Alongtrack data collected continuously by the ship's underway acquisition system from R/V Oceanus OC473 in the western North Atlantic, 35-50 degrees North in 2011 (OAPS project)

Website: https://www.bco-dmo.org/dataset/3640
Data Type: Cruise Results
Version: 1
Version Date: 2012-04-09

Project
» Horizontal and Vertical Distribution of Thecosome Pteropods in Relation to Carbonate Chemistry in the Northwest Atlantic and Northeast Pacific (OAPS)

Programs
» Science, Engineering and Education for Sustainability NSF-Wide Investment (SEES): Ocean Acidification (formerly CRI-OA) (SEES-OA)
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
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Abstract
This alongtrack data set contains information on environmental conditions for each day of the OC473 cruise, from 8/4/2011 to 9/1/2011.

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Coverage

Spatial Extent: **N**:50.10148 **E**:-41.69972 **S**:34.99692 **W**:-70.88595
Temporal Extent: 2011-08-04 - 2011-09-01

Dataset Description

This alongtrack data set contains information on environmental conditions for each day of the OC473 cruise, from 8/4/2011 to 9/1/2011.

Methods & Sampling

Alongtrack measurements were made continuously during the course of the cruise. Data collection was handled by a number of computers and custom software programs, including Calliope, the central program which collects, logs, and distributes the data. Sea surface temperature, salinity, and fluorescence data were

collected once per minute upon leaving port. Atmospheric measurements of air temperature, barometric pressure, wind speed and direction, and other meteorological variables were also collected along with time, latitude, and longitude once per minute. These data were saved on the ship's server on a daily basis in several different file formats.

Data Processing Description

BCO-DMO Processing Notes and Edits: Parameter names were modified to conform to BCO-DMO convention. Replaced 'nan' and '-999' with 'nd', where applicable. Leading spaces in front of values were deleted. Time was converted from HH:MM:SS format to GMT format. day_gmt, month_gmt, year, and yrday_new were added (computed based on date column).

The following parameters were removed from display:

hour, min, sec - redundant; time_gmt contains this information
ydTime - redundant; yrday_new and time_gmt contain this information
AT (temp_air) - redundant; column contained same values and precision as temp_air_port
HRH (humidity) - redundant; column contained same values and precision as humidity_port
IMET_PRC (precip_rate) - column contained no data for all rows
PRC - redundant; values were derived from precip_port
SBE45T - Calliope metadata states that temp_ss column is best source of sea surface temperature
Salinity - values recorded with less precision than sal_ss column
SSCND - values recorded with less precision than cond_mS column
SSTMP - values recorded with less precision than temp_ss column
SPD - Calliope metadata states that sog column is best source of speed-over-ground in knots
HdChkSum=2F - column used for QC only

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Data Files

File
alongtrack_OC473.csv(Comma Separated Values (.csv), 8.95 MB) MD5:ef48a435c9673950d2bc37bcdd65a060 Primary data file for dataset ID 3640

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Parameters

Parameter	Description	Units
date	month, day, year (GMT time) e.g. 8/4/2011. Month and day may be 1 or 2 digits. in m/d/yyyy format	unitless
time_gmt	Time GMT, 24 hour clock. Values converted from HH:MM:SS format to HHMM.SS format.	decimal hours
lat	Latitude, negative = South.	decimal degrees
lon	Longitude, negative = West.	decimal degrees
sog	Speed over ground (best source) obtained from primary GPS receiver. Name changed from 'SOG' during processing.	knots
head	The ship's heading obtained from primary true heading source (gyro). Name changed from 'HDT' during processing.	Degrees(azimuth)
cog	Course over ground (true), best source, obtained from primary GPS receiver.	Degrees(azimuth)

