



Muskox and Caribou Health Monitoring Program

ACTIVITY UPDATE AUGUST 2019



UNIVERSITY OF CALGARY
FACULTY OF VETERINARY MEDICINE



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Update prepared by Fabien Mavrot and Susan Kutz

Cover picture credit: Xavier Fernandez Aguilar

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Activity Update August 2019

Introduction

The Muskox and Caribou Health Research Program is a collaborative program among universities, communities, industry and territorial and federal government agencies. The program was initiated in 2008 in response to the apparently changing health status of muskoxen. At that time, the muskox lungworm, *Umingmakstrongylus pallikuukensis*, was detected in muskox samples submitted from a community hunt on southwest Victoria Island; this suggests a range expansion of the parasite towards the north. In addition, the bacterium *Erysipelothrix rhusiopathiae* was identified for the first time in muskoxen and was implicated in multiple severe die-offs in muskox populations from Banks and Victoria Island in 2009-2013. In response to these health changes, we launched a collaborative, multifaceted research program with the aim of understanding the general health of muskoxen in this region. The program has grown and evolved over the years and strives to bring traditional, local and scientific knowledge together to better understand the health of muskoxen and caribou.

The research that we've accomplished to date has only been possible because of the collaboration among communities, governments, universities and the qiviut and sport hunting industries. We thank all the individuals and organizations that have contributed to this work and look forward to working with you further. In the following pages, you will see a brief overview of the various projects that are currently underway as well as contact information for the researchers involved.

Please feel free to contact me about the overall project and with any questions or concerns you may have.

Best,

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Hunter-based sampling: what are we collecting from muskoxen and caribou, and why?

Information such as sex, age class and location of the sampled animal, backfat measurement and observations of any abnormalities provide additional information on the muskox and caribou populations.

MUSKOX SAMPLING COLLECTION	
SEX:	<input type="checkbox"/> Male <input type="checkbox"/> Female
AGE:	<input type="checkbox"/> Adult <input type="checkbox"/> Subadult <input type="checkbox"/> Juvenile
WEIGHT:	<input type="text"/>
HEIGHT:	<input type="text"/>
BACKFAT:	<input type="text"/>
TOOTH WEAR:	<input type="checkbox"/> Good <input type="checkbox"/> Fair <input type="checkbox"/> Poor
HAIR:	<input type="checkbox"/> Good <input type="checkbox"/> Fair <input type="checkbox"/> Poor
SCARS:	<input type="checkbox"/> None <input type="checkbox"/> Some <input type="checkbox"/> Many
OTHER:	<input type="text"/>

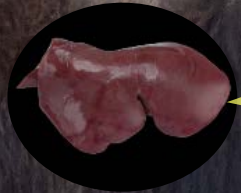
Bad teeth seem to be an increasing problem in muskoxen from Victoria Island. Examination of the **lower jaw** can help us investigate the reasons behind that.

Collecting **blood** on filter papers allows to test if the animal has been in contact with different disease agents.



Qiviut/hair, is used to evaluate the stress and trace mineral status of the animal. Stress hormone levels may indicate disease, nutritional problems, disturbance or other environmental pressures. Trace minerals are essential for growth, reproduction and immune function.

We analyze the **liver** to measure trace mineral levels and to detect toxins or contaminants that can damage the animal.



Droppings contain indicators of stress and can be used to detect parasites such as lungworms.

The **bone of the lower hind leg** can serve as an index of body size, the bone marrow is used to evaluate fatness and the skin tested for parasites. The hoof is also examined for abnormalities.



Community-based monitoring program in Ulukhaktok

What is this about?

We are collaborating on a project led by the Olokhaktomiut Hunters and Trappers Committee (OHTC) to improve the capacity of the community to conduct its own caribou and muskox monitoring program.

Denise Okheena and Mitchell Inuktalik have been hired as local monitors by the OHTC and were trained by a researcher from our group, Fabien Mavrot, to process the sample kits, follow-up with the harvesters in case of missing information, manage the project database and analyze the jaws collected by the harvesters.



Filling a sample kit questionnaire.

How is it going?

