Otolith microchemistry reveals the decline of wild fall-run salmon on the Feather River, California.

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Fall-run Chinook salmon (*Oncorhynchus tshawytscha*) from the Sacramento-San Joaquin River system form the backbone of California's salmon fishery and are heavily supplemented through hatchery production. 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 in the Central Valley. Here we used otolith strontium isotope ($^{87}Sr/^{86}Sr$) ratios of otoliths collected during carcass surveys from 2002 to 2010 on the Feather River to reconstruct their life history patterns and natal origin. This timeframe is important because it spans the salmon stock collapse in 2007-2008 in California. Our results show that prior to the salmon stock collapse ~55-67% of in-river spawners were of hatchery origin; however, hatchery contributions increased drastically (89%) in 2010 following the collapse. Data from a recent hatchery marking program corroborate our results, showing that hatchery fish continued to dominate (~90%) in 2011-2012. Though the rebound in abundance of salmon in the Feather River suggests recovery of the stock post-collapse, our otolith chemistry data document a persistent decline of wild spawning salmon, likely leading to the erosion of locally-adapted populations. Central Valley salmon are at a critical juncture, with many populations close to extinction and hatcheries can play a key role in the recovery of wild stocks but only with careful and appropriate management.