

# CARMA 2008: Update on Pathogen Research

Susan Kutz and many many others!







# ***CARMA Resilience in Human-Rangifer Systems - Pathogens***

Research Questions from CARMA IPY proposal

- 1. How do pathogens influence the health and productivity of individual caribou and caribou herds?***
- 2. How is the diversity and abundance of pathogens related to climate, geography, and population density?***
- 3. How can local-scale observations about caribou be integrated with science-based monitoring to enhance understanding of change in the Human-Rangifer System?***





# ***1. How do pathogens influence the health and productivity of individual caribou and caribou herds?***

- First step - Snapshot in time for pathogens
  - What pathogens are present (diversity)?
  - Where are they (geographic range/herd)?
  - Who (age, sex) has them?
  - When (seasonal) are they present?



# CARMA sampling – Level I





# Hind leg

**Marrow fat**

**Cortisol, stress  
proteins**

**Bone density**



**Footrot**

***Besnoitia***

***Setaria*  
*Onchocerca***



# Foot rot – mixture of bacteria





# ***Besnoitia***

- Protozoan
- Emerging in some herds
- Pathogenic – affects mobility, +/- reproduction
- Transmission – remains unknown
- Julie Ducrocq/Stephane Lair – pathology, distribution in body
- \*\*notable herd differences\*\*





# *Setaria* and *Onchocerca/Wucheraria*

- Nematodes detected in skin
- Vector borne - Climate-linked disease outbreaks





# Level I 'Advanced' – Blood strips

- Serology (Pat Curry et al.)

- ☐ *Brucella*\*\*
- ☐ *Neospora*
- ☐ *Toxoplasma*
- ☐ West Nile Virus
- ☐ Several bovine viruses





# Level I 'Advanced' – Blood strips

- PCR Detection of blood-borne pathogens (Danna Schock)
  - Trypanosomes
  - *Setaria*
  - 'other' – *Babesia*, *Anaplasma*, ...
  - Population genetics







# Level I 'Advanced' – Blood strips

- Other tests in the works
  - ☐ Progesterone (pregnancy)
  - ☐ Pepsinogen (abomasal parasitism)
  - ☐ Others?



# Level II





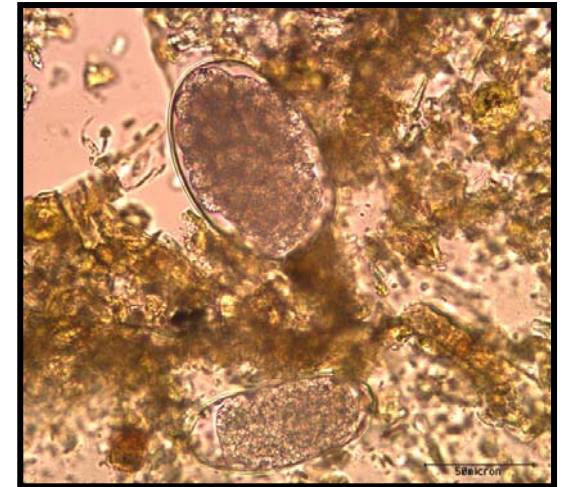
# Level II - Feces

## ■ Gastrointestinal parasites

- Abomasal nematodes – known pathogens of *Rangifer*
- 'other' gastrointestinal parasites??

- Initial results suggest different nematode parasites in George/Leaf
- Molecular ID (Nathan deBruyn)

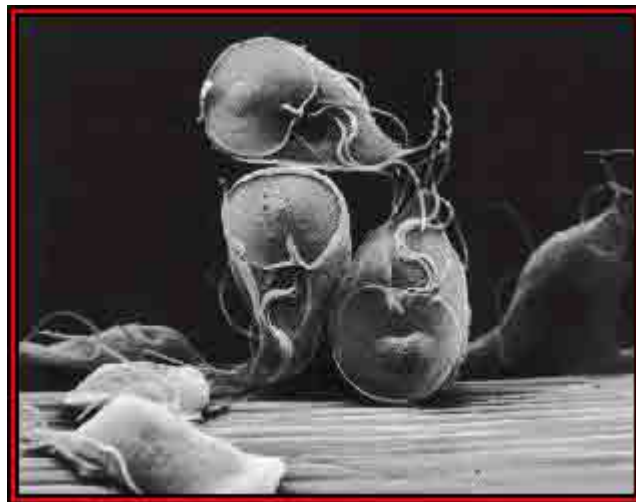
(\*\*Future - Parasite genetics paired with caribou genetics will provide valuable insight into caribou historic distribution and connectivity among populations)





# Level II - Feces

- Gastrointestinal parasites
  - *Giardia* and *Cryptosporidium*
  - Animal and human health concern – indicator of anthropogenic contamination?