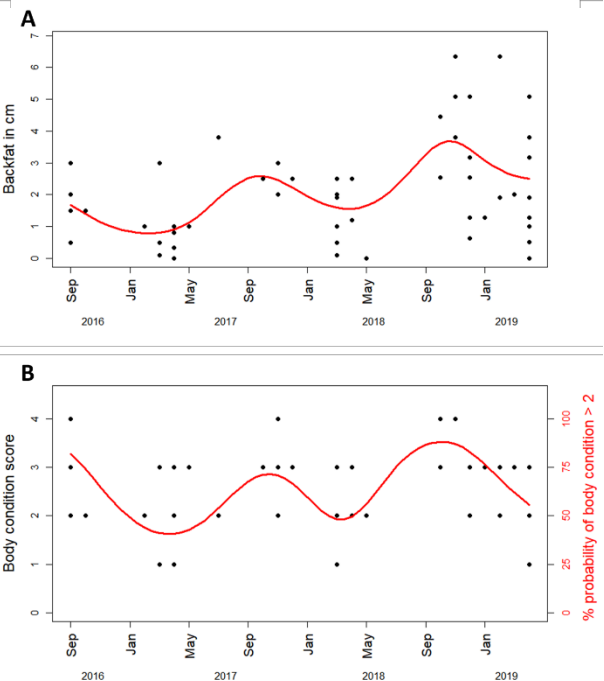
Altogether, 28 muskox and 3 caribou sample kits have been collected and processed so far. Having a monitor following up directly with the harvesters improved greatly the sample collection effort and the quality of information gathered. The samples have been shipped to our lab in Calgary and are currently being analyzed.

We used the sample kit questionnaires to look at the trend in body condition of muskoxen sampled since 2016 using both the backfat measurement and the evaluation of the harvesters (“skinny”, “not too bad”, “fat”, “really fat”). We found that both methods give similar results and a possible trend for increasing body condition.

What’s next?

We hope to collect additional caribou kits during this fall and include them in our research. The project monitor will conduct interviews with harvesters from the community to complement the scientific knowledge gained through the sample collection and analysis. Finally, we plan to have another meeting with all project partners to evaluate how the project went, discuss the results, and plan for the future of muskox and caribou health monitoring in Ulukhaktok.

Body condition in muskoxen around Ulukhaktok



Data from the sample kit questionnaires: body condition of muskoxen sampled in Ulukhaktok since 2016. Above: backfat measured by harvesters. Below: evaluation of the harvester using categories.

Traditional knowledge on Dolphin and Union caribou

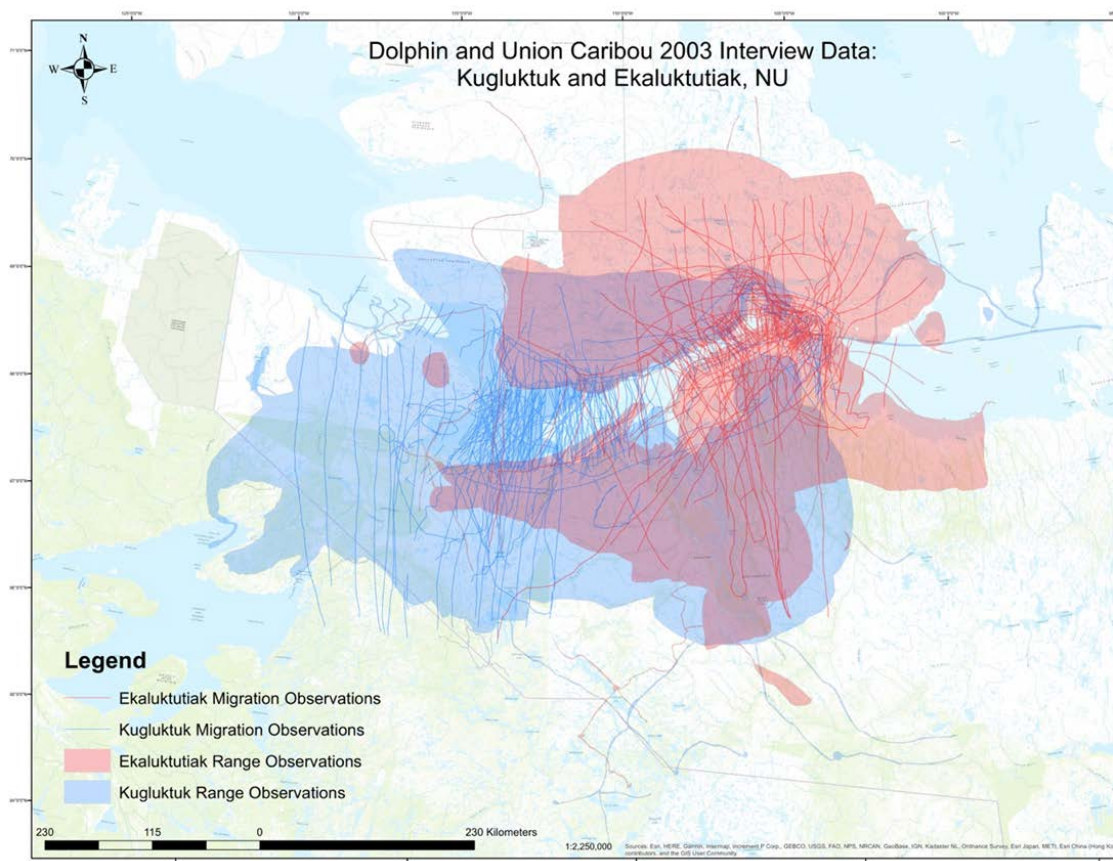
What are we doing?

