CTD Bottle Data from R/V Kilo Moana, R/V Seward Johnson KM0703, SJ0609 in the tropical and subtropical Southwest Pacific, and tropical North Atlantic from 2006-2007 (DIAZOTROPHS project)

Website: https://www.bco-dmo.org/dataset/3264
Version: 12Nov2009
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Project
» Biology and Ecology of Newly Discovered Diazotrophs in the Open Ocean (DIAZOTROPHS)

Contributors	Affiliation	Role
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Table of Contents

Dataset Description

DIAZOTROPHS - CTD bottle data
These data were collected as part of a study of the diversity and activity of nitrogen-fixing organisms in oligotrophic waters.

Methods & Sampling

See Platform deployments for cruise specific documentation

Data Processing Description

BCO-DMO Processing Notes
Generated from original files contributed to BCO-DMO as zipped data/docs files by Joseph Montoya

BCO-DMO Edits
- Date formatted to YYYYMMDD
- Time formatted to HHMM
- Parameter names modified to conform to BCO-DMO convention
- Duplicate date column deleted
- empty cells filled with 'nd' (no data)
- 'trans' parameter added to KM0703 data set with 'nd' for data values

- Data values padded to consistent decimal places

[table of contents | back to top]

Data Files

File
Bottle_Data.csv (Comma Separated Values (.csv), 493.85 KB) MD5:9eec0b826ebc92657ec78213a0c21ca5 Primary data file for dataset ID 3264

[table of contents | back to top]

Parameters

Parameter	Description	Units
Cruise	Cruise Id	text
Station	Station Id (Station number.Cast number at station)	nn.xx
depth	depth	meters
bot	bottle number	integer
date	date sampling began	YYYYMMDD
time	time sampling began	hhmm
lon	longitude; negative denotes West	decimal degrees
lat	latitude; negative denotes South	decimal degrees
press	pressure; from CTD	decibars
temp	temperature; from CTD; ITS-90	degrees Celsius
sal	salinity; from CTD; PSS-78 (PSU)	dimensionless
trans	transmissivity	voltage
Density	Density	kg/m3
SigmaT	SigmaT	unitless
fluor	fluorescence; uncalibrated	voltage
O2	oxygen; dissolved from SBE 43	umol/kg
O2_satP	oxygen saturation (percentage)	percent
Nutrient_Sample_ID	Nutrient Sample ID	text
PO4	phosphate	umol/L
SiO2	silicate	umol/L
NO3_NO2	nitrate + nitrite	umol/L
NO2	nitrite	umol/L

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	CTD Seabird 911
Generic Instrument Name	CTD Sea-Bird 911
Dataset-specific Description	CTD-rosette
Generic Instrument Description	The Sea-Bird SBE 911 is a type of CTD instrument package. The SBE 911 includes the SBE 9 Underwater Unit and the SBE 11 Deck Unit (for real-time readout using conductive wire) for deployment from a vessel. The combination of the SBE 9 and SBE 11 is called a SBE 911. The SBE 9 uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 and SBE 4). The SBE 9 CTD can be configured with auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorescence, light (PAR), light transmission, etc.). More information from Sea-Bird Electronics.

Dataset-specific Instrument Name	Fluorometer
Generic Instrument Name	Fluorometer
Dataset-specific Description	Seapoint
Generic Instrument Description	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.

Dataset-specific Instrument Name	Niskin Bottle
Generic Instrument Name	Niskin bottle
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	Nutrient Analyzer
Generic Instrument Name	Nutrient Autoanalyzer
Dataset-specific Description	Lachat Quikchem 8000 FIA system (nutrients)
Generic Instrument Description	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.

