Bacterial abundance, thymidine incorporation, bottle casts from R/V Endeavor cruise EN198 in the North Atlantic in 1989 (U.S. JGOFS NABE project)

Website: https://www.bco-dmo.org/dataset/2572
Version: November 28, 2001
Version Date: 2001-11-28

Project
» U.S. JGOFS North Atlantic Bloom Experiment (NABE)

Program
» U.S. Joint Global Ocean Flux Study (U.S. JGOFS)

Contributors	Affiliation	Role
Ducklow, Hugh W.	Marine Biological Laboratory Ecosystems Center (MBL - Ecosystems)	Principal Investigator
Chandler, Cynthia L.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Table of Contents

- Dataset Description
  - Methods & Sampling
- Data Files
- Parameters
- Instruments
- Deployments
- Project Information
- Program Information
- Funding

Dataset Description

Bacterial abundance, thymidine incorporation, bottle casts

Methods & Sampling

PI: Hugh Ducklow
of: Virginia Institute of Marine Science
dataset: Bacteria abundance, thymidine incorporation
dates: June 30, 1989 to July 04, 1989
location: N: 59.535 S: 59.4733 W: -21.0183 E: -20.8217
project/cruise: North Atlantic Bloom Experiment/Endeavor 198
ship: R/V Endeavor

DMO Note: Bacteria data from the NABE Atlantis II cruise

are reported with the biology dataset for that cruise.

Methodology

BACTERIAL ABUNDANCE & BACTERIAL THYMIDINE

& LEUCINE INCORPORATION (Ducklow, HPEL)

Abundance samples preserved in 1.25% glutaraldehyde and stored at 5ï¿½ C until microscopy was performed at Horn Point Environmental Laboratory. All samples were enumerated according to the Acridine Orange Direct Count technique of Hobbie et al., (1977) with modifications by Helen Quinby. Samples were enumerated on a Nikon Optiphot epifluorescence microscope at 1850x with a 100 watt Mercury lamp.

Thymidine incorporation samples collected from Niskin rosette casts were immediately processed as described in Ducklow and Hill (1985), with the following modifications: Samples were incubated with 5 nM 3H-thymidine (New England Nuclear, sp. act. 81 Ci/mmol) in polycarbonate bottles, disposable polyproplyene centrifuge tubes or Whirl-Pak bags. Incubations were terminated with addition of 0.37% formaldehyde, then filtered onto 0.2 ï¿½m Nuclepore filters. Extractions were carried out by rinsing each filter on its funnel support 3 times with 5% ice cold TCA, over a weak vacuum (<10 in. Hg), then 3 times with 80% ice cold ethanol. All extracted filters were stored dry in scintillation vials for counting at Horn Point Environmental Laboratory.

Leucine incorporation samples were treated according to the method described in Kirchman et al., (1985), with the following modifications: Samples were incubated with 0.5 nM 3H- leucine (NEN; Sp. Act. 73 Ci/mmol) and 10 nM nonradioactive leucine, then treated as described for thymidine.

US JGOFS NABE Bacterial Data

Bacterial data were collected on the US JGOFS NABE cruises aboard RV ATLANTIS II legs 2 and 3 and Endeavor cruise 198 by Hugh Ducklow, David Kirchman, Helen Quinby and Hans Dam. On cruise 2, only bacterial abundance was measured. On cruise 3, bacterial abundance, and bacterial thymidine and leucine incorporation were measured. On Endeavor cruise 198 only bacteria abundance and thymidine incorporation were measured by the following methods:

Abundance:

Samples preserved in 1.25% glutaraldehyde and stored at 5C until microscopy was performed at Horn Point. All samples were enumerated according to the Acridine Orange Direct Count technique of Hobbie et al., (1977) with modifications by Helen Quinby. Samples were enumerated on a Nikon Optiphot epifluorescence microscope at 1850X with a 100 watt Mercury lamp.

Thymidine Incorporation:

Samples collected from Niskin rosette casts were immediately processed as described in Ducklow and Hill (1985), with the following modifications:

Samples were incubated with 5 nM 3H-thymidine (New England Nuclear, sp. act. 81 Ci/mmol) in polycarbonate bottles, disposable polyproplyene centrifuge tubes or Whirl-Pak bags. Incubations were terminated with addition of 0.37% formaldehyde, then filtered onto 0.2 um Nuclepore filters. Extractions were carried out by rinsing each filter on its funnel support 3 times with 5% ice cold TCA, over a weak vacuum (< 10 in. Hg), then 3 times with 80% ice cold ethanol. All extracted filters were stored dry in scintillation vials for counting at Horn Point.

