Event log for R/V Tioga TI-700, August 2013 in the Gulf of Maine (Gulf of Maine Pteropods project)

Website: https://www.bco-dmo.org/dataset/472350
Version: 2013-11-22

Project
» Seasonal and Ontogenetic Effects of Ocean Acidification on Pteropods in the Gulf of Maine (Gulf of Maine Pteropods)

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

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Data Files

File
TI700_eventlog.csv (Comma Separated Values (.csv), 4.47 KB) MD5:5fc7dd8382ded7521ac73fc82fc971b3 Primary data file for dataset ID 472350

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Parameters

Parameter	Description	Units
event	event or sampling operation number	
inst	Instrument used to collect data, see: instrument list	
cast	cast number	
station	consecutive station number	
day_local	day of month, local time	
month_local	month of year, local time	
time_local	time of day, local time, using 2400 clock format	
se_flag	sampling operation start (s) or end (e) flag	
lat	latitude, negative = South	
lon	longitude, negative = West	
depth_w	depth of water	meters
depth	depth of sample	meters
comments	free text comments	
station_std	standard station number	decimal degrees
year	year	

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Deployments

TI700

Website	https://www.bco-dmo.org/deployment/472226
Platform	R/V Tioga
Report	http://bcodata.whoi.edu/GoME_Pteropods/cruise_reports/Tioga700_Cruise_Report_final.pdf
Start Date	2013-08-27
End Date	2013-08-28
Description	The central goal of this cruise was to sample the carbonate chemistry profile of two sites in the GoME and to document the abundance and vertical distribution of the pteropod species Limacina retroversa. The long-term goal of this research is to understand forcings by climate, enhanced atmospheric CO2 levels, and coastal eutrophication on seasonal and inter-annual variability in carbonate chemistry of the Gulf of Maine and the associated implications to planktonic calcifiers, notably pteropods. The specific goals of this project are to: 1. Quantify seasonal variations of carbonate system parameters and buffer intensity in deep waters of the Gulf of Maine in order to evaluate the sensitivity of these waters in response to acidification due to anthropogenic forcing, such as increase in atmospheric CO2, freshening of the GoME (decrease in total alkalinity) and increases in water-column respiration due to eutrophication. We will test the hypotheses that deep waters of the GoME are already seasonally under-saturated with respect to aragonite saturation state, and that these waters have low buffer intensity compared to overlying water, which would cause them to be more susceptible to acidification pressures and to reach critical ecological thresholds (OA < 1) more readily. 2. Quantify seasonal patterns in the abundance of the pteropod Limacina retroversa and its vertical distribution relative to concurrent measurements of water column chemical properties, testing the hypothesis that this species is absent in the acidic waters of the near-bottom nepheloid layer. The specific goals of this particular cruise were to: 1. Measure the carbonate chemistry of the water column at multiple sites in the Gulf of Maine, targeting regions where there the depth is greatest and the deep waters are mostly likely to be undersaturated 2. Measure the carbonate chemistry in the nephloid layer 3. Catch pteropods with a vertically stratified net system to quantify their size class, abundance and vertical distribution in the context of the carbonate chemistry. 4. Collect surface water and pteropods to test out methods for shell (70% ethanol), physiology (live) and gene expression studies (RNAlater).

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Project Information

Seasonal and Ontogenetic Effects of Ocean Acidification on Pteropods in the Gulf of Maine (Gulf of Maine Pteropods)

Website: http://www.whoi.edu/people/glawson/

Coverage: Gulf of Maine

This project will involve a series of five short cruises in 2013 and 2014, during which a variety of hydrographic, chemical, and biological data and samples will be collected, as well as a number of laboratory experiments examining pteropod physiology and gene expression.

From NSF proposal abstract:

Dissolution of excess anthropogenic CO2 into the ocean is causing the marine environment to decrease in pH. This "ocean acidification" is predicted to threaten a broad variety of marine organisms, particularly calcifying animals such as the thecosome (i.e., shelled) pteropods. These pelagic gastropods form an aragonite shell, are prey for a number of commercially important fish, and are significant contributors to carbon biogeochemistry. Their ecosystem importance, abundance, and sensitivity to dissolution position them as an important group for investigating the impacts of acidification. Our understanding of the effect of high CO2 on pteropods and the pelagic ecosystem, however, is limited primarily to short-term studies of adult calcification and respiration response in the polar ecosystems. There have been no seasonal studies of sensitivity and our understanding

of the effect of CO2 on pteropod early life stages is limited. Limacina retroversa is a particularly abundant thecosome pteropod in the North Atlantic, where it is prey for a number of fisheries species and other top predators. This species is also the most common pteropod in the Gulf of Maine (GoM) where it is present year round. L. retroversa thus offers the prospect of a useful model pteropod species, given both its ecological importance and its abundance in readily accessible waters. The investigators will conduct a series of short cruises to sample L. retroversa on a seasonal basis from local waters of the GoM near Cape Cod. The carbonate chemistry of the GoM fluctuates seasonally, providing the opportunity to assess the response of wild caught pteropods to natural changes in CO2. By characterizing the carbonate chemistry of the water column and measuring the metabolic rate, shell quality, and gene expression of pteropods throughout the year, the researchers will achieve a time series of pteropod sensitivity to CO2. Subsequently, using experimental manipulations the investigators will explore the effect of seasonal acclimation on pteropod response to short- and medium-term exposure to enhanced CO2. Pteropods frequently lay eggs in captivity, and at WHOI there is institutional expertise in maintaining these individuals in the laboratory. Building on these strengths, the researchers will also study the effect of CO2 on embryonic and larval development in L. retroversa. These earliest life-stages of marine calcifiers are thought to be especially sensitive since initial shell precipitation and the highly energetic processes of growth and development are impeded by CO2 exposure. They will also document mortality, shell production, abnormality, and developmental rate of clutches of pteropod embryos exposed to increased CO2.

Intellectual Merit: Thecosome pteropods are an abundant group of calcifying zooplankters that have been chronically understudied, particularly in temperate regions. Due to its accessibility and ecological importance, L. retroversa can be developed as a valuable model, interesting both as the dominant pteropod in the commercially-important GoM region and also an abundant pteropod in the temperate waters of the North Atlantic. The goal of this research is to augment our knowledge of the distribution of L. retroversa, to attain an understanding of their seasonal sensitivity to natural variability in CO2, and to see how this exposure impacts responses to both short- and medium-term CO2 exposure. Using powerful transcriptomic technologies, the research will transform our understanding of this group by investigating the molecular mechanisms of response in L. retroversa to both seasonality and varying durations and intensities of acidification, contextualized by ecosystem- and organism-level metrics. Furthermore the study will examine the effect of CO2 on the eggs of pteropods for the first time, providing insight into their sensitivity to an acidifying environment.

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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-1316040

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