Dataset-specific Instrument Name	CTD Seabird SBE 43
Generic Instrument Name	Sea-Bird SBE 43 Dissolved Oxygen Sensor
Generic Instrument Description	The Sea-Bird SBE 43 dissolved oxygen sensor is a redesign of the Clark polarographic membrane type of dissolved oxygen sensors. more information from Sea-Bird Electronics

[table of contents | back to top]

Deployments

KM0703

Website	https://www.bco-dmo.org/deployment/58016
Platform	R/V Kilo Moana
Report	http://www.rvdata.us/catalog/KM0703
Start Date	2007-03-14
End Date	2007-04-18
	The cruise began in Townsville, Australia and sampled the Coral Sea, a transect southward toward the Tasman Sea, and a transect northward toward New Caledonia, with twelve hydrostations (001-012). It then made a run eastward to 170 deg W, a northward run to 15 deg S, then a transect to the east before ending in Suva, Fiji after carrying out fourteen stations (013-026). Cruise information and original data are available from the NSF R2R data catalog. **Methods & Sampling** * Sea-Bird SBE 9 Data File: * FileName = C:CTD_DATAkm0703km0703_015-01.hex * Software Version Seasave V 7.0g * Temperature SN = 032013 * Conductivity SN = 42541 * Number of Bytes Per Scan = 30 * Number of Voltage Words = 4 * Number of Scans Averaged by the Deck Unit = 1 * System UpLoad Time = Mar 31 2007 14:12:37 ** Ship: KM0703 ** Station: 015.01 ** Operator: jpm ** Latitude: 22d 03.05m S ** Longitude: 174d 21.05m E ** Deep cast # nquan = 17 # nvalues = 1979 # units = specified # name 0 = t090C: Temperature [ITS-90, deg C] # name 1 = t190C: Temperature, 2 [ITS-90, deg C] # name 2 = c0S/m: Conductivity [S/m] # name 3 = c1S/m: Conductivity, 2 [S/m] # name 4 = prDM: Pressure, Digiquartz [db] # name 5 = sbeox0V: Oxygen Voltage, SBE 43 # name 6 = flSP: Fluorescence, Seapoint # name 7 = par: PAR/Irradiance, Biospherical/Licor # name 8 = depSM: Depth [salt water, m], lat = -20 # name 9 = sal00: Salinity [PSU] # name 10 = sal11: Salinity, 2 [PSU] # name 11 = sbeox0Mm/Kg: Oxygen, SBE 43 [umol/Kg], WS = 2 # name 12 = sbeox0PS: Oxygen, SBE 43

