Participatory wildlife health and disease surveillance: a promising new field

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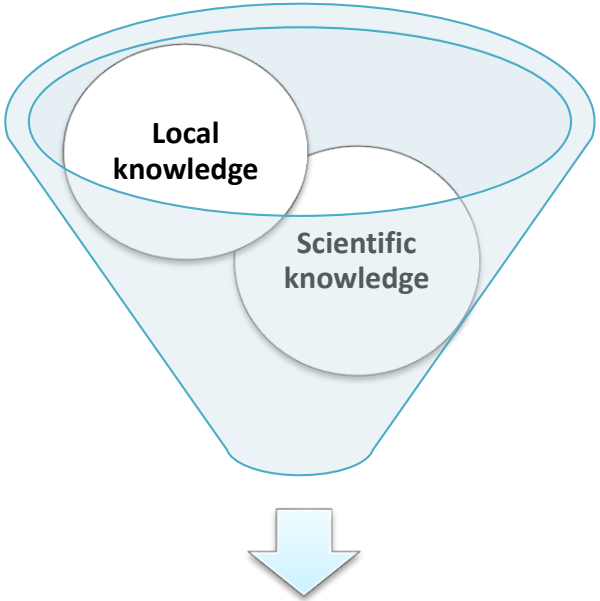
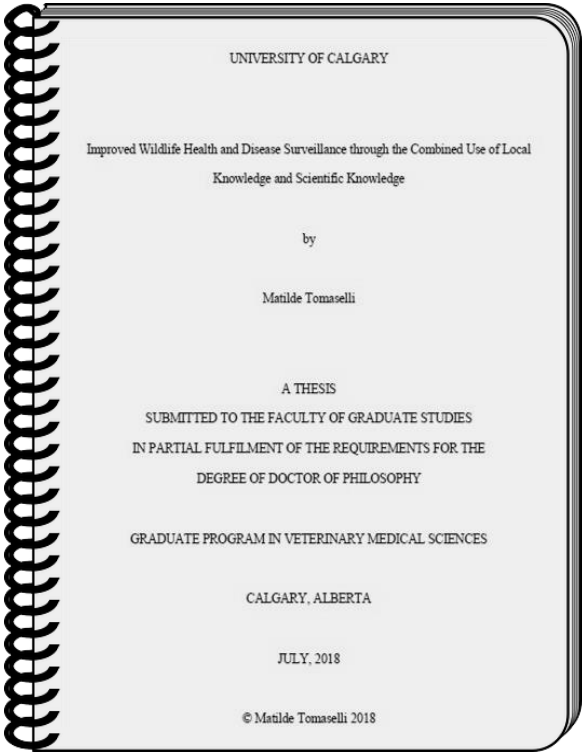
ADED National Teleconference Rounds

January 22, 2019

The practical example: PhD project - study system



Participatory Muskox Health Surveillance



UNIVERSITY OF CALGARY

Improved Wildlife Health and Disease Surveillance through the Combined Use of Local Knowledge and Scientific Knowledge

by

Matilde Tomaselli

A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE
DEGREE OF DOCTOR OF PHILOSOPHY

GRADUATE PROGRAM IN VETERINARY MEDICAL SCIENCES

CALGARY, ALBERTA

JULY, 2018

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Improved Wildlife Health and Disease Surveillance through the combined use of Local Knowledge and Scientific Knowledge

Overall aims

Investigate how Local Knowledge can improve the veterinary surveillance for wildlife and how the combination of Local Knowledge and Scientific Knowledge within a participatory framework can improve the surveillance output

Full thesis document available at
http://hdl.handle.net/1880/107597

Presentation and acknowledgements

Supervisors Drs. Sylvia Checkley and Susan Kutz
Committee Members Drs. Carl Ribble, Craig Gerlach and Brett Elkin

Thank you to the residents of Cambridge Bay whose collaboration and generous intellectual contributions made my graduate project possible and successful

Presentation outline

INTRODUCTION

Importance of and challenges for wildlife health surveillance

Traditions referenced for development of research project

Background on the study system

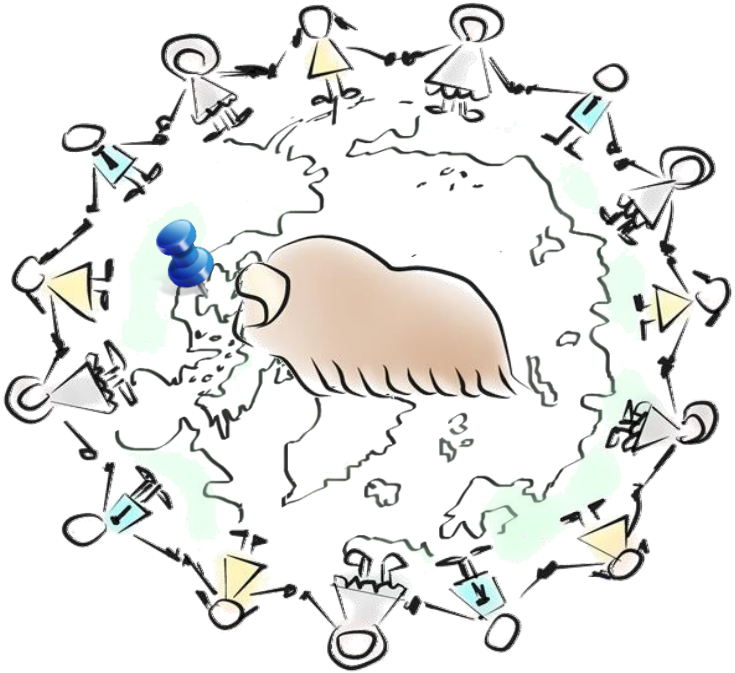
THE PARTICIPATORY MUSKOX HEALTH PROJECT

Five main thesis chapters

- Surveillance activities developed
- Connections among surveillance activities and output

CONCLUSION

Broader application of the approach



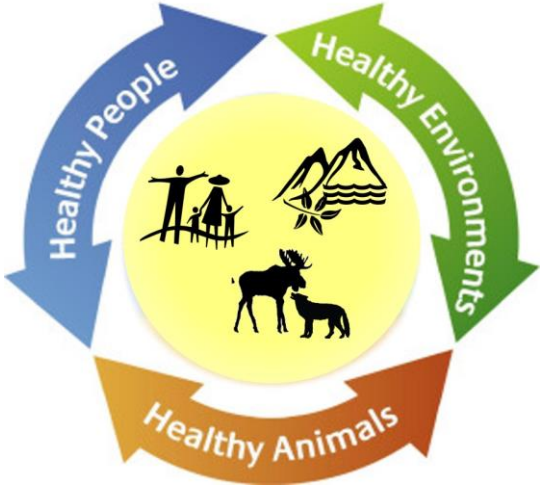
Participatory Muskox Health Surveillance

Veterinary Surveillance

"is the ongoing collection, collation, analysis of information related to animal health, and the timely dissemination of this information so that action can be taken"

OIE Terrestrial Animal Health Code, 2017

Adapted from OIE, 2010



Picture credit University of Alaska

Veterinary Surveillance

"is the ongoing collection, collation, analysis of information related to animal health, and the timely dissemination of this information so that action can be taken"

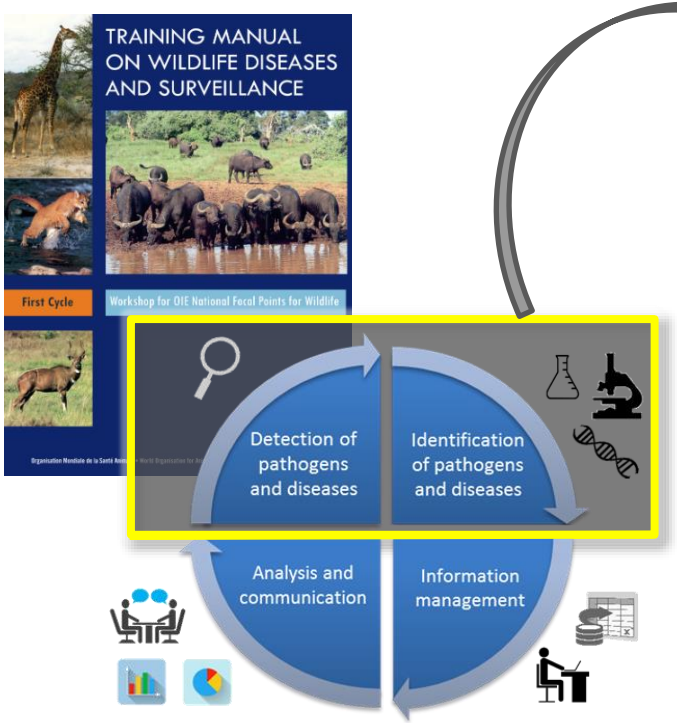
OIE Terrestrial Animal Health Code, 2017

Adapted from OIE, 2010

Interventions
Wildlife management (animals, habitat)
Wildlife and biodiversity conservation
Safeguard human and animal health

Peterson and Ferro 2007; Artois et al. 2009; OIE 2010

Challenges to wildlife health surveillance



Adapted from OIE, 2010

Challenges from

initial data aquisition and field data interpretation

- Difficulties accessing the animals / finding cases
- Lack of demographics for the target population
- Lack of validated tests
- Selection and measurment bias
- Lack of representativeness
- Logistical and financial restrictions

Learning lessons from other experiences

Participatory surveillance (PS) for livestock diseases

Ethnoveterinary knowledge

↓

Participatory epidemiology (PE) on livestock diseases

Sensitive and timely tool to identify cases of disease

+ conventional veterinary diagnostics

Used to confirm 'cases',

increasing the specificity of the surveillance

Participatory appraisal techniques

e.g., semi-structured interviews, graphic and scoring exercise

e.g., Mariner & Paskin 2000; Jost et al. 2007; Catly et al. 2012

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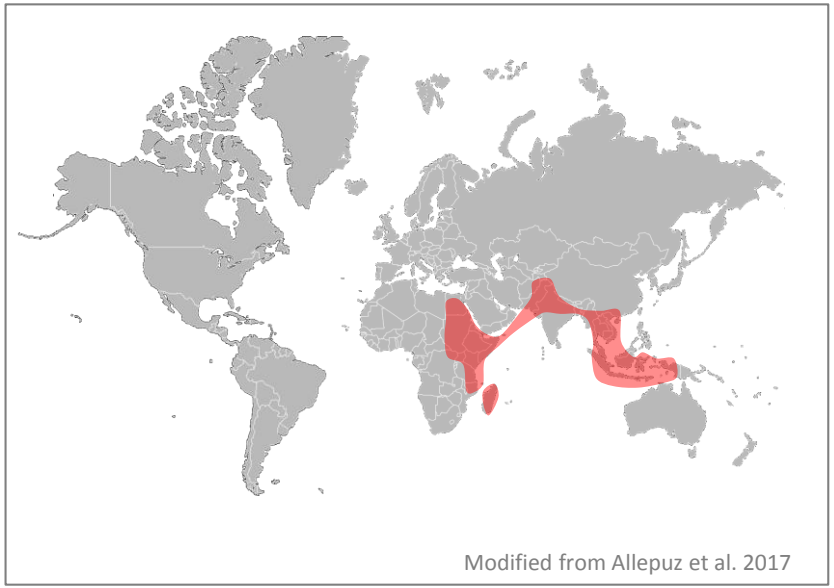


