

Understanding life history patterns of California's native fishes

Malte Willmes, Levi S. Lewis, James A. Hobbs

The Sacramento-San Joaquin Bay-Delta (Delta) forms a vital link in California's water supply. Freshwater flows are managed both for human use as well as for several species of threatened and endangered fish, causing significant conflict over limited fresh water resources. Effective management of the available water resources requires a detailed knowledge of the life history patterns of the native fishes. Calcified tissues of fish such as otoliths (fish ear bones) and fin rays have daily growth increments and can provide a life-long archive of age, growth and environmental chemical signatures. Strontium isotope ratios ($^{87}\text{Sr}/^{86}\text{Sr}$) measured using laser ablation mass spectrometry enable us to reconstruct detailed life history patterns as fish move from one habitat into another. We applied this technique to several native fish species of high concern including the Delta and Longfin smelt, Chinook salmon and White sturgeon, over various time periods encapsulating both dry and wet years (2002-2016). This allows us to investigate fish how fish life history and abundance relates to environmental parameters such as freshwater outflow, water temperature, and human impacts in the face of ongoing climate change.