Description	[% saturation], WS = 2 # name 13 = density00: Density [density, Kg/m^3] # name 14 = sigma-t00: Density [sigma-t, Kg/m^3] # name 15 = potemp090C: Potential Temperature [ITS-90, deg C] # name 16 = flag: flag # span 0 = 2.2681, 26.8348 # span 1 = 2.2692, 26.8429 # span 2 = 3.157982, 5.597767 # span 3 = 3.158523, 5.599739 # span 4 = 2.012, 2001.701 # span 5 = 1.3711, 3.0415 # span 6 = 3.1258e-02, 6.9447e-01 # span 7 = 1.0000e-12, 1.0000e-12 # span 8 = 2.000, 1980.000 # span 9 = 34.3619, 35.9051 # span 10 = 34.3664, 35.9123 # span 11 = 142.146, 210.886 # span 12 = 43.02836, 98.24801 # span 13 = 1023.3193, 1036.8703 # span 14 = 23.2987, 27.6551 # span 15 = 2.1275, 26.8322 # span 16 = 0.0000e+00, 0.0000e+00 # interval = meters: 1 # start_time = Mar 31 2007 14:12:37 # bad_flag = -9.990e-29 # sensor 0 = Frequency 0 temperature, primary, 032013, 18 Jul 06 # sensor 1 = Frequency 1 conductivity, primary, 42541, 11 Jan07, cpcor = -9.5700e-08 # sensor 2 = Frequency 2 pressure, 92859, 28 Dec06 # sensor 3 = Frequency 3 temperature, secondary, 03P2700, 22-Dec06 # sensor 4 = Frequency 4 conductivity, secondary, 042725, 21-Dec06, cpcor = -9.5700e-08 # sensor 5 = Extrnl Volt 0 Oxygen, SBE, primary, 0134, 03-Jan07 # sensor 6 = Extrnl Volt 2 Oxygen, SBE, secondary, 430325, 03-Jan07 # sensor 7 = Extrnl Volt 4 Fluorometer, Seapoint, primary # sensor 8 = Extrnl Volt 6 irradiance (PAR), primary, 4750, 8-10-06 # datcnv_date = Apr 01 2007 00:07:47, 5.37e # datcnv_in = C:CTD_DATAkm0703CTDRawkm0703_015-01.hex C:CTD_DATAkm0703CTDRawkm0703_015-01.CON # datcnv_skipover = 0 # filter_date = Apr 01 2007 00:07:54, 5.37e # filter_in = C:CTD_DATAkm0703CTDRawkm0703_015-01.cnv # filter_low_pass_tc_A = 0.030 # filter_low_pass_tc_B = 0.150 # filter_low_pass_A_vars = # filter_low_pass_B_vars = prDM # alignctd_date = Apr 01 2007 00:08:05, 5.37e # alignctd_in = C:CTD_DATAkm0703CTDRawkm0703_015-01.cnv # alignctd_adv = c1S/m 0.020, sbeox0V 5.000 # celltm_date = Apr 01 2007 00:08:11, 5.37e # celltm_in = C:CTD_DATAkm0703CTDRawkm0703_015-01.cnv # celltm_alpha = 0.0300, 0.0300 # celltm_tau = 7.0000, 7.0000 # celltm_temp_sensor_use_for_cond = primary, secondary # loopedit_date = Apr 01 2007 00:08:16, 5.37e # loopedit_in = C:CTD_DATAkm0703CTDRawkm0703_015-01.cnv # loopedit_minVelocity = 0.250 # loopedit_surfaceSoak: minDepth = 5.0, maxDepth = 20, useDeckPress = 1 # loopedit_excl_bad_scans = yes # Derive_date = Apr 01 2007 00:08:24, 5.37e # Derive_in = C:CTD_DATAkm0703CTDRawkm0703_015-01.cnv C:CTD_DATAkm0703CTDRawkm0703_015-01.CON # derive_time_window_docdt = seconds: 2 # binavg_date = Apr 01 2007 00:08:34, 5.37e # binavg_in = C:CTD_DATAkm0703CTDRawkm0703_015-01.cnv # binavg_bintype = meters # binavg_binsize = 1 # binavg_excl_bad_scans = yes # binavg_skipover = 0 # binavg_surface_bin = yes, min = 0.000, max = 5.000, value = 0.000 # file_type = ascii *END* **Processing Description** Data Processsing Notes Seabird Data Processing v 5.37e was used to post-process the raw data files from KM0703. File names have the basic format, km0703_xxx-yy.*, which reflects the station number (xxx) and event number (yy) of the cast, and the file type. For example, km0703_011-01.hex is the raw data file for hydrocast 011.01 (the first event at station 011). This directory contains binned ascii files (*.asc), bottle files (*.btl), binned binary files (*.cnv), and header files (*.hdr) for each cast. The data processing routines and parameters used are listed below in order of application. datcnv Produce *.ros bottle summary files. Derive depth, salinity, density & O2 for the rosette summary. rossum Produce bottle files (*.btl). datcnv Produce *.cnv cast files for further processing. filter Filter pressure with a time constant of 0.15 seconds. align Optimal alignments found iteratively by inspection of S‰ spikes at sharp T°C gradients. Advanced primary conductivity by +0.020 seconds Advanced secondary conductivity by 0.00 seconds. Optimal O2 advance found iteratively by inspection of O2 vs T°C plot of up/down casts. Advanced O2 voltage by 5 seconds. celltm Processed using default values of alpha = 0.03 and 1/beta = 7 to correct both primary and secondary conductivity values using corresponding temperature sensors. loopedit Filter data using fixed minimum velocity of 0.25 m/s. Remove initial surface soak (10 m) derive Calculate depth, salinity, density, [O2], potential T. binavg Average downcast into 1 m bins. Append "_bin" to raw file name. asciiout Translate to ascii data file (*.asc) , strip the header info and save it as a separate file (*.hdr).

