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A Radiogenic and Stable Strontium isotopic study of fish otoliths

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Skeletal calcium carbonates of marine origin are widely used archives in paleoceanographic studies. Aragonitic fish otoliths are essential body parts of fishes and multiple studies have shown that elemental and isotopic ratios in fish otoliths can provide crucial information about migration and life history of fishes and its surroundings, such as variations in seawater salinity and temperature. Stable Strontium isotopic ratio ($\delta^{88/86}$Sr) combined with radiogenic $^{87}Sr/^{86}Sr$ has emerged as a new tool in studies of marine archives, however there is no investigation that have focused on $\delta^{88/86}$Sr variability in otolith carbonates and its potential as geochemical proxy. Here we present combined $\delta^{88/86}Sr$-$^{87}Sr/^{86}Sr$ data of multi-species otolith samples and explore their relationship with seawater temperature and other geochemical parameters. Six otolith samples of five different species were chosen in the present study, same samples were investigated in terms of their oxygen and calcium isotopes and elemental Sr/Ca ratio in previous studies [1,2] and represents a range of seawater temperature between 2-25°C. The radiogenic $^{87}Sr/^{86}Sr$ of the otolith carbonates were obtained from un-spiked pure samples and the $\delta^{88/86}$Sr values determined using a ^{87}Sr-^{84}Sr double spike technique on Thermal Ionization Mass Spectrometer at the Centre for Earth Sciences, Indian Institute of Science Bangalore following established protocols [3,4]. The $\delta^{88/86}$Sr values of these multi-species otolith samples varied between -0.095 to 0.099 ‰ while the $^{87}Sr/^{86}Sr$ had a range of 0.709549 to 0.710551. While the degree of stable Sr isotope fractionation in the present study was significantly large compared to reported studies on skeletal carbonates, the $\delta^{88/86}$Sr values were negatively correlated with the respective seawater temperature. We further discuss the relationship between $\delta^{88/86}$Sr values and radiogenic $^{87}Sr/^{86}Sr$ data along-side other reported geochemical data to explore the potential of Sr isotopes as useful proxy in these paleo-archives.

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