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POS-50 Spectroscopic Techniques in Determining the Elemental Composition of Fish Otoliths

Tuesday 12 June 2018 18:00 (2 minutes)

The migration patterns of fish have been shown to be reflected in the elemental composition of certain bone-like structures (otoliths) within the fish. These follow a radial growth pattern with characteristic ring structures forming annually, giving a method for aging the fish. Elemental analysis of the salts present in the otolith can then be used with locational data to give a mapping of the otoliths structural changes over time. These changes are correlated to the dominant features of the water the fish was in as its otolith developed. The current technique for this type of analysis is time consuming and costly, typically utilizing an inductively coupled plasma mass spectrometer (ICP-MS). The focus of this poster is to explore methods for using laser-induced breakdown spectroscopy (LIBS) on fish otoliths to develop a rapid, cost efficient method for migration tracking, with an emphasis on transitions from salt to fresh water bodies. LIBS is a point-sampling elemental analysis technique that uses the spectral radiation produced by a sample after laser ablating it to form a plasma. This poster will discuss our work on methods of sample preparation, including cross sectioning and plating techniques used to mount the otoliths. We will describe our experiments to optimize the signal-to-noise ratio and repeatability of our measurements. A central topic of this discussion will be if a statistically significant elemental difference can be determined between the innermost and the outermost structure of the otolith using LIBS. The exploration of novel algorithmic approaches to analyzing spectroscopic data in collaboration with modern chemometric techniques will be discussed. Lastly, we will address computerized autonomous methods for calculating the area under a peak in noisy LIBS data and classification models that can be applied when working with the data sets generated in the LIBS experiments.

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