Pocillopora damicornis skeletal micromorphological analysis: Spine structures

Website: https://www.bco-dmo.org/dataset/942948
Version: 1
Version Date: 2024-11-05

Project
» Influence of environmental pH variability and thermal sensitivity on the resilience of reef-building corals to acidification stress (Coral Resilience)

Contributors	Affiliation	Role
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Related Datasets

IsRelatedTo

Barott, K., Brown, K., Putnam, H. (2024) **Gene expression of Pocillopora damicornis collected from reef of Heron Island, southern Great Barrier Reef from Jan 2021 to Feb 2021.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-11-05 http://lod.bco-dmo.org/id/dataset/942938 [view at BCO-DMO]
Relationship Description: Datasets from the same study published in Brown et al. (2024) and utilized the same code package (doi:10.5281/zenodo.14041606).

Barott, K., Brown, K., Putnam, H. (2024) **Pocillopora damicornis skeletal micromorphological analysis: Calyxes.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-11-05 http://lod.bco-dmo.org/id/dataset/942962 [view at BCO-DMO]
Relationship Description: Datasets from the same Pocillopora damicornis skeletal micromorphological analysis.

Barott, K., Brown, K., Putnam, H. (2024) **Pocillopora damicornis skeletal micromorphological analysis: Overall skeleton.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-11-05 http://lod.bco-dmo.org/id/dataset/942939 [view at BCO-DMO]
Relationship Description: Datasets from the same Pocillopora damicornis skeletal micromorphological analysis.

Barott, K., Brown, K., Putnam, H. (2024) **Pocillopora damicornis skeletal micromorphological analysis: Spine RADs.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-11-05 http://lod.bco-dmo.org/id/dataset/942955 [view at BCO-DMO]
Relationship Description: Datasets from the same Pocillopora damicornis skeletal micromorphological analysis.

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Parameters

Parameters for this dataset have not yet been identified

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Project Information

Influence of environmental pH variability and thermal sensitivity on the resilience of reef-building corals to acidification stress (Coral Resilience)

Coverage: Kaneohe Bay, Oahu, HI; Heron Island, Queensland, Australia

NSF Award Abstract:
Coral reefs are incredibly diverse ecosystems that provide food, tourism revenue, and shoreline protection for coastal communities. The ability of coral reefs to continue providing these services to society is currently threatened by climate change, which has led to increasing ocean temperatures and acidity that can lead to the death of corals, the animals that build the reef framework upon which so many species depend. This project examines how temperature and acidification stress work together to influence the future health and survival of corals. The scientists are carrying out the project in Hawaii where they have found individual corals with different sensitivities to temperature stress that are living on reefs with different environmental pH conditions. This project improves understanding of how an individual coral's history influences its response to multiple stressors and helps identify the conditions that are most likely to support resilient coral communities. The project will generate extensive biological and physicochemical data that will be made freely available. Furthermore, this project supports the education and training of undergraduate and high school students and one postdoctoral researcher in marine science and coral reef ecology. Hands-on activities for high school students are being developed into a free online educational resource.

This project compares coral responses to acidification stress in populations experiencing distinct pH dynamics (high diel variability vs. low diel variability) and with distinct thermal tolerances (historically bleaching sensitive vs. tolerant) to learn about how coral responses to these two factors differ between coral species and within populations. Experiments focus on the two dominant reef builders found at these stable and variable pH reefs: Montipora capitata and Porites compressa. Individuals of each species exhibiting different thermal sensitivities (i.e., bleached vs. pigmented) were tagged during the 2015 global coral bleaching event. This system tests the hypotheses that 1) corals living on reefs with larger diel pH fluctuations have greater resilience to acidification stress, 2) coral resilience to acidification is a plastic trait that can be promoted via acclimatization, and 3) thermally sensitive corals have reduced capacity to cope with pH stress, which is exacerbated at elevated temperatures. Coral cells isolated from colonies from each environmental and bleaching history are exposed to acute pH stress and examined for their ability to recover intracellular pH in vivo using confocal microscopy, and the expression level of proteins predicted to be involved in this recovery (e.g., proton transporters) is examined via Western blot and immunolocalization. Corals from each pH history are exposed to stable and variable seawater pH in a controlled aquarium setting to determine the level of plasticity of acidification resilience and to test for pH acclimatization in this system. Finally, corals with different levels of thermal sensitivity are exposed to thermal stress and recovery, and their ability to regulate pH is examined over time. The results of these experiments help identify reef conditions that promote coral resilience to ocean acidification against the background of increasingly common thermal stress events, while advancing mechanistic understanding of coral physiology and symbiosis.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1923743

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