PAR 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/504964
Version: 13 March 2015
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Project
» Impact of Climate Warming and Ocean Carbonation on Eelgrass (Zostera marina L.) (Impact of Climate on Eelgrass)

Contributors	Affiliation	Role
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Dataset Description

Eelgrass Climate Impacts
Experimental conditions, growth and survival of eelgrass
PAR Data - Date, PAR
Mean daily values of total integrated irradiance (mol photons m-2 d-1) calculated from 10 minute records.

Methods & Sampling

Photosynthetically Active Radiation data were recorded using a factory calibrated LI-COR LI- 90 quantum irradiance sensors placed above the tanks to characterize the sunlight regime. Data were recorded at 10 minute intervals using a LI-1000 programmable data logger from 18 April to 3 October 2013. Subsequently, data were recorded using the NI data logger and LabView software system used for temperature and pH.

Data Processing Description

PAR - Mean daily values of total integrated irradiance (mol photons m-2 d-1) were calculated from the 10 minute records and provided in this spreadsheet. 10 minute records of the processed data, along with raw

data files are available from the PIs, upon request.

BCO-DMO Processing Notes
- Generated from original file: "BORG_SeaGrass_Full_data_Records.xlsx" Sheet: "PAR" 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)

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Data Files

File
PAR_Data.csv (Comma Separated Values (.csv), 23.83 KB) MD5:22322e8b7776d0fd4fbe868890f2a6c4 Primary data file for dataset ID 504964

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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
PAR	PAR	mol photons per day

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Instruments

Dataset-specific Instrument Name	LI-COR LI-190SA PAR
Generic Instrument Name	LI-COR LI-190SA PAR Sensor
Dataset-specific Description	Photosynthetically Active Radiation data were recorded using factory calibrated LI-COR LI- 90 quantum irradiance sensors placed at 4 locations around the tanks to characterize the full sunlight regime incident on each tank. Data were recorded at 10 minute intervals using a LI-1000 programmable data logger from 18 April to 3 October 2013. Subsequently, data were recorded using the NI data logger and LabView software system used for temperature and pH. Sensor inter-calibration was performed on site using a series of neutral density filters.
Generic Instrument Description	The LI-190SA Quantum Sensor is used to accurately measure (non-aquatic) Photosynthetically Active Radiation (PAR) in the range of 400-700 nm. Colored glass filters are used to tailor the silicon photodiode response to the desired quantum response. The LI-190SA is also used as a reference sensor for comparison to underwater PAR measured by the LI-192SA or LI-193 Underwater Quantum Sensors.

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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

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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

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Funding

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

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