

Community-based wildlife health surveillance for detection of emerging pathogens in the Arctic

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Communities of the Sahtu, and Ekaluktutiak, Kugluktuk, Ulukhaktok



Pratap Kafle, Colin Letain, Anja Carlsson, Naima Jutha, Angie Schneider, Ale Young, Jian Wang, Rob Forsyth, Jesper Mosbacher, Juliette DiFrancesco, Fabien Marot, Xavier Aguilar, Andrea Hanke, Stephanie Peacock, Matilde Tomaselli

Polar Knowledge Canada, Irving Shipping, NSERC, Shane Black, Canada North Outfitting
Lisa-Marie Leclerc, Governments of Nunavut and NWT

Issue: **If** pathogens emerge from thawing permafrost, ice patches, glaciers, graves, etc....



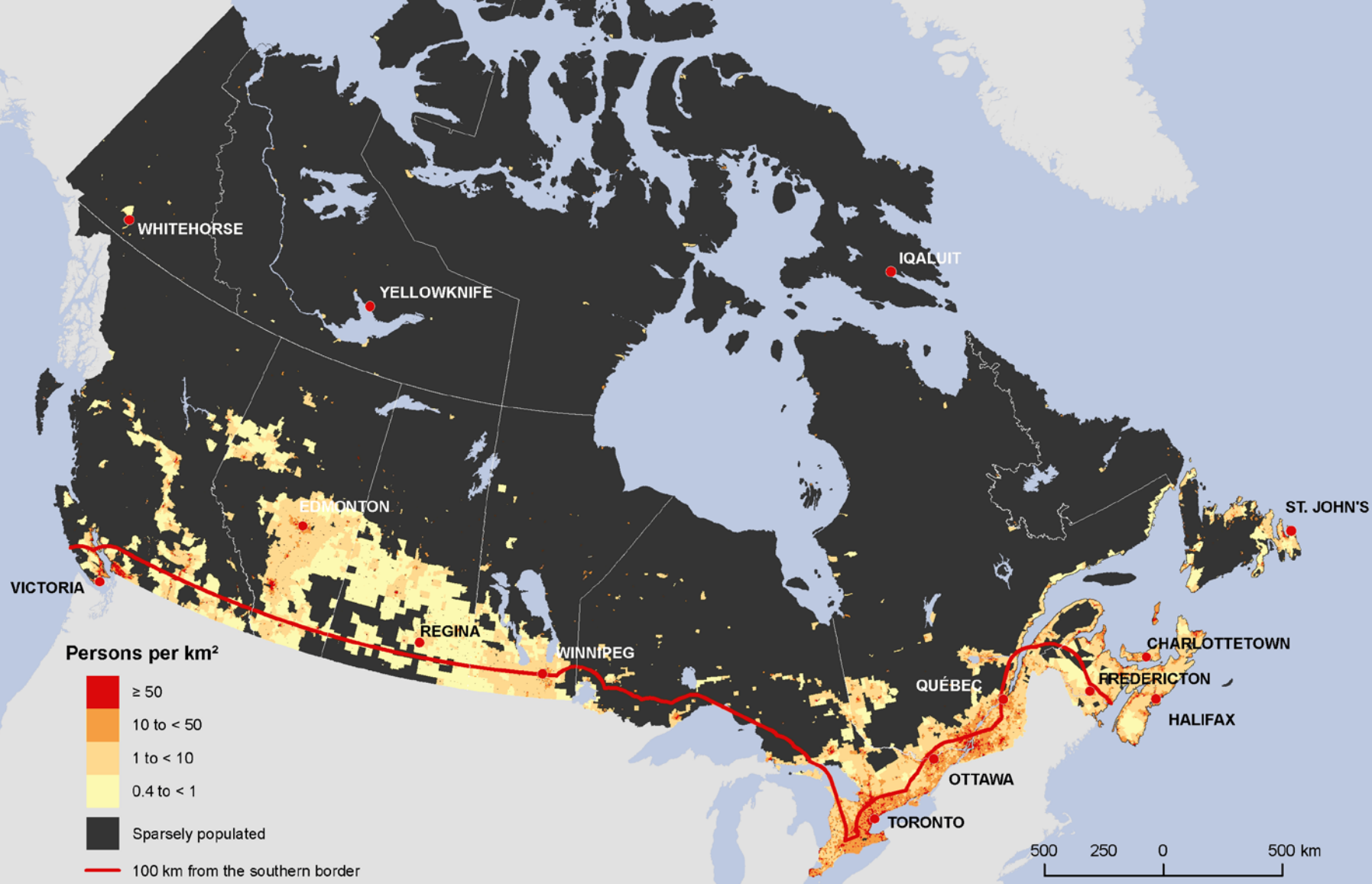
Wildlife may be:

- the first to be affected
- important sentinels and amplifying hosts
- a food safety concern

Problem: Current wildlife health surveillance
in the Arctic is often not sensitive, nor
effective



Population density, 2006 by Dissemination Area (DA)





Surveillance hampered by: expertise, fear, costs and logistics, shipping, time delays and sample quality, unknown existing pathogen diversity, no policies/reportable diseases/political will and priorities.

Unexplained wildlife mortalities and diseases

Mysterious outbreak killing seals in Arctic



Dead, sick seals washing up along shores from Alaska to Russia

CBC News · Posted: Oct 17, 2011 11:40 AM CT | Last Updated: October 17, 2011

Scores of dead ice seals found along Alaska's northwest coasts

 Author: [Tegan Hanlon](#)  Updated: June 13  Published June 12



'There had to be over 1,000': Dead geese wash up on Cambridge Bay shore

'There had to be over a thousand ... there was too many to even count,' says resident

CBC News · Posted: Aug 23, 2017 3:00 AM CT | Last Updated: Aug 23, 2017 1:12 PM CT



