Reconstruction of habitat utilization and growth histories for Longfin Smelt (*Spirinchus thaleichthys*) via otolith microchemistry

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Habitat utilization and movement patterns of threatened and endangered fishes remain critical data gaps necessary for effective conservation and management efforts. Obtaining detailed life-history data for small estuarine fishes requires novel approaches and technologies. Otolith geochemistry is a valuable tool for examining habitat use of fishes throughout multiple stages of development. We used *in situ* laser ablation MC-ICP-MS to measure strontium isotope ratios ($^{87}Sr/^{86}Sr$) across fish otoliths and retrospectively construct habitat utilization patterns of individual Longfin Smelt (*Spirinchus thaleichthys*) in the Sacramento-San Joaquin River Delta and San Francisco Estuary. These geochemical analyses have identified several life-history strategies, with some individuals hatching and rearing for long periods in fresh water, a majority hatching and rearing in fresh-low salinity water and moving rapidly to higher salinities, and some being born and surviving in saltier brackish-water zones. We also identified geochemical patterns indicative of oceanic maternal influence in Sr isotope ratios, similar to those observed for larger, ocean-going salmonids. Thus far, our work suggests that low salinity (ca. 2-ppt.) waters have disproportionately contributed to adult populations, suggesting that the low salinity zone is a critical nursery area for this species. Furthermore, in collaboration with the UC Davis Fish Culture and Conservation Lab, we are conducting extensive studies on newly cultured Longfin Smelt larvae to further validate our retrospective geochemical and growth estimation techniques and observations. These studies will provide a greatly enhanced understanding of habitat utilization and life-history diversity forthis threatened estuarine fish.