

“Vital effects” and deep sea bamboo coral (Isididae) stable isotopic composition

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Deep sea gorgonians, such as bamboo corals, have shown exciting promise as potential climatic archives of oceanic decadal-scale processes. Previous research on bamboo coral calcite oxygen isotopic composition has interpreted that $\delta^{18}\text{O}$ reflects temperature change in the ambient seawater where the corals live. Our study focused on 5 corals collected from the California margin. Four of these corals were collected via submersible on relict seamounts in central and southern California, from 1200-2136m water depth. The fifth coral was collected opportunistically by fishermen in northern California, from ~250m water depth. Radiocarbon analyses on these corals indicate that the calcite is precipitating in equilibrium with the surrounding intermediate depth water. Corals appear to grow at rates of 100 microns/year, with a lifespan of centuries. Transects of calcite samples from the edge to the center of the coral skeleton were taken for oxygen and carbon isotopes. Isotope samples were taken from the base of the coral, where the most growth is reflected, and in 3 of the 5 corals, samples were also acquired from an upper branch of the coral. The bamboo corals indicate a consistent relationship between $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$, indicative of strong vital effects influencing the stable isotopic composition. An offset reflecting the influence of water temperature is apparent in the deeper versus shallow corals. While the relationship between $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ in the coral calcite is maintained for the base and branches, the branches exhibit values shifted further away from equilibrium. This finding indicates that vital effects, which may be controlled by food source or growth rate, appear to vary through different parts of the skeleton.