

Upper Yakima River Spring Chinook Pedigree Study

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Several studies have shown that the relative reproductive success (RRS) of hatchery-origin fish in the natural environment is less than that of natural-origin fish. Yet, these studies do not evaluate RRS by determining the relative fitness in the natural environment of natural-origin fish with different percentages of hatchery ancestry (i.e., 0, 1, and 2 hatchery-origin parents). We have begun a study to examine these differences using a genetic-based parentage analysis. The concept is to genotype hatchery-origin parents that have the opportunity to reproduce in the wild, and then determine the number of adult offspring that return from hatchery x hatchery or hatchery x natural crosses. As part of a more comprehensive sampling program, in 2003 tissues were collected from all hatchery-origin spring Chinook passing Roza Dam (defined here as the parental generation), and in 2007 tissues were collected from all natural-origin four-year old returning adult Chinook (here defined as the offspring generation - F₁). To date, we have genetically analyzed all 2003 parents (1,409 males, including adults, jacks, and precocial parr; and 793 females) and a subset of the F₁ offspring (583 four-year olds from 2007).

Based on the number of hatchery- and natural-origin fish returning to Roza Dam in 2003 (minus the natural-origin fish spawning in the hatchery), the expected proportion of hatchery-origin, mixed hatchery and natural-origin, and natural-origin Chinook produced in 2003 and returning to Roza Dam in 2007 was 45%, 44%, and 11%, respectively. Based on our preliminary parentage analysis of the 583 F₁ offspring collected in 2007 (and assuming unassigned parents are of natural-origin), 28% were assigned to hatchery-origin, 51% mixed hatchery and natural-origin, and 20% natural-origin. Overall, the natural-origin Chinook produced more returning F₁ offspring than expected given a hypothesis of equal production between hatchery- and natural-origin Chinook. Furthermore, we also identified a higher proportion of hatchery-origin mothers were successful than hatchery-origin fathers.