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The effect of warble and nasal bot fly larvae parasites on the body condition of cow Porcupine Caribou

*An independent research project report for
community stakeholders*

January 15, 2004

Do warble and nasal bot fly larvae have an effect on the body condition of cow caribou?

Is it possible that these parasites have an effect on pregnancy rates or the survival of calves?

Introduction

Warble and nasal bot flies depend on the caribou to complete their lifecycle. Both flies live out their larval stages in the caribou and then develop into adults once the caribou arrive at the calving grounds. Warbles and nasal bot flies are closely related insects but are not the same organism and have very specific sites of development in the caribou host.

Most research on these parasites has been done on semi-domesticated reindeer in northern Europe. Adult flies are known to reduce body condition through harassing the animals. Parasites in general are known to reduce the amount of backfat in reindeer and caribou but there is little clear evidence that warbles and nasal bot larvae have an effect. One study on pregnant reindeer showed that warbles reduced weight gain and another study found that pregnant caribou in poor condition had more warbles.

Organisation of the Research Project



My objectives

1. To find out how many warble and nasal bot fly larvae cow Porcupine Caribou have on average.

2. To determine if these parasites have an effect on the body condition of female caribou.

How my study was organised

The best test of body condition is whether or not a cow caribou becomes pregnant and if her calf is able to survive. Pregnancy depends on the body weight and body fat of the cow. Survival of the calf depends on the protein and fat levels in the cow. I compared counts of the warble and nasal bot larvae with the body weight, fat measurements, and protein measurements of the cow caribou.

I worked with hunters from Aklavik, Fort McPherson, Inuvik, and Tsiigehtchic, NWT participating in community hunts between January and April 2003. I also consulted elders from Dawson City and Fort McPherson about the best times to find caribou and where to look for parasites in the animals.

Besides collecting warble and nasal bot numbers and body condition samples, I also collected samples in order to look for other types of parasites.

I used mathematical equations for body weight, fat levels, and protein levels that are used by Yukon Government biologists to rate the body condition of Porcupine Caribou.

My Results

A total of twenty-four female caribou were sampled. Twelve caribou were sampled February 6 – 8, 2003. Another 12 cow caribou were sampled in mid-April, 2003. Fourteen animals were pregnant, none were producing milk for a calf and none had a calf at heel. Eight cows were not pregnant.



The average number of warbles per animal was 65.42. The average number of nasal bots was 10.17. All of the animals had warbles but only 66.7% of the animals had nasal bots. There was a difference in the counts of nasal bots between February and April. In February I found that 41.7% of the animals had nasal bots and 91.6% had nasal bots in April. It was very difficult to count nasal bots in February because the larvae were so small. The difference in numbers suggested to me that I had missed larvae in February and my counts were not accurate. I decided not to include nasal bot counts in my calculations.

I realised that by April the nasal bots had moved to a new location in the caribou. In February the larvae were lodged in tissue behind the tongue. In April the larvae were in the back of the throat above the soft palate. The larvae had grown much larger and were also a darker colour although there were different stages of development present in April.

Do the warble fly larvae have an effect on pregnancy rates?

I did not find a statistically significant difference in the average number of warbles in pregnant caribou compared to non-pregnant caribou.

Do the warble fly larvae have an effect on body weight?

I did not find a statistically significant difference in the average number of warbles in cow caribou with less than average body weight compared to caribou with higher than average body weight. There was also no significant difference in the average body weight of pregnant cows versus the average body weight of non-pregnant cows.

Do the warble fly larvae have an effect on fat levels?

I found that the average number of warbles in cow caribou with less than average fat levels was slightly higher than in caribou with higher than average fat levels. There was a significant difference in the average fat level of pregnant cows when compared with the average fat level of non-pregnant cows.

Do the warble fly larvae have an effect on protein levels?

I did not find a statistically significant difference in the average number of warbles in cow caribou with less than average protein levels compared to caribou with higher than average protein levels. There was only a slight difference in the average protein levels of pregnant cows versus the average protein levels of non-pregnant cows.

