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BESNOITIA TARANDI IN CARIBOU (*RANGIFER TARANDUS*)

- Is a protozoan of which caribou are the intermediate host;
- Transmission cycle is believed to be a two-host life cycle; it is suspected that carnivores and biting arthropods represent the definitive hosts and the vectors respectively (Fig. 1);
- Lesions affect mainly the skin and the subcutaneous tissues and manifest themselves as a progressive thickening, hair loss and ulceration, primarily localized on the limbs (Fig. 2A), the head (Fig. 2B) and scrotal sac (Fig. 2D);
- Parasitic cysts (0.5-1 mm in diameter) can be observed visually on the sclera (Fig. 2C) and can be seen during histopathological examination of the lungs, the testicular tissue and other viscera;
- Diagnosis is based on the presence of parasitic cysts in the sampled tissues, confirmed by histopathology.

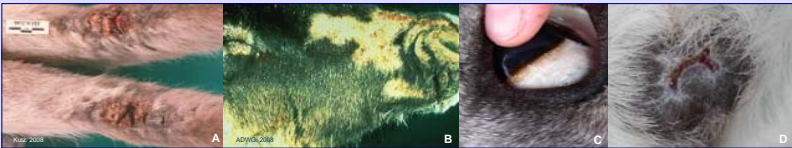
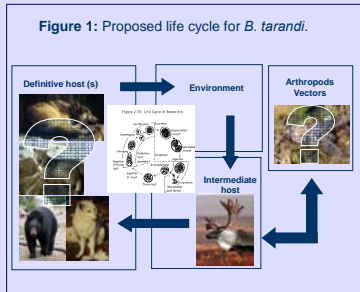


Figure 2. Macroscopic lesions observed in caribou affected by Besnoitiosis.

METHODOLOGY

- Samples examined were obtained in 2007-08 from different caribou herds via the CARMA network (Fig. 3A). With the exception of nine caribou who were specifically sampled due to their poor appearance (targeted sampling), sampling was assumed to be random or stratified for age and sex;
- Sections of skin from the rostrum, the metatarsus, the thigh, the scrotal sac and the udder, as well as sections of the conjunctiva were fixed in a 10% buffered neutral formalin solution, then embedded in paraffin before being cut into 5 µm thick sections and finally stained with hematoxylin, phloxine and saffron;
- A diagnosis of Besnoitiosis was made upon the discovery of at least one cyst having a characteristic morphology compatible with *B. tarandi*;
- The intensity of infection in the superficial dermis (number of cysts / mm²) was calculated for each section (Fig. 4).

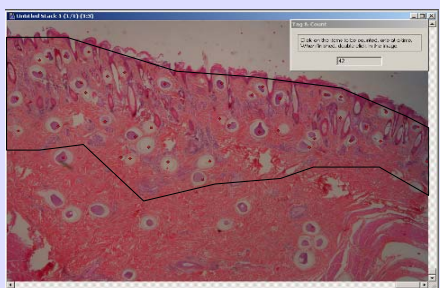
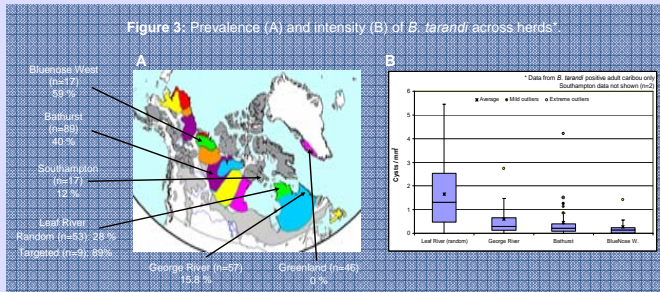


Figure 4: The determination of the intensity of infection on microscopic slides (2X magnification) was accomplished through the use of an image tool software (UTHSCA ImageTool). The measured area consisted of the superficial dermis, in other words, extending from the external surface of the skin to the base of the hair follicles and adnexal structures (surface delimited by the black line).

PRELIMINARY RESULTS HAVE SHOWN

- Herds from Western Canada have a higher prevalence compared to herds from Quebec; however, infected animals from Quebec usually display higher intensities of infection (Fig. 3A and 3B);
- B. tarandi* was not detected in the examined samples taken from the herd in Greenland;
- In the Leaf River Herd, the prevalence of *B. tarandi* was greater in animals targeted due to their poor general condition when compared to samples randomly collected and those obtained from hunters (Fig. 3A).