To better understand the recent decline in numbers in Dolphin and Union caribou population, Ph.D. student Andrea Hanke has been analyzing interviews conducted in 2003 in Kugluktuk and Ekaluktutiak (Cambridge Bay). Interviewees in 2003 recorded their observations of caribou migration and habitat use, as well as drawing locations on maps. There were some differences in caribou health, distribution and abundance observed between communities

Andrea also interviewed traditional knowledge holders in Kugluktuk in 2017/2018 to learn more about the present-day status of Dolphin and Union caribou. She is currently analyzing these data.

Why is it important?

Andrea's research will help to document the **voices of traditional knowledge holders** to better understand which factors impact Dolphin and Union caribou numbers and develop better and quicker ways to measure changes in the populations.



Migration roads of Dolphin and Union caribou based on Traditional knowledge collected in 2003 in the communities of Kugluktuk (in blue) and Ekaluktutiak (Cambridge Bay, in red). Purple shading indicates area observed by harvesters from both communities.

Understanding bad teeth in muskoxen using CT-scans

What's the issue?

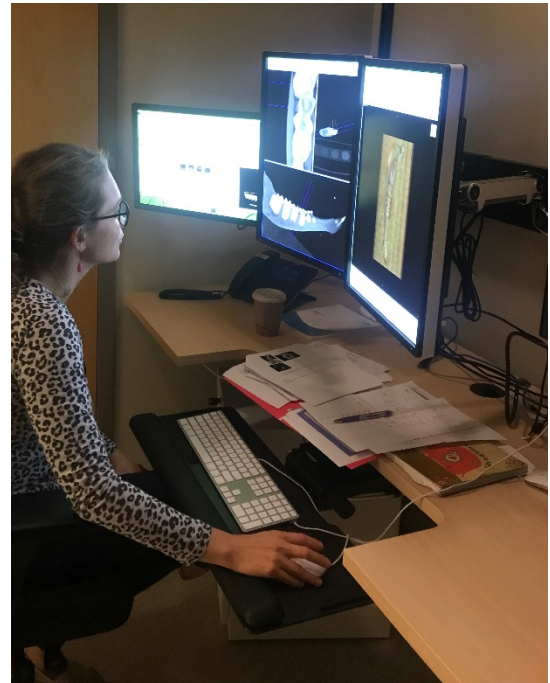
We have found that muskoxen on Victoria Island have a higher frequency of broken front teeth in comparison with the past (1989-91) and to animals from the mainland near Kugluktuk. This may be an issue as animals need good teeth to feed correctly and stay healthy.

