



Endo- and Ectoparasites of the Black Bear (*Ursus americanus*) in Northern Minnesota

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Abstract

The American black bear, *Ursus americanus*, is an important species that is widely present across North America. In any area, a variety of both endoparasites and ectoparasites may be present within the environment, and parasite burdens in these animals may have a variety of detrimental health effects, however, very little data on parasites found in black bears of northern Minnesota and surrounding regions has been collected since the 1970s. In this project, non-invasive techniques (visual examination for ectoparasites, and fecal flotation for intestinal endoparasites) were used over the course of 10 weeks to identify parasitic species present in black bears at the Vince Shute Wildlife Sanctuary in Orr, MN. Fecal flotation was performed on a total of 50 samples, and of these, only two had ascarid (roundworm) eggs present, most likely of the *Baylisascaris* species. One of the two positive samples was from a cub approximately 7 months old, while the other was from an adult female. Ectoparasites observed and identified on the bears included the hard-bodied ticks *Dermacentor variabilis* and *Ixodes scapularis* (a common carrier of *Borrelia burgdorferi*, the causative agent of Lyme disease) as well as mosquitoes and biting flies (*Tabanus* sp. and *Chrysops* sp.).

Introduction

- Parasite burdens can significantly impact the health of animals, and while many parasites and diseases transmitted via parasites have been studied in humans and domestic species, significantly less data is available for parasites affecting wild animals
- In the fall, it is legal to hunt black bears in Minnesota, making them a potential vector of diseases which can affect humans
- Previous studies^{3,4,5} from the 1970s identified multiple species of ticks, lice, fleas, ascarids, taeniid cestodes, and other nematodes, but this research has not been pursued in recent years.
- The objectives of this study were to identify which parasitic species are present and whether parasite presence changes throughout a 2.5-month study period, as well as if there are variations in parasite burden based on sex or age category of the animals observed.
- Data was collected at the Vince Shute Wildlife Sanctuary (VSWS) in Orr, MN. VSWS provides supplemental food for wild bears, which creates an environment with large numbers of bears in a relatively small area, allowing for observation and collection of fecal samples.

Materials & Methods

- Due to the nature of working with large wild animals, non-invasive techniques were used and no direct animal handling occurred.
- Data collection occurred at VSWS between June 1-August 15, 2020.
- Ectoparasites were evaluated primarily with visual observation of bears, as well as the occasional use of photography.
- Tick species in the region were also identified using specimens found in the grasses on VSWS property. Mosquitoes and flies were observed on or around the bears.
- Fresh fecal samples (n=50) were collected opportunistically and examined using non-centrifugal fecal flotation.
- ~2 grams of fecal material was collected using AmexDrug fecalyzer containers, and was then mixed thoroughly with Jorgenson Labs Sheather's Sugar Flotation Solution. Following mixing, additional flotation solution was added to form a positive meniscus, and a 2x2 cm glass coverslip was placed on top of the meniscus. Each sample was allowed to sit undisturbed for 10 minutes to allow oocysts to migrate under the coverslip.
- Following the 10 minute rest period, the coverslip was removed and placed on a glass slide. A light microscope was used to examine each slide at 40x magnification, with closer examinations at 100x or 400x where appropriate.

References

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Results

- Two species of ticks were observed, *Dermacentor variabilis* (the wood tick or American dog tick), and *Ixodes scapularis* (the deer tick). The ticks observed were primarily *D. variabilis*, and while ticks were seen on nearly all adult and subadult bears, cubs typically did not have ticks readily visible.
- Ticks were primarily present throughout the month of June and the first two weeks of July; following this their presence was reduced significantly. Ticks were mainly observed on the bear's faces, often lining the pinna, on the muzzle, or next to the eyes.
- Mosquitoes were observed on the bears throughout the duration of the data collection.
- From the second week of July to the end of data collection, *Tabanus* spp. (horseflies) and *Chrysops* spp. (deerflies) were observed on the bears.
- Of the 50 fecal samples evaluated using fecal flotation techniques, 48 samples (96%) showed no evidence of endoparasites, while 2 samples (4%) contained ascarid oocysts. Both positive samples were collected in August, with one being from an adult female and another from a cub of unknown sex.
- 58% (n=29) of fecal samples came from males, 26% (n=13) from females, and 15% (n=8) came from bears of undetermined sex.
- 84% (n=42) of fecal samples were from adult bears, 14% (n=7) came from subadult bears (~1-2 years), and 2% (n=1) came from cubs (<1 year).



Figure 1: Bears gathered for feeding at Vince Shute Wildlife Sanctuary



Figure 2: A fecal flotation setup



Figure 3: Ascarid oocysts and fecal debris viewed at 40x magnification



Figure 4: Ascarid oocyst viewed at 100x magnification



Figure 5: An adult female bear with *D. variabilis* ticks visible around the eyes and pinna



Figure 6: A 21 year old identifiable male bear 'Cheeky' who provided 3 fecal samples over 24 days for this study.

Discussion & Conclusion

- Based on the findings of previous studies^{1,3,4}, the ascarid oocysts observed on fecal flotation were likely *Baylisascaris transfuga*.
- The roughened appearance of the oocyst outer shell is consistent with *Baylisascaris* sp. as opposed to others such as *Toxocara* sp.
- Heavy ascarid burdens can cause malnutrition, intestinal blockage, vomiting, and diarrhea².
- Since both positive fecal samples were collected in August it may indicate that these parasites are prevalent during the late summer, but a larger sample size would be necessary to confirm.
- Due to the low number of positive samples this experiment is unable to suggest any correlations regarding incidence of endoparasites depending on sex, age group, or season.
- It must be noted that 3 of the fecal samples were collected from the same identifiable bear, a 21 year old male nicknamed 'Cheeky'. The samples were collected between 6/28/20 – 7/22/20 and all three samples showed no signs of endoparasites.
- The *Ixodes* ticks observed on the bears likely concentrated around the facial region due to shorter, thinner hair.
- The lack of ticks on cubs is due to sows using their teeth to gently remove ticks from their young⁵
- I. scapularis* ticks pose a health risk as they are known to cause tick paralysis and are common vectors of *Borrelia burgdorferi*, the causative bacterium of Lyme disease².
- Mosquitoes can cause anemia, and can transmit multiple bloodborne disease, most notably West Nile Virus in this region, as well as transmitting *Dirofilaria immitis*².

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