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The effect of pH and coral growth rate on the B/Ca ratio in coral skeletons

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The B/Ca ratio was suggested to work as a proxy for the carbonate ion concentration (CO_3^{2-}) at the site of calcification[1,2], which in corals is the extracellular calcifying fluid (ECF)[3]. When B/Ca is used together with the $\delta^{11}B$ pH proxy, it makes it possible to fully quantify the entire carbonate system (that is, DIC, HCO_3^-, CO_3^{2-}, pCO_2) in the ECF. However, other environmental parameters also influence the B/Ca ratio in coral skeletons. For instance, the B/Ca ratio in *Acropora* sp. increases with increasing temperatures and it decreases with increasing light intensity[4].

Here, in **Experiment 1** we measured the B/Ca of diverse coral skeletons from different species, grown simultaneously and in the same aquarium but with different growth rates depending on the species. We found that the coral skeleton growth rate has no effect on the B/Ca ratio. In **Experiment 2** we grew *Stylophora pistillata* in different aquaria at varying pH, then measured the variations in B/Ca ratio in the coral skeletons formed. We found a strong dependence: B/Ca increases with increasing pH. In conclusion, pH affects the B/Ca ratio, coral growth rate does not. Thus, the B/Ca ratio could be used as a pH proxy, at least at constant temperature and illumination.

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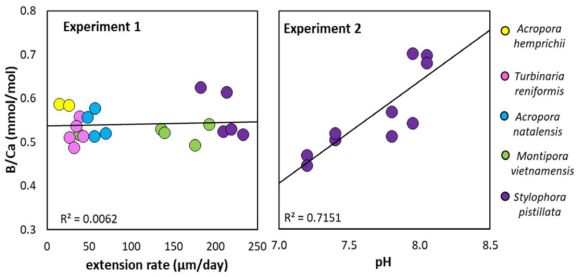

Figure 1. B/Ca ratios as a function of coral growth rate and pH. Different colors represent different coral genera and species, with growth rates varying from 15 to 233 µm/day.