


RESEARCH ARTICLE

Introgressive hybridization between native and non-local steelhead (*Oncorhynchus mykiss*) of hatchery origin

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Abstract

1. The artificial propagation and release of individuals from non-local populations is a widespread practice that can threaten the genetic integrity of native, locally adapted populations, because of domestication effects from the artificial rearing environments and inter-breeding with the local populations. Introgressive hybridization was examined in a threatened population of anadromous *Oncorhynchus mykiss* (Walbaum, 1792) (winter-run steelhead) in the Willamette Basin, Oregon. Non-local, hatchery-reared, summer-run steelhead are released annually into the basin as mitigation for the impact of numerous dams.
2. Sixteen microsatellite loci were used to detect introgression in adult steelhead of natural origin migrating into the basin before spawning during 2013 and 2014. Bayesian clustering analysis (STRUCTURE) was used to identify the level of admixture in the population and to assign individuals to clusters.
3. The Bayesian clustering analysis indicated that there are most likely two populations (or clusters) in the study area: a native, coastal, winter-run steelhead population and a non-local, summer-run steelhead population that was derived from artificial crosses between summer-run coastal and interior redband populations.
4. Introgressive hybridization was detected in 26.4% of the natural-origin adult steelhead. First-generation (F_1) hybrids were estimated as 4.9–10.1% of the natural-origin adult steelhead. Hybrids backcrossed to the native, coastal, winter-run steelhead were nine times more numerous than backcrosses to the hatchery, summer-run steelhead. The timing of upstream migration was significantly different between the native, winter steelhead and the F_1 hybrids.
5. Low numbers of summer steelhead and back-cross summer-run hybrids were identified in the natural-origin population, consistent with the reduced fitness of hatchery-reared summer steelhead in natural environments. Conservation actions that protect native populations from hatchery fish include altering stocking practices (such as integrated management or sterility), and protecting the remaining intact populations by designating genetic preserves and preventing the release of hatchery-origin or hybrid steelhead into these areas.