Biomass contribution of dominant phytoplankton and herbivorous protists taxa from R/V Porsild in Disko Bay, West Greenland from 2011-04-23 to 2011-05-07

Website: https://www.bco-dmo.org/dataset/739750
Data Type: Other Field Results, experimental
Version: 1
Version Date: 2018-07-10

Project
» Quantifying Temperature Dependence In Growth & Grazing Rates of Planktonic Herbivores (Planktonic Herbivore Temp Dependence)

Contributors	Affiliation	Role
Menden-Deuer, Susanne	University of Rhode Island (URI-GSO)	Principal Investigator
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Abstract
Biomass contribution of dominant phytoplankton and herbivorous protists taxa from R/V Porsild in Disko Bay, West Greenland from 2011-04-23 to 2011-05-07.

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Coverage

Spatial Extent: **Lat**:69.183333 **Lon**:-53.2333
Temporal Extent: 2011-04-23 - 2011-05-07

Dataset Description

Biomass contribution of dominant phytoplankton and herbivorous protists taxa.

Methods & Sampling

Sampling and analytical procedures:
For microscopy analysis of species composition and biomass via size, 100 mL of WSW from both initial and final samples were preserved with 2% acid Lugol's iodine (final concentration; Menden-Deuer, Lessard & Satterberg, 2001). Counts of dominant phytoplankton >5 µm in diameter were made with a 1 mL Sedgwick-Rafter slide, a minimum of 300 cells per sample were counted. Less abundant species, and herbivorous protists were counted in 50 mL Lugol's fixed samples settled following the Utermöhl method. The entire surface of the chamber was scanned under an inverted microscope at 100–200x to ensure adequate sample size. However when low cell numbers were encountered, multiple species were binned to increase the

confidence of the rate estimate. Taxonomic identification was based on morphological characteristics (Dodge, 1985; Tomas, 1997; Lee, Leedale & Bradbury, 2000; Horner, 2002). Protist biovolume was calculated from linear dimensions by approximating geometric shapes and converted to carbon using the conversion equations in Menden-Deuer & Lessard (2000). Microscope counts were made for samples from experiments conducted between April 23rd and May 7th. No counts were made for experiments on April 20th, or May 7th and 11th.

Data Processing Description

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- appended latitude, longitude coordinates to the data.

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Data Files

File
data_2.csv (Comma Separated Values (.csv), 628 bytes) MD5:5b1d110450bcebe11a5948b14d4e7227 Primary data file for dataset ID 739750

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Related Publications

Dodge JD. 1985. Atlas of dinoflagellates: a Scanning Electron Microscope Survey. VII, 119 pp. London: Farrand Press. https://isbnsearch.org/isbn/1850830045
Methods

Horner RA. 2002. A taxonomic guide to some common marine phytoplankton. Bristol: Biopress Ltd. https://isbnsearch.org/isbn/0948737654
Methods

Lee JH, Leedale GF, Bradbury P (eds.) 2000. An illustrated guide to the protozoa: organisms traditionally referred to as protozoa, or newly discovered groups. 2nd edition. Lawrence: Society of Protozoologists. https://isbnsearch.org/isbn/1891276239
Methods

Menden-Deuer, S., & Lessard, E. J. (2000). Carbon to volume relationships for dinoflagellates, diatoms, and other protist plankton. Limnology and Oceanography, 45(3), 569–579. doi:10.4319/lo.2000.45.3.0569
Methods

Menden-Deuer, S., Lessard, E., & Satterberg, J. (2001). Effect of preservation on dinoflagellate and diatom cell volume, and consequences for carbon biomass predictions. Marine Ecology Progress Series, 222, 41–50. doi:10.3354/meps222041
Methods

Tomas, C. R., & Hasle, G. R. (1997). Identifying marine phytoplankton. Academic Press. https://isbnsearch.org/isbn/978-0-12-693018-4
Methods

