AN INTERDISCIPLINARY APPROACH TO DESCRIBING BIOLOGICAL DIVERSITY

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I would like to express heartfelt gratitude to the communities of the Sahtú region for their generous hospitality and for always making me feel welcome.

Máhsci Cho.
BACKGROUND

September 18, 2012
Ɂehdzo Got’ıñę (RRC)
Gathering in Fort Good Hope

In September 2012 the Ɂehdzo Got’ıñę (Renewable Resources Councils) passed a joint resolution that called for a renewed commitment to adopt traditional knowledge and Dene law as the guiding principles in caribou research. This resolution is the origin of the caribou research described in this thesis.
The Dene concept of learning together has been a useful approach from which to view this collaborative research project.
THESIS ORGANIZATION

Introduction

Chapter 2: Łeghágots'enetę (learning together)

Chapter 3: Ancient diversification in glacial refugia leads to intraspecific diversity

Chapter 4: Creative convergence: exploring biocultural diversity through art

Conclusion
Chapters 2, 3 and 4 have been published in academic journals and include community collaborators as co-authors.


Recognizing and describing patterns of animal and plant life in the world – also known as biodiversity – is fundamental to understanding our environment and to the field of conservation biology.
People in all cultures use language to describe *kinds* of things and to organize patterns of repetition found in the world.

Different languages and knowledge systems can provide complementary descriptions of biodiversity.

Indigenous knowledge holds detailed information about the environment that has been largely overlooked by outside scientists.
Social-ecological systems are dynamic relationships between human cultures, living things and environments.

Biocultural diversity highlights the interactions between human diversity and the diversity of biological systems.
Caribou are central to the livelihoods and identities of indigenous people.

Caribou have different behaviors, fur colors, and life-styles in different places. Understanding and describing this variation has been difficult.

Interdisciplinary research approaches can be used to help describe caribou types and the interdependent relationships between people and wildlife in complex social-ecological systems.

In this dissertation I use multiple methods to describe caribou in the Sahtú. These methods include population genetics, phylogenetics, traditional knowledge, Dene language, and visual approaches.

A collaborative process of research that facilitates ḥeghágots’enetę (learning together) has the potential to produce sustainable conservation solutions, develop effective wildlife management policies, and ensure caribou remain an important part of the landscape.
Mind-map of research themes (presented in Chapter 4).
INTERDISCIPLINARY APPROACH

Working collaboratively with communities and understanding biocultural social-ecological systems requires a flexible, creative and interdisciplinary research approach.

Our research methods included community-based participatory research, language-based methods, population genetics, phylogenetics and visual facilitation.
COMMUNITY-COLLABORATIVE METHODS

1. Partner with ᖃᖃᐃᓐᓂᐊᖅᐳᖅ ᐅᓂᑦᑎᐊᖅ
   Gots’ę Nákedı & ᖃᖃᐃᓐᓂᐊᖅᐳᖅ ᐅᓂᑦᑎᐊᖅ

2. Community-based caribou scat collection

3. Genetic Analysis

4. Knowledge Sharing Meetings
Our project was initiated through collaborations with the SRRB and the RRCs. We held planning meetings to develop research priorities, questions and methods. We developed a Memorandum of Understanding with each RRC to confirm the governing principles of the research.
Our project was unique in that we worked with community members to noninvasively collect scat (poop) samples and we paid people $25 gift cards for gas for every pile of caribou scat they collected.
To understand caribou population structure we analyzed the outside of the scat samples. We use two markers: nuclear DNA that provides a more recent snapshot of caribou variation and mtDNA that provides information about ancestral lineages of caribou.
To ensure a collaborative production of knowledge we engaged in deliberate co-analysis of our data with an advisory group. We discussed themes, language, and ideas in two separate 3-day meetings to clarify and develop important concepts.
The advisory group helped identify Dene concepts, interpret results in collaboration, work across disciplines, and support the research process.

Members of the advisory group also co-authored reports and publications, helped review manuscripts, co-presented results and reviewed other products of the research.
There are three main types of caribou in the Sahtú region.
Charles Oudzi, of Colville Lake, collects caribou scat (poop) samples on Tets’ehxe (Drum in the Shúhtagot’ı̨nę Ngį́nį́ (Mackenzie Mountains). Caribou scat samples provided non-invasive genetic information that was used to analyze the connectivity and relationships between different caribou populations.
SCAT SAMPLES

We collected over 1000 caribou scat (poop) samples

Over 100 people participated

996 scat samples were amplified

We identified 555 unique individual caribou
We found support for three genetic groups of caribou in the region using genetic analysis.
The genetic differentiation corresponded to the caribou types recognized by Dene people.
The chapter examines how traditional knowledge, Dene language, and cultural practices help us understand the evolutionary processes that have maintained and created caribou diversity in the Sahtú region.

The genetic analysis groups caribou into types that correspond to the caribou types recognized by Dene people: t̤odzì (boreal woodland caribou), Ḏekwē (barren-ground caribou), and shúhta Ḏepē (mountain caribou).

We present culturally respectful and relevant descriptions of caribou variation through partnerships that respect the lives and experiences of people that depend on the land.

The research makes the case that by prioritizing mutual learning, researchers can broaden their understanding of biodiversity and establish a common language for collaboration.
The glacial-interglacial cycles of the last ice age have shaped the three types of caribou in the region: tǫdzì (boreal woodland caribou), ᐄekwę (barren-ground caribou), and shúhta ᐃepę (mountain caribou).

We used a computer simulations to find out whether tǫdzì first came to the Sahtú after the ice age from south or north of the ice sheets.

Results reveal that Sahtú tǫdzì evolved independently from the northern lineage. This contrasts with tǫdzì from southern Canada which belong to a lineage known to have come from south of the ice sheets – in what is present day USA.

The results are an example of intraspecific parallel origins in caribou and contribute important insights into the history of caribou during the last ice age.
This chapter examines how art and other visual techniques can be used to develop robust cross-cultural collaborations and help us display the importance of biocultural diversity.

We provided ideas for using illustrations, diagrams, drawings and other visual aids to increase research potential during all stages of the research process.

Results point to the potential for art to be used to improve communication, participation, and knowledge production among interdisciplinary research collaborations and across language and knowledge systems.
CONCLUSIONS

The research outlines comprehensive descriptions of caribou populations that reflect biocultural diversity and strengthen cross-cultural collaboration.
Including Dene language helps to strengthen people’s relationship with wildlife.

Language acknowledges traditional stewardship systems.

Using Dene language has the potential to allow for the development of common-ground from which new relationships can form.
There are likely important adaptive traits that are necessary to retaining caribou variation in the Sahtú.

Sahtú tọdzị are especially unique and adapted to the forest of the Sahtú.
The results will help with the Sahtú ṯədzį federal recovery planning process lead by the GNWT.

The research has helped with the development of community-based caribou management plans.

Results challenge the appropriateness of using Designatable Units to describe caribou across Canada.

We show that researchers must include traditional knowledge and Indigenous languages in the development of policies related to the Species at Risk Act.
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~ Jean Polfus

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