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Epizootic status and eradication of parasitic diseases in brown bears transferred to the rehabilitation center in Azerbaijan

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ABSTRACT

In recent years, no studies of parasitic diseases in wild bears have been conducted in Azerbaijan. For this purpose, we conducted research to determine the species composition and prevalence of parasitic diseases in bears kept at the Rehabilitation Center. Serological samples were taken from bears to monitor changes in hematological parameters. Fecal samples were collected to identify endoparasitic helminths and primary intestinal parasites. Peripheral blood smears were collected to identify primary blood parasites. To determine the species composition of ectoparasites parasitizing bears, clinical examinations of the animals were conducted and ectoparasites were collected. The species of ectoparasitic lice collected from bristle loss bears was identified. The lice belong to the species *Trichodectes pinguis* of the family Trichodectidae. *Trichodectes pinguis* lice were intensively observed in bears, with 380–400 specimens collected. A total of 270–310 ticks were collected from bears and their species composition was determined. The ticks belonged to the genera *Ixodes*, *Dermacentor* and *Rhipicephalus* of the family Ixodidae. The primary blood parasite *Babesia* sp. was detected in peripheral blood smears from three feverish bears. Intense invasion of red blood cells by the parasite was observed (5–7 parasites per field of view). Bear feces samples were subjected to coprological examination. As a result of the examination, were found in the samples eggs of the helminths *Baylisascaris* sp., *Uncinaria* sp., *Strongyloides* sp., and *Echinococcus* sp. Hematological blood tests in bears invasion with endo- and ectoparasites revealed significant differences compared to healthy bears. In patients with associative invasion of bears, a difference in hematological blood parameters was observed - Hb, RBC, HCT, MCV - decreased, and WBC, MCHC, neutrophils, lymphocytes and monocytes- increased. A reliable difference was observed in eosinophil parameters ($p < 0.05$).

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INTRODUCTION

Brown bears (*Ursus arctos*) are widespread in Eurasia and North America. Brown bears are potential carriers of numerous bacterial and parasitic pathogens. Bears play an important role as reservoir hosts and carriers of a number of parasitic diseases (Di Salvo and Chomel, 2020).

Brown bears eat a variety of foods depending on the season: from spring to early summer, they eat grass, berries, insects, and venison; from summer to fall, they eat pine cones and salmon; and in late fall, they eat acorns and fruit (Sato *et al.,* 2005a; Shirane *et al.,* 2021). Thus, the diversity of brown bears' feeding habits increases their risk of infection with parasitic diseases. A number of researchers who studied parasitic helminths in brown bears in Eurasia and North America noted the intense infection of bears with helminths (Cano *et al.,* 2024). Studies have shown that bears are most commonly parasitized by the helminths *Dibothriocephalus nihonkaiensis*, *Ancylostoma malayanum*, *Uncinaria* sp., and *Baylisascaris transfuga* (Sasaki *et al.,* 2019; Ohta *et al.,* 2021; Asakawa *et al.,* 2006; Asakawa, 2024; Inukai and Yamashita, 1934). In Eurasia and North America, brown bear parasites include *B. transfuga, Uncinariidae* species, *Captrongee* nematodes, *Diphyllobothriidae* and *Taenia* cestodes, *Dicrocoelium* trematode, and the primary intestinal parasite coccidian (Gau *et al.,* 1999; Foster *et al.,* 2004; Borka-Vit´ alis *et al.,* 2017; Bugmyrin *et al.*, 2017). These parasites are zoonotic, and some of them can infect humans. They have even spread to domestic animals. Cases of human infection with the cestode *D. nihonkaiensis* continue to increase (Arizono *et al.,* 2009). *Baylisascaris transfuga*, a common parasite of brown bears, is a potential zoonotic parasite (Bauer, 2013; Catalano *et al.,* 2015a; Remesar *et al.,* 2024; Samuel *et al.,* 2001). Although it is less pathogenic than *B. procyonis* (Sapp *et al.,* 2017). In addition to endoparasitic helminths, bears are also parasitized by ectoparasitic lice and ticks.

The species *Trichodectes pinguis*, belonging to the genus *Trichodectes*, parasitizes bears worldwide (Price *et al.,* 2003; Kéler, 1938). It has been noted that ectoparasites–ticks of the genera *Dermacentor, Rhipicephalus*, and *Ixodes*–parasitize bears. Reports from various countries indicate that these ticks parasitize the brown bear (*Ursus arctos*) and transmit the primary blood parasite *Babesia* sp. (Paillard *et al.,* 2015).

