Porites growth, respiration, and photophysiology and seawater carbonate chemistry from Richard B Gump Research Station - Moorea LTER, French Polynesia from 2011 (MCR LTER project)

Website: https://www.bco-dmo.org/dataset/526785 Version: 2014-08-22

Project

» Moorea Coral Reef Long-Term Ecological Research site (MCR LTER)

Program

» Long Term Ecological Research network (LTER)

| Contributors | Affiliation | Role |
|-------------------|---|------------------------|
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Table of Contents

- Dataset Description
 <u>Methods & Sampling</u>
- Data Files
- Parameters
- <u>Deployments</u>
- Project Information
- <u>Program Information</u>
 Funding

Dataset Description

This data set tested the effect of 3 pCO2 levels on the metabolism of juvenile massive Porites spp. Conducted in Moorea, French Polynesia in April-May 2011. Aerobic dark respiration, skeletal weight (i.e., calcification), biomass, and chlorophyll fluorescence were measured as well as the experimental seawater carabonate parameters.

These data were published in Edmunds PJ. (2012) Effect of pCO₂ on the growth, respiration, and photophysiology of massive *Porites* spp. in Moorea, French Polynesia. Marine Biology 159: 2149-2160.

Download data (Excel file)

Methods & Sampling

Hypothesis: that high pCO2 (76.6 Pa and 87.2 Pa vs. 42.9 Pa) has no effect on the metabolism of juvenile massive Porites spp. after 11 days at 28 °C and 545 µmol quanta/m²/s. The response was assessed as aerobic dark respiration, skeletal weight (i.e., calcification), biomass, and chlorophyll fluorescence. Corals were collected from the shallow (3-4 m) back reef of Moorea, French Polynesia (17°28.614'S, 149°48.917'W), and experiments conducted during April and May 2011. An increase in pCO2 to 76.6 Pa had no effect on any dependent variable, but 87.2 Pa pCO2 reduced area-normalized (but not biomass-normalized) respiration 36%, as well as maximum photochemical efficiency (Fv/Fm) of open RCIIs and effective photochemical efficiency of RCIIs in actinic light (Delta F/F'm); neither biomass, calcification, nor the energy expenditure coincident with calcification (J/g) was effected. These results do not support the hypothesis that high pCO2 reduces coral calcification through increased metabolic costs and, instead, suggest that high pCO2 causes metabolic depression and photochemical impairment similar to that associated with bleaching. Evidence of a pCO2 threshold between 76.6 and 87.2 Pa for inhibitory effects on respiration and photochemistry deserves further attention as it might signal the presence of unpredictable effects of rising pCO2.

Full methodology description

[table of contents | back to top]

Data Files

| File | |
|---|--|
| porites.csv(Comma Separated Values (.csv), 6.33 KB) MD5:362ec14a6aac7252059b807935273ed0 | |
| Primary data file for dataset ID 526785 | |

[table of contents | back to top]

Parameters

| Parameter | Description | Units |
|------------------|--|--------------------|
| lab | laboratory | unitless |
| lat | latitude; north is positive | |
| lon | longitude; east is positive | |
| species | Species | unitless |
| treatment | Treatment: LT-AC = ambient pCO2; LT-MC = medium pCO2; LT-HC = high pCO2 | |
| date_TLC | Date of temperature, light, carbonate chemistry measurements. Note: the respiration, growth and photophysiology measurements followed beginning a day after these were done. | |
| tank | Water source identification number | |
| рН | pH: spectrophotometric method | |
| pCO2 | Partial pressure of carbon dioxide (water) at sea surface temperature (wet air); Calculated using CO2SYS (URI: http://cdiac.ornl.gov/oceans/co2rprt.html) | atm |
| ТА | Total alkalinity: potentiometric titration | mol/kg |
| omega_Arg | Aragonite saturation state; Calculated using CO2SYS (URI: <u>http://cdiac.ornl.gov/oceans/co2rprt.html</u>) | unitless |
| irradiance | Irradiance | E/m^2/s |
| temp | Water temperature | degrees Celsius |
| surface_area | Surface area of coral tissue | cm^2 |
| respiration_area | Respiration rate per area in dark | mol/cm^2/h |
| growth_area | Calcification rate of calcium carbonate | mg/cm^2/day |
| metab_exp | Metabolic expenditure | J/g |
| respiration_mass | Dark respiration normalized to biomass | mol/mg/h |
| growth_mass | Calcification rate of calcium carbonate | mg/mg/day |
| biomass | biomass of coral | mg/cm^2 |
| phi_PS_II | Effective photochemical quantum yield | unitless |
| Fv_Fm | Maximum photochemical quantum yield of photosystem II | unitless |
| Qm | Excitation pressure | unitless |
| F_prime | Fluorescence yield in actinic light | arbitrary units |
| Fm_prime | Maximum fluorescence yield in actinic light | arbitrary units |
| Fo | Fluorescence yield in darkness | arbitrary units |
| Fm | Maximum fluorescence yield in darkness | arbitrary units |

