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Stable oxygen isotopic composition of starfish skeletons grown under controlled temperature and salinity conditions

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Starfishes have a wide geographic and bathymetric distribution and their skeletons are abundant in the geological records. As a result, they could represent promising archives of climate change over historical and geological time scales. Stable oxygen isotopic composition of biogenic carbonates (from molluscs, foraminifera, corals...) is commonly used for paleotemperature reconstruction and today several group-specific paleotemperature equations are available that also take into account the different mineralogical compositions. We investigated whether the temperature dependence of the oxygen isotopic composition of the high magnesium calcite (8 to 9% $MgCO_3$) starfish endoskeleton could be a useful addition to the existing paleotemperature equations. Juvenile *Asteria rubens* specimens were collected from the north Sea, and kept in aquaria under controlled conditions of temperature (9 to 18°C) and salinity (25 to 35) during 2 months. Based on the oxygen isotopic composition of ambient water and that of newly formed ossicles under the different growth conditions, we developed a new starfish-specific paleotemperature equation. The $\delta^{18}O$ of the aquaria water formed by the mixing of seawater and freshwater is perfectly reflected in the The $\delta^{18}O$ of the carbonates. This new "starfish" paleotemperature equation shows similarities with the equation of Epstein[1] but with values approximately 2‰ more negatives.

[1] Epstein, S. & Mayeda, T.K., 1953. Variations on the $^{18}O/^{16}O$ ratio in natural waters. Geochim. Cosmochim. Acta, 4, 213-224.