Microzooplankton abundance and carbon biomass from R/V Thomas G. Thompson TT050, TT054 cruises in the Arabian Sea in 1995 (U.S. JGOFS Arabian Sea project)

Website: https://www.bco-dmo.org/dataset/2560
Version: October 2, 2001
Version Date: 2001-10-02

Project
» U.S. JGOFS Arabian Sea (Arabian Sea)

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

Contributors	Affiliation	Role
Gowing, Marcia	University of California-Santa Cruz (UCSC)	Principal Investigator
Garrison, David L.	University of California-Santa Cruz (UCSC)	Co-Principal Investigator
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Table of Contents

Dataset Description

Microzooplankton abundance and carbon biomass

Methods & Sampling

See Platform deployments for cruise specific documentation

Data Processing Description

David Garrison and Marcia Gowing

Microzooplankton Methods

Samples for microzooplankton biomass were obtained by taking ~ 2-liter aliquots from standard hydrographic casts. Heterotrophic flagellates and some nano-planktonic non-loricate ciliates were examined by epifluorescence microscopy on samples preserved with approximately 0.5% glutaraldehyde, concentrated on 0.8 micron, black Nuclepore filters, and stained with the fluorochromes DAPI (Coleman 1980) and proflavin (Haas 1982) following the protocol outlined by Verity and Sieracki (1993). Whole water samples were preserved with buffered paraformaldehyde. Larger heterotrophic dinoflagellates, and most of

the ciliates were enumerated from 50 or 100 ml of these preserved samples that were settled and counted with an inverted microscope. Biomass was estimated by converting cell volumes (calculated from measurements of cell dimensions) using the relationship ((Log10 C = 0.94 (log10 V)-0.60); with C representing carbon as picograms per cell and V representing total cell volume in cubic microns) for flagellates (Eppley et al. 1970), and the relationship carbon per cell = 0.16 pgC/cubic micron (Stoecker et al. 1994).

Coleman, A.W. 1980. Enhanced staining of bacteria in natural environments by fluorochrome staining of DNA. Limnol. Oceanogr. 25:948-951.

Eppley, R.W., F.M.H. Reid, J.D.H. Strickland. 1970. The ecology of the plankton off La Jolla, California, in the period April through September, 1967. (ed. J.D.H. Strickland), pt. III, Estimates of phytoplankton crop size, growth rate and primary production. Bull. Scripps Inst. Oceanogr. 17:33-42.

Haas, L.W. 1982. Improved epifluorescence microscopy for observing planktonic microorganisms. Ann. Inst. Oceanogr. Paris. 58S:261-266.

Stoecker, D.K., D.J. Gifford, and M. Putt. 1994. Preservation of marine planktonic ciliates: losses and cell shrinkage during fixation. Mar. Ecol. Prog. Ser. 110:293-299.

Verity, P.G. and M.E.Sieracki. 1993. Use of color image analysis and epifluorescence microscopy to measure plankton biomass. In: (Kemp, P.F., B.F. Sherr,E.B. Sherr, and J.C. Cole, eds.) Aquatic Microbial Ecology. pp. 327-338. Lewis Publishers, Boca Raton.

[table of contents | back to top]

Parameters

Parameter	Description	Units
event	event number from event log	
sta_std	Arabian Sea standard station identifier	
sta	station number from event log	
cast	CTD cast number	
cast_type	CTD=CTD rosette; TM=TM rosette	
bot	CTD bottle number - see note, please	
depth_n	nominal depth	meters
nanoflag_het	heterotrophic nanoflagellate abundance (excluding dinoflagllates)	cells/liter
nanoflag_het_C	heterotrophic nanoflagellate biomass (excluding dinoflagllates)	micrograms C/liter
dino_het	heterotrophic dinoflagellate abundance	cells/liter
dino_het_C	heterotrophic dinoflagellate biomass	micrograms C/liter
ciliates_n	non-loricate ciliate abundance (including plastidic oligotrichs)	cells/liter
ciliates_n_C	non-loricate ciliate biomass (including plastidic oligotrichs)	micrograms C/liter
tint	tintinnid (ciliate) abundance	cells/liter
tint_C	tintinnid (ciliate) biomass	micrograms C/liter

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Niskin Bottle
Generic Instrument Name	Niskin bottle
Dataset-specific Description	CTD/Niskin Rosette bottles.
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.