Additional samples were treated to purify the labelled DNA following the method of Wicks et al., (1987). 95% of the label in the cold TCA extracts was in pure DNA. (Data available from HWD).

Leucine Incorporation:

Samples were treated according to the method described in Kirchman et al., (1985), with the following modifications:

Samples were incubated with 0.5 nM 3H-leucine (NEN; Sp. Act. 73 Ci/mmol) and 10 nM nonradioactive leucine, then treated as described for thymidine.

Biomass/production/systhesis rate conversions:

The bacteria abundance data can be converted into bacterial biomass (ugC or ugN l-1) as described for example in Lee and Fuhrman (1988). We will be measuring cell biovolumes for this conversion and have not supplied nominal biomass data at this time.

The THYINCORP data can be converted into bacterial production rates (ugC or ugN l-1 hr-1) as discussed in Ducklow and Hill (1985). We performed separate experiments to determine the conversion factors, and will report the data separately. The THYINCORP data provide a relative index of differences in bacterial production in space and time. Data on the biovolume and rate conversion factors are required for translation into absolute units.

The LEUINCORP data can be converted into bacterial protein synthesis rates (ugC or ugN l-1 hr-1) as discussed in Chin-Leo and Kirchman, (1988). We performed separate experiments to determine the conversion factors, and will report the data separately. The LEUINCORP data provide a relative index of differences in protein synthesis in space and time. Data on the biovolume and rate conversion factors are required for translation into absolute units.

References

Chin-Leo, G. And D.L. Kirchman. 1988. Estimating bacterial production in natural waters from the simultaneous incorporation of thymidine and leucine. Appl. Environ. Microbiol. 54:1934-39.

Ducklow, H.W., and S.M. Hill. 1985b. Tritiated thymidine incorporation and the growth of heterotrophic bacteria in warm core rings. Limnol. Oceanogr. 30:260-272.

Hobbie, J.E., R.J. Daley, and S. Jasper. 1977. Use of Nuclepore filters for counting bacteria by fluorescence microscopy. Appl. Environ. Microbiol. 33: 1225-1228.

Kirchman, D., E. K'nees and R. Hodson. 1985. Leucine incorporation and its potential as a measure of protein synthesis by bacteria in natural waters. Appl. Environ. Microbiol. 49: 599-607.

Lee, S. and J.A. Fuhrman. 1987. Relationships between biovolume and biomass of naturally-derived marine bacterioplankton. Appl. Environ. Microbiol. 52:1298-1303.

Wicks, R.J. and R.D.Robarts, 1987, The extraction and purification of DNA labelled with methyl-3H-thymidine in aquatic bacterial production studies, J. Plankton Res. 9:1159-66.

DMO note:
The Data Management Office has changed the units of the parameters "bact_het_mic" from cells/liter*10^9 to cells/milliliter

[table of contents | back to top]

Data Files

File
bacteria.csv (Comma Separated Values (.csv), 2.35 KB) MD5:41ea014c96abde068c7a125a5cd1bc53 Primary data file for dataset ID 2572

[table of contents | back to top]

Parameters

Parameter	Description	Units
event	event number per event log	dimensionless
sta	station number per event log	dimensionless
cast	cast number, consecutive within station	dimensionless
date	date reported as YYYYMMDD	YYYYMMDD
time	time reported as HHmm, GMT	hours/minutes
lat	latitude, minus = south	decimal degrees
lon	longitude, minus = west,	decimal degrees
depth_n	nominal depth of sample	meters
thy_incorp	thymidine incorporation	picomoles/liter/hour
bact_het_orig	heterotrophic bacteria abundance, original units; microscopy	cells/liter *10^9
bact_het_mic	heterotrophic bacteria abundance, microscopy	cells/milliliter

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Niskin Bottle
Generic Instrument Name	Niskin bottle
Dataset-specific Description	Niskin rosette bottles used to collect thymidine incorporation samples.
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

[table of contents | back to top]

