



COMMUNITY-BASED MUSKOX AND CARIBOU HEALTH MONITORING

ACTIVITY UPDATE – OCTOBER 2023

STRESS LEVELS IN QIVIUT: A RELIABLE TOOL TO MONITOR MUSKOX HEALTH?

PARTNERS



Kugluktuk Angoniattit Association



Olokhaktomiut Hunters and Trappers Committee



Ekaluktutiak Hunters and Trappers Organization



WHAT DID WE DO?

This project focused on measuring stress levels in muskoxen and determining if stressed animals are more likely to be in poor health or in declining populations.

When a muskox is stressed, it releases a hormone called cortisol that is incorporated into the hair (qiviut and guard hairs) during its growth.

First, we developed and validated a method for quantifying stress levels in qiviut (Figure 1). For this, we did an experimental study on captive muskoxen at the University of Alaska Fairbanks to assess whether an increase in stress levels is actually reflected in qiviut. Through this, we confirmed that the stress levels measured in qiviut accurately represent the stress experienced by the animal during the time of the hair's growth.



Figure 1: Qiviut sorting from guard hairs.

Second, we measured stress levels in 211 qiviut samples collected between 2015 and 2019 by hunters from Kugluktuk, Ulukhaktok, and Cambridge Bay through the sampling kits of the monitoring program. We evaluated how qiviut stress levels are related to other measures of the health of individual animals, such as body condition or infection intensity of both gastro-intestinal parasites and lungworms.

Finally, we documented traditional Inuit knowledge on the stressors affecting muskoxen through seven small group interviews with muskox hunters in Kugluktuk in 2019, and discussed the sex, seasonal and annual differences observed in qiviut stress levels. Findings were confirmed through validation sessions the following year.

WHAT DID WE FIND?

We found that qiviut stress levels were higher in males than in females, lower in 2016 and 2017, and higher in 2015 and 2018. Qiviut stress levels were also higher on Victoria Island than in Kugluktuk, and even higher on the Kent Peninsula (Figure 2). These findings were consistent with muskox population trends. The lower qiviut stress levels in Kugluktuk matched where the muskox population is stable to increasing, and higher levels on Victoria Island matched



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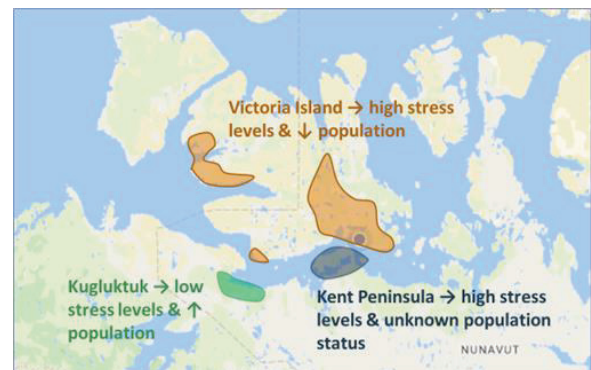
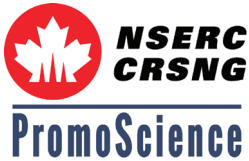


Figure 2: Geographical differences in muskox qiviut stress levels.

FUNDERS



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where the population is declining. Unfortunately, the muskox population status for the Kent Peninsula is unknown. Regarding individual animals, increased qiviut stress levels were associated with decreased marrow fat (body condition). The relationship between qiviut stress levels and infection intensity of the lungworm *Umingmakstrongylus pallikuukensis* (*Up*) varied depending on the geographical location. In Kugluktuk, qiviut stress levels increased as *Up* infection intensity decreased. This is likely due to the long-term lungworm-muskox relationship, with almost 100% of muskoxen infected and high infection intensities. In contrast, we found no relationship on Victoria Island, which may reflect minimal parasite cost and consequences at low infection intensities. There was also no relationship between qiviut stress levels and other bacteria and parasite exposure/infection intensity measures, or with incisor breakage.

During the interviews, a main discussion point was around how the world is changing. Within this changing world, we classified the factors that participants indicated as affecting muskoxen into three interlinked categories: the physical environment, which includes weather and climatic factors; the biological environment, which comprises plants and animals; and the human/muskox interactions (Figure 3). We also talked about the stressors that likely contribute to the seasonal, annual, and sex-based variations in measured qiviut stress levels. Factors potentially explaining the seasonal differences of higher qiviut stress levels in the fall and winter than in the summer are presented in Figure 4.

