Leaf morphometrics data from Virginia Aquarium Climate Change Facility, Virginia Beach VA; 2011-2015 (Impact of Climate on Eelgrass project)

Website: https://www.bco-dmo.org/dataset/505012
Version: 13 March 2015
Version Date: 2015-03-13

Project
» Impact of Climate Warming and Ocean Carbonation on Eelgrass (Zostera marina L.) (Impact of Climate on Eelgrass)

Contributors	Affiliation	Role
Zimmerman, Richard C.	Old Dominion University (ODU)	Principal Investigator, Contact
Hill, Victoria J.	Old Dominion University (ODU)	Co-Principal Investigator
Swingle, W. Mark	Virginia Aquarium	Co-Principal Investigator
Ruble, David	Old Dominion University (ODU)	Contact
Gegg, Stephen R.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Table of Contents

Dataset Description

Eelgrass Climate Impacts
Experimental conditions, growth and survival of eelgrass
Leaf morphometric data measured on 3 to 5 shoots in each tank
Experiment codes refer to specific populations and plantings:

Experiment Code	Start Date	Population
1	May 2013	South Bay, Virginia Transplants
2	April 2013	Dumas Bay, Washington
3	April 2013	Nisqually Landing, Washington
4	April 2013	False Bay, Washington (seeds)
5	April 2013	South Bay, VA nutrient manipulations
7	December 2013	South Bay, Virginia (re-planting)
8	May 2014	Dumas Bay, Washington
9	May 2014	Nisqually Landing, Washington
10	May 2014	South Bay, Virginia
11	May 2014	South Bay, VA nutrient manipulations (whole)
12	May 2014	South Bay, Virginia (pH 6.5 re-planting)
13	May 2014	South Bay, VA (DOC)
14-21	May 2014	South Bay, VA nutrient manipulations (NE)

Methods & Sampling

Leaf morphometric data were measured on 3 to 5 shoots in each tank once each month beginning in May 2013. The total length of each leaf on a shoot was measured to the nearest mm using a flexible meter tape. Widths were measured with a digital caliper. Experiment codes refer to specific populations and plantings:

Experiment Code	Start Date	Population
1	May 2013	South Bay, Virginia Transplants
2	April 2013	Dumas Bay, Washington
3	April 2013	Nisqually Landing, Washington
4	April 2013	False Bay, Washington (seeds)
5	April 2013	South Bay, VA nutrient manipulations
7	December 2013	South Bay, Virginia (re-planting)
8	May 2014	Dumas Bay, Washington
9	May 2014	Nisqually Landing, Washington
10	May 2014	South Bay, Virginia
11	May 2014	South Bay, VA nutrient manipulations (whole)
12	May 2014	South Bay, Virginia (pH 6.5 re-planting)
13	May 2014	South Bay, VA (DOC)
14-21	May 2014	South Bay, VA nutrient manipulations (NE)

Data Processing Description

Leaf morphometrics - Growth rates were determined using the hole-punch method. Growth rates were determined by measuring (1) the total length of each leaf on each shoot and (2) the distance from the original punch mark on the outer sheath to the existing hole on each leaf (Zieman and Wetzel 1980, Zimmerman et al. 1996). Replicate measures within each tank were averaged to produce single values for each experiment code.

BCO-DMO Processing Notes
- Generated from original file: "BORG_SeaGrass_Full_data_Records.xlsx" Sheet: "Growth_Rates" contributed by David Ruble
- Approx Lat/Lon of Virginia Aquarium Climate Change Facility appended to enable data discovery in MapServer
- Parameters modified to conform to BCO-DMO parameter naming conventions (Choosing a Parameter Name)

[table of contents | back to top]

Data Files

File
Leaf_Morphometrics_Data.csv (Comma Separated Values (.csv), 99.59 KB) MD5:97bee2d3dbdaf1e8404d4352f6d79610 Primary data file for dataset ID 505012

[table of contents | back to top]

Parameters

Parameter	Description	Units
Lab_Id	Lab Id – Lab identifier where experiments were conducted	text
Lat	Approximate Latitude Position of Lab; South is negative	decimal degrees
Lon	Approximate Longitude Position of Lab; West is negative	decimal degrees
date	Date	yyyymmdd
Experiment_Code	Experiment Code – Populations and Plantings (see Dataset Description and Acquisition Description for Experiment Code key)	dimensionless
Tank	Tank	dimensionless
pH_Target	pH Target	pH
Leaf_Width	Leaf Width	mm
Leaf_Length_New	Leaf Length New	cm
Leaf_Length_Total	Leaf Length Total	cm
Shoot_Size	Shoot Size	cm^2
Growth_Rate_Length	Growth Rate Length	cm/d
Growth_Rate_Area	Growth Rate Area	cm^2/d
Growth_Rate_Day_Rate	Growth Rate Day Rate	1/d

