

Understanding the adaptive consequences of hatchery-wild interactions in Alaska salmon

W. Stewart Grant

Received: 20 August 2010 / Accepted: 14 September 2011
Springer Science+Business Media B.V. 2011

Link to this article: <http://www.springerlink.com/content/du4g492408262167/>

About 31% of salmon harvested in Alaska comes from the hatchery production of hundreds of millions of pink and chum salmon and smaller numbers of sockeye, Chinook, and coho salmon. The numbers of hatchery-reared juveniles released in some areas are greater than the numbers of juveniles from wild populations. However, virtually nothing is known about the effects of hatchery fish on wild populations in Alaska. Possible effects of these interactions can be inferred from studies of salmonids in other areas, from studies of other animals, and from theory. Numerous studies show a complex relationship between the genetic architecture of a population and its environment. Adaptive responses to nature and anthropogenic selection can be influenced by variation at a single gene, or more often, by the additive effects of several genes. Studies of salmonids in other areas show that hatchery practices can lead to the loss of genetic diversity, to shifts in adult run timing and earlier maturity, to increases in parasite load, to increases in straying, to altered levels of boldness and dominance, to shifts in juvenile out-migration timing, and to changes in growth. Controlled experiments across generations show, and theory predicts, that the loss of adaptive fitness in hatchery salmon, relative to fitness in wild salmon, can occur on a remarkably short time scale. All of these changes can influence survival and impose selective regimes that influence genetically based adaptive traits. The preservation of adaptive potential in wild populations is an important buffer against diseases and climate variability and, hence, should be considered in planning hatchery production levels and release locations. The protection of wild populations is the foundation for achieving sustained harvests of salmon in Alaska.

Keywords: Adaptive potential, Alaska, Climate variability, Domestication, Genetic diversity, Hatchery-wild interactions, Mating behavior, Pacific salmon, Straying