Variation in coral calcifying fluid pH across coral habitable latitude

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Scleractinian corals are distributed throughout the coastal area across the tropical to the temperate oceans. Their aragonite skeletons contribute to reef development and the reef ecosystem. The rate of coral calcification is influenced by several factors (temperature, pH, and light intensity), which differs among coral habitats, generally being higher in the tropical zone than in the temperate zone. In addition, current global climate changes (global warming and ocean acidification) possibly impact coral calcification, and thus coral reef formation and ecosystem. It is essential to understand the main factors controlling coral calcification in order to predict changes in coral calcification in the future associated with changing coastal environments.
Since the accretion of coral skeletons occurs within the calcifying fluid (CF) between coral soft tissues and hard skeletons, the chemical composition of the CF, such as pH and aragonite saturation state (Ωara), is likely to influence coral calcification. In this study, the variation in pH and Ωara in CF of the reef-building corals collected from a wide latitudinal range (from ~7°N to 34°N) are derived using the geochemical tools to understand the contribution of environment to the chemical composition in the CF.
The pH and Ωara in the CF were derived from boron isotopes and boron concentration in the coral skeletons. Specimens were collected from the tropical (~7°N) to the temperate ocean (~34°N) and hence experienced different temperatures (annual average between ~22 - 29℃). The pH in the CF showed an increasing trend from lower to higher latitude with decreasing temperature. We found that Ωara in the CF ranges between 10-20 without a significant relation with latitude. This fact suggests corals can maintain Ωara in CF within similar range regardless of the difference in seawater environments among their habitats. Although Ωara is similar among corals, calcification rate is generally higher in tropical zone, implying that temperature mainly controls the coral calcification rate.

Keywords: coral, biomineralisation, pH, aragonite saturation state

