

PREDATION AND HARVEST

Exploring How the Environment Shapes Predator-Prey Dynamics in the Sierra Nevada

ELIZABETH A. SIEMION, *Utah State University, Logan, UT, 84322, USA; California Dept. of Fish & Wildlife, Bishop, 93514, CA USA; liz.siemion@usu.edu*

YASAMAN N. SHAKERI, *University of Wyoming, Laramie, WY, 82071, USA*

THOMAS R. STEPHENSON, *California Dept. of Fish & Wildlife, Bishop, CA, 93514, USA*

KEZIA R. MANLOVE, *Utah State University, Logan, UT, 84322, USA*

ABSTRACT: Environmental variation shapes prey selection, predation risk, and predator-prey dynamics. For example, seasonal conditions drive predator-prey dynamics by affecting the spatial arrangement of predator and prey populations, leading to changes in prey selection by predators and predation risk for prey. As such, understanding how predator-prey dynamics change under different environmental conditions has important implications for managing predator and prey species. The Sierra Nevada climate is characterized by predictable seasonal changes that drive the spatial redistributions of mule deer (*Odocoileus hemionus*) and subsequent mountain lion (*Puma concolor*) movement. For the federally endangered Sierra Nevada bighorn sheep (*Ovis canadensis sierrae*; Sierra bighorn), increased proximity to mule deer during winter is associated with elevated mountain lion predation on low-elevation winter range. We developed a Bayesian hierarchical discrete choice model that identifies prey species at mountain lion kill sites using investigated kill site characteristics and mountain lion GPS data between 2018 and 2023. Ultimately, we will use this model to determine how environmental conditions drive Sierra bighorn predation risk and predator-prey dynamics in a multi-prey system. Climate change may change the frequency and intensity of low-elevation winter range use by Sierra bighorn, affecting the extent to which mountain lions limit Sierra bighorn populations. The relationship between the environment and mountain lion prey selection will provide insight for predicting predation dynamics on Sierra bighorn under environmental change and for selecting management strategies that reduce predation risk on Sierra bighorn.

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KEYWORDS: Bayesian hierarchical discrete choice model, mountain lion (*Puma concolor*), mule deer (*Odocoileus hemionus*), Nevada bighorn sheep (*Ovis canadensis sierrae*), predator risk, Sierra bighorn, Sierra Nevada.