

Assessing the preservation potential of ichthyocarbonate in sediments from the Fiji and Chagos Archipelagos

Jadon Christian, Amanda M Oehlert, Sam Purkis, Martin Grosell, Alexandra Dempsey

Marine fish are a significant contributor to new carbonate sediment production in shallow marine environments. As part of marine fish osmoregulation processes, a Mg-rich carbonate called ichthyocarbonate is created in the intestines. These minerals are excreted continuously to the environment. Contributions by marine fish to the carbonate budget have been overlooked, creating knowledge gaps regarding the role of fish in the global carbon cycle, especially regarding their preservation in the sedimentary record. Ichthyocarbonate is composed of small (<63 microns) crystallites with unique morphologies, negative stable carbon isotope ($\delta^{13}\text{C}_{\text{carb}}$) values, and high mol%MgCO₃ content, all of which are proposed to be indicators of ichthyocarbonate in the sedimentary record. The goal of this research project is to determine the preservation potential of ichthyocarbonates in sediment samples collected by the Khaled bin Sultan Living Oceans Foundation Global Reef Expedition from Fiji and the Chagos Archipelago. While both are atoll localities with high fish biomass, Fiji has experienced more recent volcanic activity than the Chagos Archipelago, so I hypothesize that carbonate-rich sediments from Chagos Archipelago will better preserve ichthyocarbonate crystallites than those from Fiji due to sediment mineralogy differences. Sediments will undergo a variety of tests including stable carbon isotope analysis on bulk sediments and the fine fraction (<63 microns), and morphological and elemental analyses using Scanning Electron Microscopy and Energy Dispersive Spectroscopy on the fine fraction. Initial results suggest that bulk sediments from the Chagos Archipelago have significantly lower $\delta^{13}\text{C}_{\text{carb}}$ values (0.84‰, $n = 17$) than those from Fiji (2.12‰, $n = 17$, $p < 0.05$). Findings from this research will improve understanding about the fate of ichthyocarbonate in shallow marine environments and will better outline the role of marine fish in the global carbon cycle.