[table of contents | back to top]

Deployments

Edmunds_MCR_2011

| 1 | | |
|------------|---|--|
| Website | https://www.bco-dmo.org/deployment/526735 | |
| Platform | Richard B Gump Research Station - Moorea LTER | |
| Start Date | 2011-04-13 | |
| End Date | 2011-05-06 | |

[table of contents | back to top]

Project Information

Moorea Coral Reef Long-Term Ecological Research site (MCR LTER)

Website: http://mcr.lternet.edu/

Coverage: Island of Moorea, French Polynesia

From http://www.lternet.edu/sites/mcr/ and http://mcr.lternet.edu/:

The Moorea Coral Reef LTER site encompasses the coral reef complex that surrounds the island of Moorea, French Polynesia (17°30'S, 149°50'W). Moorea is a small, triangular volcanic island 20 km west of Tahiti in the Society Islands of French Polynesia. An offshore barrier reef forms a system of shallow (mean depth ~ 5-7 m), narrow (~0.8-1.5 km wide) lagoons around the 60 km perimeter of Moorea. All major coral reef types (e.g., fringing reef, lagoon patch reefs, back reef, barrier reef and fore reef) are present and accessible by small boat.

The MCR LTER was established in 2004 by the US National Science Foundation (NSF) and is a partnership between the University of California Santa Barbara and California State University, Northridge. MCR researchers include marine scientists from the UC Santa Barbara, CSU Northridge, UC Davis, UC Santa Cruz, UC San Diego, CSU San Marcos, Duke University and the University of Hawaii. Field operations are conducted from the UC Berkeley Richard B. Gump South Pacific Research Station on the island of Moorea, French Polynesia

MCR LTER Data: The Moorea Coral Reef (MCR) LTER data are managed by and available directly from the MCR project data site URL shown above. The datasets listed below were collected at or near the MCR LTER sampling locations, and funded by NSF OCE as ancillary projects related to the MCR LTER core research themes.

This project is supported by continuing grants with slight name variations:

- LTER: Long-Term Dynamics of a Coral Reef Ecosystem
- LTER: MCR II Long-Term Dynamics of a Coral Reef Ecosystem LTER: MCR IIB: Long-Term Dynamics of a Coral Reef Ecosystem ٠
- LTER: MCR III: Long-Term Dynamics of a Coral Reef Ecosystem
- LTER: MCR IV: Long-Term Dynamics of a Coral Reef Ecosystem

[table of contents | back to top]

Program Information

Long Term Ecological Research network (LTER)

Website: http://www.lternet.edu/

Coverage: United States

adapted from http://www.lternet.edu/

The National Science Foundation established the LTER program in 1980 to support research on long-term ecological phenomena in the United States. The Long Term Ecological Research (LTER) Network is a collaborative effort involving more than 1800 scientists and students investigating ecological processes over long temporal and broad spatial scales. The LTER Network promotes synthesis and comparative research across sites and ecosystems and among other related national and international research programs. The LTER research sites represent diverse ecosystems with emphasis on different research themes, and cross-site communication, network publications, and research-planning activities are coordinated through the LTER Network Office.



2017 LTER research site map obtained from https://lternet.edu/site/lter-network/

[table of contents | back to top]

Funding

| Funding Source | Award |
|--|-------------|
| NSF Division of Ocean Sciences (NSF OCE) | OCE-0417412 |
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1236905 |

[table of contents | back to top]

Site Codes

| AND | Andrews Forest LTER |
|-----|---------------------------|
| ARC | Arctic LTER |
| BES | Baltimore Ecosystem Stu |
| BLE | Beaufort Lagoon |
| | Ecosystems LTER |
| BNZ | Bonanza Creek LTER |
| CCE | California Current |
| | Ecosystem LTER |
| CDR | Cedar Creek Ecosystem |
| | Science Reserve |
| CAP | Central Arizona- |
| | Phoenix LTER |
| CWT | Coweeta LTER |
| FCE | Florida Coastal |
| | Everglades LTER |
| GCE | Georgia Coastal |
| | Ecosystems LTER |
| HFR | Harvard Forest LTER |
| HBR | Hubbard Brook LTER |
| JRN | Jornada Basin LTER |
| KBS | Kellogg Biological |
| | Station LTER |
| KNZ | Konza Prairie LTER |
| LUQ | Luquillo LTER |
| MCM | McMurdo Dry Valleys LT |
| MCR | Moorea Coral Reef LTEF |
| NWT | Niwot Ridge LTER |
| NTL | North Temperate Lakes I |
| NES | Northeast U.S. Shelf LTE |
| NGA | Northern Gulf of Alaska I |
| PAL | Palmer Antarctica LTER |
| PIE | Plum Island |
| | Ecosystems LTER |
| SBC | Santa Barbara Coastal L |
| SEV | Sevilleta LTER |
| VCR | Virginia Coast Reserve L |