Temperature from intertidal moorings along Oregon and California coasts, 2009-2015 (ACIDIC Project)

Website: https://www.bco-dmo.org/dataset/656322
Data Type: Other Field Results
Version:
Version Date: 2016-08-25

Project
» The role of calcifying algae as a determinant of rocky intertidal macrophyte community structure at a meta-ecosystem scale (ACIDIC)

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Dataset Description

Related Datasets:
Intertidal mooring chlorophyll-a
Intertidal mooring PAR

Methods & Sampling

Temperature data were collected using Onset TidbiT v2 Water Temperature Data Logger - UTBI-001 (http://www.onsetcomp.com/products/data-loggers/utbi-001). Specifications reported by Onset for this product are as follows: temperature sensor accuracy: ± 0.2°C (from 0° to 50°C); resolution: 0.02°C (at 25°C); response time: 5 minutes in water to 90% and drift: 0.1°C per year; time accuracy: ± 1 minute per month (0° to 50°C). In some cases when the primary data logger at a site failed, temperature data from a HOBO Pendant® Temperature/Light Data Logger 64K - UA-002-64 (http://www.onsetcomp.com/products/data-loggers/ua-002-64) were substituted. Specifications reported by Onset for this product are as follows: temperature sensor accuracy: ± 0.53°C (from 0° to 50°C); resolution: 0.14°C (at 25°C); response time: 5 minutes in water to 90% and drift:< 0.1°C per year; time accuracy: ± 1 minute per month (at 25°C).

Temperature data loggers were installed in the mid-intertidal zone (~ 0– 0.3 m above MLLW) at sites in California, USA. The sensor was attached by plastic cable ties to the top of a small stainless steel cage that was affixed to the rock by stainless steel lag screws using plastic high tension anchors set into pre-drilled holes; the sensor itself was thus suspended just above the rock.

Data Processing Description

Out of water (air temperature measurements) were removed from the dataset by aligning the temperature data series with tidal height predictions (downloaded from: http://tbone.biol.sc.edu/tide/) and removing observations when the tide was less than 0.5 m above the apparent tidal height of the sensor. The apparent tidal height of the sensor was determined by visual inspection of the plotted temperature and tidal height data, with focus on periods of extreme low tides. A transition from water to air is clearly indicated when the change in temperature between adjacent measurements is > |0.4| °C delineating an obvious, sharp transition as the sensor is uncovered or covered by the tide.

BCO-DMO Processing:

- Reformatted date to be consistent among all files: yyyy-mm-dd HH:MM:SS
- Replaced blanks in site name with underscores
- Reduced units right of decimal to 2 for tide and temperature
- Commented out line 2, the units
- Converted the 4 temp.xlsx files to .csv
- Converted from PC to Unix formatted .csv files

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Data Files

File
temperature.csv (Comma Separated Values (.csv), 52.01 MB) MD5:8e066658b517cfd63b4ba09a4ac7dc9c Primary data file for dataset ID 656322

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Parameters

Parameter	Description	Units
site_name	mooring location name	unitless
site_code	mooring location code	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
year	year	year
month	month	month
day	day of month (UTC)	day
time	time of day (UTC)	hours and minutes
ISO_DateTime_UTC	Date/Time (UTC) based on ISO 8601:2004E. Format: YYYY-mm-ddTHH:MM:SS[.xx]Z (UTC time)	unitless
yrday_utc	UTC day and decimal time: eg. 326.5 for the 326th day of the year or November 22 at 1200 hours (noon).	unitless
tide	tidal height: feet above MLLW (predicted)	feet
temp	temperature	degrees Centigrade

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Onset HOBO TidbiT v2 (UTBI-001) temperature logger
Generic Instrument Description	A temperature logger that measures temperatures over a wide temperature range. It is designed for outdoor and underwater environments and is waterproof to 300 m. A solar radiation shield is required to obtain accurate air temperature measurements in sunlight (RS1 or M-RSA Solar Radiation Shield). With an operational temperature range between -20 degrees Celsius and +70 degrees Celsius, the TidbiT v2 has an accuracy of +/-0.21 and a resolution of 0.02 degrees Celsius.

Dataset-specific Instrument Name	
Generic Instrument Name	Temperature Logger
Dataset-specific Description	HOBO Pendant® Temperature/Light Data Logger 64K - UA-002-64 (http://www.onsetcomp.com/products/data-loggers/ua-002-64)
Generic Instrument Description	Records temperature data over a period of time.