## Level II - Feces

- Protostrongylids (muscle, central nervous system and lung parasites)
  - Abundance, impacts, and geographic distribution linked to climate and to sympatric host species (e.g., *P. tenuis* – brainworm)
  - New species in caribou





## Level II - Feces

- Johnes Disease – *Mycobacterium avium paratuberculosis* (MAP)
- Slow growing bacteria of intestine that causes diarrhea and wasting
- Associates with Crohns disease
- High prevalence in Greenland
- (Karin Orsel, Christine Cuyler, Jeroen deBuck)





# Level II – Semi-quantitative Observations

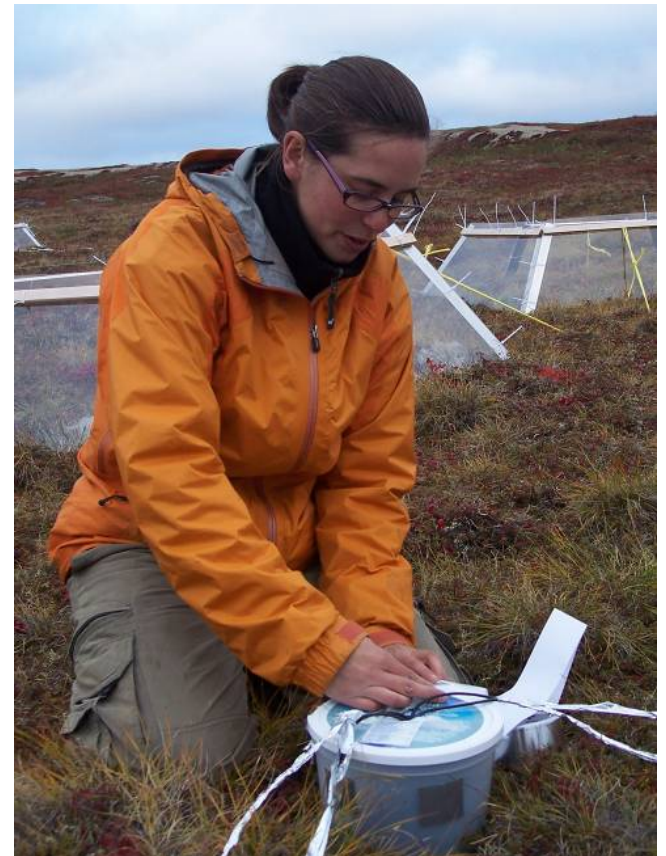
- Warbles
- Tapeworm cysts
- *Besnoitia*
- Other abnormalities





## Level III – Abomasum

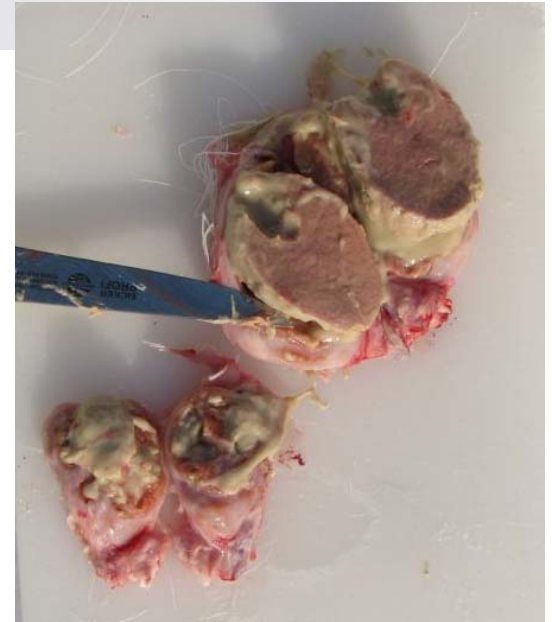
- Describe/compare abomasal parasitism within and among herds (Porcupine, Bathurst, BNE, Southampton, Greenland)
- Bathurst – (Bryanne Hoar, Bruno Croft)
  - Detailed assessment of effects, distribution across age and sex, ‘seasonal’ patterns
  - Paired with experimental lab and field work to examine epidemiology





## Level III – Other

- Testicles/Lymph Nodes – *Brucella* (Jane Harms, U of S, Mitch Campbell)
- Histology of other tissues – normal and abnormal/*Besnoitia* index (J. duCrocq/S. Lair)
- Brain – CWD – Canadian Food Inspection Agency, Lethbridge