[table of contents | back to top]

Deployments

lab_Virginia_Aquarium_Climate_Change_Facility

Website	https://www.bco-dmo.org/deployment/504835
Platform	Virginia Aquarium Climate Change Facility
Start Date	2011-02-01
End Date	2015-01-31
Description	Laboratory experiments conducted from 1 May 2013 to 31 Jan 2013 at Virginia Aquarium Climate Change Facility, Virginia Beach VA

[table of contents | back to top]

Project Information

Impact of Climate Warming and Ocean Carbonation on Eelgrass (Zostera marina L.) (Impact of Climate on Eelgrass)

Website: http://sci.odu.edu/oceanography/directory/faculty/zimmerman/researchpage/index.shtml

Coverage: Virginia Beach, VA and Southern Chesapeake Bay region 36° 49’ 32.84” N 75° 58’ 58.17” W

Project abstract from the NSF proposal:
The past few decades have accumulated mounting evidence of profound anthropogenic effects on fundamental biogeochemical processes across the planet, especially in coastal environments that support a diverse array of highly productive ecosystems including coral reefs, seagrass meadows, and estuaries. The ecological significance of seagrasses is largely due to the remarkable degree of adaptation they exhibit to a

submerged aquatic existence. Despite numerous successful adaptations, however, seagrasses have high light requirements that make them vulnerable to anthropogenic disturbances. The paradoxical vulnerability results largely from their high reliance on dissolved aqueous CO2 for photosynthesis. The potential for rising atmospheric CO2 concentrations to have significant warming impacts on the global climate has long been recognized, but the potential impacts of the "other CO2 problem", also known as ocean acidification, have only recently begun to be appreciated. As with other impacts of climate change, the increased concentrations of dissolved aqueous CO2 [CO2 (aq)] in the oceans of the world will elicit both negative and positive responses among organisms, ultimately potentiating ecological losers and winners. This project will explore the response of eelgrass to increased CO2 (aq) within the context of a warming coastal ocean using a combination of manipulative experiments, physiological/biochemical investigations and mathematical modeling. The investigators hypothesize that rising CO2(aq) will increase the high temperature tolerance of plants by improving the Q10 response of photosynthesis relative to respiration, thereby leading to higher growth rates, improved survival of vegetative shoots at high temperature, and even flowering output and seed production. This project will investigate the key relationships between environmental parameters that have both negative (ocean warming) and positive (ocean carbonation) impacts on the light requirements and dynamics of carbon balance in these critically important marine angiosperms. By focusing on Chesapeake populations growing near the southern limit of eelgrass distribution on the Atlantic coast, the investigators will gain predictive insight into how climate change may alter the geographic distribution of this critically important species in other coastal environments that may be subjected to less temperature stress but similar levels of ocean carbonation.

Objectives: The overall goal of the proposed research will be to develop a predictive mechanistic understanding of the simultaneous impacts of water temperature, [$CO_{2(aq)}$] and [HCO^{3-}] on the photosynthetic metabolism, vegetative growth and reproductive success of Zostera marina L. We will address the following questions, (1) To what extent is the upper thermal limit of eelgrass controlled by $CO_{2(aq)}$ availability, (2) Will prolonged $CO_{2(aq)}$ enrichment affect the ability of eelgrass to utilize HCO^{3-} for photosynthesis, (3) Does prolonged $CO_{2(aq)}$ enrichment increase seed production and viability, and (4) Does $CO_{2(aq)}$ enrichment affect nutritional quality of seagrass tissue, particularly C:N ratios and protein content?

These experiments will be carried out at an experimental $CO_{2(aq)}$ enrichment facility which is being constructed at the Virginia Aquarium & Marine Science Center, adjacent to Owl Creek and Rudee Inlet, in Virginia Beach, VA.

Data Inventory

1) Weather and hydrographic data for Owl Creek Experimental Facility. Metadata and time series observations of irradiance, water temperature, pH, salinity, alkalinity, CO_2 and dissolved nutrients will be posted on our web site, and final version data will be supplied to NODC for permanent archive.
2) Experimental metadata from the tanks (pH, temperature, eelgrass abundance and survival, growth rates, metabolic rates, etc.) will also be posted on our website listed above. Final data will be supplied to NODC and/or other databases as appropriate and as they become available.

Project data will also be contributed to thematic databases, including SeaBASS operated by NASA, WOOD operated by ONR, as well as NODC.

Preliminary results may be posted at the group's Web site hosted at ODU:
http://sci.odu.edu/oceanography/directory/faculty/zimmerman/researchpage/index.shtml

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1061823

[table of contents | back to top]