SJ0609

Website	https://www.bco-dmo.org/deployment/58017
Platform	R/V Seward Johnson

Start Date	2006-06-18
End Date	2006-07-31
Description	Leg 1 of the cruise began in Ft. Pierce FL with a rapid transit to Bridgetown, Barbados and two hydrostations (001-002) en route. Leg 2 extended from Barbados to Mindelo, Cape Verde, with nine hydrostations (003-010, 012). Leg 3 included a run south to the equator, then northwestward to Barbados with eleven hydrostations (013-023). **Methods & Sampling** * Sea-Bird SBE 9 Data File: * FileName = C:CTD_2006MontoyaSJ0609_003-01.dat * Software Version Seasave Win32 V 5.30b * Temperature SN = 2462 * Conductivity SN = 1851 * Number of Bytes Per Scan = 44 * Number of Voltage Words = 5 * Number of Scans Averaged by the Deck Unit = 1 * Append System Time to Every Scan * System UpLoad Time = Jun 27 2006 17:46:38 * NMEA Latitude = 12 15.42 N * NMEA Longitude = 056 08.75 W * NMEA UTC (Time) = Jun 27 2006 17:46:31 * Store Lat/Lon Data = Append to Every Scan ** Ship: RVSJ ** Cruise: RV0609 ** Station: 003.01 ** Latitude: ** Longitude: # nquan = 18 # nvalues = 2001 # units = specified # name 0 = prDM: Pressure, Digiquartz [db] # name 1 = t090C: Temperature [ITS-90, deg C] # name 2 = t190C: Temperature, 2 [ITS-90, deg C] # name 3 = c0S/m: Conductivity [S/m] # name 4 = c1S/m: Conductivity, 2 [S/m] # name 5 = sbeox0V: Oxygen Voltage, SBE 43 # name 6 = par: PAR/Irradiance, Biospherical/Licor # name 7 = flSP: Fluorescence, Seapoint # name 8 = spar: SPAR/Surface Irradiance # name 9 = xmiss: Beam Transmission, Chelsea/Seatech/Wetlab CStar [%] # name 10 = depSM: Depth [salt water, m], lat = 12.257 # name 11 = sal00: Salinity [PSU] # name 12 = sal11: Salinity, 2 [PSU] # name 13 = density00: Density [density, Kg/m^3] # name 14 = sigma-t00: Density [sigma-t, Kg/m^3] # name 15 = sbeox0Mm/Kg: Oxygen, SBE 43 [umol/Kg], WS = 2 # name 16 = sbeox0PS: Oxygen, SBE 43 [% saturation], WS = 2 # name 17 = flag: flag # span 0 = 4.023, 2025.307 # span 1 = 3.4898, 28.4555 # span 2 = 3.4888, 28.4552 # span 3 = 3.294679, 5.739951 # span 4 = 3.416995, 5.953153 # span 5 = 1.3257, 2.7303 # span 6 = 4.5700e-01, 4.5700e-01 # span 7 = 5.0092e-02, 4.0023e-01 # span 8 = 6.2045e+01, 3.3034e+02 # span 9 = 123.5789, 126.3601 # span 10 = 4.000, 2004.000 # span 11 = 31.7058, 36.8765 # span 12 = 33.0329, 38.4291 # span 13 = 1019.7891, 1037.0679 # span 14 = 19.7719, 27.8131 # span 15 = 115.612, 245.998 # span 16 = 39.85958, 95.55322 # span 17 = 0.0000e+00, 0.0000e+00 # interval = meters: 1 # start_time = Jun 27 2006 17:46:38 # bad_flag = -9.990e-29 # sensor 0 = Frequency 0 temperature, primary, 2462, 05 April 06 # sensor 1 = Frequency 1 conductivity, primary, 1851, 12 April 06, cpcor = -9.5700e-08 # sensor 2 = Frequency 2 pressure, 0468, 21 Dec 04 # sensor 3 = Frequency 3 temperature, secondary, 2146, 5 April 06 # sensor 4 = Frequency 4 conductivity, secondary, 2171, 12 April 06, cpcor = -9.5700e-08 # sensor 5 = Extrnl Volt 2 Oxygen, SBE, primary, 0556, 12 April 06 # sensor 6 = Extrnl Volt 4 altimeter # sensor 7 = Extrnl Volt 5 irradiance (PAR), primary, 4661, 19 April 06 # sensor 8 = Extrnl Volt 6 Fluorometer, Seapoint, primary # sensor 9 = Extrnl Volt 7 transmissometer, primary, CST-487DR, 27 April 06 # sensor 10 = Extrnl Volt 9 surface irradiance (SPAR), degrees = 0.0 # datcnv_date = Jun 28 2006 06:21:59, 5.37e # datcnv_in = C:CTDCTDRawsj0609_003-01.dat C:CTDCTDRawsj0609_003-01.CON # datcnv_skipover = 0 # filter_date = Jun 28 2006 06:22:48, 5.37e # filter_in = C:CTDCTDRawsj0609_003-01.cnv # filter_low_pass_tc_A = 0.030 # filter_low_pass_tc_B = 0.150 # filter_low_pass_A_vars = xmiss # filter_low_pass_B_vars = prDM # alignctd_date = Jun 28 2006 06:24:07, 5.37e # alignctd_in = C:CTDCTDRawsj0609_003-01.cnv # alignctd_adv = c0S/m -0.010, sbeox0V 5.000 # celltm_date = Jun 28 2006 06:25:11, 5.37e # celltm_in = C:CTDCTDRawsj0609_003-01.cnv # celltm_alpha = 0.0300, 0.0300 # celltm_tau = 7.0000, 7.0000 # celltm_temp_sensor_use_for_cond = primary, secondary # loopedit_date = Jun 28 2006 06:25:51, 5.37e # loopedit_in = C:CTDCTDRawsj0609_003-01.cnv # loopedit_minVelocity = 0.250 # loopedit_surfaceSoak: do not remove # loopedit_excl_bad_scans = yes # Derive_date = Jun 28 2006 06:26:44, 5.37e # Derive_in = C:CTDCTDRawsj0609_003-01.cnv C:CTDCTDRawsj0609_003-01.CON # derive_time_window_docdt = seconds: 2 # binavg_date = Jun 28 2006 06:28:00, 5.37e # binavg_in = C:CTDCTDRawsj0609_003-01.cnv # binavg_bintype = meters # binavg_binsize = 1 # binavg_excl_bad_scans = yes # binavg_skipover = 0 # binavg_surface_bin = yes, min = 0.000, max = 1.000, value = 0.000 # file_type = ascii *END* **Processing Description** Data Processsing Notes Seabird Data Processing v 5.37e was used to post-process the raw data files from KM0703. File names have the basic format, km0703_xxx-yy.*, which reflects