My Conclusions

It does not appear that the number of warbles contributed significantly to the probability of pregnancy. The average numbers of warbles were not significantly different between non-pregnant and pregnant caribou. Becoming pregnant in the fall and carrying the unborn calf through the winter is not likely influenced by these parasites. Given this, other factors besides these parasites have a greater effect on pregnancy rates.

Warble numbers do not appear to influence body weight, an element that does contribute to the probability of pregnancy. Differences in average body weights of pregnant and barren cows were not significant. Female caribou with less than the average estimated body weight did not have significantly different numbers of warbles than cows with average or greater body weight. Mathematical predictions using numbers of warbles and body weight calculations (regression analysis) showed that warbles contributed to only 1.75% of the differences in body weight (kidney fat contributed to about 69% of the differences in body weight).

Warbles may have an effect on the fat percent of female caribou. The average number of warbles was somewhat higher for caribou with lower than average calculated fat percent. At the same time the average fat levels of pregnant cows were significantly different to the average fat levels of



non-pregnant cows in this study. Adequate fat stores do have a role in the probability of pregnancy however taking these measurements at this point in the yearly cycle of the Porcupine Caribou will not tell us which came first, the warbles or the lower fat stores.

The ability of a cow to carry a calf to term and give birth to a healthy calf is dependent on the body fat and also the total body protein of the cow. The average calculated protein level was slightly higher in pregnant than in non-pregnant caribou. The average protein level was not significantly affected by numbers of warbles but mathematical predictions using numbers of warbles and body protein calculations (regression analysis) showed that warbles contributed to only 1.75% of the differences in protein levels (factors such as the animal's age, amount of backfat, and reproductive status had more influence here).

The warble larvae begin to migrate through the body of the cows when the animals are at the peak condition of the year having built up their stores of fat and protein through the summer. At this same time the warble larvae cause the immune system of the host to react against the larvae, which requires good protein levels for this to occur. It is reasonable to expect that if the cows are in good body condition, not stressed, and able to mount a good immune response, the effect of the larvae on the body condition of the cows would be minimal.

Future research

I recommend that larger sample sizes be collected if similar research is undertaken. Although it was good to have a second opportunity to sample another twelve caribou in April, the small sample size of 24 animals is the limiting factor of this study.

Not much is known about nasal bots in caribou. I encountered difficulty getting accurate counts but learned that the bot larvae change locations during their development and, later in their development, are found in a different location than reported in other animals that have nasal bot larvae parasites. Counts of nasal bots should be taken in January through to the end of April to obtain accurate counts and describe the movement of the larvae in more detail.

I would like to know what the potential is for climate change to alter infection rates. The development of these insects depends on temperature and warming trends could increase the number of insects infecting the animals.

Information on the numbers and different species of other parasites should be collected on the Porcupine Caribou Herd. In the spring of 2003, larvae of a protostrongylid nematode parasite were isolated from faecal samples from Bluenose-east barren-ground caribou in the Northwest Territories. In April 2003 I found this parasite in faecal samples from the Porcupine Caribou. DNA analysis suggests that this is a previously uncharacterised parasite and may be a close relative to a lung nematode of white-tailed deer, which has not been reported in caribou or any other northern ungulate species. Baseline data on the incidence and prevalence of parasites of the Porcupine Caribou herd is likely to provide additional information for the management and health assessment of the herd.

Acknowledgements

I have received tremendous assistance over the last two years. The completion of this project would not have been possible without the support and dedication of many; their volunteer hours and patience is greatly appreciated.