Babesiosis occurs in wild animals, including bears, as well as in farm animals with clinical signs such as anemia and hemoglobinuria. In predatory animals, babesiosis is asymptomatic (Azizova and Hasanov, 2024).

Brown bears are widespread in the wild in the Republic of Azerbaijan and in some cases even approach populated areas. This is due to climate change, urbanization, and food shortages observed around the world in recent years (Segawa *et al.,* 2021).

In recent years, no studies of parasitic diseases in wild bears have been conducted in Azerbaijan.

To this end, we conducted research to determine the species composition and prevalence of parasitic diseases in bears. Twelve brown bears seized in the forests of the Republic of Azerbaijan were kept in restaurants for exotic purposes. The bears were gathered at a rehabilitation center organized in the Khizi district of Azerbaijan. It was more convenient for specialists to examine the bears for parasitic diseases at the rehabilitation center. Clinical observations confirmed that the bears were unhealthy due to infection and invasion diseases.

Specialists from the Veterinary Scientific Research Institute were called in to determine the extent to which the bears were infected with infection and invasion diseases. Serological samples were taken from bears to monitor changes in hematological parameters. Fecal samples were collected to identify endoparasitic helminths and primary intestinal parasites. Peripheral blood smears were collected to identify primary blood parasites.To determine the species composition of ectoparasites

parasitizing bears, clinical examinations of the animals were conducted and ectoparasites were collected.

MATERIALS AND METHODS

The bears kept in the cage were anesthetized. Ectoparasitic lice and ticks were collected from the bald bears, and their species composition was determined (Fig. 1). Serological samples from bears with unfavorable clinical conditions were subjected to hematological examination. A peripheral blood smear was taken from the three fevers bear. The samples were examined using the Romanovsky-Giemsa method to detect primary blood parasites. Coprological samples were examined for the presence of helminths using the Fulleborn and Vishnauskas methods.

Fig. 1. Taking materials from bears

Hematological tests included determination of red blood cell (RBC) and white blood cell (WBC) counts, hemoglobin level, hematocrit, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC). In addition, the white blood cell count was determined: segmented neutrophils, eosinophils, lymphocytes, and monocytes (total percentage).

RESULTS

During clinical examination the bears, were noted aggressive behavior, anemia, bristle loss, and baldness in various parts of the body. In addition, clinical signs indicating that the bears were not receiving a complete diet were identified (Fig. 2).

The species of ectoparasitic lice collected from bristle loss bears was identified. The lice belong to the species *Trichodectes pinguis* of the family *Trichodectidae*. *Trichodectes pinguis* lice were intensively observed in bears, with 380–400 specimens collected. Although these lice are not carriers of infection diseases, they cause symptoms such as anemia, alopecia (hair loss), hyperpigmentation (darkening of the skin), and lichenification (thickening of the skin) in bears. The symptoms observed in the bears we monitored were recorded (Fig. 3).

Fig. 2. Weight and bristle loss in bears

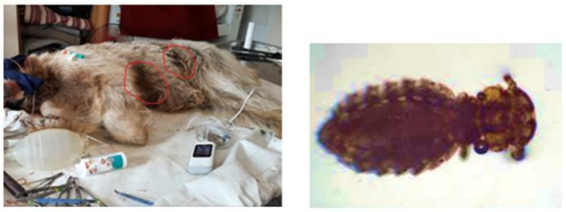

Fig. 3. Bristle loss in bears and *Trichodectes pinguis* lice

A total of 270–310 ticks were collected from bears and their species composition was determined. The ticks belonged to the genera *Ixodes*, *Dermacentor* and *Rhipicephalus* of the family Ixodidae (Fig. 4).

İxodes *Dermacentor* *Rhipicephalus*

Fig. 4. Genera of ticks collected from bears

The primary blood parasite *Babesia* sp. was detected in peripheral blood smears from three feverish bears. Intense invasion of red blood cells by the parasite was observed (5–7 parasites per field of view) (Fig. 5).

