Shallow reef pH, dissolved oxygen, temperature, and salinity from seaphox sensors deployed at Bocas del Toro, Panama in November of 2015 (Coral Calcification Physiology project)

Website: https://www.bco-dmo.org/dataset/708855
Data Type: Other Field Results
Version:
Version Date: 2018-01-09

Project
» Cellular physiological mechanisms for coral calcification and photosynthesis: extending lab-based models to the field (Coral Calcification Physiology)

Contributors	Affiliation	Role
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Coverage

Spatial Extent: **N**:9.3779 **E**:-82.1129 **S**:9.2478 **W**:-82.3034
Temporal Extent: 2015-11-03 - 2015-11-19

Dataset Description

This dataset includes pH, dissolved oxygen, temperature, and salinity values from seaphox sensor deployments at 1-8 m depths in shallow reefs in Bocas del Toro, Panama.

Methods & Sampling

Seaphox sensors were deployed at shallow coral reefs off of the island of Bocas del Toro at the following locations:

Punta Caracol (PC) Lat 9.3779, Lon -82.3034
Deployment names: PC 1m, PC 3m, PC 8m, PC 12m

Punta Vieja (PV) Lat 9.2478, Lon -82.1129
Deployment names: PV 3m, PV 8m

Data Processing Description

Seaphox sensors were calibrated from discrete seawater samples taken in the field at the time the Seaphox sensors were deployed using best practices described in Bresnahan et al. 2014.

BCO-DMO Data Manager Processing Notes
* added location names and lat lons for deployments
* splitting timestamp into date and time
* After discussion with data contributor:
* Changed name Date and Time to Date_local and Time_local for date and time in Panama local time, UTC -05:00.
* Added timestamp in ISO 8601 Notation yyyy-mm-ddThh:mm+|-hh:mm so the time zone is captured
* Removed color formatting from Excel spreadsheet and comments

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Related Publications

Bresnahan, P. J., Martz, T. R., Takeshita, Y., Johnson, K. S., & LaShomb, M. (2014). Best practices for autonomous measurement of seawater pH with the Honeywell Durafet. Methods in Oceanography, 9, 44–60. doi:10.1016/j.mio.2014.08.003
Methods

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Parameters

Parameter	Description	Units
Date_local	Date (Panama local time UTC-5)	unitless
Time_local	Time (Panama local time UTC-5)	unitless
ISO_DateTime_UTC	ISO timestamp based on the ISO 8601:2004(E) standard in format yyyy-mm-ddThh:mm+|-hh:mm	unitless
T	Temperature	degrees Celcius
S	Salinity	Practical Salinity Units (PSU)
DO	Dissolved Oxygen	uMol
pH	Seawater pH	Seawater pH units
Deployment	Deployment name (location code plus depth)	unitless
Depth	Depth of sample	meters
Location	Location name	unitless
Lat	Latitude	decimal degrees
Lon	Longitude	decimal degrees

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Instruments

Dataset-specific Instrument Name	Seaphox, Scripps Institution of oceanography
Generic Instrument Name	SeapHOx/SeaFET
Dataset-specific Description	Seaphox, Scripps Institution of oceanography, Model number 038, 039, 054 and 055
Generic Instrument Description	The SeapHOx and SeaFET are autonomous sensors originally designed and developed by the Todd Martz Lab at Scripps Institution of Oceanography. The SeaFET was designed to measure pH and temperature. The SeapHOx, designed later, combined the SeaFET with additional integrated sensors for dissolved oxygen and conductivity. Refer to Martz et al. 2010 (doi:10.4319/lom.2010.8.172). The SeapHOx package is now produced by Sea-Bird Scientific and allows for integrated data collection of pH, temperature, salinity, and oxygen. Refer to Sea-Bird for specific model information.

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Deployments

Kline_Bocas_del_Toro

Website	https://www.bco-dmo.org/deployment/722899
Platform	Panama_shore
Start Date	2015-11-03
End Date	2015-11-20

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Project Information

Cellular physiological mechanisms for coral calcification and photosynthesis: extending lab-based models to the field (Coral Calcification Physiology)

Coverage: Bocas del Toro, Panama

Description from NSF award abstract:
Coral reefs are amongst the most biodiverse and productive ecosystems in the world, providing millions of dollars of ecosystem services to coastal communities. There is growing concern about the future of coral reefs and the impact of anthropogenic stressors including eutrophication, ocean acidification, warming and sea level rise. However, the lack of knowledge of fundamental coral cellular mechanisms limits our ability to understand and predict responses and to implement appropriate management decisions. This proposal will use a combination of field and laboratory experiments to use immunological techniques to study coral cellular responses to environmental conditions. This project will focus on processes related to calcification, photosynthesis and nutrient uptake and test in nature the relevance of mechanistic models obtained from laboratory experiments. Results from this study could help generate biomarkers for future physiological, ecological and interdisciplinary studies. To maximize the scientific, societal and educational impacts of this research, a coordinated set of activities will include: (1) Training of one graduate student in molecular, cellular, and ecological research. (2) Dissemination of results through journals, conferences and undergraduate and graduate physiology courses. (3) Partnering with the Birch Aquarium at Scripps to build awareness of coral reef biology, ecology and conservation issues and disseminate the findings of this study to the general public. These activities will reach hundreds of thousands of children and adults that attend Birch annually, and millions

of viewers through online resources. (4) Engage and train undergraduate students from underrepresented minorities through the Scripps Undergraduate Research Fellowship summer program.

This research will use recently developed immunological techniques to localize and quantity proteins in specific coral cell types and determine coral responses to environmental conditions at the cellular level. One enzyme of interest is the vacuolar proton ATPase (VHA), which was recently found in the symbiosome membrane of gastrodermal cells and identified as essential for the coral's symbiotic algae to concentrate CO2 for photosynthesis. Another enzyme, the sodium/potassium ATPase (NKA), was immunolocalized to calicoblastic cells suggesting a role in calcification. Additionally, NKA was found in cells in corals from the Complex but not the Robust clades, suggesting a role in nutrient uptake only in the former. In the project a series of field and manipulative aquarium studies will be used to determine the physiological roles of VHA and NKA in two coral species, one from each clade. Specifically, this research will: (1) Localize and quantify VHA and NKA in specific tissue layers of Acropora cervicornis and Orbicella annularis from 1 and 5m depth at a lagoonal and an open ocean exposed reef in Bocas del Toro, Panama. (2) Correlate potential differences in VHA and NKA to light, pH, and nutrient levels at the different field sites and depths, to study evolutionary adaptation to environmental conditions. (3) Perform one-year reciprocal transplantations to examine chronic acclimatization. (4) Perform one-month reciprocal transplantations to examine acute acclimatization. (5) In a flowing seawater system expose corals to a range of environmentally relevant nutrient, light and pH levels to determine if any of the single factors are causing changes in the cellular responses. In addition to characterizing responses to environmental conditions on a broad temporal scale from evolutionary, chronic, to acute exposure, this research will examine potential cellular mechanistic differences between Robust and Complex corals. The long-term goal is to generate biomarkers based on specific cellular physiology processes to explain and predict effects of environmental stress (e.g. eutrophication, ocean acidification, and sea level rise) on coral homeostatic responses.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1538495

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