CTD data, bottle nutrients, and chlorophyll-a from phytoplankton taxa from R/V Pelican PE08-54, PE09-12, PE10-01 in the Northwest Florida shelf off Panama City FL. from 2008-2009 (BenDiM project)

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Version:
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Project
» Benthic Dinoflagellate Migration: Occurrence and Processes (BenDiM)

Contributors	Affiliation	Role
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Dataset Description

CTD data, bottle nutrients, and the contribution to total Chlorophyl-a by phytoplankton taxa.

Methods & Sampling

At each hydrographic station, The R/V Pelican's SeaBird CTD provided profiles for light attenuation, pressure, temperature, salinity, dissolved oxygen, chlorophyll fluorescence and turbidity during the first downcast. Beam-t measurements obtained from the CTD transmissometer were used to approximate potential PAR attenuation based on the sequential application of the percent transmission through successive 1 m layers of the water column. A Secchi disc was attached to the top of the CTD (2009).

A SeaBird Rosette on the CTD was configured with eleven 5 L Niskin bottles that were triggered during the first upcast near the sediment interface and then at 2 m intervals (~9 bottles) as well as mid-depth in the remaining water column to the surface (1 bottle) and at the surface (1 bottle).

The seawater collected by the Rosette was used for nitrate-nitrite (NO_3^- + NO_2^-) analyses and HPLC pigment determinations. In May 2008, phosphate (PO_4) and silicate (SiO_4) were also measured. For nutrient samples, 10 ml of the filtered seawater were frozen immediately after collection and returned to NCSU for laboratory analyses. In the laboratory, these samples were thawed and analyzed against a standard of natural seawater with low nitrate concentrations. NO_3^- + NO_2^- were determined colorimetrically at NCSU using an automated QuAAtro Continuous-Flow Analysis system. Precision of the NO_3^- + NO_2^- analysis was 0.1 μM with a detection limit of 1.4 μM.

For High-Performance Liquid Chromatography (HPLC) analysis, approximately 1000 ml of water from selected sample depths were filtered through a 2.5 cm diameter GF-F filters under a low pressure vacuum (< 200

mmHg). The filters were frozen with liquid nitrogen and stored for 6-9 months. In the laboratory of Dr. J. L. Pinckney (USC), excess water was removed and the filters for HPLC analysis were analyzed in the dark on a Shimadzu dual LC10-AT vp and Controller SCL-10A vs binary gradient pump. Pigments on the filters were extracted after they were allowed to incubate for 18-24 hours in an acetone solution. The supernatant separated from the filter was extracted and inserted into smaller amber vials. The HPLC analysis was run with solvent A of 80% methanol and 20% ammonium acetate and a solvent B of 80% methanol and 20% acetone. Spectra measurements between 380-700 nm were taken every 2 seconds and peaks were identified based on retention time. CHEMTAX, a matrix factorization program, was used to optimize the contribution of the selected groups to total Chl a. The taxonomic groups, dinoflagellates (both gyroxanthin and peridinin types), and diatoms in May 2008, plus chlorophytes, cyanobacteria, cryptophytes, chrysophytes, and prymnesiophytes in Oct. 2008 and 2009, were selected according to the 'hierarchical guide to interpreting pigment data'. Initial pigment ratios were selected from the literature and regional studies. The initial pigment ratio was optimized using multiple randomly generated starting points as seed values. Output ratios from the previous runs were used as input values for successive runs. Values are reported here as absolute chlorophyll units.

Data Files

File
phytoplankton_chl.csv (Comma Separated Values (.csv), 3.85 MB) MD5:ec7de761a86b396fb87627e67c0e5616
Primary data file for dataset ID 3789

Parameters

Parameter	Description	Units
cruise_id	cruise identification, official name in R2R catalog (http://www.rvdata.us/)	text
taxon	plankton taxonomic name	text
station	station number	integer
date	date of transect, gmt	mm/dd/yyyy
time	time of transect, gmt	HHMM
lat	latitude; North is positive	decimal degrees
lon	longitude; East is positive	decimal degrees
pres	pressure	decibars
depth	depth	meters
temp	seawater temperature	degrees Celsius
sal	salinity on Practical Salinity Scale	dimensionless; salinity units
sigma_0	Potential density, Sigma-theta is denoted 'sigma_0', where the last digit, a zero, is used to represent the Greek letter theta. This altered density which takes into account adiabatic heating/cooling with changes in pressure is called the 'potential density'.	kg/m^3
spar	Surface Photosynthetically Available [Active] Radiation; surface irradiance	micro-Einsteins/m2.s
dpar	PAR at depth	microEinsteins/m2.s
O2_sat_pcent	percent oxygen saturation	%
O2	dissolved oxygen	milliliters/liter
fluor	fluorescence	milligrams/meter^3
beamt	attenuation (loss of light) of a narrow well collimated beam of light; beam attenuation due to particles	1/m^2
secchi	Turbidity as measured by a Secchi disk	Formazin Turbidity Units (FTU)
NO3_NO2	nitrates plus nitrites in phytoplankton sample	micromoles/liter
PO4	phosphates	micromoles/liter
SiO4	silicate	micromoles/liter
chl_a	total chlorophyll-a of the bottle sample	micrograms chl a /liter
chla_taxon	chlorophyll-a contribution by the specific taxon	micrograms chl a /liter
cruise_name	Local name chosen by project investigators for the research expedition on a vessel, as opposed to the formal/official cruise ID asserted by the vessel operator.	text

Instruments

Dataset-specific Instrument Name	CTD Sea-Bird
Generic Instrument Name	CTD Sea-Bird
Generic Instrument Description	Conductivity, Temperature, Depth (CTD) sensor package from SeaBird Electronics, no specific unit identified. This instrument designation is used when specific make and model are not known. See also other SeaBird instruments listed under CTD. More information from Sea-Bird Electronics.

