**Genome wide association study (GWAS) results for steelhead smolt survival in Puget Sound**

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Genome-wide association studies (GWAS) use genome scans to document relationships between phenotypes (e.g., survival) and genotypes (e.g., blocks of linked SNPs or genes), based on population samples. GWAS are used in a wide variety of studies ranging from understanding diseases in humans, improving the agricultural production of domestic animals and plants, to documenting specific behavior or morphology in wild animals. In salmonids, GWAS have been used, for example, to gain a better understanding of developmental rates and migratory behavior in steelhead/rainbow trout, and disease resistance in Atlantic salmon. In this study, we looked for associations between genomic signatures in steelhead smolt and their survival while out-migrating through Puget Sound, Washington State. Steelhead smolts were implanted with acoustic transmitters, and we defined survival as a fish’s detection at Strait of Juan de Fuca (JDF) acoustic detection array. We genotyped the fish using restriction-site associated DNA (RAD) sequences (RAD-seq). RAD-seq is a genome complexity reduction technique that generally produces 1000s to 10,000s single nucleotide polymorphisms (SNPs). Following QA/QC procedures, we analyzed a dataset consisting of 104 individuals (70 mortalities, 34 survivors) and 5702 SNP loci. We used the MLM procedure in Tassel, included as cofactors year and location, and controlled for population and family (kinship) structure. Despite the small sample size, which reduced power to detect an association between genotypes and survival, and relatively short sequences (80 bp), we identified four loci with significant associations. One locus showed significant association in all tests, and had a near-perfect alignment with sequences linked to Hox gene clusters in Atlantic salmon. Hox genes control morphogenesis along the anterior-posterior axis, and can be involved with limb (fin) development. Two of the remaining three loci aligned with immunological genes in Atlantic salmon and rainbow trout.