■ Research Highlights

The importance of coral-algal symbiosis in terms of coral calcification

Reef building corals are well known for their vigorous calcification, which supports high biodiversity in coral reefs and is enabled by their symbiotic relationship with photosynthesizing zooxanthellae.

However, mechanisms confirming interaction between symbiont photosynthesis and coral calcification have not been fully elucidated.

Mayuri Inoue and colleagues at Okayama University, Universiti Brunei Darussalam, University of the Ryukyus, Geological Survey of Japan, The University of Tokyo, and Universität Münster measured chemical components and isotopic compositions in the skeletons of primary polyp of *Acropora digitifera* with and without zooxanthellae and found that only uranium-calcium ratio (U/Ca; used as a proxy for calcification fluid pH) was systematically different between symbiont and asymbiont primary polyps.

The researchers conducted three culture experiments using symbiont and asymbiont primary polyps for a period of 10 days in which temperature, salinity and, pCO_2 were controlled.. Then multiple geochemical tracers (U/Ca, Mg/Ca, Sr/Ca, $\delta^{18}O$, $\delta^{13}C$, and $\delta^{44}Ca$) in skeletons of cultured corals were analyzed.

As a result of analyzing multiple geochemical tracers, a clear and systematic decrease in skeletal U/Ca ratio, which is used as a proxy for calcification fluid pH, was observed, indicating a higher pH of the fluid in symbiotic compared to asymbiotic polyps.

This study clarified that the critical effect on coral calcification caused by symbiotic algae is the increase of pH of the calcifying fluid by photosynthesis. Therefore coral bleaching caused by environmental stresses, such as global warming, would lead to a reduction of coral calcification and hence growth of coral reefs.

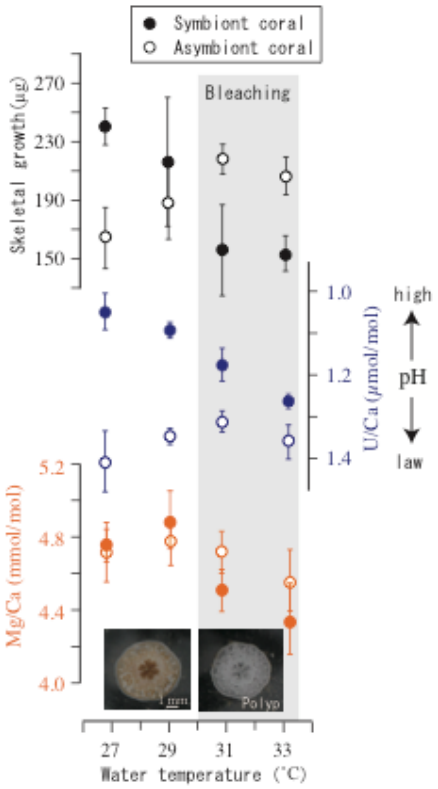

Figure caption: Growth, U/Ca and Mg/Ca ratios of symbiont and asymbiont primary polyps reared under the temperature controlled experiment.

Reference:

- Authors: Mayuri Inoue, Takashi Nakamura, Yasuaki Tanaka, Atsushi Suzuki, Yusuke Yokoyama, Hodaka Kawahata, Kazuhiko Sakai and Nikolaus Gussone.
- Title of original paper: A simple role of coral-algal symbiosis in coral calcification based on multiple geochemical tracers
- Journal, volume, pages and year: *Geochimica et Cosmochimica Acta* **235**, 76-88 (2018).
- Digital Object Identifier (DOI): 10.1016/j.gca.2018.05.016
- Journal website: https://doi.org/10.1016/j.gca.2018.05.016
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- Department website: https://www.gnst.okayama-u.ac.jp/en/
- Okayama University Scientific Achievement Repository: http://ousar.lib.okayama-u.ac.jp/56411

