

# Material properties of mussel byssal threads formed under different pH - First Break from Carrington laboratory, Friday Harbor, WA; 2010-2013 (OA - Ecomaterials Perspective project)

**Website:** <https://www.bco-dmo.org/dataset/4020>

**Version:** 27 August 2013

**Version Date:** 2013-08-27

## Project

» [Effects of Ocean Acidification on Coastal Organisms: An Ecomaterials Perspective](#) (OA - Ecomaterials Perspective)

## 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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## Dataset Description

Material properties of mussel byssal threads formed under different pH - First Break

See O`Donnell et al., 2013

## Methods & Sampling

For testing, an individual thread was excised from the byssus, with care taken to avoid loading the thread. The pebble to which the plaque was attached was epoxied to an aluminium bracket and the root of the thread was secured between cardboard with cyanoacrylate. The cardboard and aluminium bracket were secured in the clamps of an Instron 5565 materials testing frame. Byssal threads were tested while submerged in a 10 °C seawater bath by pulling normal to the substratum at 10 mm min<sup>-1</sup> until failure following ref. Thread strength, extensibility and failure location were recorded and unbroken thread portions were subsequently retested to measure distal yield and force to break plaque and proximal regions. Distal region failures were rare and excluded.

## Data Processing Description

These data are raw data from the measurement device.

### BCO-DMO Processing/Edits

- Generated from original file "Mussel Byssus final data for release 2013 07 10.xlsx", Sheet: "First" contributed by Emily Carrington
- Parameter names changed to conform to BCO-DMO parameter naming convention
- "Max Stress" column deleted
- Data values standardized to max number of decimal places reported for each parameter
- Approx Latitude, Longitude location for Friday Harbor Laboratory added to the data
- "nd" inserted into blank cells

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## Data Files

File
<b>MusselByssus_Final_First.csv</b> (Comma Separated Values (.csv), 9.57 KB) MD5:c0f1f71192c45e5ddc6e58a31ac4ba71
Primary data file for dataset ID 4020

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## Related Publications

O'Donnell, M. J., George, M. N., & Carrington, E. (2013). Mussel byssus attachment weakened by ocean acidification. *Nature Climate Change*, 3(6), 587–590. doi:[10.1038/nclimate1846](https://doi.org/10.1038/nclimate1846)  
*General*

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## Parameters

Parameter	Description	Units
Lab_Id	Laboratory identifier where experiments were conducted	dimensionless
Lat	Latitude of laboratory (South is negative)	decimal degrees
Lon	Longitude of laboratory (West is negative)	decimal degrees
Indiv	Individual Identifier	dimensionless
Cooler	Cooler Identifier	dimensionless
Tank	Tank Identifier	dimensionless
pCO2	pCO2	uatm
pCO2_SD	pCO2 Standard of Deviation (+/-)	uatm
pH	pH	total scale
pH_average_dev	pH Average Deviation (+/-)	total scale
GI	The ratio of dried gonadal tissue to total tissue mass. A proxy for reproductive investment	unitless (proportion)
CI	Dried tissue mass divided by shell length cubed	gram/cm <sup>3</sup>
Order	Order	integer
Test_Type	Test_Type (Which Test is This?)	text
Thread_Break_Location	Thread_Break_Location (Where Did the Thread Break?)	text
Thread_Break_Pattern	Thread Break Pattern	text
Distal_Diameter	Distal Diameter	mm
L0	L0	mm
Lfinal	Lfinal	mm
Max_Strain	Max Strain	unitless (proportion)
Max_Load	Max Load	Newtons (N)
Extension	Extension	mm
Yield	Yield	Newtons (N)
Lfinal_minus_L0	Lfinal - L0	mm

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## Instruments

<b>Dataset-specific Instrument Name</b>	Instron 5565 materials testing frame
<b>Generic Instrument Name</b>	Materials Testing System
<b>Dataset-specific Description</b>	Instron 5565 materials testing frame
<b>Generic Instrument Description</b>	Testing systems that are used to test a wide range of materials in tension or compression.

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## Deployments

## lab UW\_FHL\_OAEL\_Carrington

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/59061">https://www.bco-dmo.org/deployment/59061</a>
<b>Platform</b>	lab UW FHL OAEL
<b>Report</b>	<a href="http://depts.washington.edu/fhl/oael.html">http://depts.washington.edu/fhl/oael.html</a>
<b>Start Date</b>	2010-09-01
<b>End Date</b>	2013-08-31
<b>Description</b>	FHL Ocean Acidification Environmental Laboratory (OAEL) Overview FHL completed construction of a new 1500 sq. ft. experimental facility for ocean acidification research in summer 2011. The facility was funded by an award from NSF's Field Stations and Marine Laboratories (FSML) program, matching funds from the University of Washington, and private donors. The experimental facility currently includes an analytical chemistry laboratory, indoor mesocosms fed by a custom seawater-CO <sub>2</sub> blending system and temperature control, laboratory space, as well as outdoor in-water mesocosms. Led by Dr. Emily Carrington, OAEL Director ( <a href="mailto:ecarring@uw.edu">ecarring@uw.edu</a> ), this state-of-the-art ocean acidification facility offers unique research and instructional opportunities for experimental manipulations with on-site monitoring of carbonate system parameters. FHL's location, facilities, and educational mission combine to make an ideal site for the experimental mesocosm and analytical facility.

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## Project Information

### Effects of Ocean Acidification on Coastal Organisms: An Ecomaterials Perspective (OA - Ecomaterials Perspective)

**Website:** <http://depts.washington.edu/fhl/oael.html>

**Coverage:** Friday Harbor, WA

### Effects of Ocean Acidification on Coastal Organisms: An Ecomaterials Perspective

This award will support researchers based at the University of Washington's Friday Harbor Laboratories. The overall focus of the project is to determine how ocean acidification affects the integrity of biomaterials and how these effects in turn alter interactions among members of marine communities. The research plan emphasizes an ecomaterial approach; a team of biomaterials and ecomechanics experts will apply their unique perspective to detail how different combinations of environmental conditions affect the structural integrity and ecological performance of organisms. The study targets a diversity of ecologically important taxa, including bivalves, snails, crustaceans, and seaweeds, thereby providing insight into the range of possible biological responses to future changes in climate conditions. The proposal will enhance our understanding of the ecological consequences of climate change, a significant societal problem.

Each of the study systems has broader impacts in fields beyond ecomechanics. Engineers are particularly interested in biomaterials and in each system there are materials with commercial potential. The project will integrate research and education by supporting doctoral student dissertation research, providing undergraduate research opportunities via three training programs at FHL, and summer internships for talented high school students, recruited from the FHL Science Outreach Program. The participation of underrepresented groups will be broadened by actively recruiting URM and female students. Results will be disseminated in a variety of forums, including peer-reviewed scientific publications, undergraduate and graduate course material, service learning activities in K-8 classrooms, demonstrations at FHL's annual Open House, and columns for a popular science magazine.

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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 \(NSF\)](#)

## Funding

Funding Source	Award
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1041213</a>

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