**The influence of geomorphology and hydrology on *O. mykiss* life history zonation in streams**

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**Abstract**

Like many coastal watersheds along the northern California coast, tributaries to the South Fork Eel River support both resident and migratory *O. mykiss.* Through our research we aim to determine the geographical features that influence the spatial distribution of resident and migratory fish, and to explore the ecological consequences of life history zonation in tributaries. We predicted that waterfalls would be partial barriers, selecting against migratory adults travelling upstream to reach breeding grounds, particularly during dry winters. Consequently, we predicted that these partial barriers would determine the upstream extent of migratory haplotypes in these streams. To test these predictions, we sampled tissues from juvenile fish from the mouth to the uppermost reach with fish in Elder and Fox creeks, covering 7 and 2 km, respectively, during the summers of 2014 and 2015 (both dry years). We then sequenced SNPs that are under selection on the chromosomal region Omy5, and linked to resident vs. migratory life history (Pearse et al. 2014), to relate diversity at this region with location relative to waterfalls. We found that the largest waterfall on Elder Creek (3.1 m high from bedrock to crest) strongly influenced the distribution of resident and migratory life history genotypes (preliminary results suggest 72% resident haplotypes above vs. 44% below the waterfall), with migratory haplotypes decreasing with distance upstream of this waterfall. Additionally, we found longitudinal differences in density and size structure that relates to this life history zonation. In Elder Creek, the density of age-0 fishis almost 4x’s higher in the downstream reach dominated by migratory fish, while the density of age-1 and older individuals is significantly lower than upstream reaches (P < 0.05 for both comparisons). In one tributary (Fox Creek), we documented a recruitment failure for migratory fish during the drought year of 2013, presumably because migratory fish were unable to access the creek due to a barrier at the mouth and low winter stream flows. Understanding the factors that influence the extent to which the resident and migratory forms overlap, and potentially interbreed, has both conservation and ecological consequences through effects on genetic diversity, fish density, and size structure.