temp_ss	Sea surface temperature measured by SBE48 sensor. Name changed from 'SBE48T' during processing.	degrees C
sal_ss	Sea surface salinity measured by SBE45 thermosalinograph. Name changed from 'SBE45S' during processing.	PSU
month_gmt	Month, GMT. Values derived from the 'date' field.	mm
day_gmt	Day, GMT. Values derived from the date field.	dd
cond_mS	Surface conductivity from the SBE45 thermosalinograph. Name changed from 'SBE45C' during processing.	mS/cm
sound_vel	Surface sound velocity from the SBE45 thermosalinograph. Name changed from 'SBE45V' during processing.	m/s
SSC_FSI	Sea surface conductivity measured by FSI sensor.	mS/cm
SST_FSI	Sea surface temperature measured by FSI instrument.	degrees C
wind_speed_r_port	Relative wind speed, port side, obtained from Vaisala WXT520. Wind speed average in m/s (2 Hz, 10 sec sample period). Name changed from 'WXTP_Sm' during processing.	m/s
wind_speed_r_stbd	Relative wind speed, stbd side, obtained from Vaisala WXT520. Wind speed average in m/s (2 Hz, 10 sec sample period). Name changed from 'WXTS_Sm' during processing.	m/s
wind_speed_c_port	True wind speed, port side. Values calculated from the Vaisala WXT520. Raw data corrected for sensor alignment error and combined with the ship's heading, sog, and cog values.Name changed from "WXTP_TS" during processing.	m/s
wind_speed_c_stbd	True wind speed, stbd side. Values calculated from the Vaisala WXT520. Raw data corrected for sensor alignment error and combined with the ship's heading, sog, and cog values.Name changed from 'WXTS_TS' during processing.	m/s
wind_speed_kts	True wind speed from primary source (WXT520's). Name changed from 'Wnd_TS' during processing.	knots
year	year (YYYY format); derived from date column.	dimensionless
yrday_new	yearday; derived from date column.	dimensionless
temp_air_port	Air temperature in degrees C. Obtained from Vaisala WXT520 mounted on forward mast, port side, 15 m above waterline. Name changed from 'WXTP_Ta' during processing.	degrees C
temp_air_stbd	Air temperature in degrees C. Obtained from Vaisala WXT520 mounted on forward mast, stbd side, 15 m above waterline. Name changed from 'WXTS_Ta' during processing.	degrees C
depth_w_12	Depth in meters obtained from the Knudsen 12 kHz channel. 4 meter transducer depth correction has been applied. Name changed from 'Depth12' during processing.	m
depth_w_3d5	Depth in meters obtained from the Knudsen 3.5 kHz channel. 4 meter transducer depth correction has been applied. Name changed from 'Depth35' during processing.	m
wind_dir_r_port	Relative wind direction, port side. Data obtained from Vaisala WXT520 and has not been corrected for sensor mounting alignment error.A 0-degree wind comes over the bow; 90-degree wind comes over the stbd side. Name changed from 'WXTP_Dm' during processing.	degrees
wind_dir_r_stbd	Relative wind direction, stbd side. Data obtained from Vaisala WXT520 and has not been corrected for sensor mounting alignment error.A 0-degree wind comes over the bow; 90-degree wind comes over the stbd side. Name changed from "WXTS_Dm" during processing.	degrees