Modified from Allepuz et al. 2017

Participatory appraisal techniques

e.g., semi-structured interviews, graphic and scoring exercise

e.g., Mariner & Paskin 2000; Jost et al. 2007; Catly et al. 2012

Learning lessons from other experiences

Adaptive management of natural resource

Ecological knowledge

↓

Wildlife co-management systems

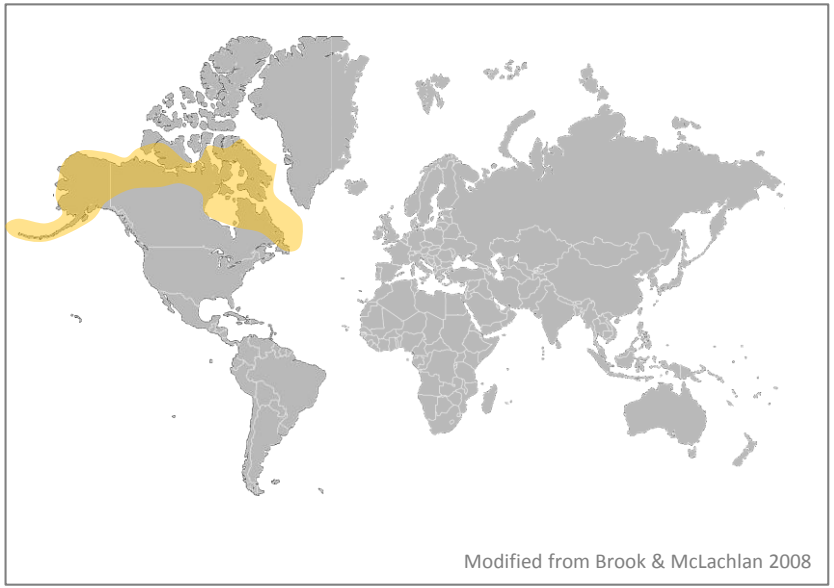
<u>Used to complement scientific information on</u>

Wildlife distribution, abundance and trends

Wildlife behavior and body condition

Interspecific interactions

Ecosystem and habitat changes



Modified from Brook & McLachlan 2008

Qualitative methods

e.g., interviews, workshops,
collaborative fieldwork, questionnaires

e.g., Berkes et al. 2000; Huntington 2000; Davis & Wagner 2003; Huntington et al. 2004

Learning lessons from other experiences

Participatory surveillance for livestock diseases

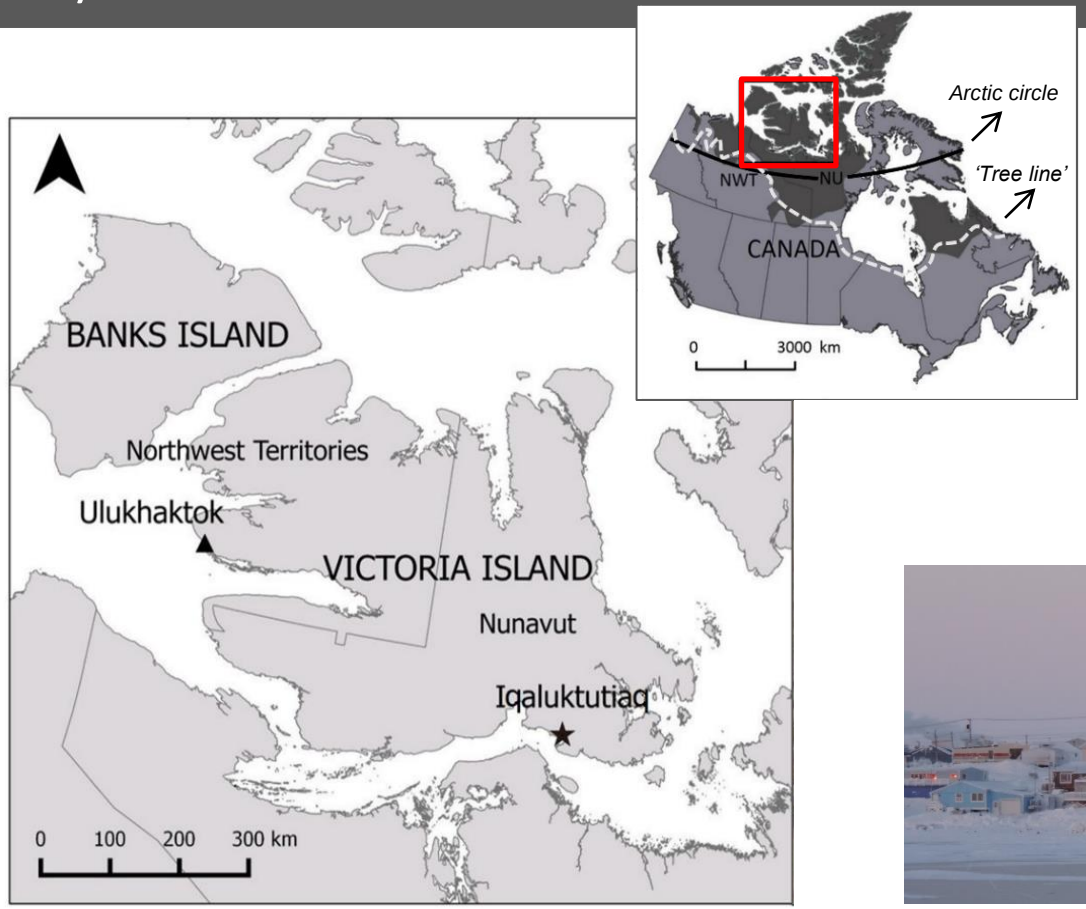
Ethnoveterinary knowledge

Adaptive management of natural resource

Ecological knowledge

Novel application of local knowledge for wildlife health surveillance

Study area



Map generated in QGIS 2.8.9

Victoria Island

217,291 km²

Cambridge Bay – Iqualuktutiaq

Settled in 1921

1,700 people

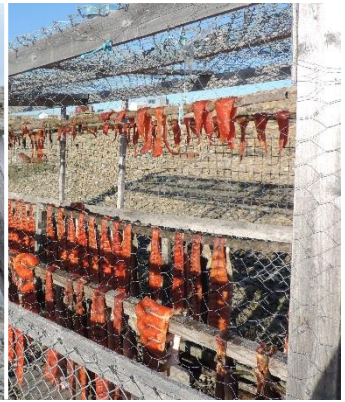
Natural Resources Canada 2018; Statistics Canada 2016

Study area

Library of Congress Archives

Iqaluktutiak Heritage Societey

Iqaluktutiak Heritage Societey



The species of study

Muskox – *Ovibos moschatus* [1,2]

- Cold-adapted ungulate
- Early 1900s almost extinct
- 1917 active management
- Recolonization of range

1 Tener 1958; 2 Lent 1999; 3 Kutz et al. 2013; 4 Kutz et al. 2015

Need to understand muskox health

Communities

Muskox – *Ovibos moschatus* [1,2]

- Cold-adapted ungulate
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Recent concerns

- Lungworm emergence and expansion [3]

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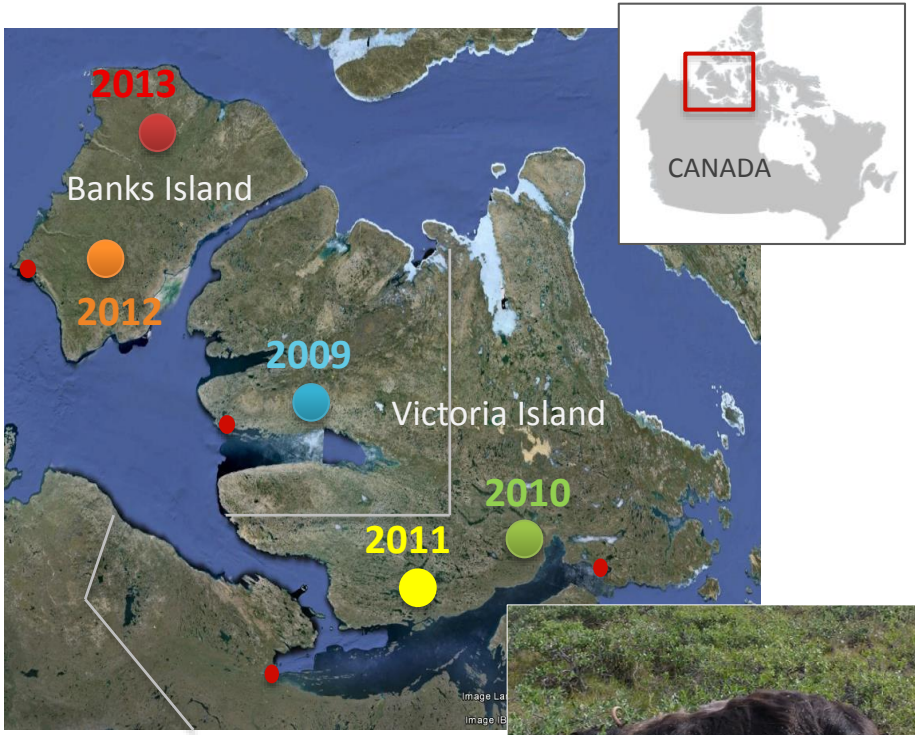

Communities

Photo credit S. Kutz

Muskox – *Ovibos moschatus* [1,2]

- Cold-adapted ungulate
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- 1917 active management
- Recolonization of range

