

Effects of Development on Caribou: Insights from *Inuit Qaujimagatuqangit* and an Ecological Model



B Adjun, P Anablak, R Atatahak

C Stevens, J Virgl, D. Panayi, G Clarke

N. Thorpe

KHTO





Outline

- Project Summary
 - Objectives, Capacity-Building, Methods, Results
- Research Questions
- Key Findings

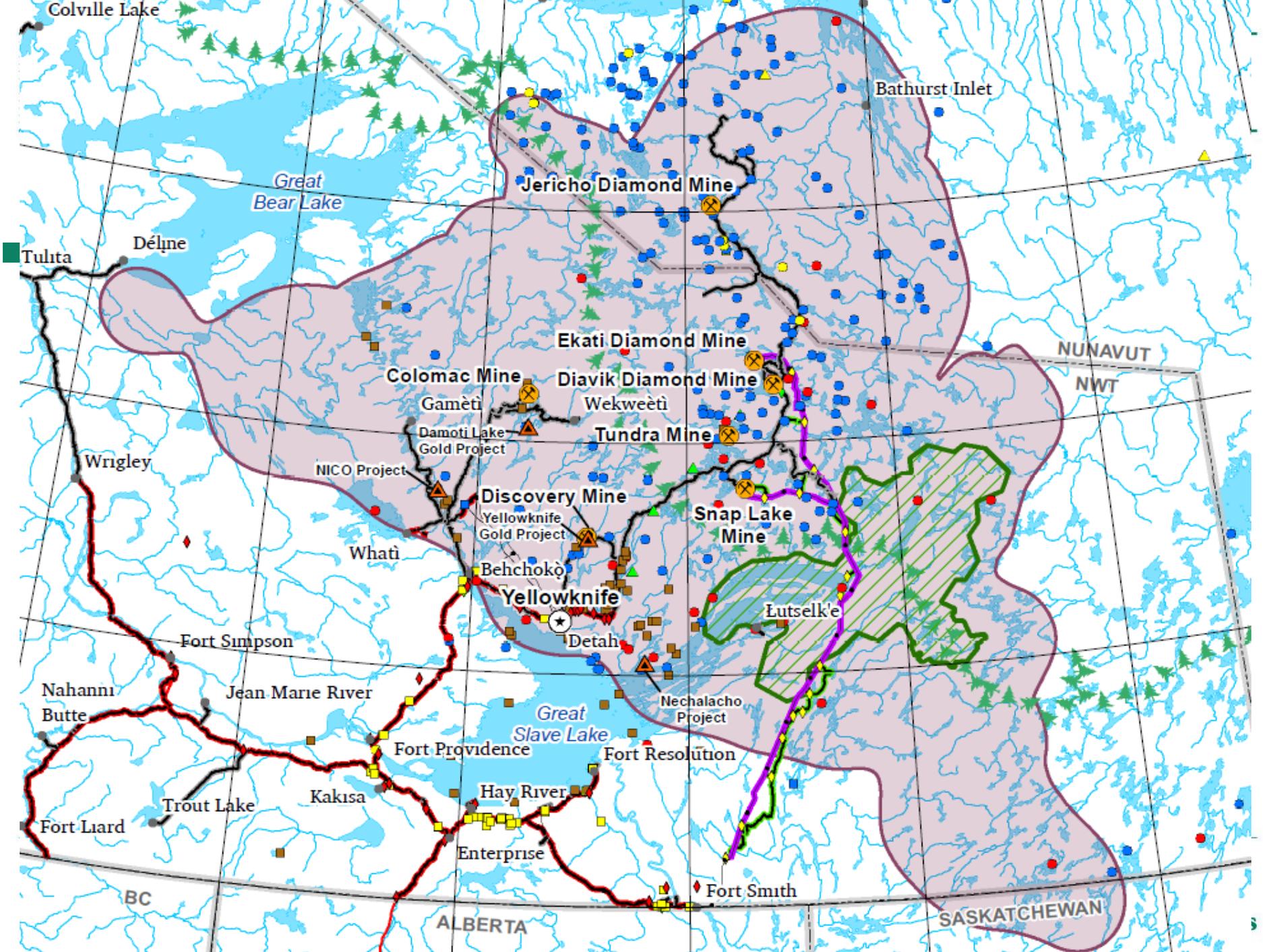
KHTO





Barrenland caribou ranges







Objectives

- KHTO wanted to use both western science and Inuit Qaujimaqatugangit (IQ) to investigate questions related to the effects of development on barren-ground caribou
- Train community researchers in both research methods



KHTO





Scientific Research Questions

- How many times do caribou encounter mine developments during migrations?
- Are caribou encountering more developments over time?
- What are the cumulative encounters of developments for caribou energetics and reproduction?
- Are energetic costs from development similar to those insect harassment?
- How do caribou behave when they encounter a mine?
- Do movements rates increase when caribou encounter a development?
- Do migratory paths become less predictable when animals encounter a development?



