Rapid light curves of Ulva australis based on PAM fluorometry under OA and eutrophication (Seaweed OA Resilience project)

Website: https://www.bco-dmo.org/dataset/731284
Data Type: experimental
Version:
Version Date: 2018-03-21

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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Table of Contents

Coverage

Spatial Extent: **Lat**:-42.998 **Lon**:147.33
Temporal Extent: 2015-07

Dataset Description

This dataset reports rapid light curves (RLC) of Ulva australis based on PAM fluorometry under OA and eutrophication. Conditions varied by light/dark cycle, nitrogen enrichment, and light levels.

Related Datasets:

Ulva pCO2 - NH4 enrichment: Data on growth rates, and physiological parameters of Ulva australis under ocean acidification (OA) and eutrophication, from July 2015 (Seaweed OA Resilience project)

Ulva pHT monitoring: Time-series of estimating pH in culture tanks of Ulva australis under ocean acidification (OA) and eutrophication (Seaweed OA Resilience project)

Rapid Light Curves_PAM: Measurements of fluorescence of photosystem II in Plocamium cartilagineum under various and pCO2 and temperature conditions

Methods & Sampling

Average pH values for day, night and whole day samples were estimated by taking the corresponding samples for each period, calculating the hydrogen ion concentration for each observation, estimating the average for the sample and taking the minus log10 of the average value to estimate average pH. A complete description of methods for implementation and monitoring of experimental treatments, and sampling methods to estimate response variables provided in the following publication:

Related Reference:

Reidenbach LB, Fernandez PA, Leal PP, Noisette F, McGraw CM, Revill AT, et al. (2017). Growth, ammonium metabolism, and photosynthetic properties of Ulva australis (Chlorophyta) under decreasing pH and ammonium enrichment. PLoS ONE 12(11): e0188389. https://doi.org/10.1371/journal.pone.0188389

Data Processing Description

BCO-DMO Processing Notes:
- added a conventional header with dataset description, PI names, version date

[table of contents | back to top]

Data Files

File	
RLC_Ulva_australis.csv	(Comma Separated Values (.csv), 8.98 KB) MD5:dd141566c2f3c83418407321e8b9f562
Primary data file for dataset ID 731284	

[table of contents | back to top]

Related Publications

Reidenbach, L. B., Fernandez, P. A., Leal, P. P., Noisette, F., McGraw, C. M., Revill, A. T., ... Kübler, J. E. (2017). Growth, ammonium metabolism, and photosynthetic properties of Ulva australis (Chlorophyta) under decreasing pH and ammonium enrichment. PLOS ONE, 12(11), e0188389. doi:10.1371/journal.pone.0188389
Results

[table of contents | back to top]

Parameters

Parameter	Description	Units
Tank_valve	Tank valve ID for culture treatment	unitless
MFC_ID	Mass-flow controller ID	unitless
Light_Cycle_pHT	Average of all total pH values between daily time 0700-1900 during the experiment for a tank	unitless
Dark_Cycle_pHT1	Average of all total pH values between daily time 1900-0700 during the experiment for a tank	unitless
Whole_Day_pHT	Average of all total pH values during the experiment for a tank	unitless
NH4_Trt	Designated level of treatment of ammonium enrichment categorical descriptor	unitless
PAR	Photosynthetically active radiation	micromole photons/meter^2/second
rETR	Relative electron transport rate at each photon flux density	unitless
rETR_beta_fit	Calculated relative electron transport rate fit with a hyperbolic function that includes a photoinhibition parameter	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Walz Underwater fluorometer - Diving-PAM, Heinz Walz, Effeltrich, Germany
Generic Instrument Name	Fluorometer
Dataset-specific Description	Used to measure chlorophyll fluorescence
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.

[table of contents | back to top]

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.

[table of contents | back to top]

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)

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1316198
NSF Office of International Science and Engineering (NSF OISE)	OISE-1515267

[table of contents | back to top]