Recent concerns

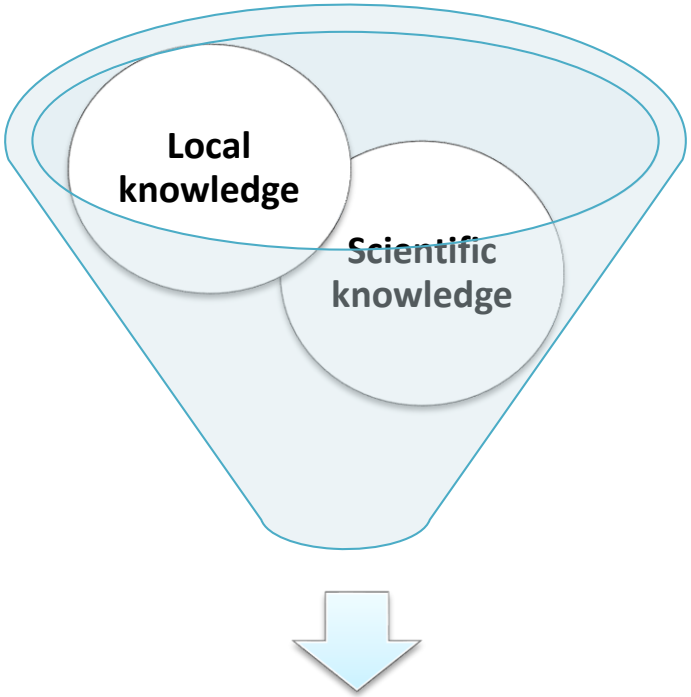
- Lungworm emergence and expansion [3]
- Die-off events
  Erysipelorthrix rhusiopathiae [4]
- Halt to commercial harvest

1 Tener 1958; 2 Lent 1999; 3 Kutz et al. 2013; 4 Kutz et al. 2015

Project overview

Individual interviews

Group interviews
Participatory activities
Feedback sessions



Hunter-based sampling

Field disease investigations
Targeted scientific studies

Surveillance activities implemented

LOCAL KNOWLEDGE

INTERVIEWS with key informants

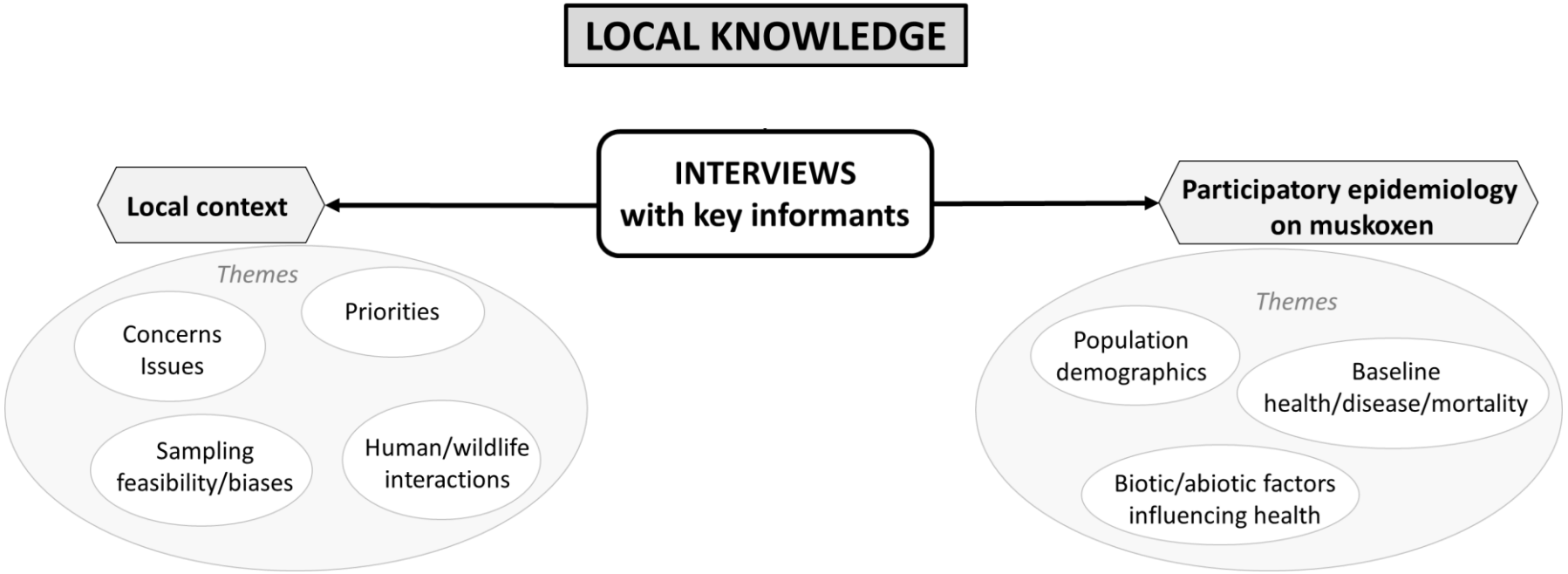
SCIENTIFIC KNOWLEDGE

HUNTER-BASED SAMPLING

FIELD DISEASE INVESTIGATIONS

TARGETED SCIENTIFIC STUDIES

Surveillance activities implemented



The interview process

Individual interviews

Understand the local context
Baseline on muskox health

July – September 2014
n=30 participants
Purposeful sampling and thematic saturation

Small group interviews

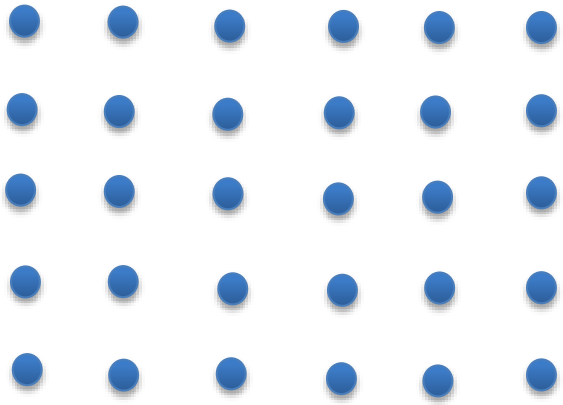
Probing muskox health themes
Obtaining quantitative PE data

November – December 2014
n=7 groups (19 participants)
Triangulation and participatory exercises

Tomaselli et al. *Arctic & Cons Biol* (2018)

The interview process

Individual interviews



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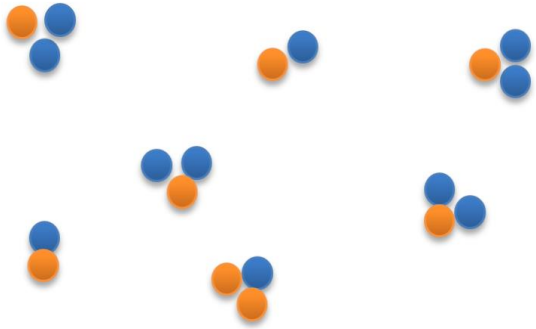

Probing muskox health themes
Obtaining quantitative PE data

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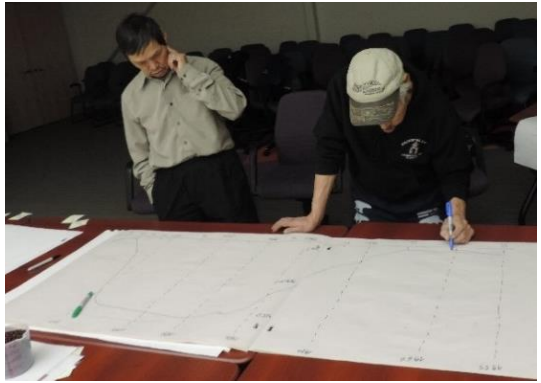
Participatory appraisal techniques



Participatory mapping

Participatory drawing

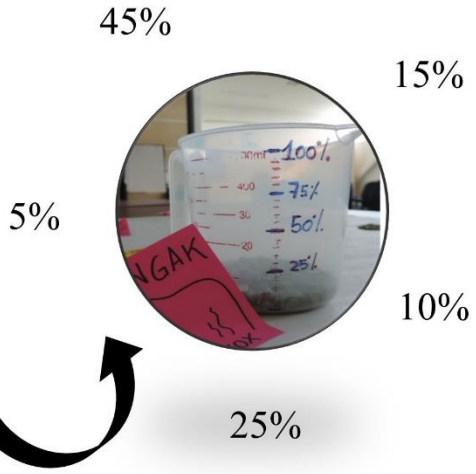
Timeline of events

Seasonal calendars

Proportional piling

Tomaselli et al. *Arctic & Cons Biol* (2018)

Schematic of proportional piling



Fixed volume of counters
(0.5 kg beans)
used as unit of measure

→

Collaborative work
to separate counters
proportionally

→

Measuring counters
to generate proportions

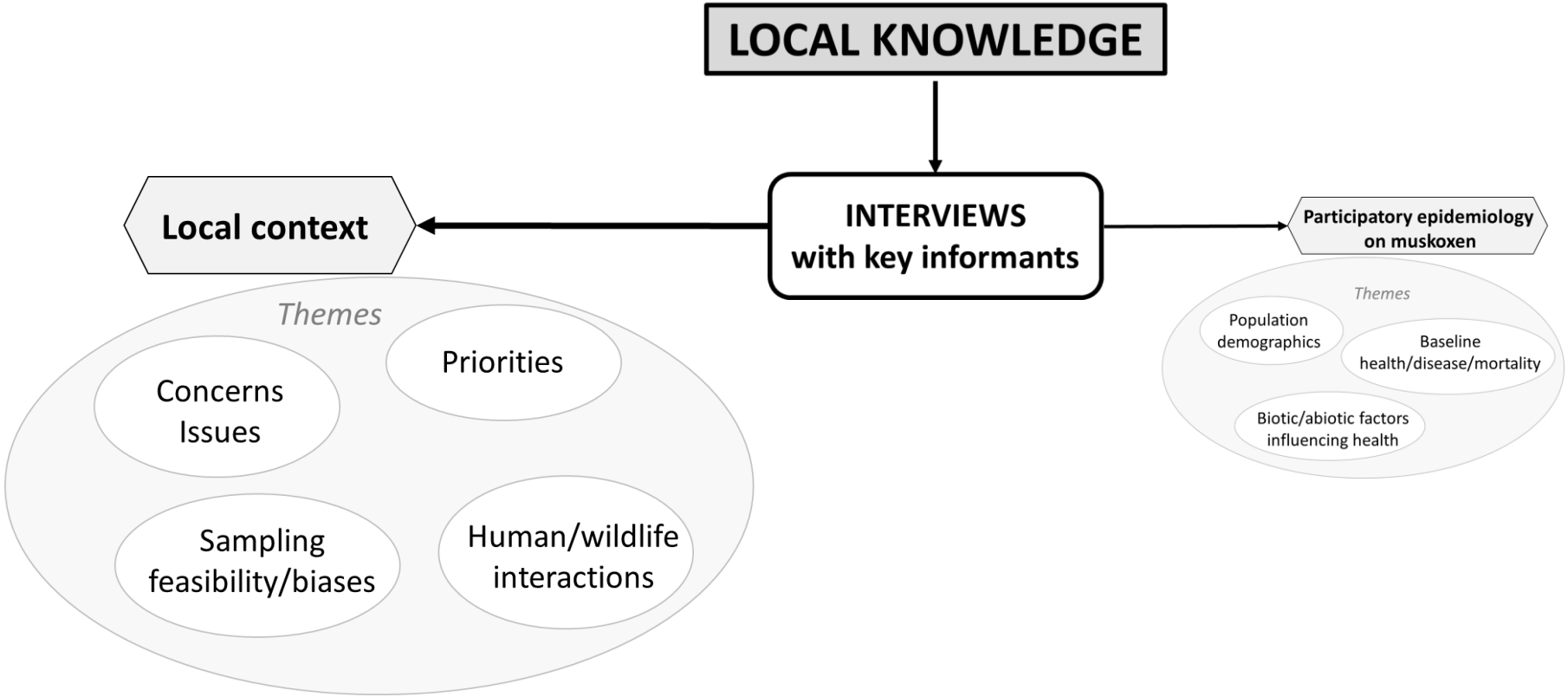
Tomaselli et al. *Cons Biol* (2018)