wind_dir_c_port	True wind direction in degrees, port side. Values are calculated from the Vaisala WXT520. Raw data corrected for sensor alignment error and combined with the ship's gyro heading, sog, and cog values. A 0-degree wind comes from the north. Name changed from 'WXTP_TD' during processing.	degrees
wind_dir_c_stbd	True wind direction in degrees, stbd side. Values are calculated from the Vaisala WXT520. Raw data corrected for sensor alignment error and combined with the ship's gyro heading, sog, and cog values. A 0-degree wind comes from the north. Name changed from 'WXTS_TD' during processing.	degrees
wind_dir_c	True wind direction from the primary source (WXT520's). Name changed from 'Wnd_TD' during processing.	degrees
press_bar_port	Barometric pressure obtained from WXT520 mounted on the forward mast, port side, 14.5 m above sea level. Data has been corrected for sensor altitude. Name changed from 'WXTP_Pa' during processing.	hPa
press_bar_stbd	Barometric pressure obtained from WXT520 mounted on the forward mast, stbd side, 14.5 m above sea level. Data has been corrected for sensor altitude. Name changed from 'WXTS_Pa' during processing.	hPa
press_bar	Barometric pressure obtained from primary source (WXT520's). Values have been corrected for sensor height above sea level (.1185 hPa per meter, Oceanus = 14.5 m).Name changed from 'BPR' during processing.	hPa
precip_port	Rain accumulation in mm. Data obtained from Vaisala WXT520 mounted on forward mast, port side, 15 m above waterline.The accumulation value is reset only when the sensor power is reset. Name changed from 'WXTP_Rc' during processing.	mm
precip_stbd	Rain accumulation in mm. Data obtained from Vaisala WXT520 mounted on forward mast, stbd side, 15 m above waterline.The accumulation value is reset only when the sensor power is reset. Name changed from 'WXTS_Rc' during processing.	mm
precip_rate_port	Rain intensity in mm/hour obtained from Vaisala WXT520 mounted on forward mast, port side, 15 m above waterline. Name changed from 'WXTP_Ri' during processing.	mm/hr
precip_rate_stbd	Rain intensity in mm/hour obtained from Vaisala WXT520 mounted on forward mast, stbd side, 15 m above waterline. Name changed from 'WXTS_Ri' during processing.	mm/hr
humidity_port	Relative humidity (%) obtained from Vaisala WXT520 mounted on forward mast, port side, 15 m above water line. Name changed from 'WXTP_Ua' during processing.	%
humidity_stbd	Relative humidity (%) obtained from Vaisala WXT520 mounted on forward mast, stbd side, 15 m above water line. Name changed from 'WXTS_Ua' during processing.	%
FLR	Fluorescence measured by WetLabs Wet-Star fluorometer located in the Wet Lab clean seawater piping. Units are counts (1 volt dc = 1000).	counts
radiation_s	Short wave radiation in watts/square-meter. Raw data is in micro-volts. Raw/8.38 = watts/square-meter. Sensor is mounted on bow mast 15 m above the waterline.Name changed from 'SWR' during processing.	watts/square-meter

Instruments

Dataset-specific Instrument Name	Fluorometer
Generic Instrument Name	Fluorometer
Dataset-specific Description	Sea surface fluorometer, WetLabs Wet-Star fluorometer located in the Wet Lab clean seawater piping. A MetraByte A/D converter is used to convert the 0-5 vdc fluorometer output to serial data.
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	Global Positioning System Receiver
Generic Instrument Name	Global Positioning System Receiver
Dataset-specific Description	The Furuno GP-1850W (primary GPS) and Furuno GP-90D receivers are the navigation devices for the ship. All GPS units are located on the bridge and are operated by the ship's watch officer. Typical data provided are Time, Position, Velocity, Course-Over-Ground and Speed-Over-Ground. Heading and altitude from Ashtech GPS.
Generic Instrument Description	The Global Positioning System (GPS) is a U.S. space-based radionavigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis. The U.S. Air Force develops, maintains, and operates the space and control segments of the NAVSTAR GPS transmitter system. Ships use a variety of receivers (e.g. Trimble and Ashtech) to interpret the GPS signal and determine accurate latitude and longitude.

Dataset-specific Instrument Name	Gyro
Generic Instrument Name	Gyro
Generic Instrument Description	Compass with a motorized gyroscope that tracks true north (heading).