We don't know yet what causes the breakage of the teeth: Is it due in a **change in the environment and plants** that the muskoxen eat? Are teeth of the muskoxen **less resistant and more breakable**? A first step toward answering those questions is to examine thoroughly the jaws and teeth of the animals, including the bones and the enamel (the substance that makes the teeth hard).

What are we doing?

We did CT-scans on 100 muskox jaws (a technique similar to X-ray). This technique allows us to see the teeth and other parts of the jaws underneath the gum that we cannot observe with the naked eye.

Now a radiologist: Dr. Zamora is examining the CT-scans to better understand why some animals have a lot of broken front teeth.



Examining CT-scans of muskox jaws.

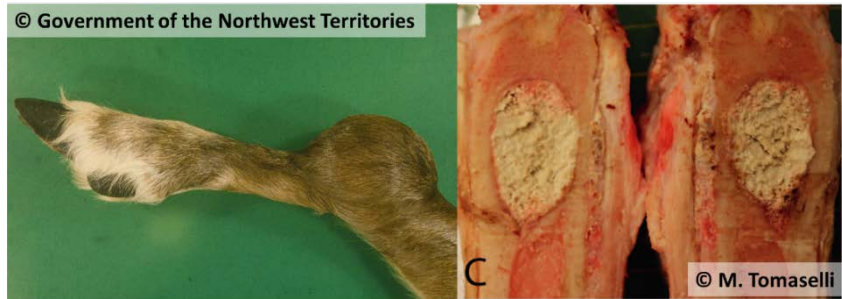


Front teeth of a muskox: left: camera picture, right: CT-scan. Note that some broken teeth (arrows) are hidden under the gum and cannot be seen on the camera picture.

Brucella in muskoxen from the Canadian Arctic

What's the issue?

Brucella is a bacterium that can infect many species of the Arctic such as caribou, muskox, dog, or human. Typically, *Brucella* will affect joints, mammary glands, and reproductive organs, causing abortion, infertility, and limping. However, the bacteria can also affect other organs such as lymph nodes or bones.



Brucella lesions. Left: in the joint of a caribou; right in the bone of a muskox.

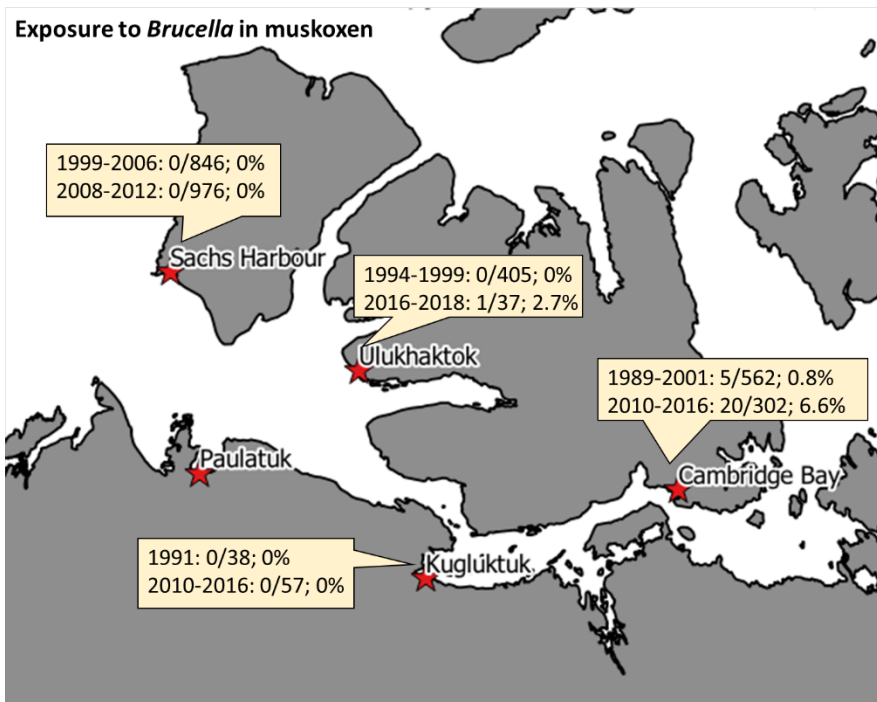
In our latest publication, former Ph.D. student Dr. Matilde Tomaselli used a combination of local/traditional knowledge and blood sample analysis to document a **recent increase in exposure to *Brucella*** in muskoxen around Cambridge Bay and Ulukhaktok. We continue testing all animals sampled by harvesters to get a better understanding of its occurrence in caribou and muskoxen around Ulukhaktok.