Feedback sessions – validation of analyzed data

Presentation of analyzed results to allow feedback

Spring 2015 and 2016
n = 31/38 ; n = 26/30,
Increasing data reliability

Tomaselli et al. *Arctic & Cons Biol* (2018)


LOCAL KNOWLEDGE
INTERVIEWS with key informants
Local context
Themes
Concerns Issues
Priorities
Sampling feasibility/biases
Human/wildlife interactions
Participatory epidemiology on muskoxen
Themes
Population demographics
Baseline health/disease/mortality
Biotic/abiotic factors influencing health

ARCTIC
VOL. 71, NO. 1 (MARCH 2018) P. 1–14
https://doi.org/10.14430/arctic4697

Iqaluktutiaq Voices: Local Perspectives about the Importance of Muskoxen, Contemporary and Traditional Use and Practices

Matilde Tomaselli[1,2] S. Craig Gerlach,[3] Susan J. Kutz,[1,4] Sylvia L. Checkley[1,5] and the Community of Iqaluktutiaq[6]

Why does exploring the local context matter for wildlife health surveillance?

Elder (Interviewee 4)

"Muskoxen have always been our meat, an important source of food … [They] were always there also when other food were scarce. But now muskoxen are scarce"

Inuk hunter (Interviewee 15)

"I have learned from Elders that muskox are important and I am the next [generation] after the Elders…It is important that younger generations try to keep the tradition, but muskox herds are declining"

Tomaselli et al. *Arctic* (2018)

Other data gathered

LOCAL KNOWLEDGE

INTERVIEWS with key informants

Local context

Themes

- Concerns Issues
- Priorities
- Sampling feasibility/biases
- Human/wildlife interactions

Platform for identification of problems and solutions

Local decline of caribou of Dolphin and Union herd

Loss of traditional harvesting/management practices

Interpretation of data on muskox health

Description of the different types of muskox harvests

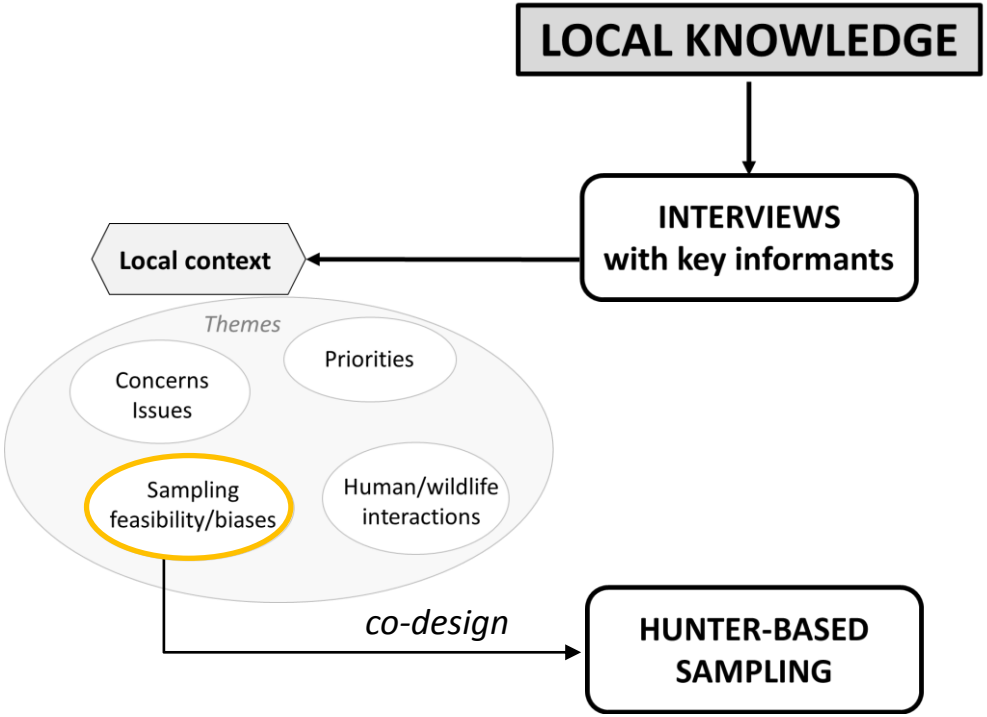
Butchering methods, parts consumed, and cultural taboos

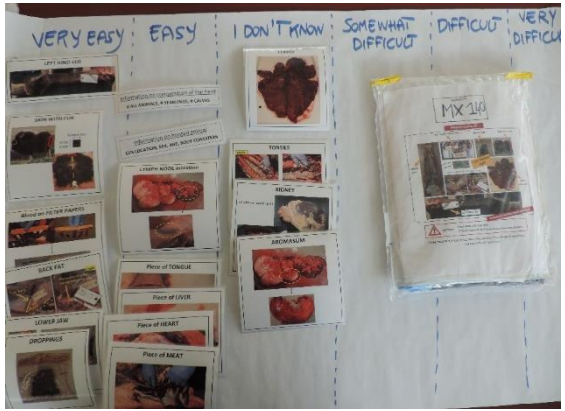
Public health risk mitigation

Interactions that can potentially increase pathogen transmission

Tomaselli et al. *Arctic* (2018)

Interviews to co-design the hunter-based sampling





Interviews to co-design the hunter-based sampling

LOCAL KNOWLEDGE

INTERVIEWS with key informants

Local context

Themes

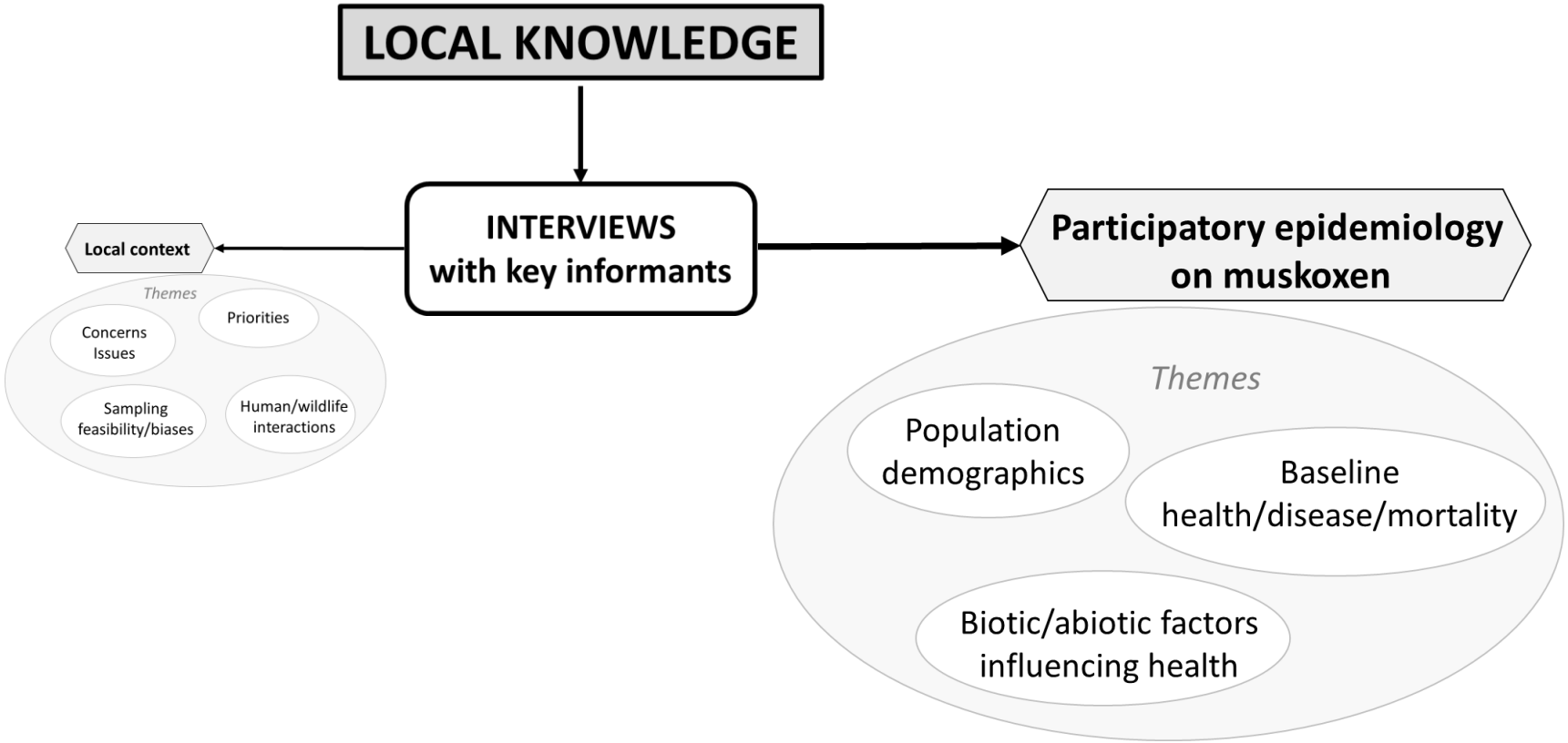
- Concerns Issues
- Priorities
- Sampling feasibility/biases
- Human/wildlife interactions

co-design

HUNTER-BASED SAMPLING

SCIENTIFIC KNOWLEDGE

The hunter-based sampling has been implemented since 2014 and is still ongoing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Biological Conservation 217 (2018) 337–348