Solution: Bring Knowledge systems together for wildlife health surveillance



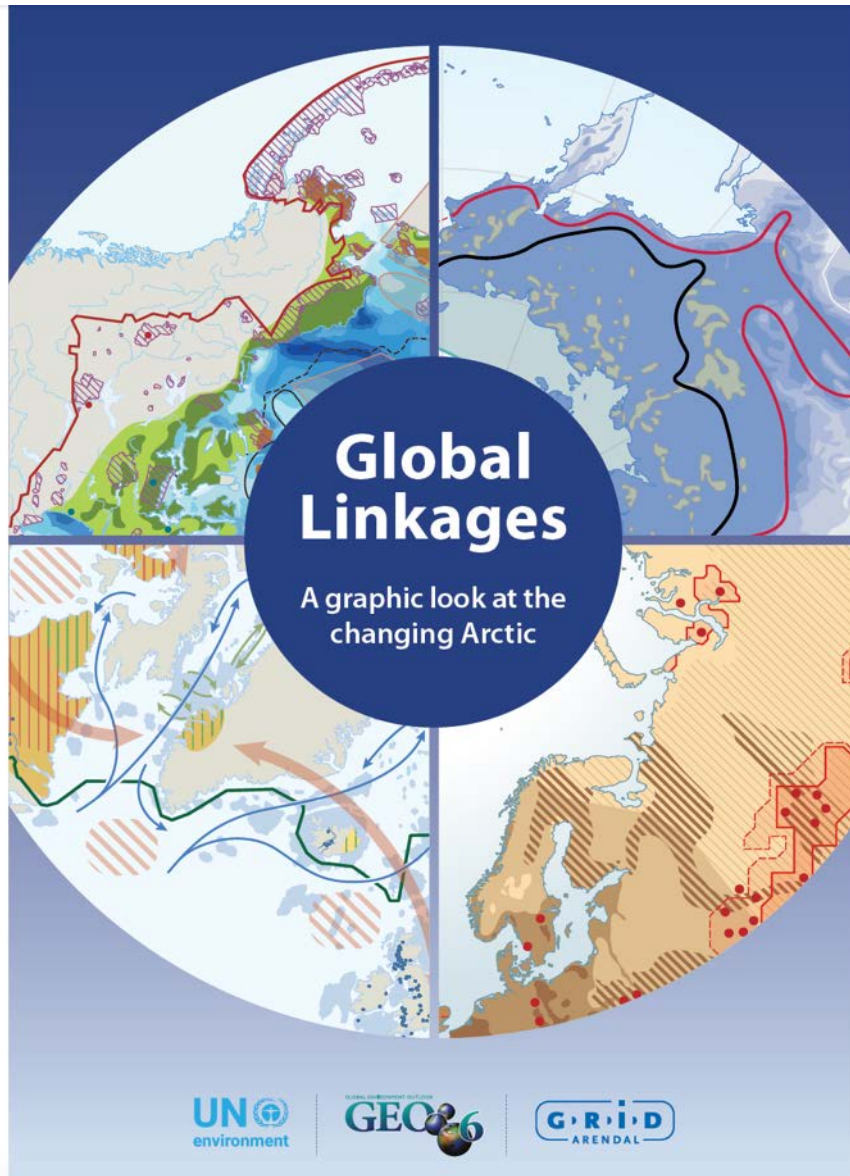
BRIDGE: INDIGENOUS AND SCIENTIFIC KNOWLEDGE

“Two-eyed seeing” supports wildlife health

Bridging Indigenous and scientific knowledge improves wildlife surveillance and fosters reconciliation

Kutz and Tomaselli, 2019. Science

Complexity – requires that we draw on all sources of knowledge



*'...adaptation that **integrates and respects local knowledge and Indigenous knowledge** will be vital to help Arctic societies address the coming challenges.*