Dataset-specific Instrument Name	Trace Metal Bottle
Generic Instrument Name	Trace Metal Bottle
Dataset-specific Description	Trace Metal (TM) Rosette bottles
Generic Instrument Description	Trace metal (TM) clean rosette bottle used for collecting trace metal clean seawater samples.

[table of contents | back to top]

Deployments

TT050

Website	https://www.bco-dmo.org/deployment/57711
Platform	R/V Thomas G. Thompson
Start Date	1995-08-18
End Date	1995-09-15

Description	**Methods & Sampling** PI: David Garrison and Marcia Gowing of: University of California-Santa Cruz dataset: Microzooplankton abundance and carbon biomass dates: August 19, 1995 to September 12, 1995 location: N: 22.4308 S: 9.9769 W: 57.3004 E: 68.7385 project/cruise: Arabian Sea/TTN-050 - Process Cruise 5 (Late SW Monsoon) ship: Thomas Thompson Note: Abundance of nanoflagellates represent the 2-20 micron size class. All other abundances represent the 20-200 micron range. DMO note: Marcia Gowing and David Garrison Microzooplankton abundances & biomass Thomas Thompson cruise TTN-050, Process Cruise 5, Arabian Sea The following samples were collected by pooling multiple bottles of the same cast (usually 60 liters). In the main data set, only a single bottle number is listed. event___ sta_std sta cast bot_single bot_multi 08290158 S15 13 7 24 19-24 08290158 S15 13 7 18 13-18 08290158 S15 13 7 12 7-12 08290158 S15 13 7 6 1-6 08290252 S15 13 8 6 1-6 09010054 S11 17 3 24 19-24 09010054 S11 17 3 18 13-18 09010054 S11 17 3 12 7-12 09010054 S11 17 3 6 1-6 09010157 S11 17 4 15 10-15 09050059 S7 21 7 24 19-24 09050059 S7 21 7 18 13-18 09050059 S7 21 7 12 7-12 09050059 S7 21 7 6 1-6 09050156 S7 21 8 6 1-6 09080057 S4 24 6 24 19-24 09080057 S4 24 6 18 13-18 09080057 S4 24 6 12 7-12 09080057 S4 24 6 6 1-6 09080148 S4 24 7 6 1-6 09110048 S2 26 7 24 19-24 09110048 S2 26 7 18 13-18 09110048 S2 26 7 12 7-12 09110048 S2 26 7 6 1-6 09110138 S2 26 8 6 1-6 09121126 S1 27 1 22 21-22 09121126 S1 27 1 18 17-18 09121126 S1 27 1 14 13-14 09121126 S1 27 1 10 9-10 09121126 S1 27 1 6 5-6 **Processing Description** David Garrison and Marcia Gowing Microzooplankton Methods Samples for microzooplankton biomass were obtained by taking ~ 2-liter aliquots from standard hydrographic casts. Heterotrophic flagellates and some nano-planktonic non-loricate ciliates were examined by epifluorescence microscopy on samples preserved with approximately 0.5% glutaraldehyde, concentrated on 0.8 micron, black Nuclepore filters, and stained with the fluorochromes DAPI (Coleman 1980) and proflavin (Haas 1982) following the protocol outlined by Verity and Sieracki (1993). Whole water samples were preserved with buffered paraformaldehyde. Larger heterotrophic dinoflagellates, and most of the ciliates were enumerated from 50 or 100 ml of these preserved samples that were settled and counted with an inverted microscope. Biomass was estimated by converting cell volumes (calculated from measurements of cell dimensions) using the relationship ((Log10 C = 0.94 (log10 V)-0.60); with C representing carbon as picograms per cell and V representing total cell volume in cubic microns) for flagellates (Eppley et al. 1970), and the relationship carbon per cell = 0.16 pgC/cubic micron (Stoecker et al. 1994). Coleman, A.W. 1980. Enhanced staining of bacteria in natural environments by fluorochrome staining of DNA. Limnol. Oceanogr. 25:948-951. Eppley, R.W., F.M.H. Reid, J.D.H. Strickland. 1970. The ecology of the plankton off La Jolla, California, in the period April through September, 1967. (ed. J.D.H. Strickland), pt. III, Estimates of phytoplankton crop size, growth rate and primary production. Bull. Scripps Inst. Oceanogr. 17:33-42. Haas, L.W. 1982. Improved epifluorescence microscopy for observing planktonic microorganisms. Ann. Inst. Oceanogr. Paris. 58S:261-266. Stoecker, D.K., D.J. Gifford, and M. Putt. 1994. Preservation of marine planktonic ciliates: losses and cell shrinkage during fixation. Mar. Ecol. Prog. Ser. 110:293-299. Verity, P.G. and M.E.Sieracki. 1993. Use of color image analysis and epifluorescence microscopy to measure plankton biomass. In: (Kemp, P.F., B.F. Sherr,E.B. Sherr, and J.C. Cole, eds.) Aquatic Microbial Ecology. pp. 327-338. Lewis Publishers, Boca Raton.