Contents lists available at ScienceDirect

Biological Conservation

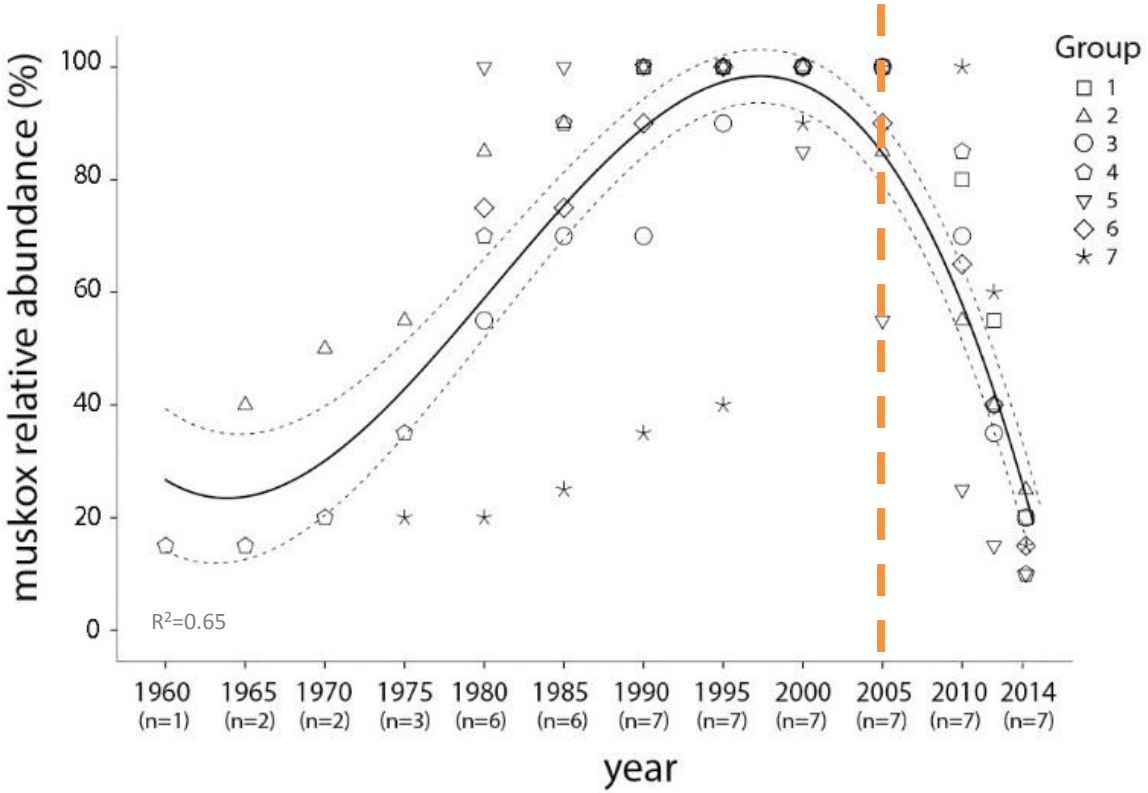
journal homepage: www.elsevier.com/locate/biocon

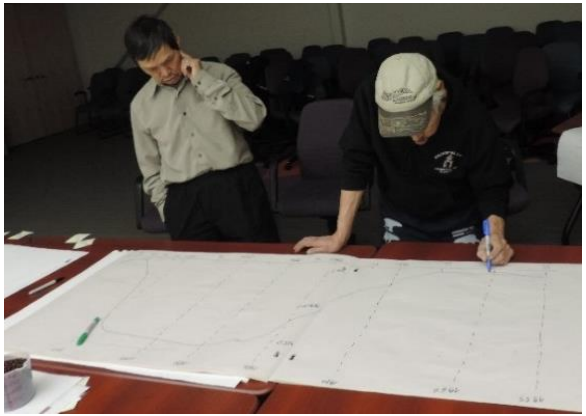
Local knowledge to enhance wildlife population health surveillance: Conserving muskoxen and caribou in the Canadian Arctic

Matilde Tomaselli[a,*], Susan Kutz[a,b], Craig Gerlach[c], Sylvia Checkley[a,d]

How can local knowledge contribute to wildlife health assessment ?

Muskox demography – relative abundance





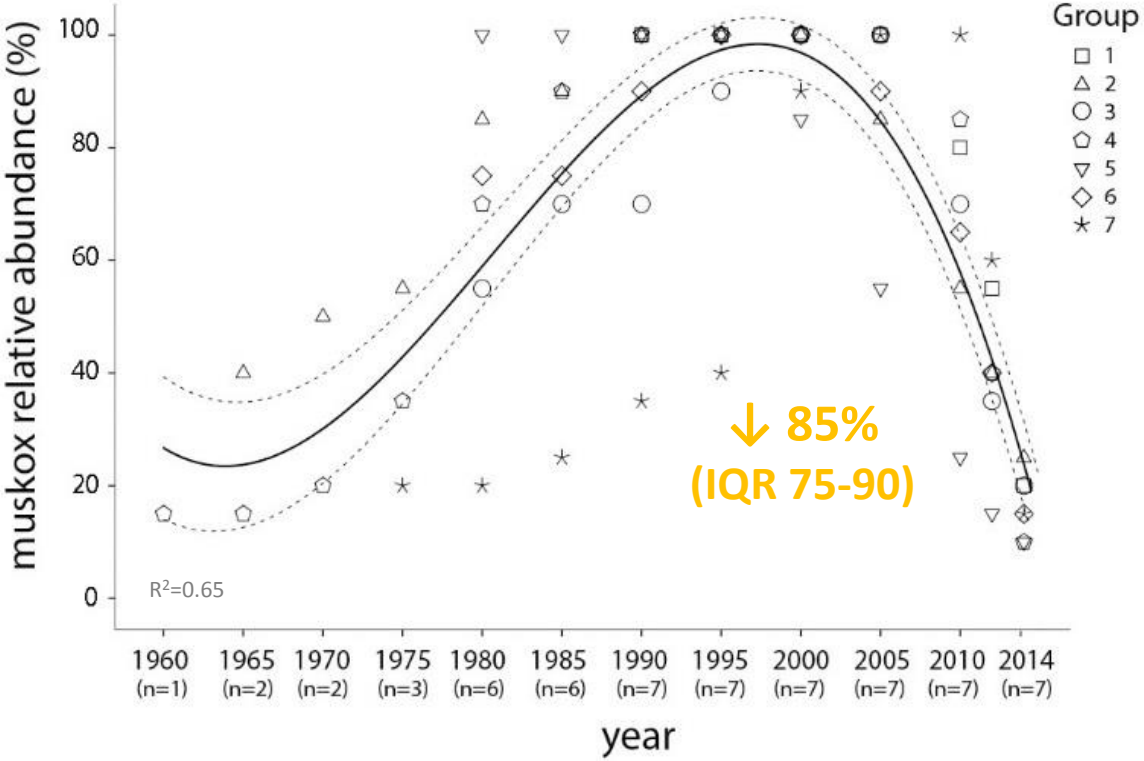
Participatory drawing

Inuk hunter (Interviewee 27)

« in 2006 or 2005 there was probably 4 times as much muskox around as there is today»

Tomaselli et al. *Cons Biol* (2018)

Muskox demography – decline



Proportional piling

Inuk hunter (Interviewee 27)

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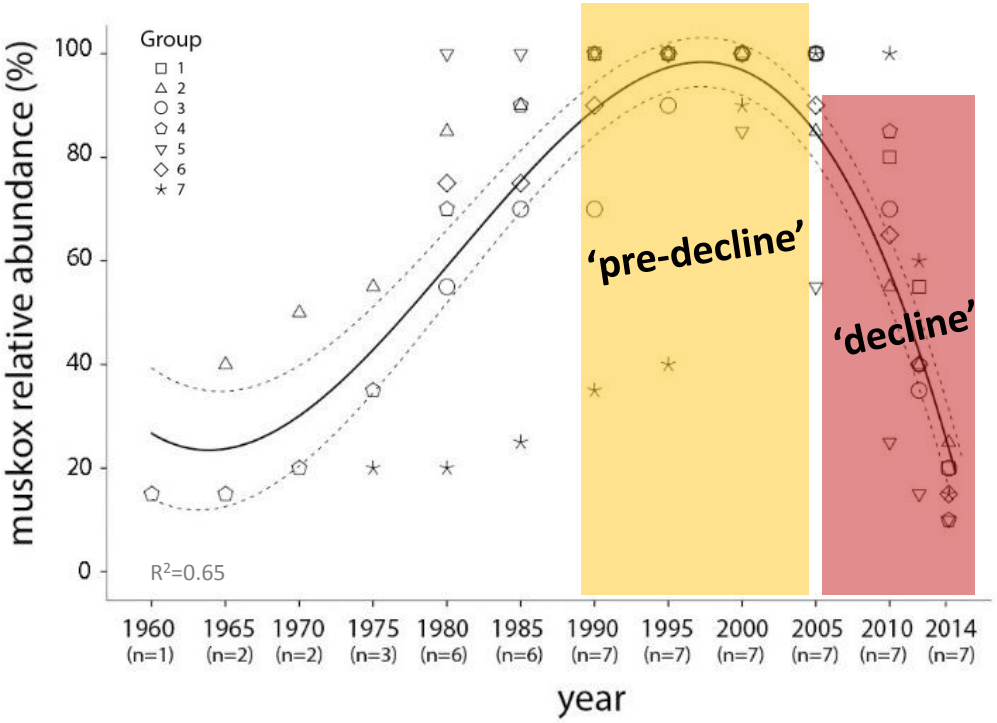
Tomaselli et al. *Cons Biol* (2018)

Comparison ‘pre-decline’ vs. ‘decline’ periods



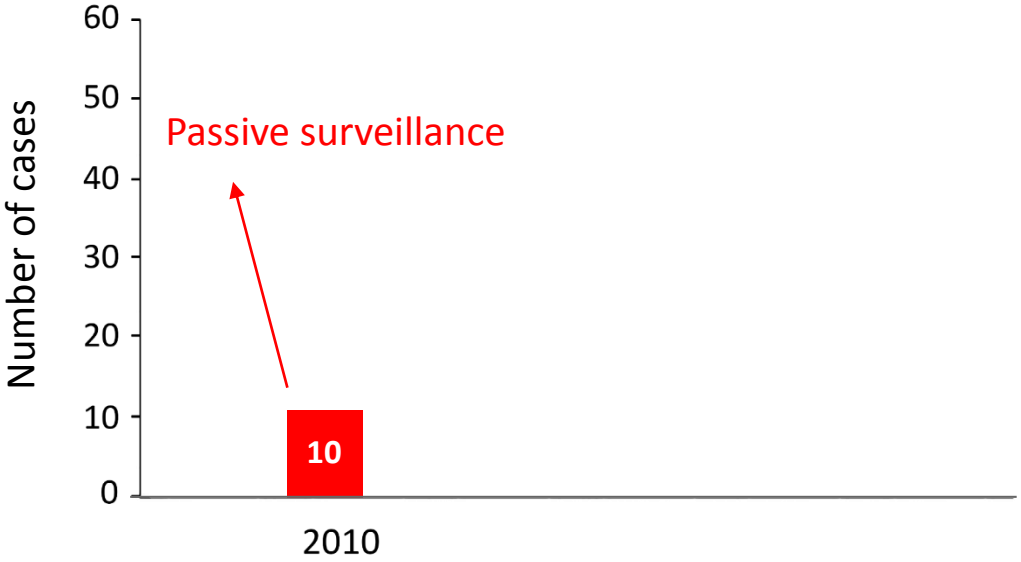
From the ‘pre-decline’ to the ‘decline’ period
↓ proportion of young
↑ proportion of muskoxen in poor body condition
↓ size of herds and ↑ distance between herds
↑ observation of mortalities, including cases consistent with disease outbreaks
↑ trends of morbidity, including newly observed abnormalities