Wildlife health knowledge accumulated over generations



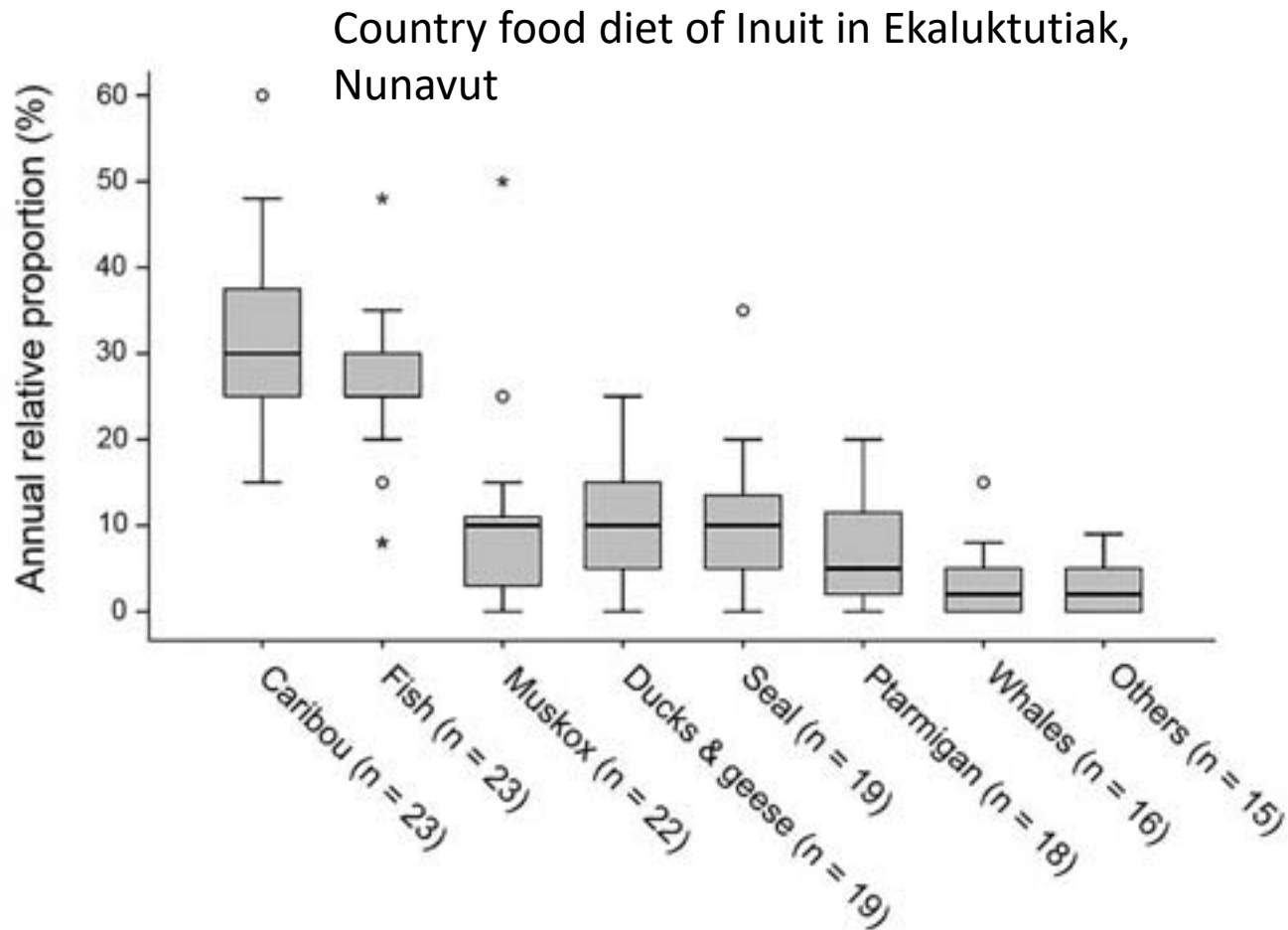
Knowledge across seasons



Knowledge of normal and abnormal



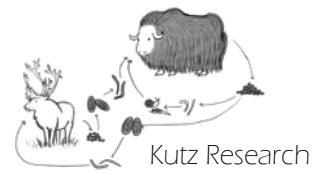
Knowledge across species



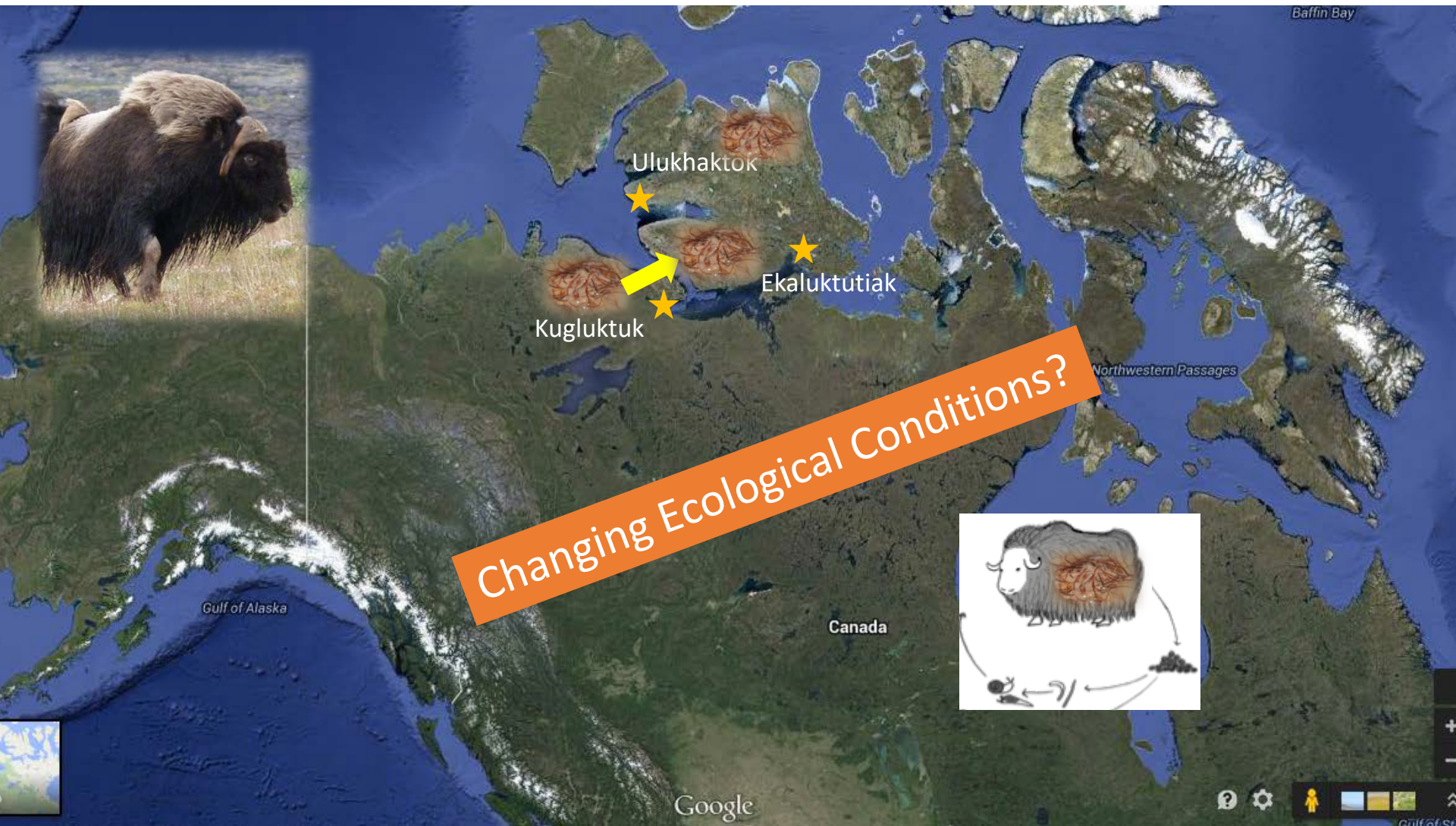
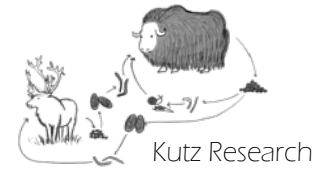
Challenge: ensure that knowledge and
experience is respected,
documented and implemented



Muskox and Caribou Health Research: Case studies



Initiated in response to emerging parasite,
2008: *Umingmakstrongylus pallikuukensis*