Caribou and muskoxen can both get brucellosis. It is important for harvesters to report any animal with *Brucella*-like lesions (swollen joint, mammary or testicle, multiple abscesses in the body).

If you are worried that you may have been exposed to an animal infected with *Brucella*, please contact health professionals.

Additional information on Brucellosis and other diseases of wildlife can be found at:

https://www.enr.gov.nt.ca/sites/enr/files/field_guide_wildlife_diseases.pdf



Over 3000 muskoxen sampled between 1989 and 2018 were tested for exposure to *Brucella*. The number of positives/number of tested is given along with the percentage of positive animals (%).

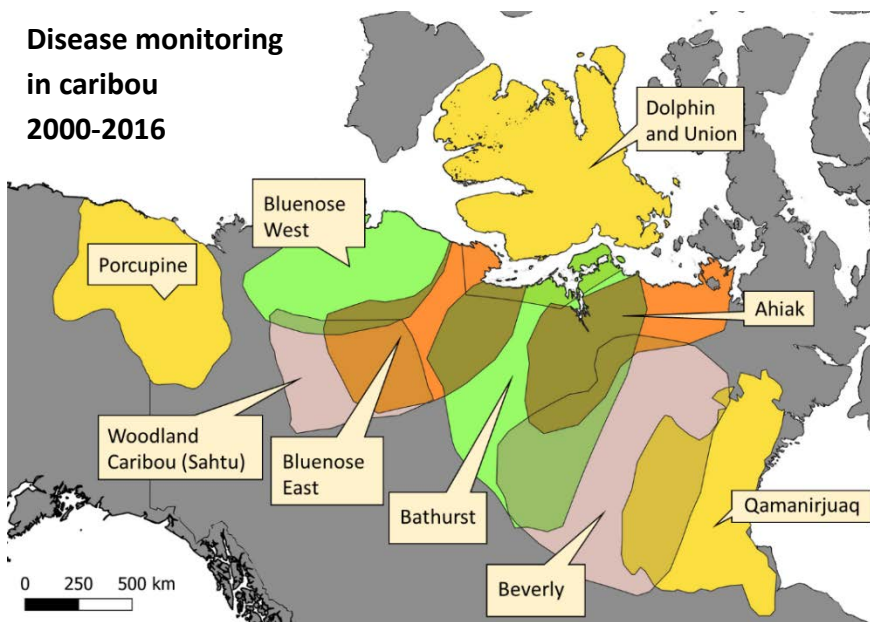
Reference:

Tomaselli et al, 2019. A Transdisciplinary Approach to *Brucella* in Muskoxen of the Western Canadian Arctic 1989–2016. *EcoHealth* doi: 10.1007/s10393-019-01433-3.

Monitoring exposure to diseases in caribou

What's this?

We regularly monitor for different known diseases in caribou and muskoxen that are sampled through the community-based caribou and muskox monitoring programs. To get a broader understanding of what diseases are present in caribou across Canada, we tested several archived samples from multiple different herds. Part of this work by our former postdoc Anja Carlsson was recently published: [Multi-pathogen serological survey of migratory caribou herds: A snapshot in time](#). This study is the result of a large-scale collaboration between numerous Inuit and First Nations harvesters, government biologists, academics, and the CARMA network (<https://carma.caff.is/>).



Summary of the analysis of over 700 caribou blood samples collected in 2000-2016. The table indicates the percentage of caribou that were exposed to different disease agents in each herd. We also provide a description of the effect of the disease agents, as it is known in livestock, and whether they can infect human. "NA" indicates that no results were available.

