Sample log for R/V Atlantis (AT26-14) Alvin dive A4703 in the Gulf of Mexico during April 2014 (Lophelia OA project)

Website: https://www.bco-dmo.org/dataset/659495
Data Type: Cruise Results
Version: 1
Version Date: 2016-09-21

Project
» Physiological and genetic responses of the deep-water coral, Lophelia pertusa, to ongoing ocean acidification in the Gulf of Mexico (Lophelia OA)

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

Contributors	Affiliation	Role
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Abstract
Sample log for R/V Atlantis (AT26-14) Alvin dive A4703 in the Gulf of Mexico during April 2014 (Lophelia OA project)

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Coverage

Spatial Extent: **Lat**:29.157778 **Lon**:-88.02
Temporal Extent: 2014-04-27

Dataset Description

Sample log from HOV Alvin dive A4703 on R/V Atlantis (AT26-14) during April 2014 in the Gulf of Mexico.

Methods & Sampling

Sample log was acquired for the dive. Time, date, and activity are described.

Data Processing Description

Data Management Office Processing Notes:
-Re-formatted column names to comply with BCO-DMO naming standards.

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Data Files

File
A4703_sample_log.csv (Comma Separated Values (.csv), 1.54 KB) MD5:3d4e7a4a7a29af95204396c4e52bf7d1 Primary data file for dataset ID 659495

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Parameters

Parameter	Description	Units
date	Date of sampling; mm/dd/yy	unitless
dive	Dive ID number	unitless
time	Time sample was taken; HH:MM	unitless
activity	Activity performed and comments	unitless
lat	Latitude	decimal degrees
lon	Longitude	decimal degrees

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Instruments

Dataset-specific Instrument Name	Pump
Generic Instrument Name	HOV Alvin Slurp Samplers
Dataset-specific Description	Pump used to collect samples from seafloor or water column
Generic Instrument Description	Small and large capacity vacuum pump samplers. May have single or multiple chambers. Slurp Samplers (from https://ndsf.whoi.edu/alvin/systems/) The slurp samplers consist of a collection chamber and a hydraulically powered water pump. A nozzle with a tube connected to it is held and moved by a manipulator while water is pulled into the nozzle by the pump. The water travels down the tube into the collection chamber, and then goes through a mesh screen before going through the pump itself. Biological samples are sucked into the nozzle and deposited in the collection chamber. They are kept from going into the pump by the mesh screen. The screen can be changed for coarser or finer mesh as needed. Two styles of collection chamber are available; single chamber and 5-chamber. Single chamber: a large cylindrical single collection chamber into which all samples will be deposited. Water weight 2 lbs, 27 lbs full of water. 5-chamber: five separate cylindrical collection chambers of 4.5 inch ID x 11.5 inch height. One chamber is used at a time and the chambers are rotated by a hydraulic actuator mounted to the bottom of the 5-chamber assembly. Water weight 10 lbs, 140 lbs full of water.

Dataset-specific Instrument Name	Niskin
Generic Instrument Name	Niskin bottle
Dataset-specific Description	Used to collect water samples
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.

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Deployments

AT26-14

Website	https://www.bco-dmo.org/deployment/658949
Platform	R/V Atlantis
Start Date	2014-04-27
End Date	2014-05-16

AT26-14_Alvin_Dives

Website	https://www.bco-dmo.org/deployment/659523
Platform	HOV Alvin
Start Date	2014-04-27
End Date	2014-05-14

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Project Information

Physiological and genetic responses of the deep-water coral, Lophelia pertusa, to ongoing ocean acidification in the Gulf of Mexico (Lophelia OA)

Coverage: Northern Gulf of Mexico

The Gulf of Mexico deep water ecosystems are threatened by the persistent threat of ocean acidification. Deep-water corals will be among the first to feel the effects of this process, in particular the deep-water scleractinians that form their skeleton from aragonite. The continued shoaling of the aragonite saturation horizon (the depth below which aragonite is undersaturated) will place many of the known, and as yet undiscovered, deep-water corals at risk in the very near future. The most common deep-water framework-forming scleractinian in the world's oceans is *Lophelia pertusa*. This coral is most abundant in the North Atlantic, where aragonite saturation states are relatively high, but it also creates extensive reef structures between 300 and 600 m depth in the Gulf of Mexico where aragonite saturation states were previously unknown. Preliminary data indicate that pH at this depth range is between 7.85 and 8.03, and the aragonite saturation state is typically between 1.28 and 1.69. These are the first measurements of aragonite saturation state for the deep Gulf of Mexico, and are among the lowest Aragonite saturation state yet recorded for framework-forming corals in any body of water, at any depth.

This project will examine the effects of ocean acidification on *L. pertusa*, combining laboratory experiments, rigorous oceanographic measurements, the latest genome and transcriptome sequencing platforms, and quantitative PCR and enzyme assays to examine changes in coral gene expression and enzyme activity related to differences in carbonate chemistry. Short-term and long-term laboratory experiments will be performed at Aragonite saturation state of 1.45 and 0.75 and the organismal (e.g., survivorship and calcification rate) and genetic (e.g., transcript abundance) responses of the coral will be monitored. Genomic DNA and RNA will be extracted, total mRNA purified, and comprehensive and quantitative profiles of the transcriptome generated using a combination of 454 and Illumina sequencing technologies. Key genes in the calcification pathways as well as other differentially expressed genes will be targeted for specific qPCR assays to verify the Illumina sequencing results. On a research cruise, *L. pertusa* will be sampled (preserved at depth) along a natural gradient in carbonate chemistry, and included in the Illumina sequencing and qPCR assays. Water samples will be obtained by submersible-deployed niskin bottles adjacent to the coral collections as well as CTD casts of the water column overlying the sites. Water samples will be analyzed for pH, alkalinity, nitrates and soluble reactive phosphorus. These will be used in combination with historical data in a model to hindcast Aragonite saturation state.

This project will provide new physiological and genetic data on an ecologically-significant and anthropogenically-threatened deepwater coral in the Gulf of Mexico. An experimental system, already developed by the PIs, offers controlled conditions to test the effect of Aragonite saturation state on calcification rates in scleractinians and, subsequently, to identify candidate genes and pathways involved in the response to reduced pH and Aragonite saturation state. Both long-term and population sampling experiments will provide additional transcriptomic data and specifically investigate the expression of the candidate genes. These results will contribute to our understanding of the means by which scleractinians may acclimate and acclimatize to low pH, alkalinity, and Aragonite saturation state. Furthermore, the investigators will continue a time series of oceanographic measurements of the carbonate system in the Gulf of Mexico, which will allow the inclusion of this significant body of water in models of past and future ocean acidification scenarios.

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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)

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1220478

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