Mussel growth rates monitored at multiple locations along Washington coast from 2008-2010 (Regenerated Nitrogen project)

Website: https://www.bco-dmo.org/dataset/511584
Version: 2014-04-14

Project
» The Role of Regenerated Nitrogen for Rocky Shore Productivity (Regenerated Nitrogen)

Contributors	Affiliation	Role
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Dataset Description

Mussels were transplanted from a single location on Tatoosh Island to other areas on Tatoosh Island and to the other sites. Mussels were held in mesh (vexar) packages which were bolted to the rock. Mussels were marked via engraving numbers on their shells with a dremel tool, and measured with calipers. Data have been analyzed and is of high quality, measurement error is less than 1 mm. Mussels were measured in centimeters.

Data Processing Description

Data were minimally processed; data is raw except for the environmental metrics included with the growth data. Effective shore level's calculation is described in Harley and Helmuth 2003. Proportion time submerged was calculated for 2008-2010 given tide height at each location using the online tide predictor http://tbone.biol.sc.edu/tide/ .

Relevant References:

Harley and Helmuth (2003) Local-and regional-scale effects of wave exposure, thermal stress, and absolute versus effective shore level on patterns of intertidal zonation. Limnol. Oceanogr., 48(4), 2003, 1498–1508. http://www.avto.aslo.info/lo/toc/vol_48/issue_4/1498.pdf

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Data Files

File
mussel_growth.csv(Comma Separated Values (.csv), 108.13 KB) MD5:a1bbe501ebdb09199995a6d534a8cedb Primary data file for dataset ID 511584

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Parameters

Parameter	Description	Units
station	sampling station	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
site	sampling site	unitless
tide	tide height	meters
plot	plot identification code	unitless
id_mussel	individual unique identifier	unitless
time_submerged	proportion of time mussel was submerged; 1 means submerged all the time	unitless
shore_level	Effective Shore Level: the tide height when a point on the shore is first splashed by waves during an incoming tide (Harley and Helmuth 2003)	meters
date_1	date of first measurement	MM/DD/YYYY
length_1	length at first measurement	centimeters
width_1	width at first measurement: distance across a valve perpendicular to the long axis of the valve	centimeters
date_2	date of second measurement	MM/DD/YYYY
length_2	length at second measurement	centimeters
width_2	width at second measurement: distance across a valve perpendicular to the long axis of the valve	centimeters
dead_flag_2	1 indicates dead at second measurement	unitless

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Deployments

Pfister_shore_2008-10

Website	https://www.bco-dmo.org/deployment/511644
Platform	Pfister shore
Start Date	2008-07-02
End Date	2010-08-22
Description	Caged mussel growth study

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Project Information

The Role of Regenerated Nitrogen for Rocky Shore Productivity (Regenerated Nitrogen)

Website: http://pfisterlab.uchicago.edu

Coverage: coastal northeast Pacific Ocean

NSF Award Abstract:
A fundamental and persistent question in a multitude of ecosystems is the extent to which new versus regenerated nutrients support ecosystem productivity. In coastal marine systems, nitrate derived from upwelling (= new nitrogen) and ammonium regeneration in coastal waters and sediments (= regenerated nitrogen) are major nitrogen sources that fuel coastal ocean productivity. Because inorganic nitrogen availability clearly regulates production in a large number of areas, understanding nitrogen supply is essential. In open coast regions away from river mouths, nitrate inputs are determined by large-scale physical processes promoting upwelling of deep, nutrient-rich water including wind direction and intensity. In contrast, regenerated nitrogen (mainly ammonium) is generally the result of local animal and microbial processes. Along marine rocky shores, where upwelling is typically used as a proxy for productivity, we know very little about the dynamics of regenerated nutrients and their potential contribution to productivity at larger scales; only upwelling is typically used as a proxy for productivity. Associations of the abundant California mussel, Mytilus californianus, with water nutrients, algal productivity, stable isotope signatures, and microbial genetics indicate potentially strong regeneration of nitrogen by these animals and suggest an important secondary role of nitrifying microbes affiliated with these animals.

In this project, the investigators will quantify the relative contribution of regenerated nitrogen on rocky shores through censuses and experiments across a gradient of mussel abundance. They will use stable nitrogen and oxygen isotopes of ammonium, nitrite, and nitrate to disentangle the contribution of different biological processes versus upwelling to the nitrogen supply and uptake of rocky shore regions. This includes both natural abundance and tracer addition studies.

Broader Impacts. Regenerated nitrogen supply, as opposed to new nitrogen via upwelling, is a local process dependent upon an intact animal community. However, mussels and other nearshore animals may be particularly vulnerable to a changing thermal environment, toxic algal blooms, and ocean acidification. Given the dramatic changes to the coastal nitrogen cycle in recent years, and potential changes to currents, upwelling, ocean chemistry, and El Niño frequencies portended by global changes to our climate, we to know the relative effect of local versus larger scale oceanic events on the nitrogen cycle. The proposed work links biological interactions in situ with its implications for coastal productivity.

In addition to expected publications in high quality journals, educational activities will continue to focus on graduate and undergraduate education and mentoring. The proposal will fund two graduate students and two undergraduates per year. The PI's will work closely with government (Olympic Marine National Sanctuary) and tribal (Makah Tribe) representatives to communicate this research. We will also work with Makah Museum Board of Trustees and the Makah Higher Education Committee to identify Makah students as research assistants. All three PI's teach broadly across their respective campuses, instructing almost every type of undergraduate major.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0928232

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