Dataset-specific Instrument Name	Knudsen 320 BR deepwater echosounder
Generic Instrument Name	Knudsen 320 BR deepwater echosounder
Dataset-specific Description	Depth data was obtained from the Knudsen bathymetry system. Values have been corrected for transducer depth (4 meters). Bathymetric systems (3.5 kHz and 12.0 kHz) include: Knudsen 320B/R with digital data logging and EPC graphic recorder, Knudsen 3260 Chirp echsounder, Edo 323 B 12 kHz transducer, and an array of 12 3.5 kHz transducers.
Generic Instrument Description	The Knudsen 320 B/R deepwater echosounder is a digital data logging system used to measure water depth (e.g. depth of the seafloor). The system is configured to work with different frequency transducers. For example, the Edo 323 B is a 12 kHz High Frequency (HF) transducer or it can be configured to work with an array of 3.5 kHz Low Frequency (LF) transducers mounted in the hull of a vessel.

Dataset-specific Instrument Name	MicroTSG Thermosalinograph
Generic Instrument Name	MicroTSG Thermosalinograph
Dataset-specific Description	SBE45 MicroTSG sensor connected to the clean seawater system in the Wet Lab. See SBE48 for best sea surface temperature data. More information on this instrument is available on its spec sheet.
Generic Instrument Description	An externally powered, high-accuracy instrument, designed for shipboard determination of sea surface (pumped-water) conductivity and temperature. Salinity and sound velocity can also be computed.

Dataset-specific Instrument Name	SBE 48 Hull Temperature Sensor
Generic Instrument Name	Sea-Bird SBE 48 Hull Temperature Sensor
Dataset-specific Description	Hull Temperature Sensor; magnetically coupled SBE48 to measure sea surface temperature (C) through the hull. Sensor is located in the bow. Sensor housing is contained in an insulation jacket to limit effect of ambient bow chamber air.
Generic Instrument Description	The SBE 48 is a high-accuracy temperature recorder with non-volatile memory, designed for shipboard determination of sea surface temperature. Installed with magnets just below the water line, the SBE 48's temperature sensor is in contact with the inside of the ship's hull. For more information, see the SBE48 Manual.

Dataset-specific Instrument Name	Weather Transmitter
Generic Instrument Name	Weather Transmitter
Dataset-specific Description	Vaisala WXT520 weather transmitters mounted on the forward mast, one each on port side and stbd side, 14.5 meters above sea level.
Generic Instrument Description	The ship-mounted Vaisala Weather Transmitter WXT520 measures: Wind speed and direction; Liquid precipitation: rainfall, duration, intensity; Barometric pressure; Air temperature and Relative humidity. (for more information see http://www.vaisala.com/en/products/multiweathersensors/Pages/WXT520.aspx)

Deployments

OC473

Website	https://www.bco-dmo.org/deployment/58720
Platform	R/V Oceanus
Report	http://hdl.handle.net/1834/43091
Start Date	2011-08-07
End Date	2011-09-01
Description	The primary objective of the proposed research is to quantify the distribution, abundance, species composition, shell condition, and vertical migratory behavior of oceanic thecosome pteropods in the northwest Atlantic and northeast Pacific, and correlate these quantities to hydrography and concurrent measurements of carbonate chemistry, including vertical and horizontal distributions of aragonite saturation. During OC473, the first cruise in the Atlantic, a combination of underway data collection and station activities will be conducted along a transect spanning 15 degrees of latitude (35° to 50° N) in the northwest Atlantic, employing six instrument packages: (1) a 1-m2 MOCNESS plankton net system; (2) a profiling Video Plankton Recorder / CTD package, including bottles for water sampling; (3) a deep (500m) towed broadband acoustic scattering system ; 94) a hull-mounted narrowband multi-frequency acoustic scattering system. It is possible that the hull mounted transducers will suffer from noise when the vessel is underway and so as a backup we will have a surface-towed sled with a backup complement of transducers; 5) an underway multi-parameter inorganic carbon analyzer and 6) a suite of chemistry-related instruments including a DIC auto-analyzer for discret bottle sample analysis, an alkalinity auto-titrator for bottle analysis and an Agilent spectrophotometer for discrete pH measurement. Supporting documentation:Cruise track image Cruise information and original data are available from the NSF R2R data catalog.