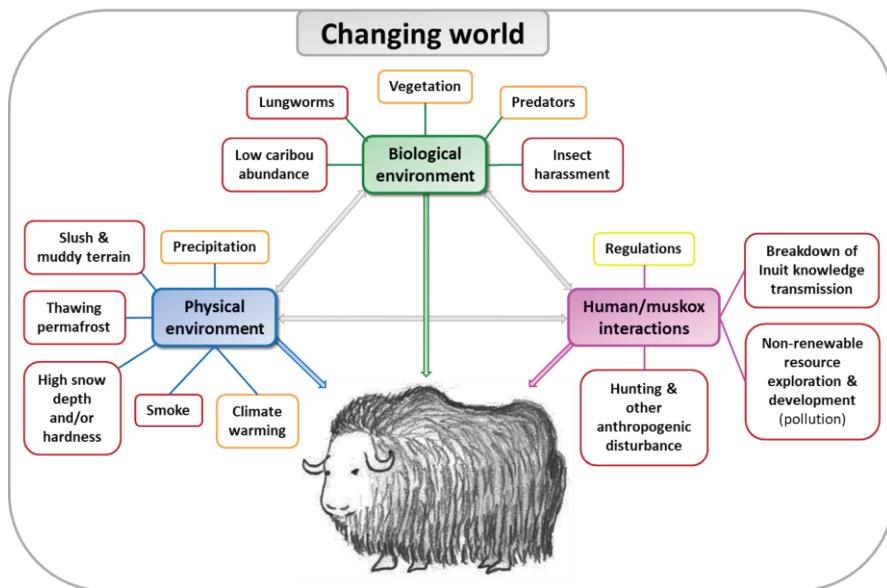


Figure 3: Factors affecting muskoxen negatively (red), positively (yellow) or both negatively and positively (orange).

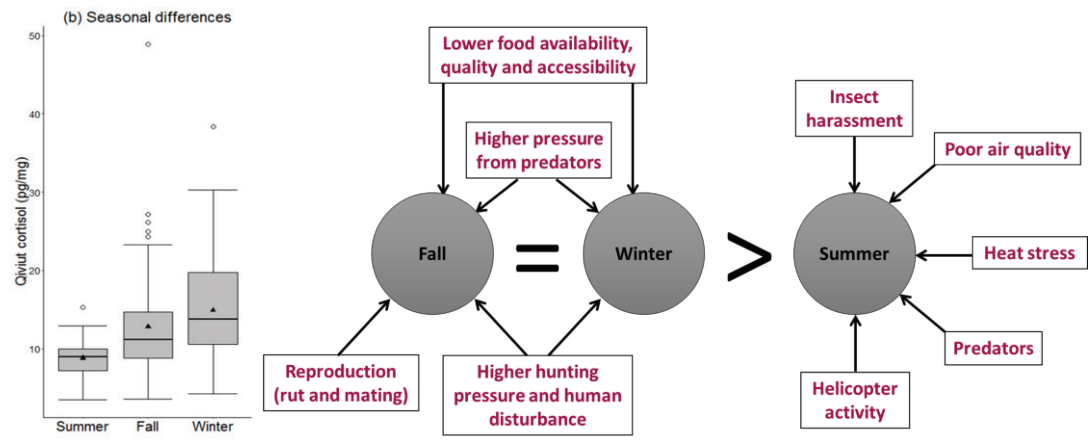


Figure 4: Seasonal variations in muskox qiviut stress (cortisol) levels and potential factors contributing to the differences.



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WHY DOES THIS WORK MATTER?

We mostly focused on evaluating associations between qiviut stress levels and individual measures of health, but our results also suggest differences in qiviut stress levels among geographical locations that are consistent with the local muskox population trends. Gathering long-term data from additional muskox populations for which population trends are known would help us confirm these relationships between population trajectory and qiviut stress levels. If they are consistent, **qiviut stress levels could be used as a tool to monitor muskox population health**. Additionally, if qiviut stress levels increase before population declines or mortality events, these measures could be eventually used as **tools to predict population health**, and inform management and conservation actions pro-actively.

The interviews provided invaluable insights on the factors affecting muskoxen and were a unique opportunity for knowledge exchange with hunters, many of whom were participating in the monitoring program. For example, the participants' accounts allowed to establish that the negative effects of insect harassment on muskoxen are probably limited but non-negligible. Posters presenting more details from this study are available at the HTO.

THANK YOU TO ALL THOSE WHO MAKE OUR RESEARCH IN THE ARCTIC POSSIBLE

For over 10 years the Kutz Research Group, the communities of Ulukhaktok, Kugluktuk and Cambridge Bay (Ekaluktutiak), the Government of Nunavut, the Government of the Northwest Territories, and Canada North Outfitting, have been partnering to investigate and monitor wildlife health on Victoria Island and the adjacent mainland. The results presented here are a direct result of this program. We thank all our collaborators and funders. Please contact Susan Kutz skutz@ucalgary.ca if you have any questions about this program.



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