

Project Summary

Rocky Mountains Cooperative Ecosystem Studies Unit

Project Title: Monitoring Genetic Variation and Parasite Abundance in Bighorn Sheep from Rocky Mountain National Park

Discipline: Natural Resources
Type of Project: Research
Funding Agency: National Park Service
Other Partners/Cooperators: University of Montana
Effective Dates: 6/30/2010 - 9/30/2012
Funding Amount: \$20,083

Investigators and Agency Representative:

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Project Abstract: The Mummy Range bighorn sheep (*Ovis canadensis*) population is among the most important wildlife populations in Rocky Mountain National Park. Because of the population's small size ($N < 100$) there is concern that it may suffer from reduced genetic variation and inbreeding, which could reduce the probability of the herd's persistence and its ability to adapt to future environmental change (e.g., disease challenges, parasites or other environmental stresses). This population has suffered disease-related die-offs in the past and could become increasingly susceptible to parasites if it suffers loss of genetic variation. Our recent study suggested that individual Mummy Range sheep with reduced genetic variation might have increased susceptibility to lung worm parasites (Luikart et al. 2008); however the study included only 30 individuals sampled in only one year (2005).

Fortunately, the increasing availability of hypervariable DNA markers (microsatellites; Maudet et al. 2004) make it feasible to determine if a population has recently suffered a genetic bottleneck and inbreeding. It is also feasible to test for loss of variation at individual functional genes associated with fitness-related traits such as disease resistance. Non-invasive fecal samples obtained in the field can yield bighorn DNA for monitoring population genetic status and inbreeding without capturing or even disturbing the target animals (Taberlet et al. 1999; Luikart et al. 2008; Beja-Pereira et al. 2009). From fecal samples, it is also possible to quantify parasite loads, which might be a useful indicator of individual fitness, inbreeding depression, and population level health.

Objectives

Our general goal is to provide high quality base line data for long-term monitoring and to conduct statistical genetic tests to assess the genetic health of the Mummy Range bighorn herd.

The specific objectives of the study are to:

- 1) quantify genetic variability and test for recent population bottlenecks in the Mummy Range herd by comparing samples from 2005 and 2010, and by using more DNA markers (20 microsatellite loci) than past studies (15 loci) for increased statistical power and reliability.
- 2) quantify the parasite abundance in the Mummy Range bighorn sheep population and compare abundance in 2005 and 2010,
- 3) test for correlations between individual genotype (e.g., heterozygosity) and parasite load.

Outcomes with Completion Dates: December 30, 2011

- A copy of the draft report submitted to RMNP by August 30, 2011.
- One hard copy and one electronic copy of the final report submitted by December 30, 2011 to RMNP.
- An oral presentation will be provided to the RMNP staff by the completion date for this project describing the research findings and the resulting management implications of this work. Management implications will be developed in collaboration with RMNP staff biologists.
- This project will likely produce a scientific publication (depending on results) which will be provided to RMNP when available.

Keywords: Bighorn Sheep, genetic structure, DNA analysis, parasites Rocky Mountain National Park University of Montana