

## **Are wild Fall run Chinook salmon headed towards extinction in the Central Valley, California?**

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The Sacramento-San Joaquin River system in California's Central Valley represents a vital link in California's water supply, and contains the southernmost spawning runs of Chinook salmon (*Oncorhynchus tshawytscha*). Fall run Chinook from the Sacramento River system form the backbone of California's salmon ocean fishery and 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. Identifying temporal trends in the contribution of hatchery and wild origin fish to the overall in-river escapement is thus of vital importance for assessing the extinction risk and resiliency of Fall run Chinook salmon in the Central Valley.

We used otolith strontium isotope ( $^{87}\text{Sr}/^{86}\text{Sr}$ ) ratios of fish collected during carcass surveys from 2002 to 2010 on the Feather River to reconstruct their life history patterns and natal origin. Our results show that a large proportion (~50-90%) of in-river spawners are of hatchery origin, with the proportion of hatchery fish dramatically increasing in 2009 and 2010 after the salmon stock collapse (2007-2008). Constant fractional marking data show hatchery fish continuing to dominate on the natural spawning grounds over the following two years (90% in 2011 and 2012), indicating that hatchery fish have effectively replaced wild fish in this river. This introgression of hatchery with wild origin fish likely further promotes the erosion of life history diversity and weakens the Chinook salmon population portfolio, causing synchrony among populations and loss of resilience in the Feather River and the Central Valley overall.