IQ Research Questions

- What is going on with caribou?
- How are caribou affected by development and human disturbance?
- What should we do about?



KHTO





Methods

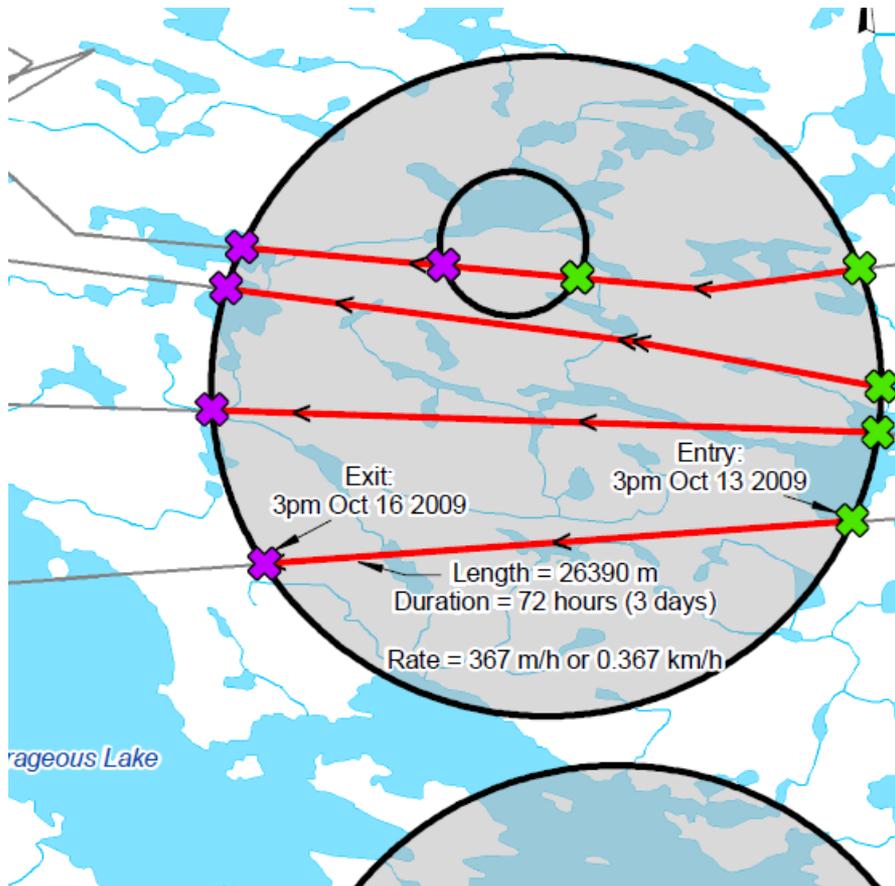
- *Scientific Component:* energetics model, spatial data collected from long-term monitoring of collared animals
 - Calculate the potential number of sensory disturbances on the landscape (through encounter rates and residency times) based on GIS methods and collar data
 - At this stage and scale, model is an exploratory tool
- *IQ Component:* semi-directed interviews
 - Collaborate with KHTO to prepare draft questionnaire and protocols on data use, storage and access
 - Carry out and verify interviews (n=9)

KHTO





Key Findings from Model



- Used GNWT collared caribou data, 138-day exposure period
- Identified encounters with development Zone Of Influence
- Estimated energy loss from encounters at about 0.047 kg/disturbance
- Compared to 0.15 kg/day of potential insect harassment
- Bathurst cows may encounter up to 19 disturbances, may lose up to 0.5 kg (assumes strong response to most events)
- 44 days of high insects = 6.6 kg loss of body mass

KHTO





Key Findings from IQ

- Effects from **environmental change** were cited as having the most significant influence on barren-ground caribou
- Effects from development were typically considered in the context of **cumulative effects**



KHTO





Key Findings from IQ

- Developments are influencing changes to movements and migration routes
 - Attractant
 - Deterrent



KHTO





Cumulative Effects: Habituation

- *Wherever there is human activity, the caribou are aware of their surroundings. Some do become skittish, while some become used to human development and it doesn't bother them (Anonymous).*
- *The young caribou are growing up with the developments versus the older caribou so they are used to it and becoming more accustomed to it (Anonymous).*



