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Calcification recovery after exposure to ocean acidification conditions - results from culture experiments and geochemical signature

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Ocean acidification is a consequence of current anthropogenic climate changes. The concomitant decrease in pH and carbonate ion concentration in sea water may have severe impacts on calcifying organisms, such as foraminifera. The composition of the shells (called tests) of these cosmopolitan unicellular organisms roughly reflects environmental conditions at the calcification time, and they can fossilise. Thus, foraminifera are widely used as proxy for past environmental parameters, including for the carbonate system.

The aim of this study was to evaluate the effects of varying pH on calcification and test geochemistry of the symbiont-bearing species *Peneroplis* spp. We performed culture experiments to study their resistance to ocean acidification conditions, as well as their calcification recovery once placed back under open ocean pH 7.9.

After 3 days at pH 6.9 and dark conditions, strongly decalcified specimens were observed, with the inner organic lining clearly appearing. These specimens were still alive, as attested by cytoplasm streaming. Some of the specimens were then placed back at pH 7.9, in light/dark conditions. After one month, a new calcification phase started for the majority of the specimens, by addition of new chambers. The trace elements concentrations of the new calcite were analysed by LA-ICPMS. The incorporation of B and Zn appeared to have been rapidly impacted by changes in the culture conditions. Moreover, the newly formed chambers were most of the time abnormal, and the general structure of the tests was altered, which has potential impacts on reproduction and in situ survival of the specimens. In conclusion, if symbiont-bearing foraminifera show some resistance and recovery abilities to short term lowered pH conditions, they will remain strongly affected by ocean acidification.