Bear feces samples were subjected to coprological examination. As a result of the examination, were found in the samples eggs of the helminths *Baylisascaris* sp., *Uncinaria* sp., *Strongyloides* sp.,

and *Echinococcus* sp. The helminth eggs detected confirmed the presence of severe forms of helminthiasis, which affected the physiological condition and live weight of the bears. This also indicates that, despite the cage content, in their feeding regime sanitary standards were not observed. The bears were fed food typical of the wild (Fig. 6).

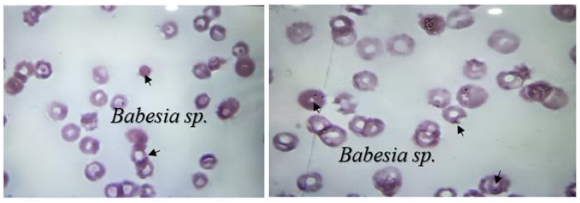

Fig. 5. *Babesia* sp. parasite in red blood cells under microscopy

Fig. 6. Helminths egg in bear under microscopy

Analysis of the results shows that even when kept in cage, bears develop severe forms of associative parasitic diseases. Serological samples from bears infected with babesiosis, helminthiasis, lice, and ticks were subjected to hematological examination (Table 1).

Table 1. Hematological parameters in bears with associative invasion

Parameters	Results	Reference
Haemoglobin (g/dl)	92-109	137-171
RBC (10^6/µl)	5.8-7.1	6.2-8.0
Haematocrit (%)	0.35-0.43	0.40-0.49
MCV (fl)	49-60	57-70
MCHC (g/dl)	376-412	332-366
WBC (10^3 /µl)	4.6-14.1	3.9-11.5
Segmented neutrophils (%)	57.8-92.5	62.2-93.6
Eosinophils (%)	5.8-9.6	0.0-4.3
Lymphocytes (%)	5.4-40.8	4.8-32.6
Monocytes (%)	0.8-11.3	0.7-11.7

Hematological blood tests in bears invasion with endo- and ectoparasites revealed significant differences compared to healthy bears. In patients with associative invasion of bears, a difference in hematological blood parameters was observed- Hb, RBC, HCT, MCV- decreased, and WBC, MCHC, neutrophils, lymphocytes and monocytes- increased. A reliable difference was observed in eosinophil parameters ($p < 0.05$).

To bring the bears out of a critical condition, they were transfused with Ringer's solution with lactate. To destroy ectoparasites, acaricidal solution Flugon 1% was instilled into the lumbar region at a rate of 1 ml per 10 kg of live weight. The bear, which had Babesia sp., was given a preparation with the active substance imidocarb dipropionate. For this purpose, the bear was given Piro-stop intramuscularly at a dose of 1 g per 50 kg of live weight. The sick animals were given the anthelmintic drug Caniverm (10 tablets per 100 kg of live weight) for 2 days in a row before morning feeding. After treatment, the bears were observed. After treatment, the recovered bears were released into reserves organized for them.

DISCUSSION

Studies conducted on brown bear parasites show that the helminth *Baylisascaris transfuga* is the most widespread species in the world (Catalano *et al.,* 2015a; Strkolcov´a *et al.,* 2018; Hwang *et al.,* 2021; Haynes *et al.,* 2023). The worm has a direct life cycle and is transmitted through feeding on developing eggs in the environment (Bauer, 2013). Young bears are more susceptible to infection. They have weak immunity to *Baylisascaris* species. With age, bears develop a certain degree of immunity to *Baylisascaris* helminths (Sapp *et al.,* 2017). Another widespread species, the helminth *Uncinaria*, has been found in brown and black bears (*Ursus americanus*) (Rausch *et al.,* 1979; Kilinç *et al.,* 2015). It is known that two species of the genus *Uncinaria- U. rauschi* and *U. yukonensis*- parasitize bears (Seguel *et al.,* 2017). In Europe, cases of bear infection with *Diphyllobothridae* are relatively rare. This is probably due to low feeding intensity (Orosov´a *et al.,* 2016; Remesar *et al.,* 2024).

Studies conducted in the provinces of Erzurum and Van in Turkey and in Scandinavia noted that brown bears are infected with *Trichodectes pinguis* lice (Dik and Kilinç, 2015; Kırman *et al.,* 2023; Esteruelas *et al.,* 2016).