Coming Together

Study Question	IQ	Energetics Model
<p>How many times do caribou encounter mine development during migrations?</p>	<p>There were no quantitative data identifiable through the IQ literature review or interview process. However, several accounts were recorded of caribou interacting with mine (and other) developments.</p>	<p>Based on the information relating to the period from 1996 through 2009 the mean encounter rate with a zone of influence was 9.0 encounters per 138 days (SD = 9.5) for female caribou. Mean encounter rates have increased from 2.9 encounters per 138 days during baseline conditions in 1996 to 13.8 encounters per 138 days in 2009.</p>
<p>Are caribou encountering more mine developments over time?</p>	<p>There were no quantitative data identifiable through the IQ literature review or interview process. However, several accounts were recorded of caribou interacting with mine sites such as Echo Bay and Lupin, suggesting that interactions with developments are not entirely a recent phenomenon. No discernible information relating to an increase or decrease in encounters with mine developments was identified. However, interviewees offered the qualitative observation that caribou can't help but encounter more developments due to the increased number.</p>	<p>Yes, based on the information relating to the period from 1996 through 2009 there is an increase in both the frequency and duration of caribou and development zone of influences. Mean annual encounter rates have increased 4.5-times from 1996 to 2009. For comparison, the proportion of the summer to autumn range in ZOI cover has increased only 1.4-times during the same time period. Also, the proportion of range in ZOI cover was not necessarily correlated with encounter rates. For example, mean annual encounter rates with ZOIs peaked in 2003 at 19.7 encounters per 138 days, whereas the proportion of summer to autumn range in ZOI cover peaked in 2006 at 6.0%.</p>
<p>What are the implications of cumulative encounters with developments for energetics and reproduction?</p>	<p>Qualitative observations documented through the interviews and literature review suggest that cumulative encounters are having an impact on energetics and reproduction. Some interviewees commented that increases in developments are directly responsible for lower reproduction due to changes in movements and rutting and calving behaviour. Other interviewees did not link development to changes in energetics and reproduction.</p>	<p>The implications for caribou energetics and reproduction (i.e., parturition rate) appear to be minor if there are only 20 encounters, on average, with sensory disturbances. Our energy model predicted that one disturbance event results in an expenditure of 1.69 MJ or 0.0471 kg, and therefore, hundreds of such disturbance events are required to have a noticeable impact on the autumn body weight of an 80 kg cow.</p>
<p>What are the relative effects of sensory disturbances versus insect harassment?</p>	<p>There were no direct comparisons between sensory disturbances versus insect harassment made during the IQ interviews. Sensory disturbances were discussed less frequently than environmental change, for example changes in insect activity.</p>	<p>Bergerud et al. (2008) argues that the effect of sensory disturbances on caribou are relatively insignificant compared to the stress the animals sometimes face by oestrid flies. Our results also emphasize the relatively minor influence of existing active developments on energetics. For example, the effects of an average year of insect harassment on weight loss was over 3.4-times higher than the effects from the maximum (annual) number of sensory disturbance events.</p>



Coming Together

- Monitoring at mines showed that caribou behaviour is changed closer to developments and disturbances: IQ provided further insight into exactly how this behaviour changes
- The scientific modeling was based on a very conservative approach, where extreme examples were used whenever there was uncertainty. IQ does not operate in this fashion, and thus may be more precise.
- The scientific modeling looks at large-scale changes at the herd level. The IQ focuses on observations of specific groups of caribou by individual hunters.
- Our research shows that TK and science can both contribute meaningful input and are often complementary rather than overlapping. A full discussion of a topic such as caribou requires both ways of knowing.



Final Thoughts

- *Things have changed. The first time I ever saw a kabloonag (white person), I cried. Now I don't. Just like the animals and everything on the land, everything has changed now (Alice Ayalik)*
- *The worlds' problems are too complex, and the threats are too immanent to work alone. Only by joining together will we be able to truly understand the interactions between people, culture and nature (Drew and Henne 2006)*

KHTO





Quana and Quanamik!

- Elders and hunters: Alice Ayalik, Colin Adjun, Charlie Bolt, John Ivarluk, Bobby Kakolak, Laura Kohoktak, Allen Niptanatiak, Joseph Niptanatiak and Anonymous
- Support: Barb Adjun (KHTO) and Grant Clarke (Golder)
- Funding: KIA and NWMB
- IQ Component Contacts
 - kugluktukhto@qiniq.com
 - nt.thorpe@gmail.com
- Science Component Contacts
 - cstevens@golder.com
 - jvirgl@golder.com
 - dpanayi@golder.com



KHTO

