

BPT014-02

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海洋酸性化がサンゴ礁棲有孔虫の石灰化に与える影響

Effects of ocean acidification on calcification of symbiont-bearing reef foraminifers

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Ocean acidification (the decrease in the carbonate ion concentration and the pH) in response to rising atmospheric pCO₂ is generally expected to reduce calcification by reef calcifying organisms, with potentially severe implications for coral reef ecosystems. Algal symbiont-bearing, reef-dwelling foraminifers are one of the most important primary and carbonate producers in coral reefs. They mainly produce high-Mg calcite shells, whose solubility can exceed that of aragonite produced by corals, making it the "first responder" in coral reefs to the decreasing CaCO₃ saturation state of seawater. Previous laboratory experiments have shown that the decrease in the pH causes *Marginopora* (a large discoid foraminifer with a porcelaneous shell and dinoflagellate symbionts) to reduce their calcification rates. However, it has recently been suggested that the response of marine calcifying organisms to ocean acidification varies between species. Here we report the results of culture experiments to investigate the effects of ongoing ocean acidification on the calcification of three taxa of symbiont-bearing reef foraminifers by using a high precise pCO₂ control system (the AICAL system). Living clonal individuals of three foraminiferal taxa (*Baculogypsina*, *Calcarina*, and *Amphisorus*) were subjected to seawater with five different pCO₂ levels from 300 to 1000 ppm, which were adjusted and kept constant by bubbling with CO₂ gas with the AICAL system. Cultured individuals were maintained for 12 weeks in an indoor flow-through system under constant seawater temperatures, light intensity, and photoperiod. After experiments, the shell diameter and shell weight of each cultured specimen were measured. Results showed that net calcification of *Baculogypsina*, which secretes a hyaline shell and is host to diatom symbionts, increased under the intermediate levels of pCO₂ (600 and 800 ppm) and decreased at a higher pCO₂ level (1000 ppm). Net calcification of *Calcarina*, which also secretes a hyaline shell and is host to diatom symbionts, generally decreased under elevated pCO₂, but increased under the intermediate levels of pCO₂ (600 or 800 ppm). Net calcification of *Amphisorus*, which secretes a porcelaneous shell and is host to dinoflagellate symbionts, tended to decrease under elevated pCO₂. Size-normalized shell weights under different pCO₂ levels indicate that shell weights of *Baculogypsina* increased, but those of *Calcarina* and *Amphisorus* decreased with elevated pCO₂. These different responses among three taxa are possibly attributed to the decrease in the carbonate ion concentration, the enhancement of calcification by the photosynthesis of algal symbionts, and differences in calcification mechanisms (in particular, different carbonate species

used for calcification) among taxa. Our finding suggests that ongoing ocean acidification will be favorable for some hyaline taxa of symbiont-bearing reef foraminifers under the intermediate levels of pCO₂ (600 and 800 ppm), but unfavorable for those with both hyaline and porcelaneous shells at higher pCO₂ levels (over 1000 ppm).