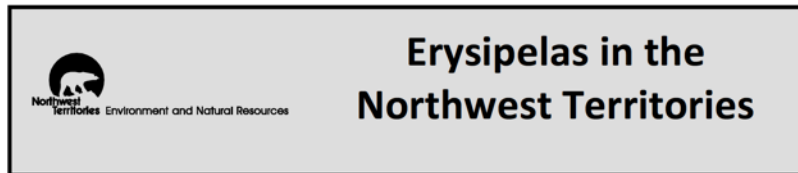
Unusual Muskox Mortality Events



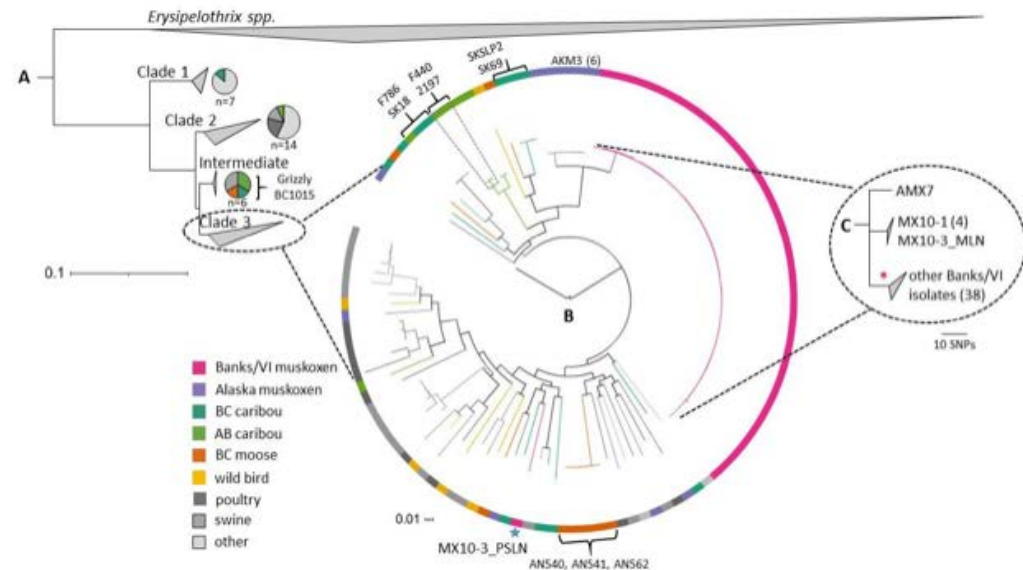
Mortalities: 2009-2012

2012: Septicemia - Bacterium
Erysipelothrix rhusiopathiae identified

- Zoonotic, generalist opportunist bacteria
- Public Health messaging



Whole genome sequencing: single outbreak strain (Forde et al.)



An unusual case of *Erysipelothrix rhusiopathiae* prosthetic joint infection from the Canadian Arctic: whole genome sequencing unable to identify a zoonotic source

Michael Groeschel^{1*}, Taya Forde², Shannon Turvey³, A. Mark Joffe³, Catherine Hui⁴, Prenilla Naidu^{1,5}, Fabien Mavrot⁶, Susan Kutz⁶ and Ameeta E. Singh^{3*}

Community-based Wildlife Health Surveillance

General Approach

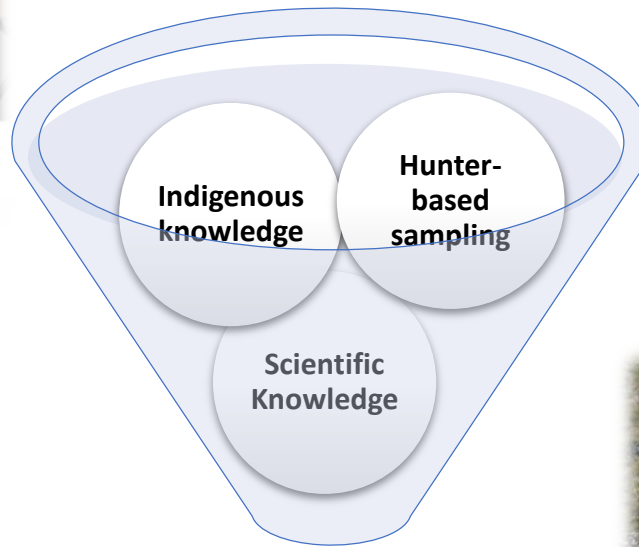


Individual interviews



Group interviews

Participatory activities



**Caribou/Muskox
Health**

Food Security

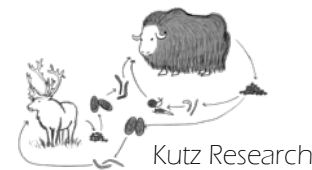


Hunter-based sampling



*Targeted sample collection
Scientific studies
Informed by CBWHS*

Training to enhance surveillance capacity



Monitor Training



Bringing local science into the classroom



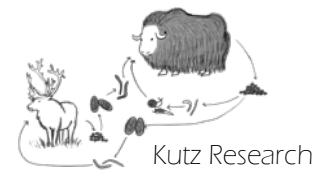
U Calgary disease workshop



Engaging community members



Documenting Local and Indigenous Knowledge in Ekaluktutiak



- Individual semi-structured interviews

(30 experts)

Hunting practices

Importance of muskoxen

Population distribution and changes

Muskox health and diseases



- Small group interviews – 7 groups^{+ Caribou}

Participatory exercises

distribution - *mapping exercise*

population dynamics – *drawing exercise*

population demography - *proportional piling*

disease prevalence - *proportional piling*

changes over time - *timeline of events*

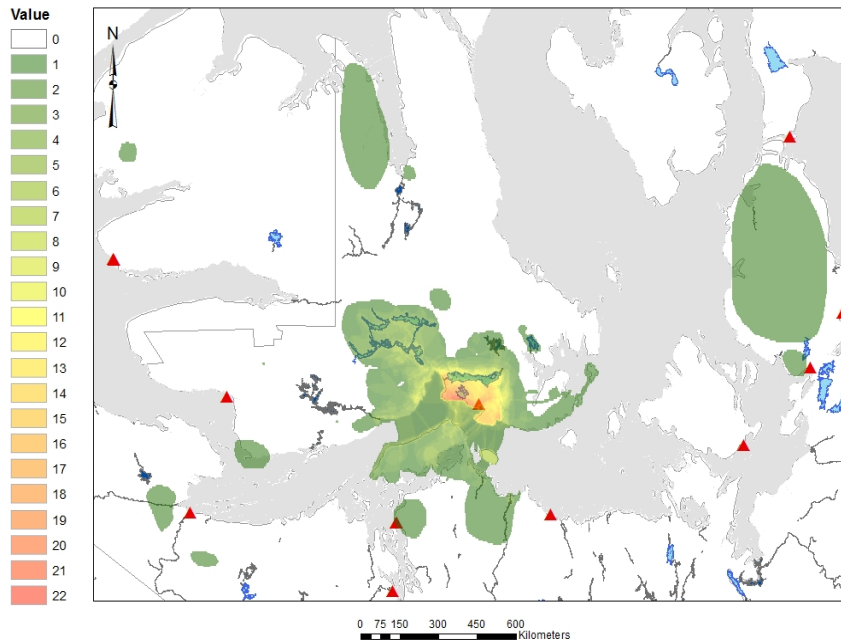


- Validation of results

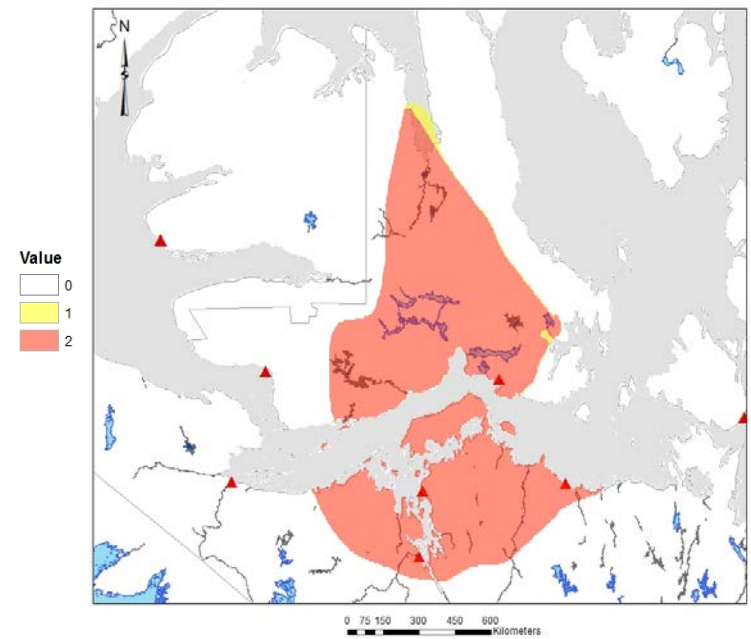
Results of group interviews: Area of Observation



