Exploring the Geneflow-Disease Trade-off within Bighorn Sheep Metapopulations

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ABSTRACT: Metapopulation connectivity is generally thought to increase population growth due to the beneficial effects of gene-flow on fitness. However, when disease is present in a system, the connectivity that leads to gene-flow can also facilitate disease transmission, potentially muting connectivity's predicted benefits for population growth. To explore trade-offs between gene-flow and pathogen transmission in real-world bighorn sheep (*Ovis canadensis*) metapopulations, we incorporated temporally dynamic movement and connectivity rates into a model of metapopulation growth, gene- flow, and pathogen transmission dynamics. We parameterized simulations with movement and connectivity parameters specific to 3 environmentally distinct ecoregions inhabited by bighorn sheep within the State of Nevada. The timing and duration of mating season, and the resulting seasonal connectivity structure, varied between ecoregions due to differing environmental constraints. This led to different outcomes to the disease-gene-flow trade-off depending on the timing and intensity of connectivity. These findings highlight the need for detailed, system-specific analyses of movement and connectivity when considering optimal management in the face of competing pathogen and gene-flow mediated risks.

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