 11.11 KB) MD5:ead7d55f7ba964032d7bbaad3fea15d6 Primary data file for dataset ID 750823

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Related Publications

Johnson, M. D. (2015). Inducible Mixotrophy in the DinoflagellateProrocentrum minimum. Journal of Eukaryotic Microbiology, 62(4), 431–443. doi:10.1111/jeu.12198
Methods

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Parameters

Parameter	Description	Units
Prey	Either fluorescently labeled bacteria (FLB) or the cryptophyte Teleaulax amphioxeia (CRYPT) was used	unitless
Strain	Prorocentrum minimum culture strain name	unitless
treatment	Treatments are as follows: LOG1 is 3 days growing in F/2 in log phase; LOG2 is 7 days growing in F/2 in log phase; STAT1 is 14 days growing in F/2 in stationary phase; STAT2 is 21 days growing in F/2 in stationary phase; P1 is 3 days of growing under phosphorous starvation (F/2-P); P2 is 7 days of growing under phosphorous starvation (F/2-P); P3 is 14 days of growing under phosphorous starvation (F/2-P); P4 is 21 days of growing under phosphorous starvation (F/2-P)	unitless
rep	Replicate for each strain (treatment) n=3	unitless
cells	Number of P. minimum cells counted	unitless
cells_feeding	Number of P. minimum cells with ingested fluorescently labeled prey	unitless
pcnt_cells_feeding	The percentage of cells feeding	unitless
GFI	Number of green fluorescent inclusions (GFIs); GFIs are food vacuoles of ingested FLB	unitless
GFI_per_cell	Number of GFIs per P. minimum cell	unitless
OFI	Number of orange fluorescent inclusions (OFIs); OFIs are food vacuoles from ingesting phycoerythrin-containing cryptophyte prey	unitless
OFI_per_cell	Number of OFIs per P. minimum cell	unitless

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Fluorescence Microscope
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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Project Information

Exploring the physiological and ecological basis of mixotrophy in marine food webs (Mixo Foodwebs)

Coverage: laboratory: Woods Hole, Mass. USA

Marine phytoplankton are responsible for about half of global primary production despite being seasonally or chronically nutrient limited. To cope with this, many phytoplankton supplement their nutritional needs through mixotrophy, which involves feeding on bacteria or other algae. These microscopic Venus Fly Traps of the ocean are major players in marine microbial food webs, yet we know so little about when they feed and how their eating is balanced with photosynthesis. This research will shed light on how environmental and cellular factors control mixotrophy, and how mixotrophy and photosynthesis are integrated in the overall metabolism. While understanding the ecological role of mixotrophy in ocean food webs is center to this work, results from this study will also shed light on the evolution of mixotrophy by identifying potential tradeoffs between feeding and photosynthesis.

Mixotrophy refers to species that combine some level of phagotrophy and phototrophy, and represents a diverse array of ecological interactions and cellular and metabolic adaptations. While often perceived as an exception to the norm, mixotrophy is commonplace in marine food webs, affording phytoplankton greater ecological fitness during periods of low or limiting nutrients while stabilizing food webs. Many mixotrophs have a low chlorophyll: carbon ratio, which tends to make them poor phototrophic competitors. In turn, feeding allows these species to achieve maximum growth while in some cases also eliminating their competitors. Other mixotrophs are strong phototrophic competitors, and only feed when severely nutrient limited. This research will determine the cellular and environmental factors that lead to feeding by marine phytoplankton, and how the contrasting metabolisms of heterotrophy and photosynthesis are integrated within a cell. This research will involve laboratory-based experiments on model dinoflagellate and chrysophyte cultures. Using microscopy, physiology, proteomics and metabolomics approaches, this work will test hypotheses about the ultimate causes and consequences of mixotrophy. The major objectives are to determine 1) environmental controls for inducing mixotrophy, 2) the role of prey quality on predator selection, 3) cellular and molecular controls of mixotrophy, and 4) nutrient assimilation and integrated metabolism. Using these various research approaches, this work will produce a comprehensive view of several mixotrophs and provide new insights into cellular, ecological, and evolutionary aspects of mixotrophy. Results from this research will improve our understanding of the physiological and ecological role of mixotrophy in marine phytoplankton, and provide much needed molecular markers for studying this process in both the laboratory and field.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1436169

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