A review of the relative fitness of hatchery- and natural-origin salmon and steelhead

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Estimates of the relative fitness of hatchery- and natural-origin salmon can help determine the benefits and risks of artificial propagation in supplementing natural stocks. Data on relative fitness can be used to parameterize productivity models, improve the assessments of natural population productivity, and assist in predicting the effectiveness of stocking as part of an overall recovery effort. Published information on relative fitness of hatchery and natural-origin salmon (i.e., ratio of hatchery recruits per spawner to natural recruits per spawner) is biased towards one iteroparous species (steelhead, *O. mykiss*), and includes studies of several non-locally adapted hatchery populations that have been highly domesticated. Recently, an important study (Araki et al. 2007) estimated that hatchery-origin fish with two hatchery-origin parents had only 55% the relative lifetime fitness of hatchery-origin fish with one hatchery and one natural-origin parent, suggesting rapid fitness loss and a genetic basis for it. Recent models such as the All H Analyzer (AHA) have been used for several different species and life history types (e.g., ocean and stream-type Chinook salmon) and require relative fitness estimates to guide best management practices. Therefore, an up-to-date, broad-scale assessment and understanding of relative fitness data is essential. In this presentation, I summarize information on published and non-published studies that have attempted to quantify relative fitness. I discuss evidence for fitness loss in the context of species differences, local adaptation, life history, spawner density, gender, and hatchery objectives.