Executive Summary

Title: Quantifying forest stand and landscape attributes that influence mountain caribou habitat fragmentation and predation rates
Number: Y081201

The decline of mountain caribou populations has been linked to high predation rates due to a warming climate and changing landscape composition. These factors are thought to affect caribou dynamics by increasing the production of non-caribou ungulates (NCU), with a subsequent increase in predators. A warming climate can favour NCU through shorter winters and by increasing the fire frequency, which increases the production of NCU forage. Similarly, changing landscape composition through forestry also produces more NCU forage, and hydro reservoirs and major highways can act as movement barriers thus fragmenting caribou populations (Apps and McLellan 2006). Although research has shifted from limiting factors such as lichen and other forage supply to predator prey dynamics, several key components of caribou metapopulation dynamics remain unstudied. These include: 1) Dispersal among subpopulations 2) the habitat use and diet composition and factors limiting the distribution of alternate ungulates in caribou range 3) A synthesis of caribou ecology across scales and 4) Spatial partitioning among mountain caribou, moose, and wolves in the Columbia Mountains.

Below we provide a summary of our major findings, to date, for each of these objectives.

Caribou Dispersal

Dispersal behaviours are known to influence the risk of extinction for local populations and meta-populations. We analyzed a long-term dataset of radiolocation records to determine parameters of mountain caribou dispersal. Among 252 animals followed for 2 or more years, 8.3 % of the animals moved to new mating grounds at a distance greater than one home range from their initial breeding home range that we observed. Annual home ranges differed among age groups, and suggest that 2-year old caribou are more likely to disperse. Analysis of summer home range switching supported this notion, with all natal dispersal occurring among 2-year old caribou, but not 1-year old or 3-year old caribou. The average annual rate of breeding dispersal was 2.9 %, but dispersal rates were found to differ among sub-populations, with Columbia North caribou having the largest annual dispersal rate of 13.5 %. Dispersal distances were generally short relative to this species' body size and home range size. There were only 2 documented cases (0.8 % of animals) where dispersal resulted in potential gene flow among local populations. These results suggest that mountain caribou are not prone to dispersing often or far, and are therefore susceptible to negative issues associated with poor dispersal among local populations.
Limiting factors of alternate prey: The influence of forest cover on mule deer habitat selection, diet, and nutrition during winter in a deep-snow ecosystem

Recent research in western North America suggests that open forage areas are a greater limiting factor to mule deer abundance than closed conifer forests. However, much of this work was conducted in ecosystems prone to fire and low snow depths compared to the limits of mule deer range such as the Columbia Mountains, British Columbia, where snow is deep and fires are rare. We used snow track surveys as a measure of habitat use and fecal nitrogen as an index of dietary quality to compare the relative value to mule deer of open deciduous canopies to closed coniferous canopies in a wet ecosystem with deep snow and few fires. Deciduous canopies contain higher levels of understory forage compared to dense coniferous canopies, which are better at intercepting snow. We also evaluated food habits across landscapes with contrasting forest canopies. Results corroborated previous work in that foraging areas such as deciduous stands were strongly selected by deer, despite deeper snow relative to closed coniferous stands. Deer consumed fewer understory shrubs in coniferous-dominated stands, suggesting lower nutritional intake in these stands. Finally, deer appeared to derive a nutritional benefit in landscapes that had a higher proportion of open deciduous canopies, as indexed by fecal nitrogen. However, not all open canopy stands were of equal value to deer – Deciduous-dominated stands were selected, whereas clearcuts were avoided. Similarly, not all closed coniferous stands were equally selected: Cedar-hemlock stands were avoided whereas Douglas-fir stands were selected and indeed contained the highest proportion of deer tracks. We suggest that winter foraging areas have been underrepresented in management policy in British Columbia, but that snow-interception cover provided by coniferous stands still play a role in winter deer ecology in deep-snow ecosystems.

Scale-depandant synthesis

Here we summarize results of studies conducted at three different spatial scales ranging from broad limiting factors at the population level to studies describing the selection of feeding sites within seasonal home ranges of individuals. The goal of this multi-scale review is to provide a more complete picture of caribou ecology and to determine possible shifts in limiting factors across scales. Our review produced two important results. First, mountain caribou select old forests and old trees at all spatial scales, signifying their importance for foraging opportunities as well as conditions required to avoid alternate ungulates and their predators. Second, relationships differ across scales. For example, landscapes dominated by roads and edges negatively affect caribou survival, but appear to attract caribou during certain times of the year. This juxtaposition of fine-scale behaviour with broad-scale vulnerability to predation could only be identified through integrated multi-scale analyses of resource selection. Consequently we suggest that effective management strategies for endangered species require an integrative approach across multiple spatial scales to avoid a focus that may be too narrow to maintain viable populations.
Spatial partitioning among mountain caribou, moose, and wolves in the Columbia Mountains. The Southern Mountain population of mountain caribou (Rangifer tarandus caribou) is threatened in Canada, with predation the proximate cause of these declines. To reduce predation risk, caribou isolate themselves from predators and other prey species. I examined the spatial partitioning of mountain caribou, moose (Alces alces), and wolves (Canis lupus), and mortality sources of caribou in the north Columbia Mountains, British Columbia (2003 – 2006). Spatial separation between caribou and wolves was highest in late winter and lowest in spring and calving season. Engelmann spruce/subalpine fir forests, alpine areas, and old forests (> 140 yrs) were important variables that separated these species. The main predator of adult caribou was bears, with wolf predation increasing in importance after 2000. Wolf diet was comprised of moose (91 – 99%) with small relative proportions of caribou, deer and beaver. This information will provide critical information for effective wildlife management and planning caribou recovery strategies.

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