Project Information

Horizontal and Vertical Distribution of Thecosome Pteropods in Relation to Carbonate Chemistry in the Northwest Atlantic and Northeast Pacific (OAPS)

Coverage: 35 and 50 degrees North in the northwest Atlantic and northeast Pacific

Modified version of the NSF award abstract:
The impact of ocean acidification on marine ecosystems represents a vital question facing both marine scientists and managers of ocean resources. Thecosome pteropods are a group of calcareous planktonic molluscs widely distributed in coastal and open ocean pelagic ecosystems of the worldi¡s oceans. These animals secrete an aragonite shell, and thus are highly sensitive to ocean acidification due to the water column's changing carbonate chemistry, and particularly the shoaling of the aragonite compensation depth at which seawater becomes corrosive to aragonite. In many regions, however, relatively little is known about the abundance, distribution, vertical migratory behavior, and ecological importance of pteropods. Assessing the likely ecosystem consequences of changes in pteropod dynamics resulting from ocean acidification will require a detailed understanding of pteropod distribution and abundance relative to changing aragonite saturation in the water column.

The primary objective of this project is to quantify the distribution, abundance, species composition, shell condition, and vertical migratory behavior of oceanic thecosome pteropods in the northwest Atlantic and northeast Pacific, and correlate these quantities to hydrography and concurrent measurements of carbonate chemistry, including vertical and horizontal distributions of aragonite saturation. In particular, the project will capitalize on present-day variability in the depth distribution of aragonite saturation levels within and between the Atlantic and Pacific Oceans as a "natural experiment" to address the hypotheses that pteropod vertical distribution, species composition, and abundance vary as the compensation depth becomes shallower. Secondary objectives are to develop acoustic protocols for the remote quantification of pteropod abundance for future integration into ocean acidification monitoring networks, and to characterize carbonate chemistry and nutrients along portions of two WOCE/CLIVAR Repeat Hydrography transects (A20 in the Atlantic and P17N in the Pacific) to identify decadal-scale changes in the carbonate system. These hypotheses and objectives will be addressed through two cruises along survey transects between 35 and 50 degrees North in the northwest Atlantic and northeast Pacific involving a combination of station-work and underway measurements, and a comprehensive array of instruments, including acoustic, optical, towed net, hydrographic, and carbonate chemistry sensors and sampling systems.

This highly inter-disciplinary project, combines expertise in zooplankton ecology, acoustics, and marine chemistry. The proposed work will result in a detailed baseline understanding of variability in the horizontal and vertical distribution, as well as species composition, of thecosome pteropods in the northwest Atlantic and northeast Pacific, making a key contribution to zooplankton ecology generally. In addition, by quantifying the response to current spatial variability within and between the Atlantic and Pacific Oceans, the project will provide important information on the likely response of pteropod distribution to future changes in the vertical distribution of aragonite saturation levels, a necessary component in modeling the impacts of ocean acidification on marine ecosystem function, services, and resources.

Ocean acidification is increasingly appreciated as an urgent societal concern. Thecosome pteropods are key prey for a variety of commercially-exploited fish species, and the improved understanding the PIs seek of pteropod distribution and likely response to changing water column carbonate chemistry will have important implications for our understanding of potential effects of ocean acidification on marine resources.

Program Information

Science, Engineering and Education for Sustainability NSF-Wide Investment (SEES): Ocean Acidification (formerly CRI-OA) (SEES-OA)

Website: https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503477

Coverage: global

NSF Climate Research Investment (CRI) activities that were initiated in 2010 are now included under Science, Engineering and Education for Sustainability NSF-Wide Investment (SEES). SEES is a portfolio of activities that highlights NSF's unique role in helping society address the challenge(s) of achieving sustainability. Detailed information about the SEES program is available from NSF (https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504707).

