Monitoring the life histories of animifalia using LA-MC-ICP-MS measurements of $^{87}Sr/^{86}Sr$ in otoliths, bones, fin rays, scales and teeth.

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Alkaline earth metals (Mg, Sr, Ba) and strontium istopic compositions ($^{87}Sr/^{86}Sr$) are used as biomarkers for tracing life histories in fish. These compositions are typically measured through laser ablation plasma source mass spectrometry (LA-ICP-MS and LA-MC-ICP-MS) of fish otoliths. Otoliths accrete chronologically and record changes in habitat, temperature, movement and diet. The spatial resolution needed to resolve these changes may vary with the size and growth rate of the otolith but generally falls between 20 - 60 microns. In some cases, such as in cartilaginous fish, otoliths don't form periodic structures. Additionally, harvesting an otolith is an inherently destructive method, killing the fish. For these reasons, and because laser ablation is cheaper and faster than alternatives, exploration into other types of biologically-derived minerals such as fin rays, scales and teeth may be advantageous for certain types of fish and biomarking other marine and terrestrial animifalia.

LA-MC-ICP-MS methods measuring $^{87}Sr/^{86}Sr$ in bones and teeth have been conducted in previous studies with archeological human [1] and modern rat teeth [2]. Generally compared to carbonates, measurement of biophosphate minerals pose greater analytical uncertainty due to lesser Sr and greater Rb concentrations, more matrix complexity (ie. organics such as proteins), spatial heterogenity, and formation of the $^{40}Ca^{31}P^{16}O^{+}$ molecular isobar. Preliminary laser ablation testing of white and green sturgeon fin rays and leopard shark teeth have shown excellent agreement with purified solution (difference < 0.0001 $^{87}Sr/^{86}Sr$.) The $^{40}Ca^{31}P^{16}O^{+}$ isobar may be attenuated by simple adjustment to the ion sampling depth of the plasma. Addition of nitrogen in the carrier gas and lessening RF power (cool plasma) operation may also reduce oxide formation, decreasing artifact.

[1] Simonetti *et al* 2008, *Archaemetry* **50**, 2 371-385 [2] Copeland *et al* 2008, *Rap. Com. Mass Spect.* **22**: 3187-3194