



Genetic Evidence of Local Adaptation in Desert Bighorn Sheep Native to the Great Basin

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ABSTRACT: Desert bighorn sheep (*Ovis canadensis nelsoni*) occupy a diversity of desert ecosystems throughout the southwestern United States. Significant climatic differences among these desert ecosystems suggests the potential for adaptation to local conditions in this taxon. We tested for signatures of local adaption using 2b-RAD reduced representation genotyping in conjunction with high resolution climate data for 30 native populations of desert bighorn sheep (291 individuals) distributed throughout much of its North American range. Population differentiation and ecological association tests on 11,303 SNPs identified outlier loci with alleles private to the Great Basin of California and Nevada. Private allele frequencies were correlated with higher elevation and lower annual mean temperature; logistic regression, $P < 0.001$. Outlier loci mapped to a ~ 5 Mb sequence on chromosome 8 of the domestic sheep genome (Oar v3.0) encompassing the EPH receptor A7 gene and six other undescribed protein coding genes. Our data suggest the few remaining desert bighorn herds native to the Great Basin may represent a unique ecotype and should be managed accordingly. Understanding the range of adaptive genetic variation present within desert bighorn sheep may prove instrumental in predicting how this taxon might respond to global climate change.

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KEYWORDS Desert bighorn sheep; *Ovis canadensis nelsoni*; genetic variation; adaptive ecotypes; SNPs; Great Basin; desert southwest.