

*A Comparison of Life-History Traits of Natural origin and
Second-Generation Hatchery Origin Upper Yakima River Spring
Chinook Salmon Returning in 2006*

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Abstract

We compared age composition, passage timing, and size-at-age of supplementation hatchery (SH; first-generation) and hatchery control (HC; second-generation) and natural origin (NO) adult spring Chinook salmon returning to the upper Yakima River in 2006 were compared. Also, spawn timing of HC and NO adults were compared.

- In 2006, the majority of NO fish returned at age 4 (83%), age 5 adults made up 10%, and age 3 (jacks) comprised 7% of the returns. SH fish returned predominantly at age 4 (85%), while 5 adults made up 1% of annual returns. HC returns were made up of 6% age 3 and 94% age 4 adults. The first returns of age 5 HC adults will not occur until 2007. The proportions of age 3 SH and HC jacks were much lower in 2006 than in hatchery returns over the period 2001 to 2005. However, this is likely a harbinger of a poor return from all age classes in the BY2003 cohort rather than an actual reduction in the proportion of males adopting this life history strategy.
- Age 4 mean SH and HC body length and weight distributions at RAMF were significantly smaller than NO adults by 1.0 to 1.3 cm and 0.2 to 0.3 kg, but did not differ significantly between each other. In contrast, HC, SH, and NO age 3's were not significantly different and HC adults were largest.
- Over the period 2001 to 2006 there was a significant decline in body size in all age 4 Yakima River Basin wild/natural origin populations as well as the upper Yakima hatchery population. During the period 1990 to 2000 the wild populations exhibited no trend in body size of age 4 fish. Because the wild control population in the Naches experienced the same rate of decline as the upper Yakima natural and hatchery origin groups between 2001 and 2006, we concluded that the supplementation program was not the cause, and reduced size over time is more likely related to large scale phenomenon such as oceanic and/or main stem Columbia River environments shared by all the populations.
- The body size of High and Low hatchery treatment groups differed significantly at the time of juvenile release, but after approximately 18 months of post-release ocean growth the body size of age 4 High and Low growth treatment groups were not significantly different. Thus, the differences in size-at-release did not translate into comparable size differences in adult returns.

- For the first time in 9 years we observed sexual dimorphism in age 4 upper Yakima returns. In all Types, mean female POHP lengths were significantly greater than males (NO (male = 58.0, female = 59.6), HC (male = 56.8; female = 57.9), SH (male = 56.9; female = 58.0)). Body weight dimorphism followed the same general trend, but was not statistically significant (NO (male = 3.6; female = 3.7), HC (male = 3.4; female = 3.4), SH (male = 3.4; female = 3.5)).
- Median passage timing of age 4 adults was significantly different (Kruskal-Wallis $p=0.010$), with HC and SH returns passing 6 and 2 days later than NO adults, respectively. Median passage timing of age 3 Types were not significantly different (KW $p=0.468$) and HC and SH returns were 2.5 days later and 2 days earlier than NO adults, respectively. As noted in previous years, jack (age 3) median passage was significantly later by 12-14 days than age 4 adults (all KW tests $p<0.01$).
- Mean spawn timing of HC fish was significantly earlier than NO fish by 7.5 days, and was greater than the mean shift of 5 to 7 days earlier in SH spawn timing noted between 2001 and 2005.

These analyses focused primarily on comparisons within 2006 returns. Ultimately we intend to compare SH, HC, and NO upper Yakima River spring Chinook salmon returning between 2005 and 2008 in order to estimate whether the trends observed in first generation hatchery returns (2001-2004) continue as the project progresses into the second generation of returns and the Hatchery Control line implementation continues.

These data should be considered preliminary until published in a peer-reviewed journal.