Use of in situ laser ablation MC-ICP-MS to validate strontium isotope analysis of otoliths, spines, scales and fin rays.

Malte Willmes[1*], Justin Glessner[2], Scott Carleton[3], James A. Hobbs[1],

[1] Wildlife, Fish and Conservation Biology, University of California, Davis, 1 Shields Ave, Davis Ca. 95616, USA.

[2] Interdisciplinary Center for Plasma Mass Spectrometry, University of California, Davis, 1 Shields Ave, Davis Ca. 95616, USA.

[3] US Geological Survey, New Mexico Cooperative Fish and Wildlife Research Unit, New Mexico State University, Las Cruces, NM 88011, USA.

*corresponding author: mwillmes@ucdavis.edu

Strontium isotope ratios (^{87}Sr:^{86}Sr) in otoliths, are a well-established tool to determine provenance and movement patterns of fish. Alternative tissues (scales, spines, fin rays) may also provide valuable geochemical information and are particularly useful as a non-lethal alternative. However, these tissues do not consist of aragonite, like many otolith, but are comprised of biological apatite. Analyses of biological apatite using in situ laser ablation multi-collector inductively coupled plasma mass spectrometry (LA-MC-ICP-MS) is complicated by polyatomic interferences on mass 87.

We developed new analytical protocols and applied in situ LA-MC-ICP-MS ^{87}Sr:^{86}Sr isotope ratio analysis to walleye (*Sander vitreus*) otoliths, scales, and spines, green sturgeon (*Acipenser medirostris*) pectoral fin rays and a salmon shark (*Lamna distropis*) tooth. These samples were selected because they originate from homogenous ^{87}Sr:^{86}Sr isotope reservoirs, allowing us to decouple potential analytical interferences from actual mobility and habitat change of the fish.

We find that instrument conditions tuned for reduced oxide levels significantly improve the accuracy of the analysis in alternative tissues and produce results comparable to otolith. This new technique will allow us to test if these mineralized tissues record the same life history information as an otolith and if they are inert to chemical exchange after formation.