

Managing for Caribou Recovery 2 – Species Focus

Speaker Abstracts

Moving Genes Around: Considerations for caribou breeding and translocation programs

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Various caribou populations are declining in and outside protected areas. For example, caribou herds located in Jasper National Park (JNP) are at the quasi-extinction threshold mainly as result of wolf predation. Ecological conditions are now improving, and a breeding program could be considered, along the limited recovery options, to provide a reliable source of caribou for herd augmentation. Some source populations have been identified, so far based on ecological and genetic data, but limited to neutral molecular markers. Genomic studies, based for example on Single Nucleotide Polymorphisms (SNPs – including non-neutral marker too), can provide critical information, also accounting for actual genes in both source and captive bred stocks. We examined 30,000 SNPs across caribou herds, also including JNP, distributed throughout western Canada. Caribou were grouped in two main clusters, following a geographic separation further south than the currently accepted boundary between the barren-ground and woodland subspecies. Secondly, herds belonging to the southern group were clearly separated in boreal vs. mountain. Moreover, we detected genes under selection within each caribou group. Some of these genes were found to be linked to morphological characteristics, migratory behavior, and to habitat-selection and climatic factors. These findings suggest that specific mutations, resulting in different behaviours and ecologies, are maintained within caribou groups. Overall, we detected genetic mutations that any conservation plan needs to consider. Moving alien animals in areas with locally differentiated genes could have detrimental consequences. We therefore interpret our results in view of caribou breeding programs and evaluate applications to other threatened species.

Biosketch: Maria did her undergrad on Forestry at Padua University (Italy), a master's on Wildlife Management and Conservation also at Padua University. Then, she worked for the Adamello Brenta Nature Park on various species and now is a PhD candidate at the University of Calgary focusing on caribou conservation genomics.

Caribou on the Move: Identifying migratory behaviours to preserve intraspecies biodiversity

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Preserving intraspecies biodiversity is a fundamental conservation goal because it strengthens species adaptability. Conservation biology literature highlights the importance of examining the

concordance of ecological traits with genetic traits potentially of adaptive value since extirpation of locally adapted populations can concurrently result in the permanent loss of those adaptations. Across most of their range, caribou are declining, with some recent population extirpations. As populations decline and are lost, gene-to-environment associations are also at risk of disappearing. Migratory or sedentary movement behaviours are considered adaptive relative to local ecological conditions of barren-ground and woodland caribou populations (respectively). In addition, these behaviours may be genetically influenced. My research contributes to addressing an important question: is the presence of migratory movement behaviour associated to (a)genomic differences, (b)environmental factors, or (c)genomic differences when controlling for environmental factors? Through collaborations with government agencies of Alberta, British Columbia, Northwest Territories and Yukon, genetic and GPS telemetry data were obtained for 362 barren-ground and woodland caribou from 31 herds across Western Canada. Utilizing a Net Squared Displacement (NSD) approach, individuals were categorized as migratory or non-migratory based on patterns of movement behaviour. Despite the common description of woodland caribou as non-migratory, migratory behaviour was found to occur widely in woodland caribou populations. Populations may therefore be more behaviourally diverse and adaptable than previously thought. From these results, correlations of migratory behaviour with genomic traits and with environmental conditions are being evaluated. Specifying migration behaviours within populations may help refine conservation and management strategies to aid caribou recovery.

Biosketch: Jessica Theoret obtained a Bachelor of Science in Environmental Science with first class honours at the University of Calgary and is currently pursuing a Master of Environmental Design, also from University of Calgary. Theoret is a passionate Albertan dedicated to informative science, conservation and environmental protection in the province she calls home.

Woodland Caribou Calving Fidelity in Northern Ontario

Phil Walker, Jen Shuter, Ian Thompson, John Cook, Rachel Cook, John Fryxell, and Evelyn Merrill
Determining if woodland caribou express space-use fidelity during the calving period can have significant implications for land management coinciding in caribou ranges. If caribou express calving range fidelity, the protection of these regions may be critical to caribou persistence. Using GPS telemetry data, we evaluated calving fidelity at 1) the calving-range scale and 2) the birth-site scale. We used a movement-based, statistical approach to predict parturition events of GPS collared caribou within three distinct regions in northern Ontario. We determined that 56 individuals had multiple predicted parturition events across 2010-2014. First, we evaluated individual calving range fidelity using a Jaccard overlap index of 95% utilization distributions (UD) calculated for the calving period (1 May to 30 June). Mean individual Jaccard overlap index values were 0.24 ± 0.19 (\pm SD) indicating moderate range fidelity, with values ranging from 0 to 0.85. Secondly, we evaluated inter-annual birth-site fidelity by comparing the Euclidean distance between an individual's two birth-sites to 10,000 random distances generated between the individual's two calving 95% UD. Forty-seven percent of individuals had significantly closer birth-sites compared to random distances with a mean distance between birth sites of 1.7 ± 1.4 (\pm SD) kms compared to 18.7 ± 17.4 (\pm SD) kms for individuals with birth-site distances not significantly shorter than random

distances. We identified substantial individual variation in calving-area and birth-site fidelity, which supports the inconsistency associated with site fidelity previously observed in woodland caribou. Therefore, as a conservative approach we recommend the protection of woodland caribou calving areas.

Biosketch: PhD Candidate at the University of Alberta studying woodland caribou and in my spare time I enjoy photography.