Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.12197

Does the mineralogy of ichthyocarbonate change as a fish matures?

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Sinking fluxes of carbon in the ocean are important components of the biological and carbonate pumps in the ocean, variations in which drive changes in atmospheric CO_2 through time. Marine fish contribute to the biological pump through both active and passive carbon transport mechanisms[1], and to the carbonate pump through the excretion of ichthyocarbonates[2]. Ichthyocarbonates are carbonate precipitates that are continuously formed in the intestines of marine fish for osmoregulatory purposes[2], and can vary in mineralogy from calcite, aragonite, high-Mg calcite, to amorphous carbonate[3]. The solubility of such calcium carbonate minerals is dependent upon the mol%Mg of the mineral[2]. Thus, mineralogy of ichthyocarbonates is likely to be an important variable determining fates of these precipitates in the oceans and may determine whether they are deposited to the sedimentary record or are dissolved in the deep sea. In this study, we evaluated how differing life stages of marine fish impact the mineralogy of the ichthyocarbonates they produce. To accomplish this, we conducted daily tank-collections of ichthyocarbonates produced by juvenile, late juvenile, sub-adult, and adult Gulf Toadfish. In addition, we evaluated whether metabolic differences induced by feeding influence ichthyocarbonate mineralogy. Ichthyocarbonate morphology will be assessed using Scanning Electron Microscopy as previously described[4]. Samples will also be prepared with an internal standard following published methods [5] to quantify mineralogy and mol%Mg content using a Panalytical X-Pert Pro X-ray diffractometer. Results from these analyses will improve predictions of ichthyocarbonate fate in the oceans, and the role they play in sediment production and global carbon cycling.

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4 Perry, C. T. *et al. Proc Natl Acad Sci U S A* **108**, 3865-3869, (2011).

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