Tomaselli et al. *Cons Biol* (2018)

Muskox mortalities consistent with disease outbreaks

Cambridge Bay 2010

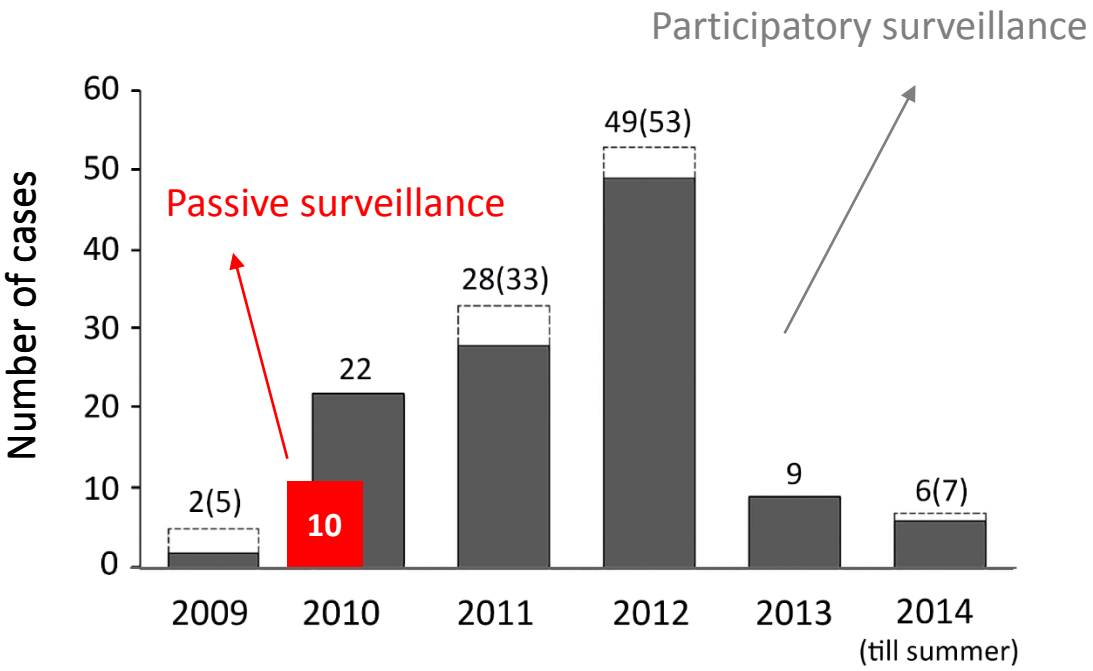
Photo credit S. Kutz



Tomaselli et al. *Cons Biol* (2018)

Muskox mortalities consistent with disease outbreaks

Photo credit S. Kutz



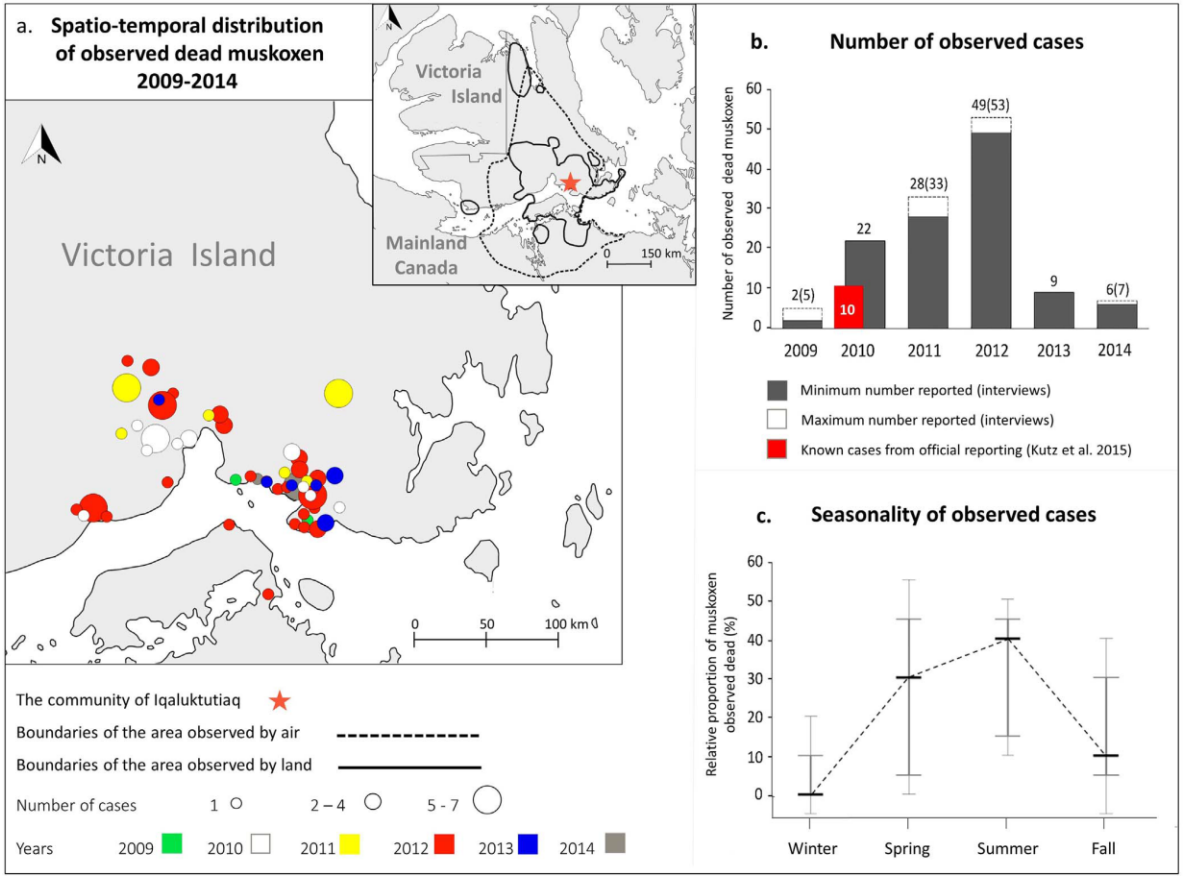
Tomaselli et al. *Cons Biol* (2018)

Muskox mortality consistent with outbreak

Participatory mapping

Timeline of events

Proportional piling



Tomaselli et al. *Cons Biol* (2018)

Baseline of morbidity: observed lesions and abnormalities

ALREADY NOTICED PRIOR THE DECLINE

Abscesses and traumas

White cysts in meat/heart

Swollen joints, limping animals → Increasingly observed since mid-2000s

Sand paper disease

Warble larvae

Liver cysts

Lung cysts (liquid and solid)

Hoof overgrown/infections

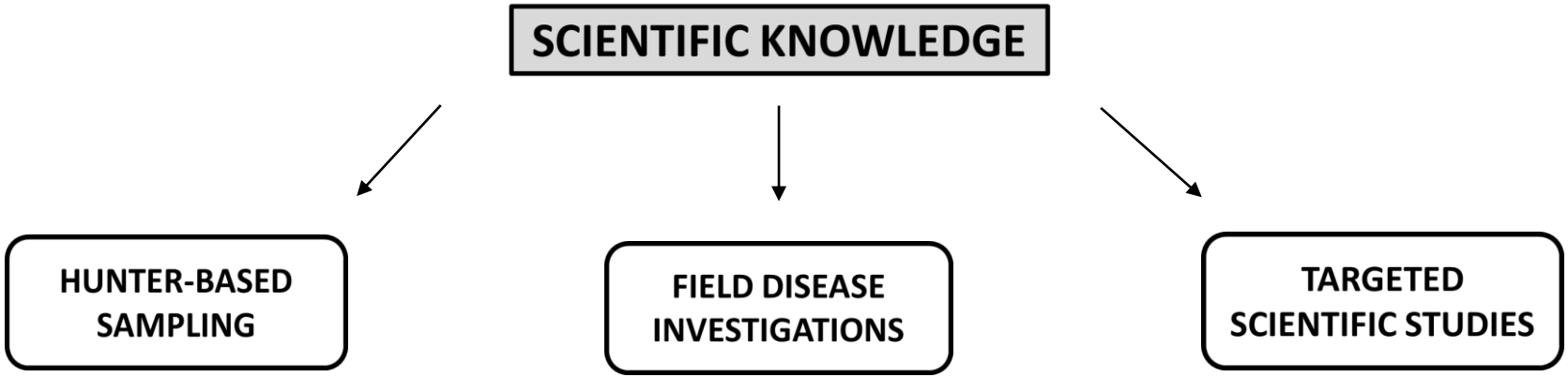
NEWLY OBSERVED SINCE THE DECLINE

Scabby lesions (nose and mouth)

White eyes – corneal opacity

Yellow color of subcutaneous tissue

Tomaselli et al. *Cons Biol* (2018)



Conventional surveillance activities

In this program these activities were informed by local knowledge e.g., logistics, targeting priorities, and data interpretation

DOI: 10.7589/2015-12-327

Journal of Wildlife Diseases, 52(3), 2016, pp. 000–000

Contagious Ecthyma, Rangiferine Brucellosis, and Lungworm Infection in a Muskox (*Ovibos moschatus*) from the Canadian Arctic, 2014

Matilde Tomaselli,[1,4] Chimoné Dalton,[1] Pádraig J. Duignan,[1,2] Susan Kutz,[1,2] Frank van der Meer,[1] Pratap Kafle,[1] Om Surujballi,[3] Claude Turcotte,[3] and Sylvia Checkley[1]

Why does collaboration with hunters and prompt field disease investigation matter for wildlife health surveillance?

