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Stable isotopes of a submarine cavernicolous micro-bivalve: Potential application to East China Sea

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The aragonite micro-bivalve *Carditella iejimensis*, which is less than 3.5 mm in height and length, inhabits the sediment surface within submarine caves at Okinawa, Japan. The many specimens of this species are also found from cored deposits of the submarine caves. To evaluate $\delta^{18}\text{O}$ values ($\delta^{18}\text{O}_{\text{shell}}$) of the whole shells as proxy of tropical sea surface water temperature, we analyzed $\delta^{18}\text{O}_{\text{shell}}$ of living whole shells obtained from the >1 mm fraction from submarine caves Daidokutsu (30 m depth) and Shodokutsu (20 m depth) collected at six periods. A significant positive correlation exists between $\delta^{18}\text{O}_{\text{shell}}$ and $\delta^{13}\text{C}_{\text{shell}}$ in four of six datasets from Shodokutsu, indicating that vital effects may affect $\delta^{18}\text{O}_{\text{shell}}$ of *C. iejimensis* of Shodokutsu. On the other hand, the positive correlation is not identified in both six datasets of living shells and dead shells of cored sediments from Daidokutsu. Observed values are very close to the predicted isotopic equilibrium $\delta^{18}\text{O}$ values from environmental data. These show that $\delta^{18}\text{O}_{\text{shell}}$ of Daidokutsu can be used as proxy of water temperature and the isotopic composition of the ambient seawater in which the animals live. Based on the $\delta^{18}\text{O}_{\text{shell}}$ record from well-dated sediment cores recovered from Daidokutsu, anomalously lowering of temperature ($6.6 \pm 2.5^\circ\text{C}$ relative to the present) and dry events (enrichment in $\delta^{18}\text{O}$ seawater of 0.5 per mil) occurred at sea surface condition in the southern East China Sea at 6,400 to 6,300 cal. years BP.

Keywords: submarine cave, micro-bivalve, oxygen isotope, temperature