Coral Reefs
https://doi.org/10.1007/s00338-024-02555-z

REPORT

Potential environment effect on ultrahigh resolution Sr/Ca of giant clam shells from South China Sea

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Received: 23 February 2024 / Accepted: 21 August 2024

Abstract The hourly to monthly resolution Sr/Ca profiles of modern juvenile giant clam (*Tridacna* spp.) shells from the northern South China Sea were obtained using ICP-OES, LA-ICP-MS and NanoSIMS. The results showed the variability of Sr/Ca profiles determined by different analytical methods were consistent on monthly time scale. The hourly resolved Sr/Ca determined by NanoSIMS showed pronounced daily cycles which may be associated with the diurnal cycle of the physiology, environment and/or weather condition. By comparison of daily resolution Sr/Ca and contemporaneous instrumental environment data, no robust link was observed between environmental parameters and juvenile *Tridacna* Sr/Ca, and only weak correlation was found between daily outgoing longwave radiation (OLR) ($r = -0.167$, $p < 0.01$) and Sr/Ca. However, the effective solar radiation cannot explain the variability of nightly Sr/Ca, and some other factors are more likely to influence the Sr/Ca of juvenile *Tridacna*. Moreover, no consistent correlation was observed between Sr/Ca and growth rate of *Tridacna*. The mechanism of juvenile *Tridacna* Sr/Ca is still mysterious, conducting artificial culture experiments seems the best way to unravel the mechanisms behind Sr^{2+} incorporation into *Tridacna* shells.

Keywords Giant clam shell · Sr/Ca · South China sea · NanoSIMS

Introduction

Precisely dated, ultra-high-resolution (hourly, daily) climate archives could greatly improve our understanding of past environmental changes and enable paleoweather analysis (Saenger et al. 2009; Sano et al. 2012; Cobb et al. 2013; McGregor et al. 2013; Yan et al. 2015, 2020). While trees can provide annually resolved climatic data of the terrestrial realm (Briffa et al. 1990; Esper et al. 2002; Masson-Delmotte et al. 2005; Miller et al. 2006; Fowler et al. 2012, St. George 2014), shallow-water corals and many marine bivalves serve as subseasonally to annually resolved paleoenvironmental recorders in the marine realm (Schöne et al. 2002; Saenger et al. 2009; Cobb et al. 2013; Loubere et al. 2013; McGregor et al. 2013; Dee et al. 2020; García-Escárzaga et al. 2020; Nicastro et al. 2020). However, few paleoclimate archives provide information that would be required for the reconstruction of past weather phenomena, which is still almost blank. One of such archives is the shell of giant clams, e.g., *Tridacna* spp.

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Published online: 02 September 2024