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Parameters

Parameter	Description	Units
Date	Experimental date as YYYY-MM-DD	unitless
Chaetoceros_spp	Biomass contribution	micrograms of carbon per liter (µg C L-1)
Thalassiosira_spp	Biomass contribution	micrograms of carbon per liter (µg C L-1)
Skeletonema	Biomass contribution	micrograms of carbon per liter (µg C L-1)
Other_Diatoms	Biomass contribution	micrograms of carbon per liter (µg C L-1)
Ciliates_gt20um	Biomass contribution	micrograms of carbon per liter (µg C L-1)
Ciliates_lt20um	Biomass contribution	micrograms of carbon per liter (µg C L-1)
Gyrodinium_spp	Biomass contribution	micrograms of carbon per liter (µg C L-1)
Gymnodinium_cf_undulans	Biomass contribution	micrograms of carbon per liter (µg C L-1)
Protoperidinium_spp	Biomass contribution	micrograms of carbon per liter (µg C L-1)
lat	latitude of observations. South being negative.	decimal degrees
lon	longitude of observations. West being negative.	decimal degrees

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Deployments

Disko_Bay

Website	https://www.bco-dmo.org/deployment/739730
Platform	R/V Porsild
Start Date	2011-04-21
End Date	2011-05-11

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Project Information

Quantifying Temperature Dependence In Growth & Grazing Rates of Planktonic Herbivores

(Planktonic Herbivore Temp Dependence)

Coverage: Narragansett Bay

NSF Award Abstract:
Plankton, single-celled organisms that inhabit the world's oceans are responsible for the generation of oxygen, cycling energy and matter between the atmosphere and the deep ocean and are the basis for virtually all seafood harvested. These life-giving functions critically depend on the relative rates at which plankton grow and get eaten. How temperature influences those rates is essential to understand plankton responses to environmental changes and ocean dynamics. It is well established that plankton grow faster when temperatures are higher however, whether feeding has a similar temperature dependence is unknown. That means oceanographers are missing key data required to build global predictive models. This project will fill essential knowledge gaps and measure physiological rates of singled celled zooplankton across temperature gradients representing the global ocean, from polar to tropical regions and throughout the seasonal cycle. Researchers will combine laboratory experiments with specimens taken from the coastal ocean (Narragansett Bay), which is exemplary in its strong seasonal temperature variations. These data will provide a clear picture of the production capacity and activity of plankton in a global and dynamic ocean. The project supports an early career scientist, as well as graduate and undergraduate students. Scientists will continue communicating their research to the public through large-scale outreach events, education at the high-school level, and engagement through online and other media. Moreover, researchers will continue collaborating with the Metcalf Institute for Marine & Environmental Reporting to support their Annual Science Immersion Workshop for Journalists and their ongoing work to disseminate research findings through web-based seminars.

Grazing is the single largest loss factor of marine primary production and thus affects a key transfer rate between global organic and inorganic matter pools. Remarkably, data for herbivorous protist growth and grazing rates at temperatures representative of the vast polar regions and during winter and spring periods are extremely sparse. By combining laboratory experiments with ground truthing fieldwork, this project alleviates a central knowledge gap in oceanography and delivers the empirical measurements necessary to derive algorithms to incorporate temperature dependence of heterotrophic protist growth and grazing rates into biogeochemical models. The extraordinary seasonal temperature fluctuations in a temperate coastal estuary (Narragansett Bay) are exploited to measure rates of heterotrophic protists isolated from different temperatures and seasons and to quantify the temperature and acclimation responses of these ecotypes. This project delivers data urgently needed to solve the conundrum of whether herbivorous growth and predation is depressed at low temperatures, implying low trophic transfer rates and high carbon export, or if predation proceeds at rates comparable to temperate systems with primary production largely lost to predation. Large temperature gradients in the global ocean mean that cross-biome and biogeochemical models are particularly sensitive to assumptions about the temperature dependence in modeled rate processes. Establishment of the dependence of heterotrophic plankton physiological rates (growth and grazing) to gradients of temperature, mimicking realistic conditions experienced by plankton in a changing ocean, is a key step towards integrating much needed biological information in biogeochemical modeling efforts. This project makes a significant contribution to linking ecological research with ecosystem models by providing empirically rooted algorithms of the temperature dependence of protistan herbivory and growth rates, key processes in the transformation of organic matter in global biogeochemical cycles and tools critically missing in ecosystem models.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1736635

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