Fish Otoliths as Bioindicators of Arsenic Exposure in Pacific Northwest Lakes

Marlee Brown, Amber Smith and Jim Gawel*

The Southern Puget Sound has been exposed to elevated metal concentrations downwind of a former copper smelter operated by ASARCO for almost 100 years. As a result of smelter metal emissions, downwind lakes in the Puget Sound lowlands were contaminated with arsenic, resulting in long-term effects on lake biota. Although arsenic has been measured in fish muscle tissue, we expect that concentrations may vary depending on seasonal changes in lake chemistry and feeding behavior. We hypothesize that analyzing arsenic concentrations in fish otoliths will provide us with a measure of time-averaged arsenic exposure over their lifetime. Otoliths were dissected from two sunfish species, pumpkinseed (*Lepomis gibbosus)* and bluegill (*Lepomis macrochirus)* which were collected from Lake Killarney and Steel Lake in 2019. Using fish length to estimate age, the fish sampled were 3-5 years old. Samples were cleaned of excess tissue, dried, and digested in a microwave using nitric acid. Arsenic concentrations were measured by inductively coupled plasma mass spectrometry and a dogfish standard was used for QA/QC of the digestion method. We found higher concentrations of arsenic in Lake Killarney than Steel Lake, consistent with previous arsenic measurements in fish muscle tissues. Steel Lake mean As concentrations were 478 μg As/kg whereas Lake Killarney fish otoliths were measured at 1,022 μg As/kg. High levels of As pose a serious health risk in humans and can cause cancer, therefore using sunfish as bioindicators are a way to monitor potential human health risks.