Dataset-specific Instrument Name	High Performance Liquid Chromatograph
Generic Instrument Name	High-Performance Liquid Chromatograph
Generic Instrument Description	A High-performance liquid chromatograph (HPLC) is a type of liquid chromatography used to separate compounds that are dissolved in solution. HPLC instruments consist of a reservoir of the mobile phase, a pump, an injector, a separation column, and a detector. Compounds are separated by high pressure pumping of the sample mixture onto a column packed with microspheres coated with the stationary phase. The different components in the mixture pass through the column at different rates due to differences in their partitioning behavior between the mobile liquid phase and the stationary phase.

Dataset-specific Instrument Name	Niskin bottle
Generic Instrument Name	Niskin bottle
Dataset-specific Description	The CTD was configured with eleven 5 L Niskin bottles that were triggered during the first upcast near the sediment interface and then at 2 m intervals (~9 bottles) as well as mid-depth in the remaining water column to the surface (1 bottle) and at the surface (1 bottle). The seawater collected by the Rosette was used for nitrate-nitrite (NO3- + NO2-) analyses and HPLC pigment determinations.
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	Photosynthetically Available Radiation Sensor
Generic Instrument Name	Photosynthetically Available Radiation Sensor
Generic Instrument Description	A PAR sensor measures photosynthetically available (or active) radiation. The sensor measures photon flux density (photons per second per square meter) within the visible wavelength range (typically 400 to 700 nanometers). PAR gives an indication of the total energy available to plants for photosynthesis. This instrument name is used when specific type, make and model are not known.

Dataset-specific Instrument Name	Secchi Disc
Generic Instrument Name	Secchi Disc
Generic Instrument Description	Typically, a 16 inch diameter white/black quadrant disc used to measure water optical clarity

Deployments

PE08-54

Website	https://www.bco-dmo.org/deployment/58880
Platform	R/V Pelican
Start Date	2008-05-15
End Date	2008-05-21
Description	Acrobat surveys and CTD/rosettes transects Cruise information and original data are available from the NSF R2R data catalog.

PE09-12

Website	https://www.bco-dmo.org/deployment/58881
Platform	R/V Pelican
Start Date	2008-10-15
End Date	2008-10-20
Description	Acrobat surveys and CTD/rosettes transects Cruise information and original data are available from the NSF R2R data catalog.

PE10-01

Website	https://www.bco-dmo.org/deployment/58882
Platform	R/V Pelican
Start Date	2009-07-08
End Date	2009-07-15
Description	Acrobat surveys and CTD/rosettes transects Cruise information and original data are available from the NSF R2R data catalog.

Project Information

Benthic Dinoflagellate Migration: Occurrence and Processes (BenDiM)

Coverage: Northwest Florida shelf off Panama City, FL

Most applications of the standardized dinoflagellate diel vertical migration (DVM) hypothesis consider a surface

goal in daylight and a subsurface nutrient goal at night because of the visibility of surface blooms. The sub-surface nutrient source, however, can be so deep that dinoflagellates are unable to reach the surface during a 12 h ascent. At least three literature reports document a sediment-oriented expression of an alternative DVM pattern characteristic of continental boundaries with wider, more gently sloping shelves that can yield high biomass, near-bottom dinoflagellate accumulations. The targeted dinoflagellate niche, here termed 'Benthic Dinoflagellate Migration' or 'BenDiM', is influenced by light and nutrient gradients but is unique in that a DVM exists between a nutrient source near or at the sediment-sea interface and a light intensity in the lower euphotic zone that supports a net increase in population size. The project specifically deals with: 1) the different dinoflagellate species that occupy the BenDiM niche on the continental shelf off Panama City, FL between the 60 m and 20 m contours between May and Nov; 2) the light acclimation, the nutrient uptake capabilities, and the behavioral patterns required of different dinoflagellate species that occupy the BenDiM niche; and, 3) the effect of representative physical water motion on the formation, transport and fate of the different BenDiM dinoflagellate species populations. The study includes: 1) a pelagic/benthic field program with three 7-day cruises during different months between May and Oct in 2008 and Jul 2009; 2) laboratory studies on the light, nutrient, and behavioral characteristics of BenDiM dinoflagellates that allow successful competition with near-bottom pelagic diatoms and the microphytobenthos; and 3) a physical-biological modeling study to plan, integrate and extend the field and laboratory results. The cruise program applies standard UNOLS ship capabilities extended with instrumentation that includes: 1) an Acrobat undulating system instrumented with SeaBird CTD-O2 system, Biospherical PAR, SeaPoint Chlorophyll and CDOM Fluorometers, Seapoint Turbidity, Satlantic ISUS Nitrate Sensor, Brooke-Oceans Laser Optical Plankton Counter, and General Oceanics Flow Meter with integrated GPS and echo sounding location system and a real-time graphical display of the collected data, 2) the FlowCAM, and 3) the autonomous vertical profiler (AVP). The laboratory effort applies a proven motion analysis system for studying dinoflagellate behavior and a well-developed mesocosm capability for studying dinoflagellate physiology, biochemistry, and behavior. The modeling effort builds on an existing, biologically intense modeling approach that incorporates parameterization of dinoflagellate physiology, biochemistry and behavior in a representative physical field.

Funding