	the station number (xxx) and event number (yy) of the cast, and the file type. For example, km0703_011-01.hex is the raw data file for hydrocast 011.01 (the first event at station 011). This directory contains binned ascii files (*.asc), bottle files (*.btl), binned binary files (*.cnv), and header files (*.hdr) for each cast. The data processing routines and parameters used are listed below in order of application. datcnv Produce *.ros bottle summary files. Derive depth, salinity, density & O2 for the rosette summary. rossum Produce bottle files (*.btl). datcnv Produce *.cnv cast files for further processing. filter Filter pressure with a time constant of 0.15 seconds. align Optimal alignments found iteratively by inspection of S‰ spikes at sharp T°C gradients. Advanced primary conductivity by +0.020 seconds Advanced secondary conductivity by 0.00 seconds. Optimal O2 advance found iteratively by inspection of O2 vs T°C plot of up/down casts. Advanced O2 voltage by 5 seconds. celltm Processed using default values of alpha = 0.03 and 1/beta = 7 to correct both primary and secondary conductivity values using corresponding temperature sensors. loopedit Filter data using fixed minimum velocity of 0.25 m/s. Remove initial surface soak (10 m) derive Calculate depth, salinity, density, [O2], potential T. binavg Average downcast into 1 m bins. Append "_bin" to raw file name. asciiout Translate to ascii data file (*.asc) , strip the header info and save it as a separate file (*.hdr).

[table of contents | back to top]

Project Information

Biology and Ecology of Newly Discovered Diazotrophs in the Open Ocean (DIAZOTROPHS)

Coverage: Tropical and Subtropical Southwest Pacific and tropical North Atlantic

Biology and Ecology of Newly Discovered Diazotrophs in the Open Ocean

The productivity of the oceans is limited by the availability of nutrients, which has implications for the fluxes of carbon between the atmosphere and oceans. In a previous award the PIs found that previously unrecognized N2-fixing unicellular cyanobacteria are active and abundant in oligotrophic oceans. This finding has important implications for nitrogen cycling in the oceans and for the role of "new" nitrogen in carbon fixation.

