

# Pigments and Nutrients from ARSV Laurence M. Gould, RVIB Nathaniel B. Palmer LMG0402, NBP0606 in the Southern Drake Passage and Scotia Sea from 2004-2006 (BWZ project)

**Website:** <https://www.bco-dmo.org/dataset/3478>

**Version:** 10 May 2011

**Version Date:** 2011-05-10

## Project

» [Blue Water Zone](#) (BWZ)

Contributors	Affiliation	Role
<a href="#">Mitchell, B. Gregory</a>	University of California-San Diego (UCSD-SIO)	Principal Investigator
<a href="#">Gegg, Stephen R.</a>	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](#)
- [Funding](#)

## Dataset Description

Concentration of pigments in phytoplankton, Particulate organic matter concentration, Macronutrients

One component of a Biological dataset collected from Southern Drake Passage and Scotia Sea

Ocean biology data were collected in Southern Drake Passage and Scotia Sea during two research cruises supported by NSF awards. These two cruises, namely LMG0402 and NBP0606, were conducted during Feb. to March 2004 and Jul. to Aug 2006, respectively. Dataset includes concentration of pigments in phytoplankton, particulate organic matter concentration, macronutrients, primary productivity and microbial biomass and productivity

As part of the data collection from the collaborative research, this dataset was for the study of plankton community structure and their response to the distribution and natural variability of dissolved iron in Southern Drake Passage and Scotia Sea

## Methods & Sampling

### Notes:

1. HPLC pigments samples were analyzed by CHORS/SDSU for LMG0402 and by HPL for NBP0606, respectively
2. Pigments not found by CHORS were given a concentration of 0; pigments not found by HPL were given a concentration of 0.0001

[ [table of contents](#) | [back to top](#) ]

## Data Files

**File****Pigments\_Nutrients.csv**(Comma Separated Values (.csv), 1.35 MB)  
MD5:c6eaa079e01b3755f9d94900b02bb1a7

Primary data file for dataset ID 3478

[ [table of contents](#) | [back to top](#) ]**Parameters**

Parameter	Description	Units
cruise_id	Cruise name	text
cast_id	identification of CTD/TMC cast	text
date	Date (GMT)	YYYYMMDD
time	Time (GMT)	HHMM
lat	Station latitude (South is negative)	decimal degrees
lon	Station longitude (West is negative)	decimal degrees
Rosette_Bottle_ID	Rosette bottle number	integer
depth	Depth where sample taken	meters
Chlorophyll_a_Fluor	Chlorophyll a by fluorometric analysis; Pigments_Fluor	mg m-3
Nitrate	Nitrate; Macro-nutrients	umol/l
Nitrite	Nitrite; Macro-nutrients	umol/l
Ammonium	Ammonium; Macro-nutrients	umol/l
Phosphate	Phosphate; Macro-nutrients	umol/l
Silicate	Silicate; Macro-nutrients	umol/l
Chlorophyll_c3	Chlorophyll c3; Pigments_HPLC	mg m-3
Chlorophyll_c2	Chlorophyll c2; Pigments_HPLC	mg m-3
Chlorophyll_c1	Chlorophyll c1; Pigments_HPLC	mg m-3
Chlorophyllide_a	Chlorophyllide a; Pigments_HPLC	mg m-3
Pheophorbide_a	Pheophorbide a; Pigments_HPLC	mg m-3
Peridinin	Peridinin; Pigments_HPLC	mg m-3
Butanoyloxyfucoxanthin	Butanoyloxyfucoxanthin; Pigments_HPLC	mg m-3
Fucoxanthin	Fucoxanthin; Pigments_HPLC	mg m-3
Neoxanthin	Neoxanthin; Pigments_HPLC	mg m-3
Prasinoxanthin	Prasinoxanthin; Pigments_HPLC	mg m-3
Violaxanthin	Violaxanthin; Pigments_HPLC	mg m-3
Hexanoyloxyfucoxanthin	Hexanoyloxyfucoxanthin; Pigments_HPLC	mg m-3
Diadinoxanthin	Diadinoxanthin; Pigments_HPLC	mg m-3
Alloxanthin	Alloxanthin; Pigments_HPLC	mg m-3
Diatoxanthin	Diatoxanthin; Pigments_HPLC	mg m-3
Zeaxanthin	Zeaxanthin; Pigments_HPLC	mg m-3
Lutein	Lutein; Pigments_HPLC	mg m-3

