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Ichthyocarbonate dissolution and the oceanic alkalinity budget

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The precipitation and dissolution of marine carbonate minerals play a fundamental role in Earth's climate. In the oceans, carbonate mineral dissolution results in alkalinity production, which can buffer CO_2 concentrations in the atmosphere-ocean system on millennial timescales. Although not yet widely considered in marine carbonate budgets, marine fish make significant contributions to the oceanic inorganic carbon cycle [1] , with carbonate production magnitudes that may rival those of coccolithophores or foraminifera [2] . Fish-produced carbonate minerals (ichthyocarbonate) are continuously formed in the intestines of teleost fish and excreted to the environment, where they may be deposited in sedimentary environments or may sink and dissolve in oceanic settings [3,4]. Quantitative understanding of ichthyocarbonate fate is critical to accurate predictions of the role of marine fish in the global carbon cycle and their impact on alkalinity budgets. Here, progress made towards defining the role of fish diet and ichthyocarbonate composition in determining the fate and ultimate dissolution depth will be presented. Results expand the view that marine fish are important "carbon engineers" in the context of the oceanic biological pump [5], and will demonstrate the fundamental contributions of marine fish to the alkalinity budget of Earth's oceans.

[1] Wilson et al., (2009), *Science*, *323*(5912), pp.359-362.

[2] Oehlert et al. (2024), *Science of The Total Environment*, *916*, p.169895.

[3] Grosell and Oehlert (2023), *Physiology*, *38*(4), pp.178-188.

[4] Folkerts et al. (2024), *Science of The Total Environment*, *916*, p.170044.

[5] Anderson et al. (2024), *NPJ Ocean Sustainability*. 3, 17.