The PIs will address three major issues:
First, there are at least two distinct groups of cyanobacteria that appear to be separated in space and time, due to unknown ecological variables.

Second, the geographic distribution and factors controlling the distribution are unknown, so it is not clear how these organisms should be included in biogeochemical models.

Finally, one of the groups of cyanobacteria appears to fix N2 during the day,

which revives the enigma of simultaneous nitrogen fixation and photosynthesis that was previously limited to discussions of Trichodesmium.

PUBLICATIONS PRODUCED AS A RESULT OF THIS RESEARCH

Burns, J.A., Zehr, J.P., Montoya, J P, Kustka, A.B., and Capone, D. G.. "Effect of EDTA addtiions on natural Trichodesmium spp. (CYANOPHYTA) populations," Journal of Phycology, v.42, 2006, p. 900.

Campbell, L, E.J. Carpenter, J.P. Montoya, A.B. Kustka, D.G. Capone. "Picoplankton community structure within and outside a Trichodesmium bloom in the southwestern Pacific Ocean," Vie et Milieu, v.55, 2005, p. 185.

Capone, D.G., J.A. Burns, J.P. Montoya, A. Subramaniam, C. Mahaffey, T. Gunderson, A.F. Michaels, and E.J. Carpenter. "Nitrogen fixation by Trichodesmium spp.: An important source of new nitrogen to the tropica and subtropical North Atlantic Ocean," Global Biogeochemical Cycles, v.19, 2005, p. doi:10.10.

Holl, C.M. & J.P. Montoya. "Interactions between nitrate uptake and nitrogen fixation continuous cultures of the marine diazotroph Trichodesmium (Cyanophyta)," Journal of Phycology, v.41, 2005, p. 1178.

Holl, C.M., T.A. Villareal, C.D. Payne, T.D. Clayton, C. Hart, J.P. Montoya. "Trichodesmium in the western Gulf of Mexico: 15N2-fixation and natural abundance stable isotope evidence," Limnology and Oceanography, v.52, 2007, p. 2249.

Holl, C.M., Waite, A.M., Pesant, S., Thompson, P, Montoya, J P. "Unicellular diazotrophy as a source of nitrogen to Leeuwin Current coastal eddies," Deep-Sea Research I, v.54, 2007, p. 1045.

Krauk, J.M, T.A. Villareal, J.A. Sohm, J.P. Montoya, and D.G. Capone. "Plasticity of N:P ratios in laboratory and field populations of Trichodesmium spp.," Aquatic

Microbial Ecology, v.72, 2006, p. 243.

Montoya, J P, Holl, C.M., Zehr, J.P., Hansen, A., Villareal, T.A., Capone, D.G..
"High rates of N2-fixation by unicellular diazotrophs in the oligotrophic Pacific,"
Nature, v.430, 2004, p. 1027.

Montoya, J.P., M. Voss, and D.G. Capone. "Spatial variation in N2-fixation rate
and diazotroph activity in the Tropical Atlantic," Biogeosciences, v.4, 2007, p. 396.

Subramaniam, A, P.L. Yager, E.J. Carpenter, C. Mahaffey, K. Bjorkman, S. Cooley,
A. Kustka, J.P. Montoya, A. Sañudo-Wilhelmy, R. Shipe, and D.G. Capone. "Amazon River
enhances diazotrophy and carbon sequestration in the tropical North Atlantic Ocean,"
Proc. Natl. Acad. Sci, v.105, 2008, p. 10460.

Waite, AM; Muhling, BA; Holl, CM; Beckley, LE; Montoya, JP; Strzelecki, J; Thompson, PA;
Pesant, S. "Food web structure in two counter-rotating eddies based on delta N-15 and
delta C-13 isotopic analyses," DEEP-SEA RESEARCH PART II-TOPICAL STUDIES IN OCEANOGRAPHY,
v.54, 2007, p. 1055-1075. View record at Web of Science

[table of contents | back to top]

Funding

Funding Source	Award
Gordon and Betty Moore Foundation (GBMF)	unknown DIAZOTROPHS Moore
NSF Division of Ocean Sciences (NSF OCE)	OCE-0425363
NSF Division of Ocean Sciences (NSF OCE)	OCE-0425583

[table of contents | back to top]