Results from a field disease investigation

Summer 2014

Orf-like lesion observed
in a outfitted-hunted muskox

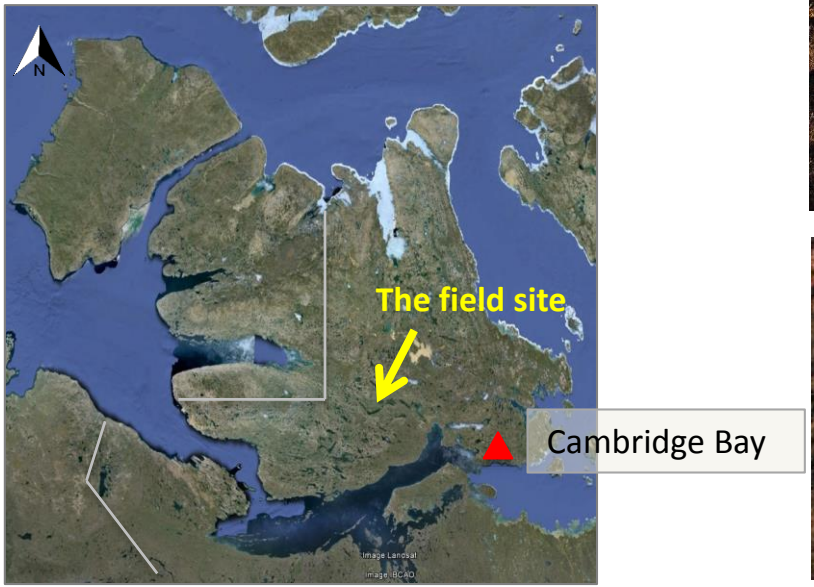
HUNTER-BASED SAMPLING → **'Case finding'** → **FIELD DISEASE INVESTIGATIONS**

Tomaselli et al. *JWD* (2016)

Results from a field disease investigation

Summer 2014

FIELD DISEASE INVESTIGATIONS



Tomaselli et al. *JWD* (2016)

Results from a field disease investigation

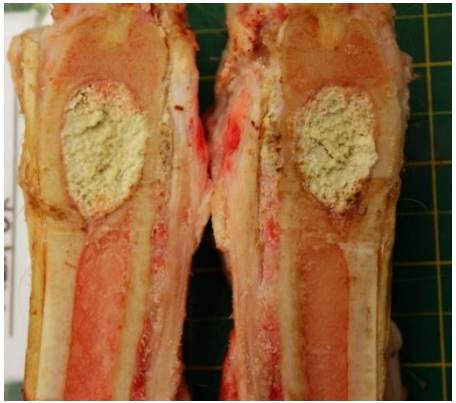
Summer 2014

FIELD DISEASE INVESTIGATIONS

Specific diagnosis to the observations made by hunters

Zoonoses

Contagious ecthyma
Orf virus



Rangiferine brucellosis
***Brucella suis* biovar 4**

Tomaselli et al. *JWD* (2016)

Results from a field disease investigation

Summer 2014

FIELD DISEASE INVESTIGATIONS

Specific diagnosis to the observations made by hunters

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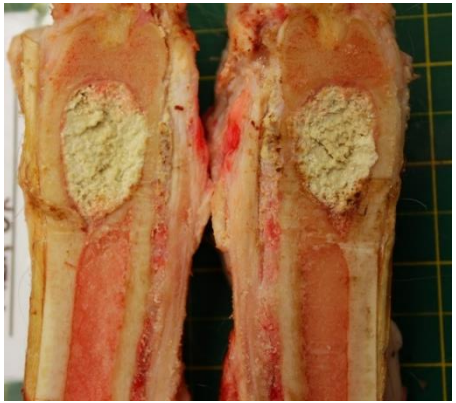
Orf virus



Rangiferine brucellosis
***Brucella suis* biovar 4**

Tomaselli et al. *JWD* (2016)

INTERVIEWS with key informants

PE data on muskox health

***Orf*-like lesions**

Observed in 2004, 2008 in bulls and in 2012 in a dead calf

***Brucella*-like syndromes**

Noticed since the 1980s

↑ trend since mid-2000s

Tomaselli et al. *Cons Biol* (2018)

Brucella in muskoxen of the western Canadian Arctic 1989-2016, a transdisciplinary approach

Matilde Tomaselli, Brett Elkin, Susan Kutz, Jane Harms, Ingebjørg Nymo, Tracy Davison, Lisa-Marie Leclerc, Marsha Branigan, Mathieu Dumond, Morten Tryland, Sylvia Checkley

Submitted to EcoHealth (accepted)

How can local knowledge inform

and help interpretation of data from scientific studies?

Interconnection between surveillance activities

INTERVIEWS with key informants

PE data on muskox health

↓ number of muskoxen since mid-2000s
↓ proportion of young
↑ *Brucella*-like syndromes since mid-2000s

FIELD DISEASE INVESTIGATIONS

Sport-hunted muskox - Summer 2014

Euthanized cow - Spring 2015

Isolation of *Brucella suis* biovar 4

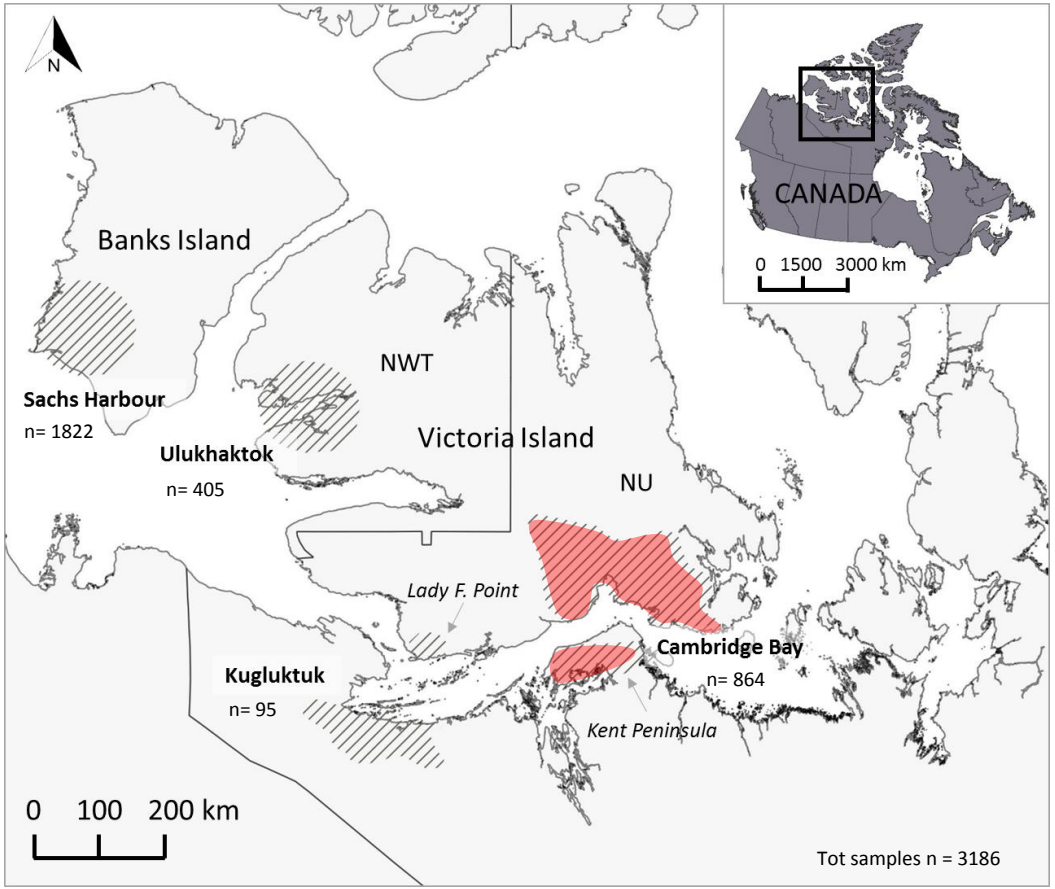
HUNTER-BASED SAMPLING

+ Existing samples archives
Commercial harvest

TARGETED SCIENTIFIC STUDIES

Study to assess
Brucella exposure and infection in muskoxen

Study to assess *Brucella* exposure and infection in muskoxen 1989-2016



Legend

Sampled area

Serology positive(*Brucella spp.*) and/or microbiology positive (*Brucella suis* biovar 4) sample

Many challenges for data interpretation

Unknown characteristics of serology assays

Different type of assays used

Different type of blood samples tested

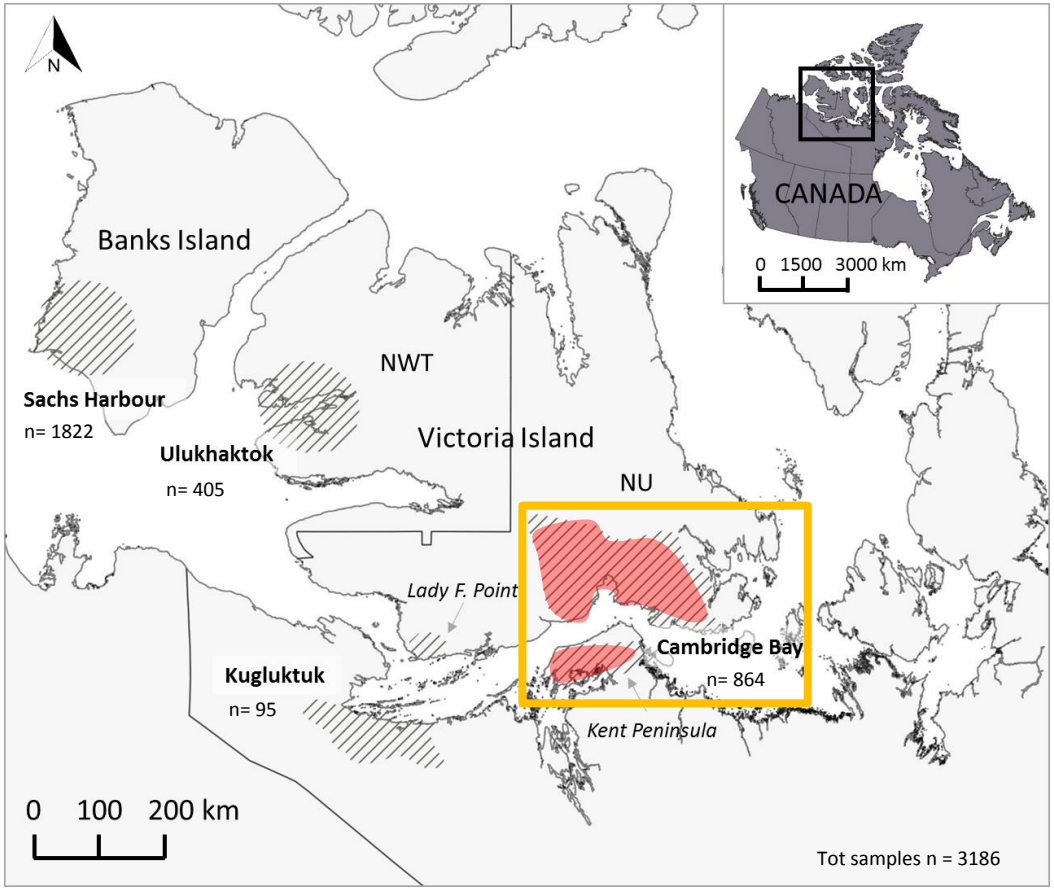
Missing information on the study population

Inadequate sample size

Cross-sectional study design

Tomaselli et al. *EcoHealth* (accepted)

Study to assess *Brucella* exposure and infection in muskoxen 1989-2016



Legend

Sampled area

Serology positive(*Brucella spp.*) and/or microbiology positive (*Brucella suis* biovar 4) sample

Cambridge Bay area

Multiple knowledge sources, including PE

↑ confidence in the results obtained

Cambridge Bay – serology data

↑ trend of *Brucella* exposure

since the population peak of the late 1990s

Tomaselli et al. *EcoHealth* (accepted)

Wildlife surveillance: from global challenges to local solutions, learning from the Muskox Project in Canada's Arctic

Intended for submission to the Scientific Review of the OIE

What is the value of participatory wildlife health surveillance and its potential for broader application ?