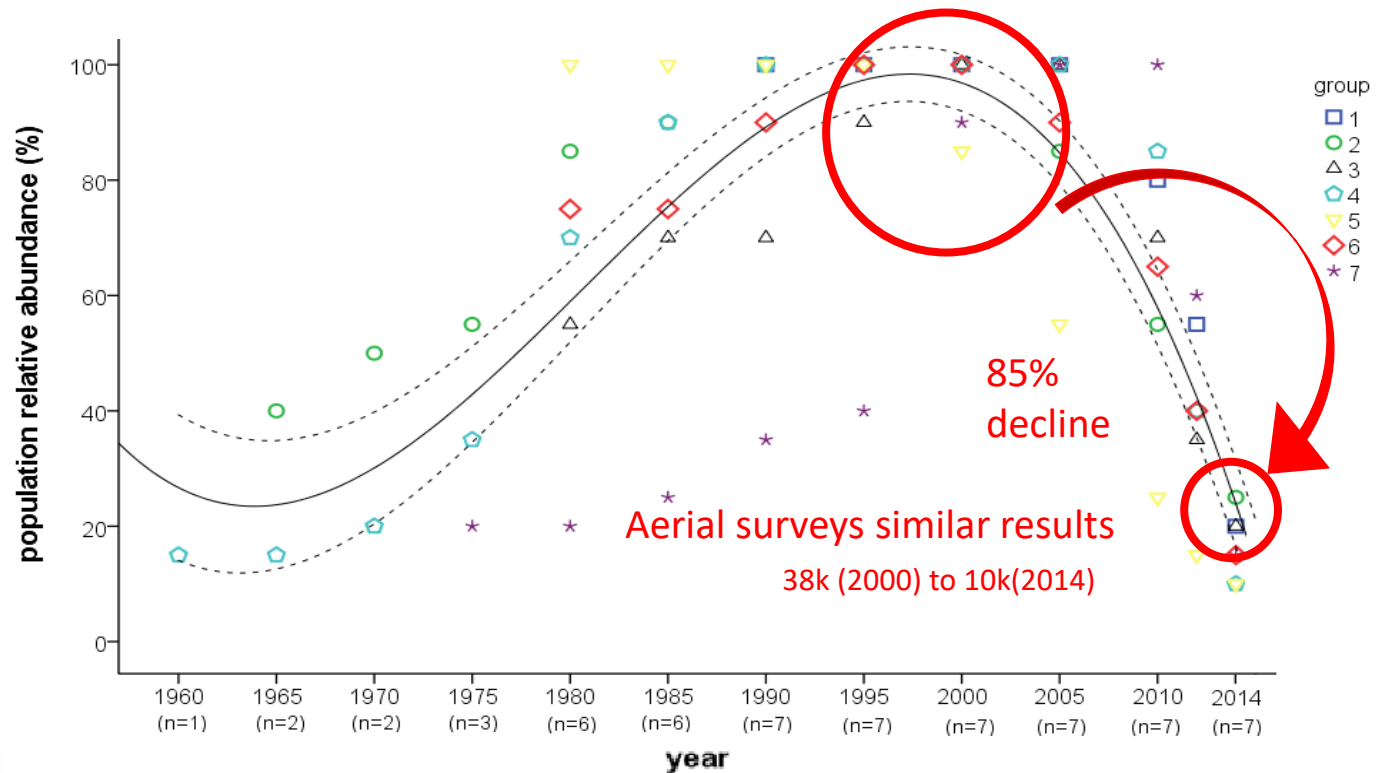
Residents



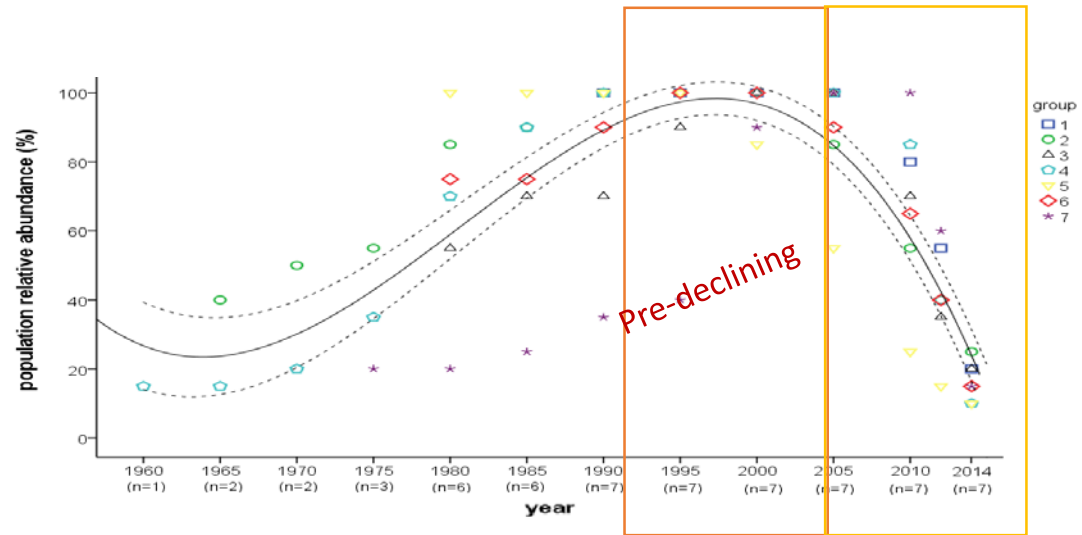
Pilots



Muskox population trends (n=7 group interviews)



Comparing Health Indicators during Peak and Decline periods



Declining

Proportional piling with beans used to quantify people's perceptions (participatory epidemiology)



