Stable isotope ratios and mass of carbon and nitrogen in Ulva cells under ocean acidification conditions (Seaweed OA Resilience project)

Website: https://www.bco-dmo.org/dataset/732564
Data Type: experimental
Version: 1
Version Date: 2018-03-26

Project
» Ocean Acidification: Scope for Resilience to Ocean Acidification in Macroalgae (Seaweed OA Resilience)

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
This dataset includes carbon and nitrogen content and stable isotope values from Ulva lactuca tissue grown at 15° C and various CO2 levels, from May 2015 through July 2015.

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Coverage

Spatial Extent: **N**:34 **E**:-118 **S**:33 **W**:-119
Temporal Extent: 2015-05-11 - 2015-07-27

Dataset Description

This dataset includes carbon and nitrogen content and stable isotope values from *Ulva lactuca* tissue grown at 15° C and various CO2 levels, from May 2015 through July 2015.

Related Datasets:
Ulva: Carbonate chemistry pCO2: Carbonate chemistry of Ulva lactuca culture pots testing the effects of pCO2 variability (Seaweed OA Resilience project)
Ulva: Chl a: Chlorophyll a per unit biomass in Ulva lactuca under ocean acidification (OA) conditions (Seaweed OA Resilience project)
Ulva: Growth: Growth rates of Ulva exposed to different average and variability of pCO2 (Seaweed OA Resilience project)
Ulva: pH and temperature time-series: Time-series at 10 minute sampling interval of pH and temperature in

Ulva culture pots (Seaweed OA Resilience project)
Ulva: pH Drift: Carbonate chemistry over a time course with Ulva in pH drift experiments (Seaweed OA Resilience project)
Ulva: Photosynthesis and respiration: Rates of photosynthesis and respiration by Ulva exposed to different average and variability of pCO2 (Seaweed OA Resilience project)
Ulva: seawater delta13C: Stable isotope ratio and concentration of carbon in seawater from Ulva OA experiments (Seaweed OA Resilience project)

Methods & Sampling

Ulva was collected prior to each trial in May, June and July 2015 near Malibu, CA (34°04'12"N 118°56'69"W)

Culture pots were placed in large thermally insulated coolers in a temperature-controlled water bath at 15C under saturating illumination of ~550 µmoles photons/m^2/s. pCO2 treatments were supplied to closed culture pots by use of a gas mixing system combining Nitrogen, Oxygen and Carbon Dioxide to specific CO2 partial pressures, 20.9% oxygen and the balance being Nitrogen.

Data Processing Description

BCO-DMO Processing Notes:
- added a conventional header with dataset name and description, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions

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Data Files

File	
Ulva_CHN_iso.csv	(Comma Separated Values (.csv), 4.88 KB) MD5:20798a547ba4c2785f60d548fb62291b
Primary data file for dataset ID 732564	

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Parameters

Parameter	Description	Units
Sample_ID	Trial number: time=0 or end (E); pot number; replicate	unitless
pCO2_avg	Average pCO2 partial pressure in seawater tanks	microatmospheres (µatm)
pCO2_sd	Variability of pCO2 partial pressure - standard deviation	microatmospheres (µatm)
d13C	Isotopic composition of delta 13C of plant relative to Pee Dee Belemnite (PDB)	parts per thousand (ppt)
C_mass_sample	Mass of carbon in sample	micrograms
d15N	isotopic composition of delta 15N of plant relative to air	parts per thousand (ppt)
N_mass_sample	Mass of nitrogen in sample	micrograms
C_N	Ratio (by mass) of Carbon to Nitrogen	unitless
mass_plant	Mass of plant tissue sample	milligrams

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Dataset-specific Description	Instrument located at the University of California, Davis Stable Isotope Facility (UCD-SIF) and used to measure isotope carbon and nitrogen isotopes.
Generic Instrument Description	The Isotope-ratio Mass Spectrometer is a particular type of mass spectrometer used to measure the relative abundance of isotopes in a given sample (e.g. VG Prism II Isotope Ratio Mass-Spectrometer).

Dataset-specific Instrument Name	Analytical balance (Mettler Toledo XP205)
Generic Instrument Name	scale or balance
Dataset-specific Description	Used to weigh dried plant tissue samples.
Generic Instrument Description	Devices that determine the mass or weight of a sample.

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Project Information

Ocean Acidification: Scope for Resilience to Ocean Acidification in Macroalgae (Seaweed OA Resilience)

Coverage: Temperate coastal waters of the USA (30 - 45 N latitude, -66 to -88 W and -117 to -125 W longitude)

Benthic macroalgae contribute to intensely productive near shore ecosystems and little is known about the potential effects of ocean acidification on non-calcifying macroalgae. Kübler and Dudgeon will test hypotheses about two macroalgae, *Ulva* spp. and *Plocamium cartilagineum*, which, for different reasons, are hypothesized to be more productive and undergo ecological expansions under predicted changes in ocean chemistry. They have designed laboratory culture-based experiments to quantify the scope for response to ocean acidification in *Plocamium*, which relies solely on diffusive uptake of CO2, and populations of *Ulva* spp., which have an inducible concentrating mechanism (CCM). The investigators will culture these algae in media equilibrated at 8 different pCO2 levels ranging from 380 to 940 ppm to address three key hypotheses. The first is that macroalgae (such as Plocamium cartilagineum) that are not able to acquire inorganic carbon in changed form will benefit, in terms of photosynthetic and growth rates, from ocean acidification. There is little existing data to support this common assumption. The second hypothesis is that enhanced growth of Ulva sp. under OA will result from the energetic savings from down regulating the CCM, rather than from enhanced photosynthesis per se. Their approach will detect existing genetic variation for adaptive plasticity. The third key hypothesis to be addressed in short-term culture experiments is that there will be a significant interaction between ocean acidification and nitrogen limited growth of *Ulva* spp., which are indicator species of eutrophication. Kübler and Dudgeon will be able to quantify the individual effects of ocean acidification and nitrogenous nutrient addition on *Ulva* spp. and also, the synergistic effects, which will inevitably apply in many highly productive, shallow coastal areas. The three hypotheses being addressed have been broadly identified as urgent needs in our growing understanding of the impacts of ocean acidification.

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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-1316198

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