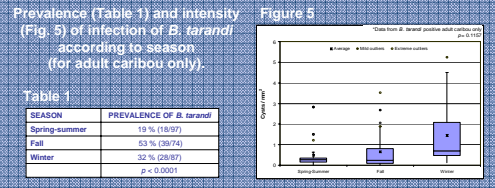
- B. tarandi* seems to be more prevalent during the fall, but the intensity of infection in affected animals is similar between seasons (Table 1 and Fig. 5);
- Higher prevalence of *B. tarandi* is found in males when compared to females; however, the intensity of infection in affected animals is similar between the genders (Table 2 and Fig. 6);
- Adult caribou have a higher prevalence of *B. tarandi* when compared to the calves, but the intensity of infection is similar between age categories (Table 3 and Fig. 7);
- B. tarandi* presents a tropism for the testicular structures in which it often induces a marked inflammatory reaction;
- Skin from the metatarsal region seems to be the best sampling site for the diagnosis of *B. tarandi* but the combination of metatarsus and rostrum increases the likelihood of diagnosis (Table 4);
- Results from the evaluation of blood parameters performed on selected animals, suggests a possible association between the intensity of infection and circulating levels of globulins and of two muscular enzymes (Aspartate aminotransferase and Creatine kinase);
- These preliminary results will be evaluated in the comprehensive epidemiologic analysis.

DISCUSSION

- B. tarandi* is commonly encountered in caribou, but the prevalence and the intensity of infection varies among the herds;
- The apparent increase in the prevalence following the summer months supports the suspected role of arthropods as vectors of *B. tarandi*;
- Results of the examination of animals in poor general condition suggest that this parasite can have a significant impact on the health of an individual caribou;
- Testicular lesions as a result of *B. tarandi* presence could potentially be associated with reduced fertility in males;
- Recommended samples allowing the evaluation of this parasitic disease are scrotal sacs with the testes and sections of skin from the metatarsus and the rostrum;
- Impact of this parasite on the dynamic of the caribou population is unclear. However, our preliminary findings show that the relationship between this parasite, its host and the ever changing Arctic environment is worth further investigation.

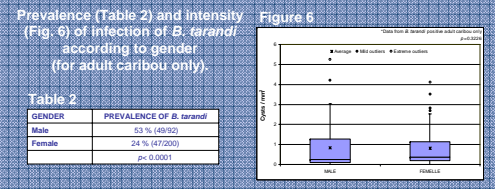
CARMA NETWORK COLLABORATORS

- Joëlle Taillon and Steeve Côté (Université Laval, Québec)
- Vincent Brodeur, Stéphane Rivard, Lina Lambert and Denis Vandal (Ministère des Ressources naturelles et de la Faune, Québec)
- Brett Elkin, Bruno Croft and Mitch Campbell (Environment and Natural Resources, Government of the Northwest Territories)
- Christine Cuyler (Greenland Institute of Natural Resources)



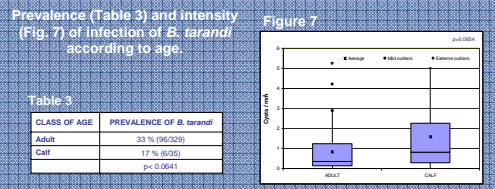
SEASON	PREVALENCE OF <i>B. tarandi</i>
Spring-summer	13% (16/97)
Fall	53% (28/74)
Winter	32% (28/87)

p < 0.0001



GENDER	PREVALENCE OF <i>B. tarandi</i>
Male	53% (49/92)
Female	24% (47/200)

p < 0.0001



CLASS OF AGE	PREVALENCE OF <i>B. tarandi</i>
Adult	33% (86/259)
Calf	17% (6/35)

p < 0.0641

SAMPLING SITE	Percent of Besnoitia+ animals with cysts in:
Rostrum and Metatarsus	93%
Metatarsus	86%
Rostrum	82%
Conjunctiva	48%
Scrotal sac	48%
Thigh	43%
Udder	30%