Exploring the hydrogen isotopic composition of deep-sea corals

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Despite the widespread use of hydrogen isotopic analyses in environmental investigations, no previously-published work has attempted to measure or utilize the hydrogen isotopic composition (δ D) of deep-sea corals. Geographically widespread, forming annual growth rings, and having lifespans on the scale of hundreds of years, δ D measurements of deep-sea coral skeletons have the potential to elucidate oceanographic parameters at well-resolved spatial and temporal resolutions.

We present a method for the determination of annually-resolved δ D in gorgonin, a complex proteinaceous material making up the horny skeletal component of gorgonian corals. We address the issue of exchangeable hydrogen in gorgonin by controlling the isotopic composition of the exchangeable fraction of the total hydrogen pool using a heated batch equilibration technique. Coupled with seawater δ D profiles, the δ D of particulate organic matter (POM) filtered from seawater, and the δ D of plankton trawl samples, we attempt to identify the relationships between trophic exchange, physical oceanographic parameters, and the δ D of gorgonin from 3 species of live-collected coral.

Results include a 43-year record from a Primnoa pacifica colony collected from the Gulf of Alaska, three 10-year records from Primnoa resedaeformis colonies collected from the Labrador Sea, and a 40-year record from a Keratoisis grayii colony collected from southern Baffin Bay. Preliminary data show an unprecedented range of δ D values in all three species, ranging from -40‰ to -110‰. Final results will determine the suitability of gorgonin δ D as a potential marine environmental proxy by testing the reproducibility of δ D values between adjacent colonies.

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