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琉球列島産現生腕足動物（*Basiliola lucida*）殻の炭素・酸素同位体組成の個体差
Intraspecific Variations in Carbon and Oxygen Isotope Compositions of a Modern Brachiopod Collected off Okinawa-jima

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Carbon ($d^{13}C$) and oxygen ($d^{18}O$) isotope compositions in rhynchonelliform brachiopod shell calcite have been widely used as proxies of $d^{13}C$ of dissolved inorganic carbon (DIC) and $d^{18}O$ of ancient seawater, respectively. The use of brachiopods as a paleoenvironmental proxy is based on the presupposition that the shell calcite is precipitated in isotopic equilibrium with ambient seawater. Recently, it was shown that the modern brachiopod calcite display variable carbon and oxygen isotope offsets from the range of equilibrium calcite (= calcite precipitated in isotopic equilibrium with ambient seawater) even within a single shell and degree of the disequilibrium varies from species to species [e.g., Auclair *et al.*, 2003, *Chem. Geol.*, 202, 59-78; Yamamoto *et al.*, 2010a, *Palaeo-3.*, 291, 348-359; Yamamoto *et al.*, 2010b, *G-cubed*, 11, Q10009]. However, a single specimen was examined for each species in the previous studies that dealt with within-shell variations. Therefore, further geochemical investigations are needed to reveal intraspecific variations in isotopic compositions to establish the isotopic compositions of brachiopod shells as a much more reliable paleoenvironmental proxy.

This study presents intraspecific variations in carbon and oxygen isotope profiles along the growth axis of modern brachiopod shells of *Basiliola lucida* collected from shelf to shelf slope environments (180-320 m water depth) off Okinawa-jima and Amami-o-shima, southwestern Japan. The $d^{13}C$ and $d^{18}O$ values of each shell are rather constant with no significant variations. The $d^{13}C$ values are greater than those of equilibrium calcite with two outlier shells. The $d^{18}O$ profiles show enrichment in ^{18}O relative to equilibrium calcite throughout the growth axis, which underestimates seawater temperature, although the differences in the $d^{18}O$ values among the samples correspond to those of seawater temperatures among the brachiopod growth sites. Significant offsets of $d^{13}C$ and $d^{18}O$ values from the range of equilibrium calcite indicate that the isotopic compositions in the shells of *B. lucida* are influenced by vital effects that are generally explained by kinetic fractionation and metabolic effects. However, the degrees of the effects on $d^{13}C$ and $d^{18}O$ values are comparatively constant in each individuals. In conclusion, the use of *B. lucida* as a proxy of ancient seawater temperature is not very recommend. However, if water depths of the brachiopod-yielding horizons are determined independently by other fossils (e.g., benthic foraminifers) in a given geologic section, $d^{18}O$ value of *B. lucida* can be used as a proxy to determine depth gradient of seawater temperature for the past.

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