1. Pile of beans



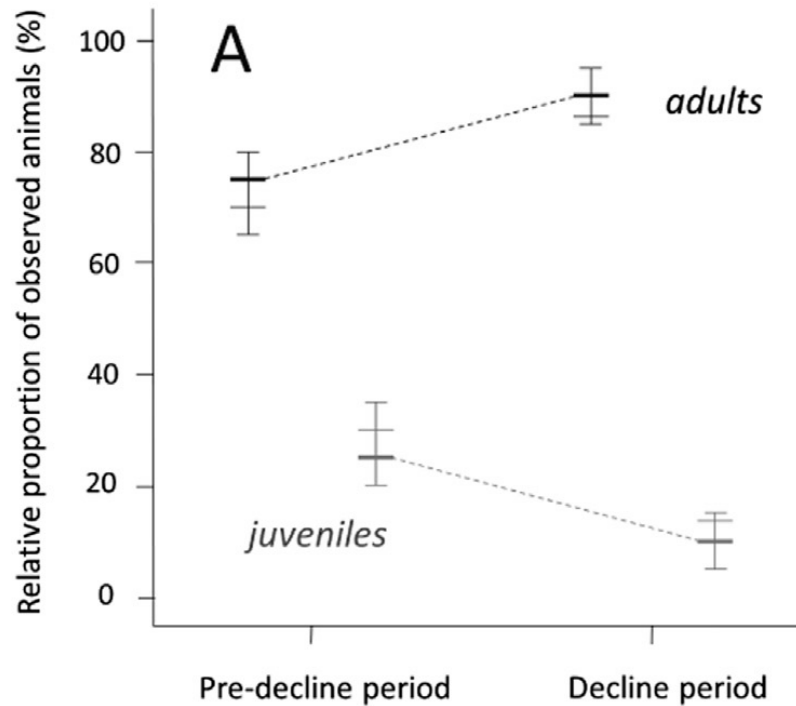
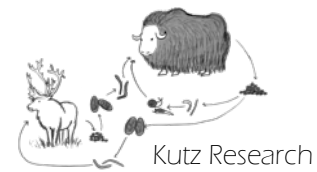
2. Work
collaboratively

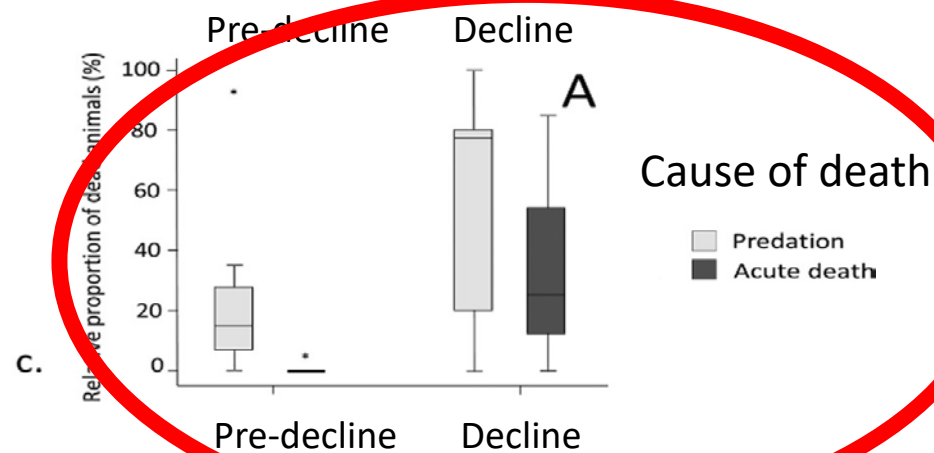
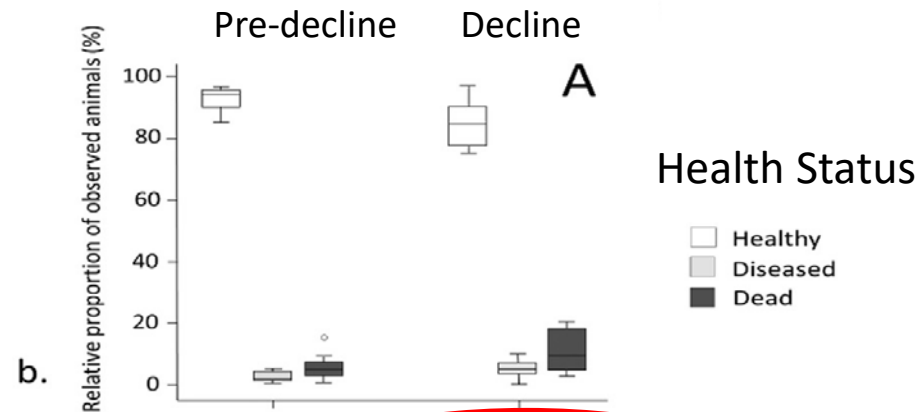
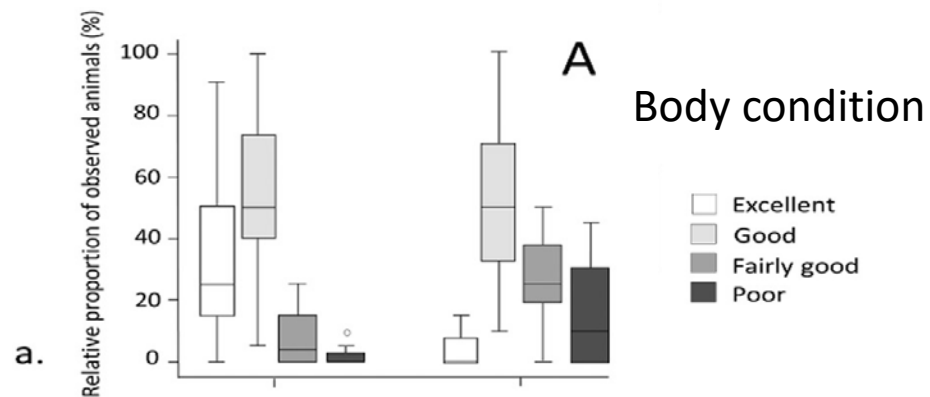