TT054

Website	https://www.bco-dmo.org/deployment/57715
Platform	R/V Thomas G. Thompson
Start Date	1995-11-30
End Date	1995-12-28
Description	**Methods & Sampling** PI: David Garrison and Marcia Gowing of: University of California - Santa Cruz dataset: Microzooplankton abundance and carbon biomass dates: December 05, 1995 to December 24, 1995 location: N: 19.2079 S: 9.9674 W: 58.1373 E: 67.1739 project/cruise: Arabian Sea/TTN-054 - Process Cruise 7 (Early NE Monsoon) ship: Thomas Thompson Note: Abundance of nanoflagellates represent the 2-20 micron size class. All other abundances represent the 20-200 micron range. DMO Note on multiple-bottle events **Processing Description** David Garrison and Marcia Gowing Microzooplankton Methods Samples for microzooplankton biomass were obtained by taking ~ 2-liter aliquots from standard hydrographic casts. Heterotrophic flagellates and some nano-planktonic non-loricate ciliates were examined by epifluorescence microscopy on samples preserved with approximately 0.5% glutaraldehyde, concentrated on 0.8 micron, black Nuclepore filters, and stained with the fluorochromes DAPI (Coleman 1980) and proflavin (Haas 1982) following the protocol outlined by Verity and Sieracki (1993). Whole water samples were preserved with buffered paraformaldehyde. Larger heterotrophic dinoflagellates, and most of the ciliates were enumerated from 50 or 100 ml of these preserved samples that were settled and counted with an inverted microscope. Biomass was estimated by converting cell volumes (calculated from measurements of cell dimensions) using the relationship ((Log10 C = 0.94 (log10 V)-0.60); with C representing carbon as picograms per cell and V representing total cell volume in cubic microns) for flagellates (Eppley et al. 1970), and the relationship carbon per cell = 0.16 pgC/cubic micron (Stoecker et al. 1994). Coleman, A.W. 1980. Enhanced staining of bacteria in natural environments by fluorochrome staining of DNA. Limnol. Oceanogr. 25:948-951. Eppley, R.W., F.M.H. Reid, J.D.H. Strickland. 1970. The ecology of the plankton off La Jolla, California, in the period April through September, 1967. (ed. J.D.H. Strickland), pt. III, Estimates of phytoplankton crop size, growth rate and primary production. Bull. Scripps Inst. Oceanogr. 17:33-42. Haas, L.W. 1982. Improved epifluorescence microscopy for observing planktonic microorganisms. Ann. Inst. Oceanogr. Paris. 58S:261-266. Stoecker, D.K., D.J. Gifford, and M. Putt. 1994. Preservation of marine planktonic ciliates: losses and cell shrinkage during fixation. Mar. Ecol. Prog. Ser. 110:293-299. Verity, P.G. and M.E.Sieracki. 1993. Use of color image analysis and epifluorescence microscopy to measure plankton biomass. In: (Kemp, P.F., B.F. Sherr,E.B. Sherr, and J.C. Cole, eds.) Aquatic Microbial Ecology. pp. 327-338. Lewis Publishers, Boca Raton.

[table of contents | back to top]

Project Information

U.S. JGOFS Arabian Sea (Arabian Sea)

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

Coverage: Arabian Sea

The U.S. Arabian Sea Expedition which began in September 1994 and ended in January 1996, had three major components: a U.S. JGOFS Process Study, supported by the National Science Foundation (NSF); Forced Upper Ocean Dynamics, an Office of Naval Research (ONR) initiative; and shipboard and aircraft measurements supported by the National Aeronautics and Space Administration (NASA). The Expedition consisted of 17 cruises aboard the R/V Thomas Thompson, year-long moored deployments of five instrumented surface buoys and five sediment-trap arrays, aircraft overflights and satellite observations. Of the seventeen ship cruises, six

were allocated to repeat process survey cruises, four to SeaSoar mapping cruises, six to mooring and benthic work, and a single calibration cruise which was essentially conducted in transit to the Arabian Sea.

[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 Arabian Sea NSF

[table of contents | back to top]