Gyroxanthin_diester	Gyroxanthin diester; Pigments_HPLC	mg m-3
Chlorophyll_b	Chlorophyll b; Pigments_HPLC; CHORS did not report this pigment	mg m-3
Divinyl_Chlorophyll_b	Divinyl Chlorophyll b; Pigments_HPLC; HPL included this pigments into Chlorophyll b	mg m-3
Monovinyl_Chlorophyll_b	Monovinyl Chlorophyll b; Pigments_HPLC; HPL did not report this pigment	mg m-3
Chlorophyll_a_Allomer	Chlorophyll a Allomer; Pigments_HPLC; HPL did not report this pigment	mg m-3
Divinyl_Chlorophyll_a	Divinyl Chlorophyll a; Pigments_HPLC	mg m-3
Monovinyl_Chlorophyll_a	Monovinyl Chlorophyll a; Pigments_HPLC	mg m-3
Chlorophyll_a_epimer	Chlorophyll a epimer; Pigments_HPLC; HPL did not report this pigment	mg m-3
Pheophytin	Pheophytin; Pigments_HPLC	mg m-3
alpha_Carotene	alpha-Carotene; Pigments_HPLC; HPL did not report this pigment	mg m-3
beta_Carotene	beta-Carotene; Pigments_HPLC; HPL did not report this pigment	mg m-3
alpha_beta_Carotene	the sum of alpha and beta carotene; Pigments_HPLC	mg m-3
Total_Chlorophyll_a	Total Chlorophyll a; Pigments_HPLC	mg m-3
POC	Particulate organic carbon; CHN	mg m-3
PON	Particulate organic nitrogen; CHN	mg m-3

[ [table of contents](#) | [back to top](#) ]

## Instruments

<b>Dataset-specific Instrument Name</b>	CHN Elemental Analyzer
<b>Generic Instrument Name</b>	CHN Elemental Analyzer
<b>Generic Instrument Description</b>	A CHN Elemental Analyzer is used for the determination of carbon, hydrogen, and nitrogen content in organic and other types of materials, including solids, liquids, volatile, and viscous samples.

<b>Dataset-specific Instrument Name</b>	Fluorometer
<b>Generic Instrument Name</b>	Fluorometer
<b>Generic Instrument Description</b>	A fluorometer or fluorimeter is a device used to measure parameters of fluorescence: its intensity and wavelength distribution of emission spectrum after excitation by a certain spectrum of light. The instrument is designed to measure the amount of stimulated electromagnetic radiation produced by pulses of electromagnetic radiation emitted into a water sample or in situ.

<b>Dataset-specific Instrument Name</b>	Liquid Scintillation Counter
<b>Generic Instrument Name</b>	Liquid Scintillation Counter
<b>Generic Instrument Description</b>	Liquid scintillation counting is an analytical technique which is defined by the incorporation of the radiolabeled analyte into uniform distribution with a liquid chemical medium capable of converting the kinetic energy of nuclear emissions into light energy. Although the liquid scintillation counter is a sophisticated laboratory counting system used to quantify the activity of particulate emitting ( $\beta$ and $\alpha$ ) radioactive samples, it can also detect the Auger electrons emitted from $^{51}\text{Cr}$ and $^{125}\text{I}$ samples.

<b>Dataset-specific Instrument Name</b>	Nutrient Autoanalyzer
<b>Generic Instrument Name</b>	Nutrient Autoanalyzer
<b>Generic Instrument Description</b>	Nutrient Autoanalyzer is a generic term used when specific type, make and model were not specified. In general, a Nutrient Autoanalyzer is an automated flow-thru system for doing nutrient analysis (nitrate, ammonium, orthophosphate, and silicate) on seawater samples.

[ [table of contents](#) | [back to top](#) ]

## Deployments

### LMG0402

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/58666">https://www.bco-dmo.org/deployment/58666</a>
<b>Platform</b>	ARSV Laurence M. Gould
<b>Report</b>	<a href="http://bcodata.whoi.edu/BWZ/071126_2007_Report_Mitchell_0444134.pdf">http://bcodata.whoi.edu/BWZ/071126_2007_Report_Mitchell_0444134.pdf</a>
<b>Start Date</b>	2004-02-13
<b>End Date</b>	2004-03-23

### NBP0606

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/57976">https://www.bco-dmo.org/deployment/57976</a>
<b>Platform</b>	RVIB Nathaniel B. Palmer
<b>Start Date</b>	2006-07-01
<b>End Date</b>	2006-08-15
<b>Description</b>	NBP (Nathaniel B. Palmer) R/V Nathaniel B. Palmer July 2006: The research was conducted in the same region of the Drake Passage as the AMLR cruise. Samples were obtained aboard the R/V Nathaniel B. Palmer. Lat/Lon bounding box -60.4991Lat, -58.5613Lon -62.3599Lat, -58.0392Lon -60.2783Lat, -57.4509Lon -61.2683Lat, -54.2852Lon

[ [table of contents](#) | [back to top](#) ]

## Project Information

## **Blue Water Zone (BWZ)**

**Coverage:** Antarctica, Drake Passage, N: -52.6061, S: -65.1877 , E: -52.965, W: -68.325

### **NSF Proposal Title: Collaborative Research: Plankton Community Structure and Iron Distribution in the Southern Drake Passage and Scotia Sea**