3. Measuring & generating
proportions

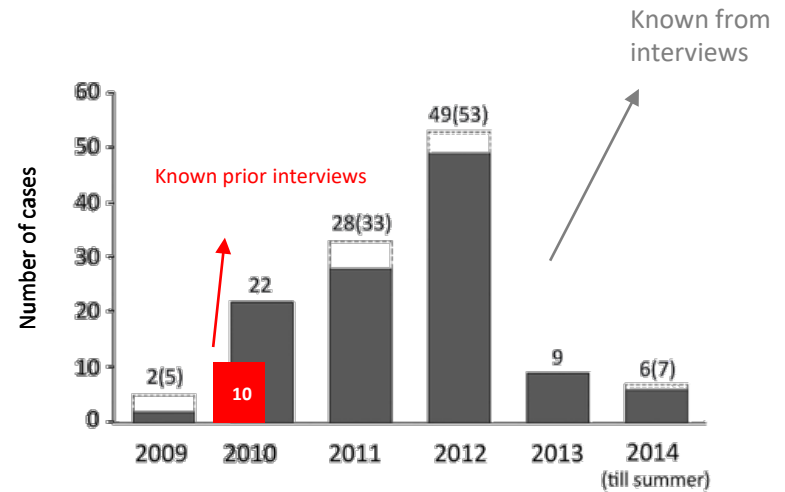
40%
20%
15%
25%

Proportion of juveniles declined



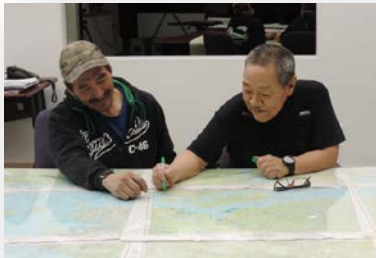
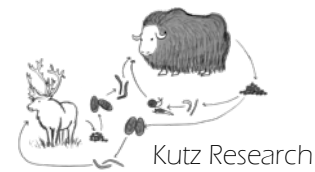


Acute Muskox Mortalities



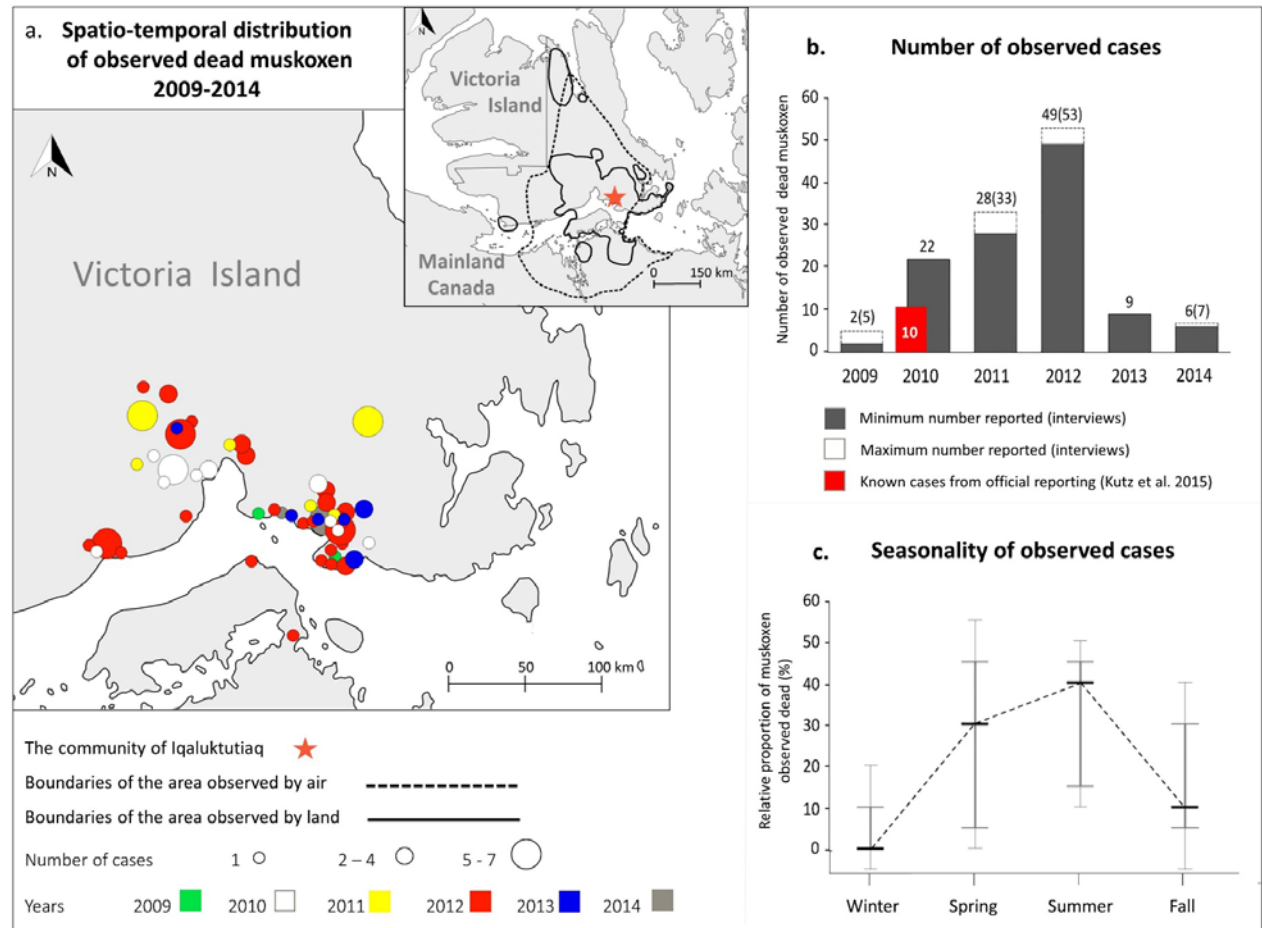
Science missed the epidemic!!!

Spatio-Temporal Distribution of Muskox Mortalities: Local/Indigenous knowledge



Participatory mapping – where?

Timeline of events– when?



