

## The effect of high pCO<sub>2</sub> seawater on foraminiferal oxygen and carbon isotopes

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Ocean acidification in response to rising atmospheric pCO<sub>2</sub> is generally expected to reduce rates of calcification by reef calcifying organisms, with potentially severe implications for coral reef ecosystems. Various studies have revealed potentially dramatic responses in a variety of calcareous organisms to the range of pCO<sub>2</sub> values projected to occur over this century. In our previous culture experiment with two algal symbiont bearing, reef dwelling foraminifers, *Amphisorus kudakajimensis*, which hosts dinoflagellate symbionts, and *Calcarina gaudichaudii*, which host diatom symbionts, in seawater under five different pCO<sub>2</sub> conditions, net calcification of *A. kudakajimensis* was reduced under higher pCO<sub>2</sub>, whereas calcification of *C. gaudichaudii* generally increased with increased pCO<sub>2</sub>. These different responses among the two species are possibly due to differences in calcification mechanisms (in particular, the specific carbonate species used for calcification), and to links between calcification by the foraminiferal hosts and photosynthesis by the algal endosymbionts. However, knowledge about the factors of different calcification responses is poorly understood. To shed light on the factors leading to different calcification response to ocean acidification between perforate and imperforate, we analyzed the stable isotope composition of reef-dwelling foraminifers: *Amphisorus hemprichii*, belong to imperforate species, *Baculogypsina sphaerulata* and *C. gaudichaudii* belong to perforate species, subjected to five varied acid seawater for twelve weeks almost same as above-mentioned culture experiment. Oxygen isotope ratio value of cultured foraminiferal tests under five varied pCO<sub>2</sub> seawater, which temperature and intensity of light was adjusted constantly for experimental period, indicated no significant correlation to pCO<sub>2</sub>. The results show that oxygen isotope ratio stay constant within narrower range from CO<sub>3</sub><sup>2-</sup> concentration (111 to 264 μmol/kg). On the other hand, carbon isotope ratio of foraminiferal tests indicated heavy trend with increasing pCO<sub>2</sub>. Alteration of carbonate chemistry result from ocean acidification may be effect strongly on carbon isotope composition relate to metabolic system (i.e. photosynthesis and respiration). In perforate species, both of oxygen isotope ratio and carbon isotope ratio was lighter than that in imperforate. For oxygen isotope ratio variation possibility among species would be caused by their Mg-content concentration in calcite shells. The distinct difference in the level of carbon isotope ratio values between imperforate and perforate foraminifera indicates different amounts of metabolic CO<sub>2</sub> used for shell construction. Therefore, oxygen and carbon isotopes ratio of foraminiferal test have the potential to reveal calcification mechanism of two species.

Keywords: ocean acidification, reef-dwelling foraminifera, culture experiment, oxygen and carbon isotopes, calcification