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Parasites in Grizzly Bears from the Central Canadian Arctic

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ABSTRACT: Standardized flotation techniques were used to survey 56 grizzly bear (*Ursus arctos*) fecal samples for parasites. The samples were collected during the spring and autumn of 1995 and 1996 in the central Arctic of the Northwest Territories (Canada). Parasites of the genera *Nematodirus*, gastrointestinal coccidia, and an unidentified first stage protostrongylid larva are reported for the first time from grizzly bear feces in North America. Parasites of the genera *Diphyllobothrium* and *Baylisascaris* also were collected. Prevalence of gastrointestinal parasites were significantly different between the spring and autumn seasons (31% and 58% respectively). Thus, we provide evidence supporting the theory that bears void gastrointestinal parasites before hibernation.

Key words: Fecal samples, grizzly bears, parasites, seasonal prevalence, survey, *Ursus arctos*.

Recent literature documenting the parasites of free-ranging populations of grizzly bears (*Ursus arctos*) is lacking. In the Arctic climes of North America, only Skinker (1931), Rausch (1954), Rausch et al. (1956), Choquette et al. (1969), and Rausch and Hilliard (1970) have documented helminth fauna of grizzly bears.

Some researchers have speculated that bears, shortly before hibernation, void most of the adult endoparasites that derive nourishment from host ingesta (Rush, 1932; Rausch, 1954). Pre-denning losses of gastrointestinal parasites with subsequent reinfection in spring have been attributed to bears changing their diet (Rausch, 1954; Rausch, 1961; Frechette and Rau, 1978). However, evidence in support of bears voiding adult parasites is limited and causal factors remain questionable.

The study area was an approximate 40,000 km^2 region in the central Arctic of the Northwest Territories (NWT), Canada, centered around the Daring Lake Research Station (64°52′N, 111°37′W), 300 km northeast of Yellowknife. Fecal samples (n = 116) were collected during 1995 and 1996 for 2 wk following emergence of bears from dens in late May, and for 3 wk preceding hibernation in mid-October. Samples were collected either directly from the rectum of anesthetized bears, or from areas they had recently (<24 hr) occupied. Feces were frozen in the field and stored at −20 C until analyzed.

Feces were analyzed for parasites at the Diagnostic Parasitology Laboratory at the Western College of Veterinary Medicine (Saskatoon, Saskatchewan, Canada). Laboratory procedures included Foreyt's (1994) standard sugar flotation and Baermann techniques, and a modified flotation technique for flukes developed by Wobeser et al. (1985).

We assumed bears sampled in 1995 and 1996 were independent, thus data between years were pooled for analysis. Also, within each season, feces were sometimes collected from an individual bear on more than one occasion. To maintain independence, we analyzed only one fecal sample (either the first after den emergence or the last before hibernation) from each bear per season. Our data consisted of 56 independent samples with 32 from spring after den emergence, and 24 from autumn preceding hibernation. A chi-square test for two independent samples was then used to examine for seasonal differences in prevalence of gastrointestinal parasites (Siegel and Castellan, 1988). We considered a value of $P \leq 0.05$ to be significant.

Gastrointestinal parasites were seen in 43% of the 56 samples. Prevalence of gastrointestinal parasites were 18% *Diphyl-*

lobothrium sp., 14% coccidia, 11% strongyles, and 5% *Baylisascaris* sp. Additionally, an unidentified species of dorsal spined first stage protostrongylid larvae (L_1) were found in 9% of the samples, and *Nematodirus* sp. in 2%. Strongyle eggs were not identified to genus, but *Uncinaria* sp. have been frequently reported in grizzly bears from North America (Rogers and Rogers, 1976); thus, for purposes of statistical analysis we assumed these to be bear gastrointestinal parasites. Samples containing only protostrongylid larvae or *Nematodirus* were considered to be free from gastrointestinal parasites for statistical analysis as it is unlikely these parasites live in the gastrointestinal tract of bears.

The prevalence of gastrointestinal parasites was 10 of 32 samples (31%) in spring, and 14 of 24 samples (58%) in autumn. These prevalences were significantly different ($\chi^2 = 4.1$, df = 1, $P = 0.04$). Serial samples were available from four individual bears. Gastrointestinal parasites were present in three of four samples in autumn 1995, and one of four samples in spring 1996. The single bear in which gastrointestinal parasites were not found in autumn 1995 only had coccidia in the feces the following spring.

Ova and larvae of parasites recovered by fecal analysis often can only be identified to genus level. The finding of adult parasites at necropsy or molecular techniques are often used for more specific identification. *Diphyllobothrium* sp. and *Baylisascaris* sp. were likely *D. ursi* and *B. transfuga* and the strongyles were likely *Uncinaria yukonensis* or *U. rauschi,* parasites previously reported in grizzly bears of North America (Rogers and Rogers, 1976).

The dorsal spined L_1 may either be a primary parasite of the bears or ingested with a prey species. Lungworm parasites of black bears from North America and grizzly bears from Eurasia are limited to the genus *Crenosoma,* but there have been no reports of *Crenosoma* sp. or any Protostrongylidae in grizzly bears from North America (Brglez and Valentincic, 1968; Addison, 1978). Protostrongylid larvae have been reported from muskoxen (*Ovibos moschatus*) (Hoberg et al., 1995) and caribou (*Rangifer tarandus*) (Lankester and Hauta 1989), both mammals that are prey species of grizzly bears in the central Arctic (Gau, 1998). However the L_1 we collected differed from the L_1 *Umingmakstrongylus pallikuukensis* of muskoxen, and we could not determine whether it differed from the L_1 *Parelaphostrongylus andersoni* of caribou.

The role of coccidia (*Eimeria* spp. and *Isospora* spp.) in grizzly bear populations in Eurasia are undetermined (Craighead and Mitchell, 1982). With a prevalence of 14%, and coccidians in general being broadly distributed within populations (Barrett and Dau, 1981), the coccidians we found may be enzootic in grizzly bears in the central Arctic rather than incidentally occurring through the ingestion of infected prey species.

Nematodirus sp. have been reported from caribou (Fruetel and Lankester, 1989) and muskoxen of the NWT (Samuel and Gray, 1974). *Nematodirus* sp. collected from feces of a single bear was probably secondary to ingestion of infected prey. Grizzly bears of the interior central Arctic of the NWT consume caribou more than any other prey species (Gau, 1998).

We documented that autumn prevalence of gastrointestinal parasites in feces of grizzly bears was significantly higher than spring prevalence, with three of the four serial fecal samples following the same trend. Thus, we have presented evidence supporting the hypothesis that bears void gastrointestinal parasites before hibernation but believe the causal factors remain questionable. Rush (1932) and Rausch (1954, 1961) speculated that loss before and reinfestation of parasites after hibernation, was facilitated through changes in dietary items. However, the diet items for the bears in our study were similar for the early spring and late autumn seasons (Gau, 1998). Choquette et al. (1969) also was skeptical of changes in di-

etary items explaining the elimination of parasites before bear hibernation. Frechette and Rau (1978) considered a cessation of feeding to explain the changes they observed in the prevalence of bear parasites. We have no evidence to support or refute Frechette and Rau's (1978) claim. Thus, it remains unknown whether a change in diet items, the quantity or quality of consumed food, or some physiological or biochemical change in bears' gastrointestinal tracts caused the seasonal change we observed in the prevalence of gastrointestinal parasites.

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