Ecophysiological responses of *Lithothamnion crispatum* and *Sonderophycus capensis* to alterations in temperature, $p\text{CO}_2$ and nutrients

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Ocean Acidification

How will changes in ocean chemistry affect marine life?

\[ \text{CO}_2 + \text{H}_2\text{O} + \text{CO}_3^{2-} \rightarrow 2 \text{HCO}_3^- \]

carbon dioxide  water  carbonate ion  2 bicarbonate ions

Consumption of carbonate ions impedes calcification
Heating our discussions!
On the role of the Agulhas system in ocean circulation and climate

Lisa M. Beal, Wilhelmus P. M. De Ruijter, Arne Biastoch, Rainer Zahn & SCOR/WCRP/IAPSO Working Group 136*
Heat wave
Community shift

Graphs showing changes in percentage cover and abundance over years 2006 to 2011.
Potential Effects of Increasing Atmospheric CO₂ on Phytobenthos?

Increased Atmospheric CO₂

Increased Atmospheric Temperature

Changes in Climate
- Altered storms
- Increased dust

Ice Melting

Increases in acidity

Increased temperature

Ice melting

Sea level rise

Changes in climate

Decr. calcification
Incr. dissolution

Species range shifts
Community changes
Coastal water quality changes
Hydrodynamic changes
Fertilization effects

The Anthropocene: From Global Change to Planetary Stewardship
Will Steffen, Åsa Persson, Lisa Deutsch, Jan Zalasiewicz, Mark Williams, Katherine Richardson, Carole Crumley, Paul Crutzen, Carl Folke, Line Gordon, Mario Molina, Venkatraman Ramanathan, Johan Rockström, Margaret Schellnhuber, Umo Schellnhuber

DOI 10.1007/s12380-011-0185-x
Impacts of ocean acidification on marine organisms: quantifying sensitivities and interaction with warming

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Mesocosm

Mesocosmos recifal do Projeto Coral Vivo - BA
Mesocosms Arraial
Objective

Evaluate in a microcosm experiment the effects of the temperature, CO$_2$ and nutrients increases on the physiology of two subtidal calcareous algae from the Brazilian coast: *Lithothamnion crispatum* Hauck and *Sonderphycus capensis* (M) M.J. Wynne.
Rhodolith bed
Rhodolith Beds Are Major CaCO₃ Bio-Factories in the Tropical South West Atlantic

Gilberto M. Amado-Filho¹, Rodrigo L. Moura²*, Alex C. Bastos³, Leonardo T. Salgado¹, Paulo Y. Sumida⁴, Arthur Z. Guth⁵, Ronaldo B. Francini-Filho⁶, Guilherme H. Pereira-Filho⁶, Douglas P. Abrantes¹, Poliana S. Brasilheiro¹, Ricardo G. Bahia¹, Rachel N. Leal¹, Les Kaufman⁷, Joanie A. Kleypas⁸, Marcos Farina⁹, Fabiano L. Thompson²

Figure 1. World distribution of living rhodolith beds (from Foster 2001).

Figure 2. The study region off eastern South America, Abrolhos Bank. (A) Bathymetric map showing the areas surveyed with SSS (black lines), ROV ground truth sites (red dots) and mixed-gas dive collecting sites (green dots). (B) Distribution, and annual calcium carbonate production of rhodolith beds. The gray area indicates the total area occupied by the rhodolith beds, whereas the gray scale variations correspond to estimates of the annual calcium carbonate production (expressed as kg m⁻² yr⁻¹).
doi:10.1371/journal.pone.0035171.g002
Experiment design

- **Temperature**: 30°C, 18°C
- **pH**: 7.8, 8.2 ± 0.2

- **50 L**
  - pH 8.2 ± 0.2
- **50 L + CO2**
  - pH 7.8 ± 0.2

- **N. Nutrient**
- **H Nutrient**
Main parameters

50 µmol fotons m$^{-2}$ s$^{-1}$
Challenges
Highlights

- Multifactorial experiments are crucial to robust biological evaluation
- Decalcification of *Sonderophycus* was higher than in *Lithothamnion*
- Evaluation of interaction between climate change factors and local stressors should be regarded with priority.
- Introduce our results about algae biology in the discussion - mitigation and remediation programs
- Support networks to optimize infra-structure and students formation
Team

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Thank you!

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