

# Stable isotope ratio and concentration of carbon in seawater during Plocamium culture experiments, 2014-2015 (Seaweed OA Resilience project)

**Website:** <https://www.bco-dmo.org/dataset/731237>

**Data Type:** experimental

**Version:** 1

**Version Date:** 2018-03-19

## 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                      |
|----------------------------------|---|---------------------------|
| <a href="#">Kubler, Janet E.</a> | California State University Northridge (CSUN)       | Principal Investigator    |
| <a href="#">Dudgeon, Steve</a>   | California State University Northridge (CSUN)       | Co-Principal Investigator |
| <a href="#">Copley, Nancy</a>    | Woods Hole Oceanographic Institution (WHOI BCO-DMO) | BCO-DMO Data Manager      |

## Abstract

Stable isotope ratio and concentration of carbon in seawater during Plocamium culture experiments, 2014-2015.

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## Coverage

**Spatial Extent:** N:34 E:-118 S:33 W:-119

**Temporal Extent:** 2014-09-09 - 2015-02-23

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## Dataset Description

This dataset includes stable isotope ratio and concentration of carbon in seawater during Plocamium culture experiments grown under various temperatures and CO<sub>2</sub> levels, from July 2014 to February 2015.

### Related Datasets:

[Plocamium carbon nitrogen and stable isotopes](#): Plocamium carbon and nitrogen content and stable isotope values, 2014-2015 (Seaweed OA Resilience project)

[Plocamium culture carbonate chemistry](#): Carbonate chemistry in experimental cultures of Plocamium cartilagineum cultured at different temperatures and pCO<sub>2</sub> levels (Seaweed OA Resilience project)

[Plocamium cultures pH and temperature](#): Plocamium culture pot pH and temperature time-series at 10 minute

sampling intervals from 2014-2015 (Seaweed OA Resilience project)

[Plocamium exptl treatments summary](#): Summary of pCO<sub>2</sub> and temperature treatment combinations for each culture pot and experimental trial (Seaweed OA Resilience project)

[Plocamium growth and biomass](#): Experimental results of Plocamium cartilagineum growth and biomass as a function of pCO<sub>2</sub> and temperature (Seaweed OA Resilience project)

[Plocamium pigments](#): Photosynthetic pigment concentrations in Plocamium cartilagineum, trials 3-8, 2014-2015 (Seaweed OA Resilience project)

[Plocamium: pH drift](#): Carbonate chemistry over a time-course in pH drift experiments with Plocamium growth collected at Catalina Island, 2014-2015 (Seaweed OA Resilience project)

[Rapid Light Curves\\_PAM](#): Measurements of fluorescence of photosystem II in Plocamium cartilagineum under various and pCO<sub>2</sub> and temperature conditions

## Methods & Sampling

Samples for delta-13C of dissolved inorganic carbon (DIC) in the seawater were stored in 20 mL glass vials with cone lids to exclude air from samples. Samples were stored at room temperature in low light until prepared for analysis using the exetainer gas evolution technique for DIC (Li et al. 2007). Then, the samples were sent to the University of California, Davis Stable Isotope Facility (UCD-SIF) for analysis using the GasBench -isotope ratio mass spectrometry technique.

## Data Processing Description

### BCO-DMO Processing Notes:

- added conventional header with dataset name, PI name, version date
- removed trailing hyphen in date records

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## Data Files

| File   |
|--|
| <b>Seawater_delta13C.csv</b> (Comma Separated Values (.csv), 1.84 KB)<br>MD5:f6d85c3818de6d120d8dbf6a47a699ad<br>Primary data file for dataset ID 731237 |

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## Related Publications

Li, Z.-P., Tao, M.-X., Li, L.-W., Wang, Z.-D., Du, L., & Zhang, M.-F. (2007). Determination of Isotope Composition of Dissolved Inorganic Carbon by Gas Chromatography-Conventional Isotope-ratio Mass Spectrometry. Chinese Journal of Analytical Chemistry, 35(10), 1455–1458. doi:[10.1016/s1872-2040\(07\)60089-9](https://doi.org/10.1016/s1872-2040(07)60089-9)  
*Methods*

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## Parameters

| Parameter  | Description  | Units                         |
|------------|--|-------------------------------|
| Date       | Sample collection date formatted as yyyy-mm-dd                                   | unitless                      |
| Sample     | Trial number: experiment end (E)-pot number.replicate                            | unitless                      |
| d13CVPDB   | Isotopic composition of delta-13C (seawater) relative to Pee Dee Belemnite (PDB) | parts per thousand (ppt)      |
| C_Conc_2ml | Carbon concentration in a 2 ml sample  | micrograms/milliliter (ug/mL) |
| C_Conc_3ml | Carbon concentration in a 3 ml sample  | micrograms/milliliter (ug/mL) |

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## Instruments

|   |  |
|---|--|
| <b>Dataset-specific Instrument Name</b> | GasBench   |
| <b>Generic Instrument Name</b>          | Isotope-ratio Mass Spectrometer  |
| <b>Dataset-specific Description</b>     | Used to measure isotope concentrations of 13C in the seawater samples.   |
| <b>Generic Instrument Description</b>   | 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). |

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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 CO<sub>2</sub>, and populations of *Ulva* spp., which have an inducible concentrating mechanism (CCM). The investigators will culture these algae in media equilibrated at 8 different pCO<sub>2</sub> 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](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](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                       |
|--|-----------------------------|
| <a href="#">NSF Division of Ocean Sciences (NSF OCE)</a> | <a href="#">OCE-1316198</a> |

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