# ***1. How do pathogens influence the health and productivity of individual caribou and caribou herds?***

- Snapshot in time for pathogens - Yes
  - What, where, who and when?
- Evaluate relationships between pathogens and body condition, growth, and productivity of individuals and of herds
  - Variable sampling efforts and intensity across herds (metatarsal>blood>feces)





# Fall and Winter collections

	BNW	Bath	G/L*	Porc*	Baffin*
Leg	+	+	+	+	+
Blood	+	+	+	+	+
Feces	+	+	+	+	+
Abom	+/-	+	-	+	-
Histo	+/-	+		+	-
CWD	-	+/-	-	+	-





# Spring collections

	Bath	G/L*	Greenland	Southampton
Leg	+	+	+	+
Blood	+	+	+	+
Feces	+	+	+	-
Abom	+	-	+	+
Histo	+	?	+	+
CWD	+/-	-	+	-





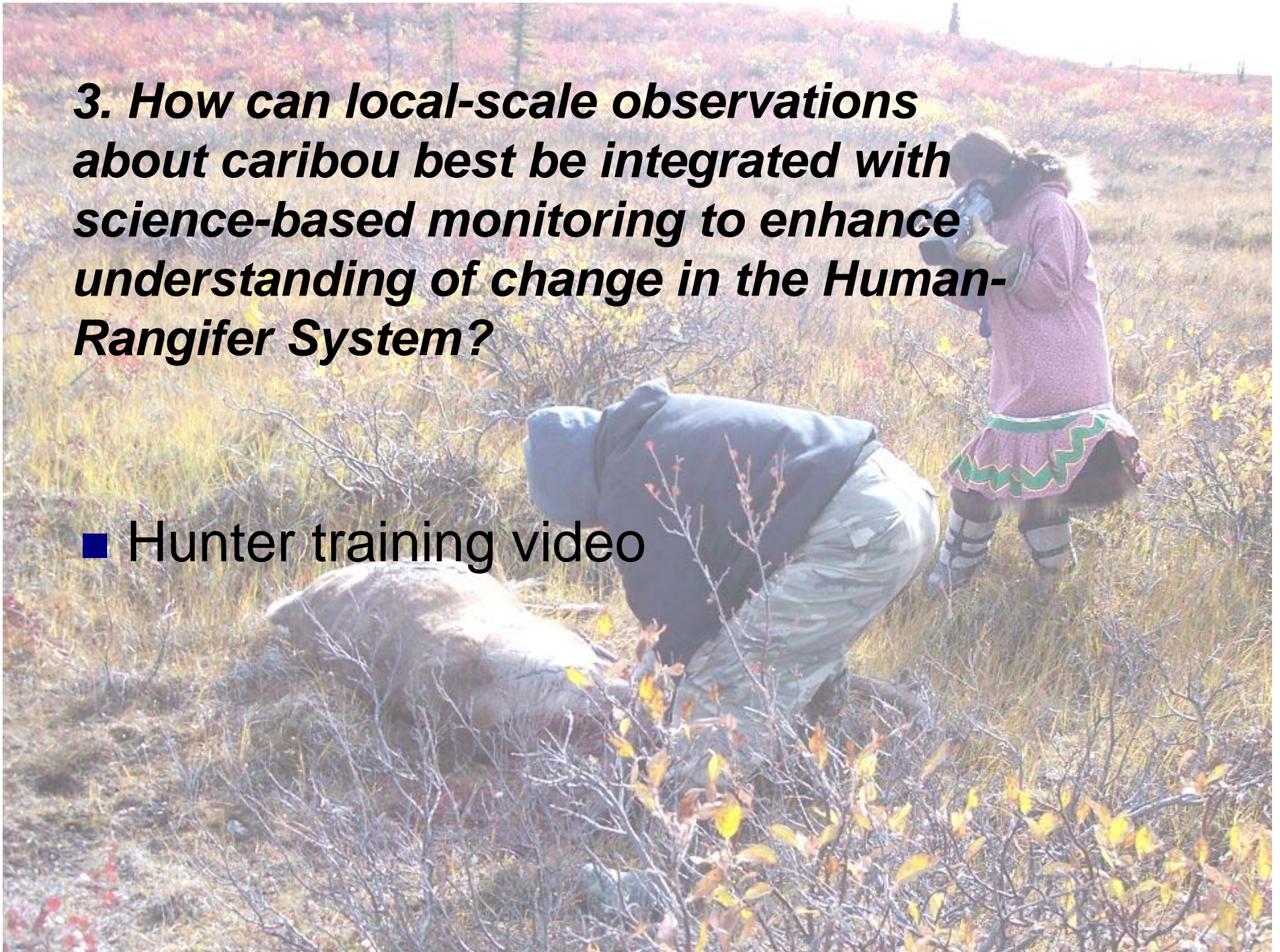
## ***2. How are diversity and abundance of pathogens related to climate, geography, (behaviour, sympatric species), and population density?***

