

Identifying hatchery versus wild origin of Chinook Salmon (*Oncorhynchus tshawytscha*) on the Feather River spawning grounds using otolith strontium isotope ratios

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Chinook Salmon (*Oncorhynchus tshawytscha*) populations in California are heavily subsidized with the production of hatchery fish. However, the spawning of hatchery origin Chinook with wild fish has been found to compromise the genetic integrity of the wild origin populations through processes such as outbreeding, genetic homogenization and reduction of life history diversity. Determining the proportion of hatchery origin fish on the in-river spawning grounds is thus a direct prerequisite for the effective management of salmon populations. We used otolith strontium isotope ($^{87}\text{Sr}:^{86}\text{Sr}$) ratios of fish collected during carcass surveys for each year from 2002 to 2010 on the Feather River to reconstruct their life history patterns and determine their origin. Isotopically determined hatchery origin classifications were validated using otoliths of known hatchery origin from coded wire tag information and achieved an accuracy of 95%. Our results show, that a large proportion (~50-90%) of in-river spawning fish in the Feather River are of hatchery origin, with the proportion of hatchery fish dramatically increasing in 2009 and 2010. We also identified fish originating from other tributaries which contributed generally less than 10% to the spawning populations, with most strays originating from the near-by Yuba River. The high proportions of in-river spawning hatchery origin chinook salmon documented in this study indicate, that fitness of natural origin Chinook may be significantly impaired and suggest that introgression between hatchery and natural origin Chinook may be a factor contributing to the depressed status Central Valley Chinook salmon.