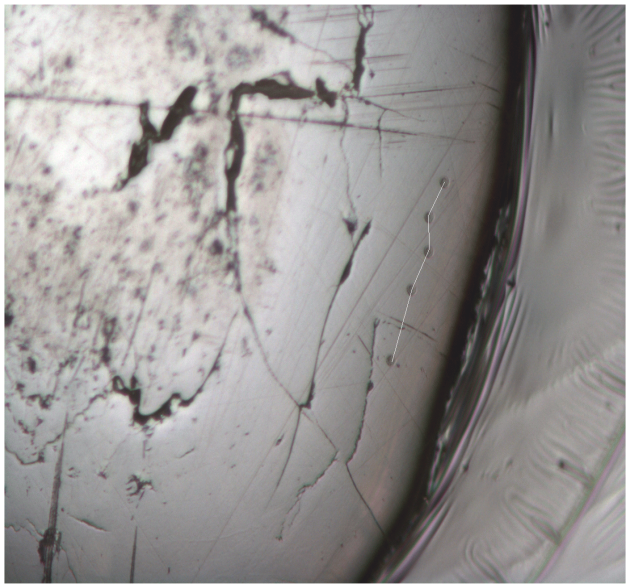
**Use of Elemental Analysis in Stock Discrimination of Bristol Bay Sockeye Salmon**

In recent years, below average returns of sockeye salmon to the Bristol Bay region have prompted state and federal agencies to declare the Bristol Bay region of Alaska an economic disaster area. Specific mechanisms related to reduced Bristol Bay sockeye salmon production are unknown due to the lack of stock-specific information on early marine residence, and sparse or outdated information on the life history of immature and subadult salmon as they travel the waters of the Bering Sea and North Pacific Ocean. To assess life history characteristics of Bristol Bay sockeye salmon stocks in the North Pacific Ocean and Bering Sea, researchers must be able to identify salmon, at least by their country or continent of origin and ideally by region or watershed of origin when captured in various commercial fisheries and during research sampling.

The NOAA Fisheries Marine Salmon Interactions and Ocean Carrying Capacity programs in conjunction with the University of Alaska Fairbanks, the U.S Geological Survey, and Alaska Department of Fish and Game have initiated a pilot study using the elemental analysis of otoliths as a tool for separating sockeye salmon smolts from the Kvichak, Egegik, and Ugashik rivers in eastern Bristol Bay. We used a chemical microprobe operated and maintained by the advanced instrumentation laboratory of the University of Alaska Fairbanks to determine the concentrations of nine common elements found in the freshwater zone of the sagital otoliths of sockeye salmon smolts. The photo at the right shows microprobe tracks on a sectioned and polished sagittal otolith from a sockeye salmon smolt. Linear discriminate analysis provided information on how well the elemental data could be used to separate the fish by river system.



It was assumed that the otolith concentrations would be reflective of the concentrations of those elements in the freshwater system. ANOVA indicated that the nine elements (Ca, K, Cl, P, S, Na, Mg, Sr, and Fe) were significantly different between the three systems ($p<0.05$). Discriminate analysis of the elemental data showed three distinct groups corresponding to the three river systems. The Kvichak river system sockeye were grouped correctly 91.3 % of the time followed by Ugashik and Egegik river fish at 70.8% and 68.0%, respectively. Overall, 76.4% of the samples were correctly classified to the correct river system. The use of probe-based technology for discrimination of mixed salmon stocks in Bristol Bay, Alaska would be useful to managers and researchers. Combined with isotope analysis and genetic characteristics, as well as scales and parasite analysis, elemental analysis can be an effective tool to discriminate between sockeye salmon stocks in Bristol Bay.