In recognition of the need for basic research concerning the nature, extent and impact of ocean acidification on oceanic environments in the past, present and future, the goal of the SEES: OA program is to understand (a) the chemistry and physical chemistry of ocean acidification; (b) how ocean acidification interacts with processes at the organismal level; and (c) how the earth system history informs our understanding of the effects of ocean acidification on the present day and future ocean.

Solicitations issued under this program:
NSF 10-530, FY 2010-FY2011
NSF 12-500, FY 2012
NSF 12-600, FY 2013
NSF 13-586, FY 2014
NSF 13-586 was the final solicitation that will be released for this program.

PI Meetings:
1st U.S. Ocean Acidification PI Meeting(March 22-24, 2011, Woods Hole, MA)
2nd U.S. Ocean Acidification PI Meeting(Sept. 18-20, 2013, Washington, DC)
3rd U.S. Ocean Acidification PI Meeting (June 9-11, 2015, Woods Hole, MA – Tentative)

NSF media releases for the Ocean Acidification Program:

Press Release 10-186 NSF Awards Grants to Study Effects of Ocean Acidification

Discovery Blue Mussels "Hang On" Along Rocky Shores: For How Long?

Discovery nsf.gov - National Science Foundation (NSF) Discoveries - Trouble in Paradise: Ocean Acidification This Way Comes - US National Science Foundation (NSF)

Press Release 12-179 nsf.gov - National Science Foundation (NSF) News - Ocean Acidification: Finding New Answers Through National Science Foundation Research Grants - US National Science Foundation (NSF)

Press Release 13-102 World Oceans Month Brings Mixed News for Oysters

Press Release 13-108 nsf.gov - National Science Foundation (NSF) News - Natural Underwater Springs Show How Coral Reefs Respond to Ocean Acidification - US National Science Foundation (NSF)

Press Release 13-148 Ocean acidification: Making new discoveries through National Science Foundation research grants

Press Release 13-148 - Video nsf.gov - News - Video - NSF Ocean Sciences Division Director David Conover answers questions about ocean acidification. - US National Science Foundation (NSF)

Press Release 14-010 nsf.gov - National Science Foundation (NSF) News - Palau's coral reefs surprisingly resistant to ocean acidification - US National Science Foundation (NSF)

Press Release 14-116 nsf.gov - National Science Foundation (NSF) News - Ocean Acidification: NSF awards $11.4 million in new grants to study effects on marine ecosystems - US National Science Foundation (NSF)

Ocean Carbon and Biogeochemistry (OCB)

Website: http://us-ocb.org/

Coverage: Global

The Ocean Carbon and Biogeochemistry (OCB) program focuses on the ocean's role as a component of the global Earth system, bringing together research in geochemistry, ocean physics, and ecology that inform on and advance our understanding of ocean biogeochemistry. The overall program goals are to promote, plan, and coordinate collaborative, multidisciplinary research opportunities within the U.S. research community and with international partners. Important OCB-related activities currently include: the Ocean Carbon and Climate Change (OCCC) and the North American Carbon Program (NACP); U.S. contributions to IMBER, SOLAS, CARBOOCEAN; and numerous U.S. single-investigator and medium-size research projects funded by U.S. federal agencies including NASA, NOAA, and NSF.

The scientific mission of OCB is to study the evolving role of the ocean in the global carbon cycle, in the face of environmental variability and change through studies of marine biogeochemical cycles and associated ecosystems.

The overarching OCB science themes include improved understanding and prediction of: 1) oceanic uptake and release of atmospheric CO2 and other greenhouse gases and 2) environmental sensitivities of biogeochemical cycles, marine ecosystems, and interactions between the two.

The OCB Research Priorities (updated January 2012) include: ocean acidification; terrestrial/coastal carbon fluxes and exchanges; climate sensitivities of and change in ecosystem structure and associated impacts on biogeochemical cycles; mesopelagic ecological and biogeochemical interactions; benthic-pelagic feedbacks on biogeochemical cycles; ocean carbon uptake and storage; and expanding low-oxygen conditions in the coastal and open oceans.

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1041068