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Title: The distribution of neutral and adaptive genetic variation in California steelhead: Impacts of and on Central Valley water projects

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Abstract: California Central Valley Steelhead (*Oncorhynchus mykiss*) are listed as threatened under the ESA throughout the Sacramento and San Joaquin watersheds and are the subject of active recovery efforts and ongoing research and monitoring, including using genetic data. The distribution of neutral and adaptive genetic variation among populations above and below dams and between coastal and inland lineages can provide insights into life-history variation. We found that strength of association between genotype and phenotype depended on population ancestry, with individuals from the Central Valley exhibiting little to no association between run-timing and genotype. These results show that significant genetic and phenotypic differences are maintained between Central Valley and central coast *O. mykiss* lineages. In addition, water management practices at the federal Central Valley Project (CVP) and California State Water Project (SWP) negatively impact juvenile salmonids migrating through the San Francisco Bay Delta. To investigate this, a combination of parentage and population genetic approaches were used on fish collected at the CVP and SWP facilities from 2014-2020 to identify hatchery-origin individuals independent of adipose fin status, with the proportion of individuals assigned to hatchery parents varying across years as well as between adipose-intact and fin clipped juveniles. In 2024, a much larger number of steelhead juveniles were captured at the pump facilities than in previous years, and a high proportion of them were not adipose-fin clipped. Genetic analysis confirmed that they were natural-origin *O. mykiss*. Together these results improve our understanding of the population-specific impacts of Central Valley water export operations on *O. mykiss* in the Sacramento-San Joaquin Delta.