- **Within and among herd comparisons**
- **Preliminary differences**
  - **Johnes**
  - ***Besnoitia***
  - **Warbles**
  - ***Brucella***
- **Insight into transmission patterns**
- **Generating many new questions**



***3. How can local-scale observations about caribou best be integrated with science-based monitoring to enhance understanding of change in the Human-Rangifer System?***

- Hunter training video



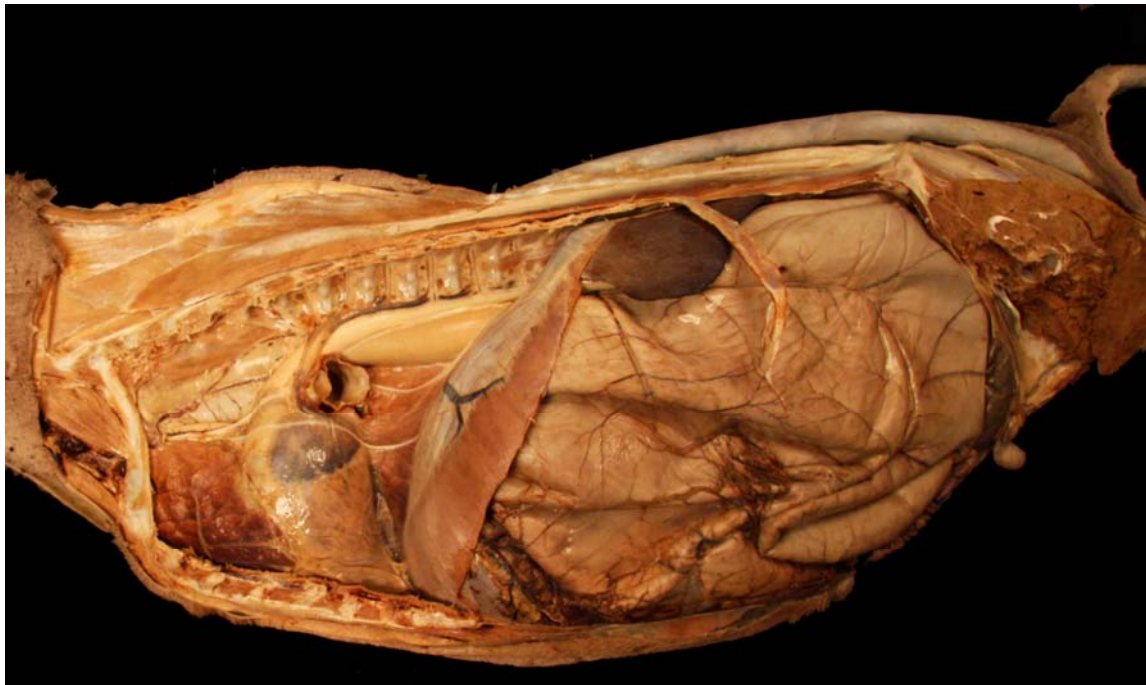


# Quebec, Baffin and Porcupine Level I training, hunter-based collections, interviews, follow-up





# Rangifer Anatomy Project (RAP) – visual resources for education, communication, and research (Ryan Brook, Christoph Muelling, Peter Flood, Jason Anderson et al.)







# ***Summary***

- 1. How do pathogens influence the health and productivity of individual caribou and caribou herds?***
  - *Snapshot of pathogens*
  - *Reasonable data on individuals*
  - *Variable data across herds*
- 2. How is the diversity and abundance of pathogens related to climate, geography, and population density?***
  - *Very interesting initial findings – Johnes, Brucella, Besnoitia*
  - *Sample size is a challenge*
  - *Analyses over the next few years*
- 3. How can local-scale observations about caribou be integrated with science-based monitoring to enhance understanding of change in the Human-Rangifer System?***
  - *In progress, need feedback, ongoing refinement, and evaluation*



- Collections – importance of consistency and full datasets
- Patience – time to get results
- Huge, but very productive, team effort from field to lab bench and back



- Generating more questions than answers!