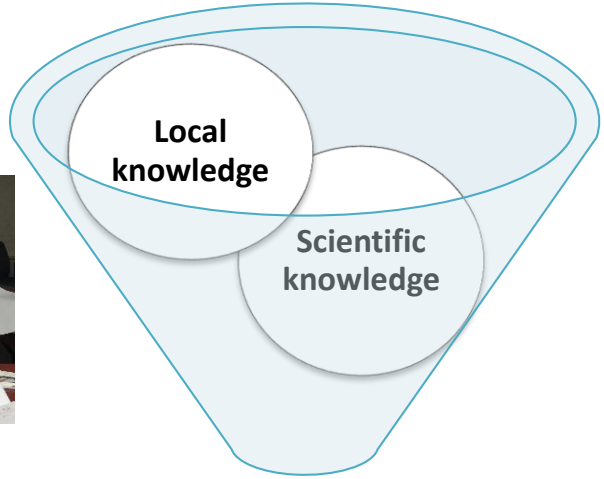
INTERVIEWS with key informants

Individual interviews

Group interviews

Participatory activities

Feedback sessions



Participatory Muskox Health Surveillance

HUNTER-BASED SAMPLING

FIELD DISEASE INVESTIGATIONS

TARGETED SCIENTIFIC STUDIES

INTERVIEWS with key informants

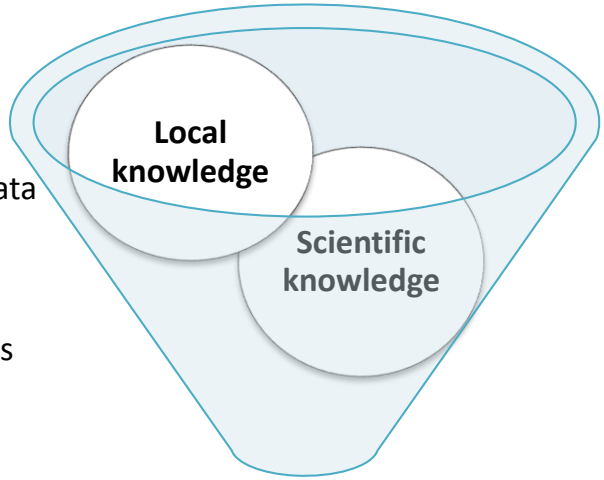
Filled missing historic/contemporary health data
e.g., demography, morbidity, mortality, etc.

Identified health changes

Informed research questions and hypotheses

Supported scientific data interpretation

↑ Sensitivity
↑ Timeliness



↑ Reliability
↑ Accuracy

HUNTER-BASED SAMPLING

FIELD DISEASE INVESTIGATIONS

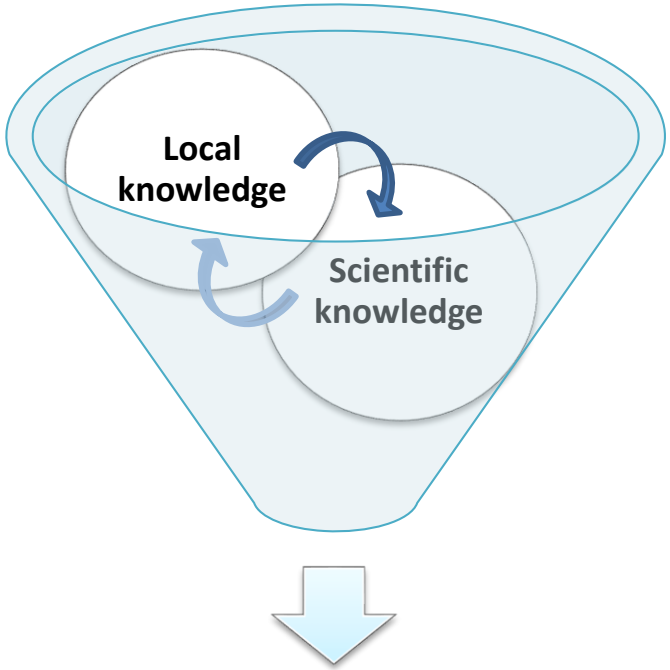
TARGETED SCIENTIFIC STUDIES

Made samples available

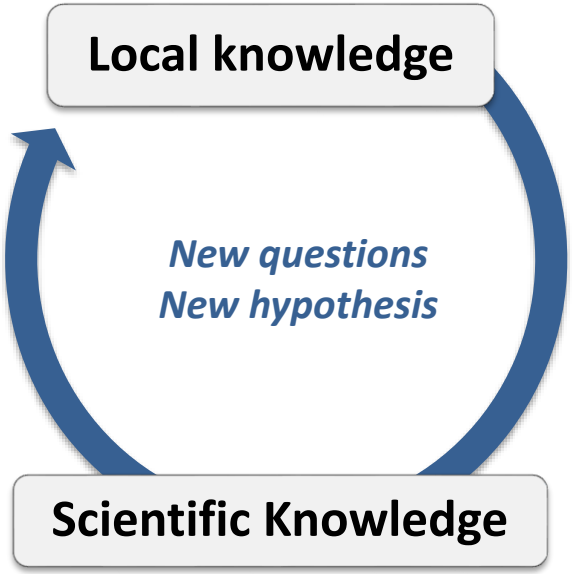
Provided a specific diagnosis

Tested research hypotheses

↑ Specificity



Participatory wildlife health surveillance



Assessment continuously made relevant to the local reality

Participatory wildlife health surveillance - added values

Trust

Identification of problems priorities and solutions

Ownership

Empowerment

Co-management

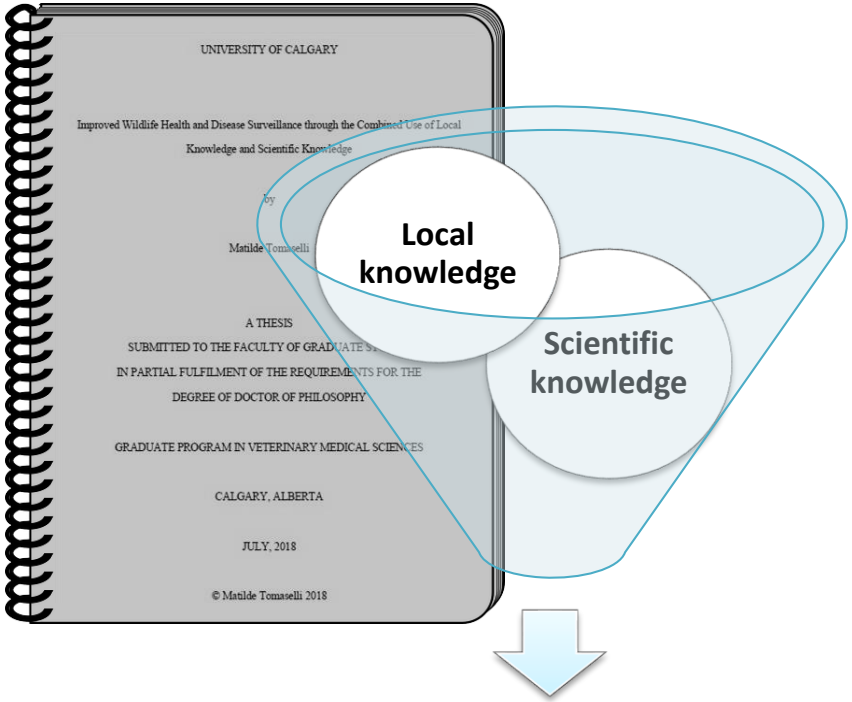
Collaboration

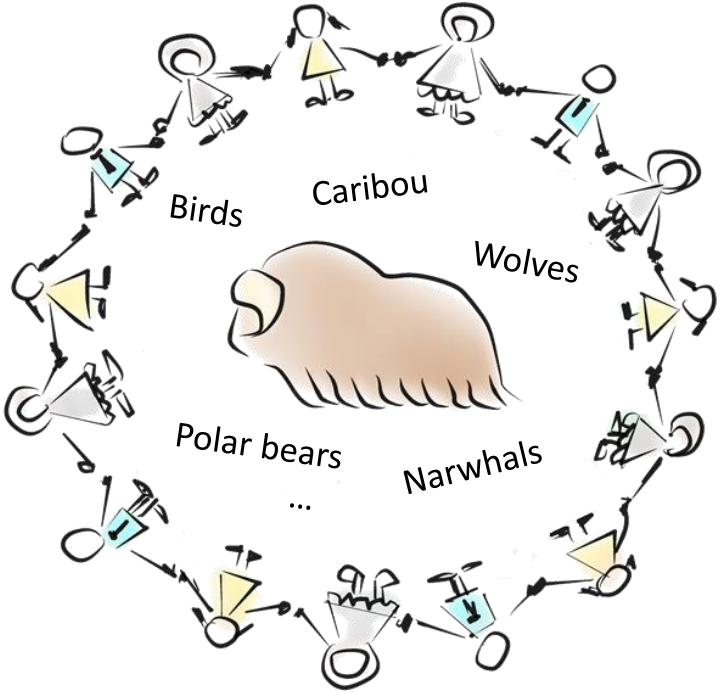
Resilience

Reconciliation

James Haniliak & Eva Kakolak
Co-presenters at ArcticNet 2016

Model to apply to other communities, wildlife species, and settings





Participatory Wildlife Health Surveillance

Promising approach to improve the veterinary surveillance capacity for wildlife in the Arctic and beyond

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Thanks for your attention!

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