	Pathogen	Main impact on livestock	Transmissible to human ?	Porcupine	Woodland Caribou (Sahtu)	Blue Nose West	Blue Nose East	Dolphin and Union	Bathurst	Ahiak-Beverly	Qamanirjuaq
Bacteria	<i>Brucella suis</i> biovar 4	Abortion, weak calf, joint disease	Yes	Negative	NA	<50%	<50%	<50%	<50%	Negative	Negative
	<i>Erysipelothrix rhusiopathiae</i>	Joint disease, skin lesions, acute death, abortion	Yes	<50%	NA	<50%	<50%	<50%	<50%	<50%	<50%
Parasites	<i>Neospora caninum</i>	Abortion	No	Negative	<50%	Negative	NA	<50%	<50%	<50%	>50%
	<i>Toxoplasma gondii</i>	Abortion	Yes	Negative	NA	Negative	<50%	<50%	<50%	Negative	<50%
Virus	Alphaherpesherpesvirus	Respiratory problems, abortion	No	<50%	<50%	>50%	>50%	>50%	<50%	>50%	>50%
	Bovine Respiratory Syncytial virus	Respiratory problems	No	Negative	NA	Negative	NA	Negative	Negative	NA	Negative
	Para-influenza virus (PI3)	Respiratory problems	No	<50%	Negative	<50%	<50%	Negative	<50%	<50%	<50%
	Pestivirus	Abortion, weak calf/lamb, respiratory problems	No	>50%	>50%	>50%	<50%	<50%	>50%	>50%	<50%
	West Nile Virus	Neurologic disease (reindeer)	Yes	Negative	NA	Negative	NA	Negative	Negative	NA	Negative

References:

Curry, 2012. Blood on filter paper for monitoring caribou health: Efficacy, community-based collection, and disease ecology in circumpolar herds. Thesis, University of Calgary

Carlson et al., 2015. The Sahtu Wildlife Health Monitoring Program Summary report of results 2002-2014. Report. Government of the Northwest Territories

Carlson et al., 2019. Multi-pathogen serological survey of migratory caribou herds: A snapshot in time. Plos One 14(7): e0219838

Educational activities with First Nation and Inuit students

With the support of the NSERC: Promoscience Program, we have been able to engage the youth of Kugluktuk and Ulukhaktok in science. We have conducted educational activities in the classrooms but also on the land, thanks to the Hunters and Trappers Committee and the Helen Kalvak school in Ulukhaktok. In addition, we have also collaborated with the IndigeSTEAM/Power To Choose Aboriginal Youth STEM Programs to welcome First Nation Youth from Calgary visiting our veterinary faculty for a summer camp (for more information visit: <https://indigesteam.ca/power-to-choose>).



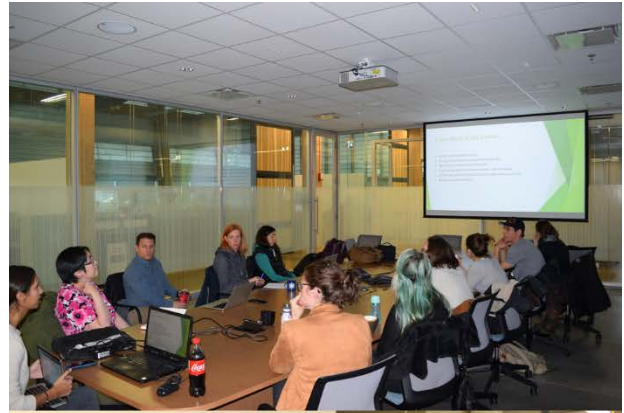
Last year, we have delivered over 30 hours of courses, workshops and hands-on activities to students from grade 4 to 12. We are looking forward to the coming school year and to continuing our work with aboriginal youth.



Wildlife health and Disease workshop at the University of Calgary

In November 2018, together with Dr. Rothenburger and Dr. Whiteside from the University of Calgary, our group organized a workshop on Wildlife Health and Disease. The workshop was intended for First-Nation and Inuit community members as well as wildlife officers and biologists working in the Canadian North. During the workshop, the participants learned about different diseases encountered in harvested wildlife, how to take appropriate samples and measurements and how to protect themselves when working on carcasses of animals that might be infectious for people.

The positive feedbacks we received and the great interest showed by the participants motivated us to organize a similar workshop in the community of Kugluktuk in the coming year.



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