Seeing is be-Leaving: Perception Informs Migratory Decisions in Sierra Nevada Bighorn Sheep (*Ovis canadensis sierrae*)

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ABSTRACT: Seasonal migration is a behavioral response to predictable variation in environmental resources, risks, and conditions. In behaviorally plastic migrants, migration is a conditional strategy that depends, in part, on an individual's informational state. The cognitive processes that underlie how facultative migrants understand and respond to their environment are not well understood. We compared perception of the present environment to memory and omniscience as competing cognitive mechanisms driving altitudinal migratory decisions in an endangered ungulate, the Sierra Nevada bighorn sheep (*Ovis canadensis sierrae*) using 1,298 animal years of data, encompassing 460 unique individuals. We built a suite of statistical models to partition variation in fall migratory status explained by cognitive predictors, while controlling for non-cognitive drivers. To approximate attribute memory, we included lagged attributes of the range an individual experienced in the previous year. We quantified perception by limiting an individual's knowledge of migratory range to the area and attributes visible from its summer range, prior to migrating. Our results show that perception, in addition to the migratory propensity of an individual's social group, and an individual's migratory history, are the best predictors of migration in our system. Our findings suggest that short-distance altitudinal migration is, in part, a response to an individual's perception of conditions on alterative winter range. In long-distance partial migrants, exploration of migratory decision-making has been limited, but it is unlikely that migratory decisions would be based on sensory cues from a remote target range. Differing cognitive mechanisms underpinning short and long-distance migratory decisions will result in differing levels of behavioral plasticity in response to global climate change and anthropogenic disturbance, with important implications for management and conservation of migratory species.

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