Hunter-based sampling



MUSKCOX SAMPLE COLLECTION

ANIMAL ID

ULU-011

COMMUNITY:

Uluksatuk

HUNTER'S NAME

CONTACT:

KILL DATE:

24 / 02 / 2019
dd mm yy

TAG NUMBER:

TYPE OF HUNT

☐ Community

☒ Individual

☐ Sport

KILL LOCATION:

Grassland bay

(for example: Naratunek)

MANAGEMENT ZONE:

LATITUDE

N

LONGITUDE: W

SEX:

☐ Female

☒ Male

☐ Unknown

If female specify if:

☐ pregnant

☐ lactating

☐ none

☐ unknown

AGE CLASS:

☐ Calf

☒ Yearling

☐ 2 y old

☐ 3 y old

☐ 4 y old or more

☐ Unknown

BODY CONDITION:

☐ Really fat

☐ Fat

☒ Not bad

☐ Skinny

BACK FAT:

0.75 inches

HERD SIZE N°:

all animals

25

N° CALVES:

0

N° YEARLINGS:

3

SAMPLES COLLECTION (check the box when collected):

☒ BLOOD

☒ SKIN+FUR

☒ DROPPINGS

☒ LEFT HIND LEG

☒ JAW

☒ LIVER

☒ LEFT KIDNEY

☐ ABNORMAL TISSUE specify: _____

COMMENTS:

Standardized sampling, Indicators of Health

Disease syndromes

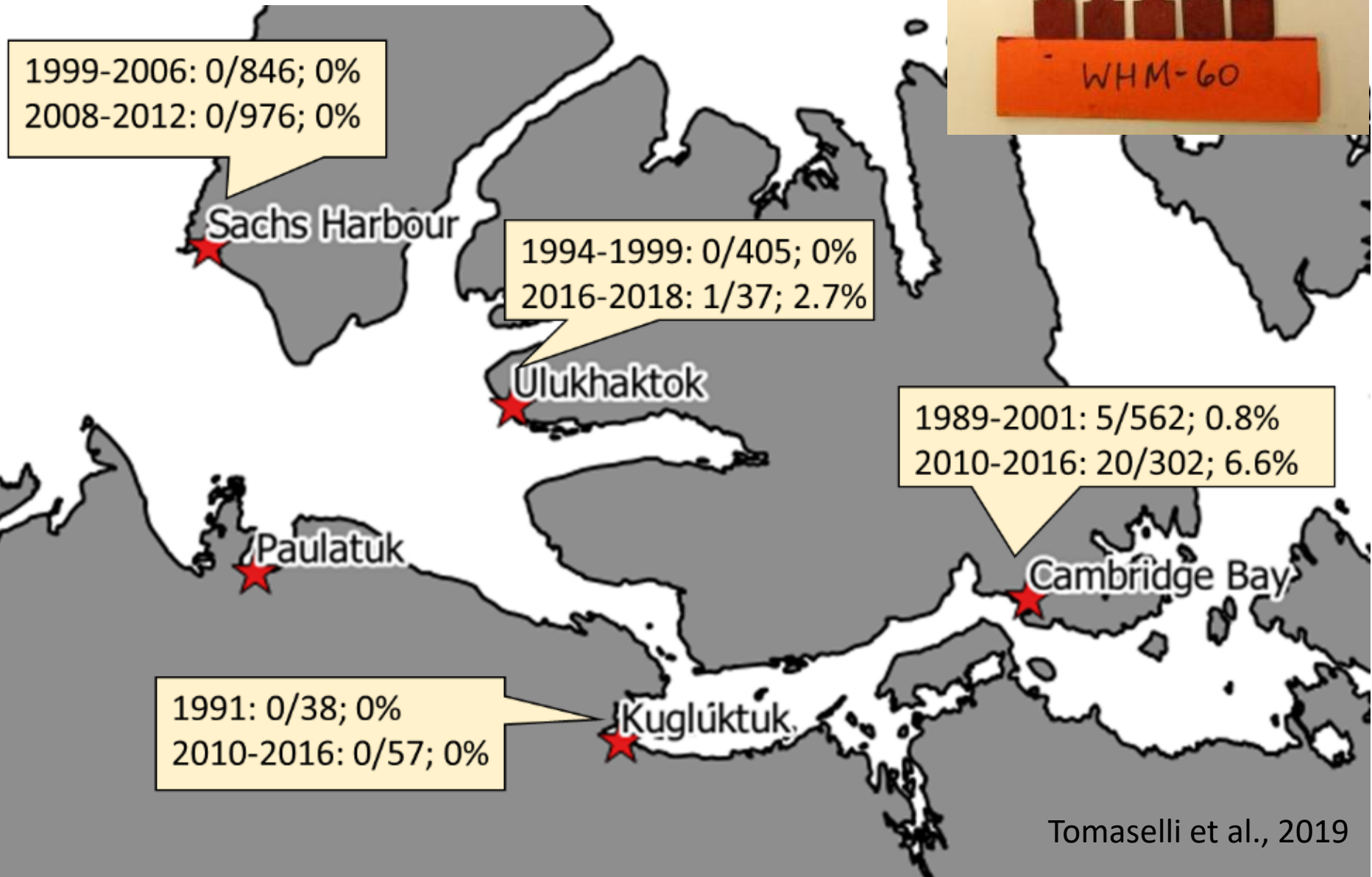
Local/Indigenous Knowledge

- Skinnier
- Scabs on mouth
- Overgrown hooves
- Tooth abnormalities
- Fewer calves
- Limping

Hunter Sampling



Brucellosis in muskoxen: increasing on Victoria Island



So What?



Wildlife as sentinels of change



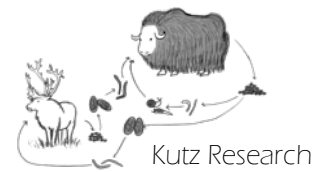
Wildlife as potential reservoirs and
amplifying hosts for emerging diseases



Intimate connection between northern peoples and wildlife

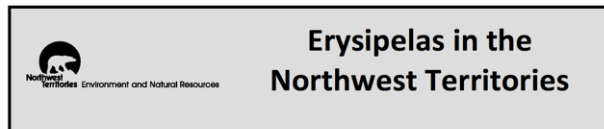
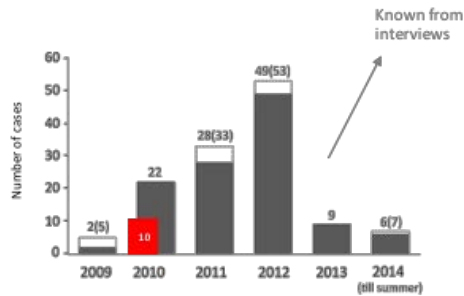


Indigenous Knowledge and Hunter-based sampling



- Contextual understanding, experiential knowledge, on a temporal and spatial scale that can't be accomplished through western science
- Informs science and generates research hypotheses
- **Early detection of change**

Effective wildlife health surveillance requires bridging knowledge systems



Erysipelas in the
Northwest Territories



Final cautionary note

Los Angeles Times

Science



Alaska villagers living in bird flu's flight path



SHOW CAPTION ▾

1 / 25

- 'Government scientists swooping in...'
- 'They came bearing a warning: The wild birds that the Yup'ik have hunted for millennia may be carrying the first traces of the deadly bird flu virus ...'

"It's kind of scary, you know," said resident Ronnie Peter, 39. "That's like, our food, you know."



Thank you!