Deployments

EN198

Website	https://www.bco-dmo.org/deployment/57739
Platform	R/V Endeavor
Start Date	1989-06-28
End Date	1989-07-07
Description	post bloom cruise; 7 locations; 63°N 25°W to 59°N 14°W **Methods & Sampling** PI: Hugh Ducklow of: Virginia Institute of Marine Science dataset: Bacteria abundance, thymidine incorporation dates: June 30, 1989 to July 04, 1989 location: N: 59.535 S: 59.4733 W: -21.0183 E: -20.8217 project/cruise: North Atlantic Bloom Experiment/Endeavor 198 ship: R/V Endeavor Methodology BACTERIAL ABUNDANCE & BACTERIAL THYMIDINE & LEUCINE INCORPORATION (Ducklow, HPEL) Abundance samples preserved in 1.25% glutaraldehyde and stored at 5ï¿½ C until microscopy was performed at Horn Point Environmental Laboratory. All samples were enumerated according to the Acridine Orange Direct Count technique of Hobbie et al., (1977) with modifications by Helen Quinby. Samples were enumerated on a Nikon Optiphot epifluorescence microscope at 1850x with a 100 watt Mercury lamp. Thymidine incorporation samples collected from Niskin rosette casts were immediately processed as described in Ducklow and Hill (1985), with the following modifications: Samples were incubated with 5 nM 3H-thymidine (New England Nuclear, sp. act. 81 Ci/mmol) in polycarbonate bottles, disposable polyproplyene centrifuge tubes or Whirl-Pak bags. Incubations were terminated with addition of 0.37% formaldehyde, then filtered onto 0.2 ïï¿½m Nuclepore filters. Extractions were carried out by rinsing each filter on its funnel support 3 times with 5% ice cold TCA, over a weak vacuum (

[table of contents | back to top]

Project Information

U.S. JGOFS North Atlantic Bloom Experiment (NABE)

Website: http://usjgofs.whoi.edu/research/nabe.html

Coverage: North Atlantic

One of the first major activities of JGOFS was a multinational pilot project, North Atlantic Bloom Experiment (NABE), carried out along longitude 20° West in 1989 through 1991. The United States participated in 1989 only, with the April deployment of two sediment trap arrays at 48° and 34° North. Three process-oriented cruises where conducted, April through July 1989, from R/V *Atlantis II* and R/V *Endeavor* focusing on sites at 46° and 59° North. Coordination of the NABE process-study cruises was supported by NSF-OCE award # 8814229. Ancillary sea surface mapping and AXBT profiling data were collected from NASA's P3 aircraft for a series of one day flights, April through June 1989.

A detailed description of NABE and the initial synthesis of the complete program data collection efforts appear in: Topical Studies in Oceanography, JGOFS: The North Atlantic Bloom Experiment (1993), Deep-Sea Research II, Volume 40 No. 1/2.

The U.S. JGOFS Data management office compiled a preliminary NABE data report of U.S. activities: Slagle, R. and G. Heimerdinger, 1991. U.S. Joint Global Ocean Flux Study, North Atlantic Bloom Experiment, Process Study Data Report P-1, April-July 1989. NODC/U.S. JGOFS Data Management Office, Woods Hole Oceanographic Institution, 315 pp. (out of print).

[table of contents | back to top]

Program Information

U.S. Joint Global Ocean Flux Study (U.S. JGOFS)

Website: http://usjgofs.whoi.edu/

Coverage: Global

The United States Joint Global Ocean Flux Study was a national component of international JGOFS and an integral part of global climate change research.

The U.S. launched the Joint Global Ocean Flux Study (JGOFS) in the late 1980s to study the ocean carbon cycle. An ambitious goal was set to understand the controls on the concentrations and fluxes of carbon and associated nutrients in the ocean. A new field of ocean biogeochemistry emerged with an emphasis on quality measurements of carbon system parameters and interdisciplinary field studies of the biological, chemical and physical process which control the ocean carbon cycle. As we studied ocean biogeochemistry, we learned that our simple views of carbon uptake and transport were severely limited, and a new "wave" of ocean science was born. U.S. JGOFS has been supported primarily by the U.S. National Science Foundation in collaboration with the National Oceanic and Atmospheric Administration, the National Aeronautics and Space Administration, the Department of Energy and the Office of Naval Research. U.S. JGOFS, ended in 2005 with the conclusion of the Synthesis and Modeling Project (SMP).

[table of contents | back to top]

Funding

Funding Source	Award
National Science Foundation (NSF)	unknown NABE NSF

[table of contents | back to top]