The Shackleton Fracture Zone (SFZ) in Drake Passage of the Southern Ocean defines a boundary between low and high phytoplankton waters. Low chlorophyll water flowing through the southern Drake Passage emerges as high chlorophyll water to the east, and recent evidence indicates that the Southern Antarctic Circumpolar Current Front (SACCF) is steered south of the SFZ onto the Antarctic Peninsula shelf where mixing between the water types occurs. The mixed water is then advected off-shelf with elevated iron and phytoplankton biomass. The SFZ is therefore an ideal natural laboratory to improve the understanding of plankton community responses to natural iron fertilization, and how these processes influence export of organic carbon to the ocean interior. The bathymetry of the region is hypothesized to influence mesoscale circulation and transport of iron, leading to the observed patterns in phytoplankton biomass. The position of the Antarctic Circumpolar Current (ACC) is further hypothesized to influence the magnitude of the flow of ACC water onto the peninsula shelf, mediating the amount of iron transported into the Scotia Sea. To address these hypotheses, a research cruise will be conducted near the SFZ and to the east in the southern Scotia Sea. A mesoscale station grid for vertical profiles, water sampling, and bottle incubation enrichment experiments will complement rapid surface surveys of chemical, plankton, and hydrographic properties. Distributions of manganese, aluminum and radium isotopes will be determined to trace iron sources and estimate mixing rates. Phytoplankton and bacterial physiological states (including responses to iron enrichment) and the structure of the plankton communities will be studied. The primary goal is to better understand how plankton productivity, community structure and export production in the Southern Ocean are affected by the coupling between bathymetry, mesoscale circulation, and distributions of limiting nutrients. The proposed work represents an interdisciplinary approach to address the fundamental physical, chemical and biological processes that contribute to the abrupt transition in chl-a which occurs near the SFZ. Given recent indications that the Southern Ocean is warming, it is important to advance the understanding of conditions that regulate the present ecosystem structure in order to predict the effects of climate variability. This project will promote training and learning across a broad spectrum of groups. Funds are included to support postdocs, graduate students, and undergraduates. In addition, this project will contribute to the development of content for the Polar Science Station website, which has been a resource since 2001 for instructors and students in adult education, home schooling, tribal schools, corrections education, family literacy programs, and the general public.

#### **PUBLICATIONS PRODUCED AS A RESULT OF THIS RESEARCH**

Hewes, C. D., Reiss, C.S., Kahru, M., Mitchell, B.G., and Holm-Hansen, O.. "Control of phytoplankton biomass by dilution and mixed layer depth in the western Weddell-Scotia Confluence (WSC)," *Marine Ecology Progress Series*, v.366, 2008, p. 15.

Hiscock, M., Lance, V., Apprill, A., Bidigare, R., Mitchell, B., Smith Jr. W., Barber, R.. "Photosynthetic maximum quantum yield increases are an essential component of the Southern Ocean phytoplankton response to iron," *Proceedings of the National Academy of Sciences*, v.105(2), 2008, p. 4775.

Holm-Hansen, O., Kahru, M., Hewes, C.. "Deep chlorophyll a maxima (DCMs) in pelagic Antarctic waters. II. Relation to bathymetric features and dissolved iron concentrations," *Marine Ecology-Progress Series*, v.297, 2005, p. 71.

Hopkinson, B., Mitchell, B. G., Reynolds, R. A., Wang, H., Selph, K., Measures, C., Hewes, C., Holm-Hansen, O., Barbeau, K.. "Iron limitation Across Chlorophyll Gradients in the Southern Drake Passage: Phytoplankton Responses to Iron Addition and Photosynthetic Indicators of Iron Stress," *Limnology and Oceanography*, 2007, p. 2540.

Hopkinson, B., Mitchell, B. G., Reynolds, R. A., Wang, H., Selph, K., Measures, C., Hewes, C., Holm-Hansen, O., Barbeau, K.. "Iron limitation Across Chlorophyll Gradients in the Southern Drake Passage: Phytoplankton Responses to Iron Addition and Photosynthetic Indicators of Iron Stress," *Limnology and Oceanography*, v.52, 2007, p. 2540.

Kahru, M., Mitchell, B. G., Gille, S. T., Hewes, C. D. and Holm-Hansen, O.. "Eddies enhance biological production in the Weddell-Scotia Confluence of the Southern Ocean," *Geophys. Res. Lett.*, 34,, v.24, 2007, p. L14603.

[ [table of contents](#) | [back to top](#) ]

---

## Funding

Funding Source	Award
<a href="#">NSF Antarctic Sciences (NSF ANT)</a>	<a href="#">ANT-0444134</a>

[ [table of contents](#) | [back to top](#) ]