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Deployments

KH_intertidal_2008-2015

Website	https://www.bco-dmo.org/deployment/656366
Platform	Kibesillah Hill Ecological Time-Series Station
Start Date	2010-01-01
End Date	2015-12-29
Description	Long-term monitoring site

MSP_intertidal_2009-2013

Website	https://www.bco-dmo.org/deployment/656804
Platform	MacKerricher State Park Rocky Intertidal Monitoring Site
Start Date	2009-03-29
End Date	2013-12-31
Description	Long-term monitoring site

MC_intertidal_2009-2015

Website	https://www.bco-dmo.org/deployment/656810
Platform	Moat Creek Ecological Time-Series Station
Start Date	2009-01-01
End Date	2015-12-31
Description	Long-term monitoring site

BH_intertidal_2008-2015

Website	https://www.bco-dmo.org/deployment/656816
Platform	Bodega Head State Marine Reserve Intertidal Long-Term Ecological Research Site
Start Date	2008-03-13
End Date	2015-12-31
Description	Long-term monitoring site

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Project Information

The role of calcifying algae as a determinant of rocky intertidal macrophyte community structure at a meta-ecosystem scale (ACIDIC)

Coverage: US West Coast; North bounding latitude: 45.00N, South bounding latitude: 38.00N

Algal Communities in Distress: Impacts and Consequences (ACIDIC)

Environmental stress models have recently been modified to incorporate the influence of facilitation to join negative effects such as predation, competition, and abiotic stress as determinants of community structure.

Nevertheless, our empirical understanding of the processes that regulate the expression of facilitation effects across systems and the potential for facilitation to amplify or dampen the ecological consequences of climate change remains limited. This project focuses on facilitation dynamics in the broader meta-ecosystem concept, which hypothesizes that variation among communities depends not only on locally-varying species interactions and impacts of abiotic factors such as environmental stress and physical disturbance but also on regionally- and globally-varying ecosystem processes such as dispersal and flows of materials such as nutrients and carbon. The investigators will study the influence of a potentially critical facilitative interaction between coralline algal turfs and canopy-forming macrophytes including kelps and surfgrass in a rocky intertidal meta-ecosystem. The research will be conducted in a climate change context, with a focus on how the macrophyte-coralline interaction is influenced by ocean conditions, including factors driven by variable upwelling (temperature, nutrients, phytoplankton abundance, and light) and increases in ocean acidification, which vary in a mosaic pattern along the coast of the northern California Current (NCC) in Oregon and northern California.

The goal of the project is to test the hypothesis that the coralline turf-macrophyte canopy interaction is a cardinal interaction in the determination of low rocky intertidal community structure, and that disruption of this interaction would dramatically alter the structure and function of this kelp- and surfgrass-dominated assemblage. The project will take advantage of, and enhance, a research platform established across 17 sites spanning ~800 km in the NCC coastal meta-ecosystem with prior NSF funding that will at each site: (1) quantify ocean conditions, including temperature, nutrients, phytoplankton, light (PAR), and carbonate chemistry to document the response of community structure oceanographic variation across a meta ecosystem mosaic; (2) carry out field experiments testing the nature of the interaction between coralline algal turfs (primarily Corallina vancouveriensis) and dominant canopy species, the kelp Saccharina sessile and the surfgrass Phyllospadix scouleri; and (3) carry out laboratory experiments focusing on the mechanism of the interaction, specifically testing the effects of carbonate chemistry, light, temperature, and nutrients. Component (1) will employ both remote sensors deployed in the intertidal (fluorometers, thermal sensors, PAR sensors, and a recently developed pH sensor) and direct sampling (nutrients, phytoplankton, pCO2, and pH) to quantify the in situ exposure regime of benthic primary producers to resources, energy, and environmental stress across spatial scales. These metrics will be combined with a newly developed index for quantifying local-scale variation in upwelling intensity to characterize the linkages between climate forcing and ecosystem state. Coupling oceanography with our field and laboratory experiments will provide unique and valuable insights into how the current state of rocky intertidal ecosystems is likely to be altered in the future.

Intellectual Merit. The project will contribute one of the first studies to test the community consequences of varying upwelling and CO2 across an ecosystem scale. How these factors alter the direct and indirect interactions of key species is of fundamental importance in our efforts to learn how field ecosystems will respond to climate change. Such knowledge is crucial to our efforts to manage and conserve marine communities facing human-induced variation in climate.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1061233
NSF Division of Ocean Sciences (NSF OCE)	OCE-1061530
NSF Division of Ocean Sciences (NSF OCE)	OCE-1519401

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