I would like to thank the following people and organisations for their assistance with this project:

My local advisors:

- 1 Ms. Dorothy Cooley, Department of Environment, Dawson City, Yukon (primary mentor)
- 2 Mr. Don Russell, Research Manager, Canadian Wildlife Service, Whitehorse, YT

Mr. Alan Anderson, Fish and Wildlife Steward for Tr'ondëk Hwëch'in First Nation, Dawson City, Yukon (assistance with obtaining samples)

Canadian Imperial Bank of Commerce, Dawson City, Yukon (funding of research project and travel/accommodation for Arctic Ungulate Conference, Saariselkä, Finland, and International Workshop on Arctic Parasitology, Rovaniemi, Finland)

Canadian Wildlife Service, Whitehorse, Yukon (use of library and photocopier)

Dawson Campus, Yukon College, Dawson City, Yukon (photocopying, faxing, use of computer software)

Dawson District Renewable Resources Council, Dawson City, Yukon (support for funding applications and project proposal)

Eagle Plains Hotel and Restaurant Staff and Management, Eagle Plains, Yukon

Fort McPherson Community Radio, Fort McPherson, Northwest Territories (broadcasting notices about meetings, research project information for hunters)

Fort McPherson Coop/ Inns North Hotel, Fort McPherson, Northwest Territories

Mr. Jeff Hunston, Director, Heritage Branch, Tourism, Yukon Territorial Government, Whitehorse, YT (Scientists and Explorers Licences 2002, 2003)

Dr. Susan Kutz, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Saskatchewan (suggestions for general protocols, sample preservation and recovery, use of photographs)

Mr. Martin Keinzler, Department of Environment, Yukon Government, Dawson City, Yukon (tissue and sample processing)

Mr. Kirby Meister, Conservation Officer, Department of Environment (assistance recruiting hunters)

Mr. John Nagy, Regional Biologist, Department of Resources, Wildlife and Economics, Government of Northwest Territories, Inuvik, Northwest Territories (initial planning of project, advice on abomasal tissue processing)

Northern Research Institute, Yukon College, Whitehorse, Yukon (funding of research project)

Porcupine Caribou Technical Committee (support for and feedback on project proposal)

Porcupine Caribou Management Board (support for funding applications and project proposal)

Mr. Edward Roberts, Tr'ondëk Hwëch'in elder, Dawson City, Yukon (advice on finding nasal bots, working with hunters)

Mr. Doug Stewart, Director, Wildlife and Fisheries Division, Department of Resources, Wildlife and Economics, Government of Northwest Territories, Yellowknife, NT (Wildlife Research Permits 2002, 2003)

Tetlit Gwich'in Renewable Resources Council, Fort McPherson, Northwest Territories (support for project and assistance recruiting community hunters)

Tr'ondëk Hwëch'in First Nation, Dawson City, Yukon (support for project)

Ms. Mary Rose Vittrekwa, Executive Assistant to the Tetlit Gwich'in Renewable Resources Council, Fort McPherson, Northwest Territories (assistance recruiting community hunters)

Wildlife Management Advisory Council (NWT), Mr. Larry Carpenter (Chair), Joint Secretariat – Inuvialuit Renewable Resources Committees, Inuvik, Northwest Territories (recommendation of project)

Yukon College Professional Development Committee, Whitehorse, Yukon (funding of research project)

Assistants during field trips and laboratory work:

- 1 Drs. Sandy Cook and Ted Kilpatrick, (assistance on parasite collection trip)
- 2 Ms. Erin Waterman, student in RRMT 127, Dawson Campus, Yukon College
- 3 Ms. CJ Russell, student in RRMT 127, Dawson Campus, Yukon College
- 4 Ms. Jessica Joinson, student in Chemistry 11/12, Robert Service School, Dawson City

Hunters:

Mr. Collin Koe, Fort McPherson, Northwest Territories
Mr. Robert Vittrekwa, Fort McPherson, Northwest Territories
Mr. Albert Frost, Inuvik, Northwest Territories
Mr. Tommy Wright, Inuvik, Northwest Territories
Mr. Trevor Dobbs, Fort McPherson, Northwest Territories
Mr. Freddy Blake, Fort McPherson, Northwest Territories
Mr. Clarence Roberts, Fort McPherson, Northwest Territories
Mr. Johnny Charlie, Fort McPherson, Northwest Territories
Mr. Collin, Fort McPherson, Northwest Territories
Mr. Alfred Itsi, Fort McPherson, Northwest Territories