As a result of studies conducted in various countries of America, it was established that ectoparasitic ticks of bears belong to the genera *Dermacentor*, *Ixodes* and *Rhipicephalus*. The main blood parasite of bears is *Babesia sp*. This also indicates that it is ticks of this genus that transmit *Babesia* sp. to bears (Shaw *et al.,* 2015; Skinner *et al.,* 2017; DiVincenti *et al.,* 2019; Reichert *et al.,* 2024).

CONCLUSION

The results of parasitological studies conducted on bears kept in the wild and in cages are identical. This also indicates that the parasite fauna of bears, regardless of the place of keeping, maintains its biodiversity. This is directly related to the unfavorable conditions of keeping bears in cages.

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REFERENCES

Arizono N, Yamada M, Nakamura-Uchiyama F, Ohnishi K. 2009. Diphyllobothriasis associated with eating raw Pacific salmon. Emerging Infectious Diseases **15**, 866–870.

Asakawa M, Mano T, Gardner SL. 2006. First record of *Ancylostoma malayanum* (Alessandrini, 1905) from brown bears (*Ursus arctos* L.). Comparative Parasitology **73**, 282–284.

Asakawa M. 2024. An overview on parasites from wild and captive bears in Japan. Journal of Hokkaido Veterinary Medical Association **68**, 8–10.

Azizova AA, Hasanov AM. 2024. Veterinary protozoology part I: Piroplasmids. Textbook. Science and Education, Baku, 216 pp.

Bauer C. 2013. Baylisascariosis—infections of animals and humans with 'unusual' roundworms. Veterinary Parasitology **193**, 404–412.

Borka-Vitális L, Domokos C, Földvári G, Majoros G. 2017. Endoparasites of brown bears in eastern Transylvania, Romania. Ursus **28**(1), 20–30.

Bugmyrin SV, Tirronen KF, Panchenko DV, Kopatz A, Hagen SB, Eiken HG, Kuznetsova AS. 2017. Helminths of brown bears (*Ursus arctos*) in the Kola Peninsula. Parasitology Research **116**, 1755–1760.

Cano EV, Penteriani V, Vega I, Delgado MdM, González-Bernardo E, Bombieri G, Zarzo-Arias A, Fernández RS-A, Paz-Silva A. 2024. Influence of seasonality and biological activity on infection by helminths in Cantabrian bear. International Journal for Parasitology: Parasites and Wildlife **23**, 100916.

Catalano S, Lejeune M, Tizzani P, Verocai G, Schwantje H, Nelson C, Duignan P. 2015. Helminths of grizzly bears (*Ursus arctos*) and American black bears (*Ursus americanus*) in Alberta and British Columbia, Canada. Canadian Journal of Zoology **93**, 765–772.

Di Salvo AR, Chomel BB. 2020. Zoonoses and potential zoonoses of bears. Zoonoses and Public Health **67**, 3–13.

Dik B, Kılınç ÖO. 2015. First case of *Trichodectes pinguis* (Phthiraptera: Ischnocera: Trichodectidae) on a bear (*Ursus arctos*) in Turkey. Türkiye Parazitoloji Dergisi **39**, 313–315.

DiVincenti L, Garner M, Thomas B, Birkenheuer A. 2019. *Babesia* sp. infection in a zoo-housed polar bear (*Ursus maritimus*). Veterinary Parasitology: Regional Studies and Reports **18**, 100350.

Esteruelas NF, Malmsten J, Bröjer C, Grandi G, Lindström A, Brown P, Swenson JE, Evans AL, Arnemo JM. 2016. Chewing lice *Trichodectes pinguis pinguis* in Scandinavian brown bears (*Ursus arctos*). International Journal for Parasitology: Parasites and Wildlife **5**(2), 134–138.

Foster GW, Cunningham MW, Kinsella JM, Forrester DJ. 2004. Parasitic helminths of black bear cubs (*Ursus americanus*) from Florida. Journal of Parasitology **90**, 173–175.

Gau RJ, Kutz S, Elkin BT. 1999. Parasites in grizzly bears from the central Canadian Arctic. Journal of Wildlife Diseases **35**, 618–621.

Haynes E, Coker S, Yabsley MJ, Niedrighaus KD, Ramey AM, Verocai GG, Hilderbrand GV, Joly K, Gustine DD, Mangipane B, Leacock WB, Crupi AP, Cleveland CA. 2023. Survey for selected parasites in Alaska brown bears (*Ursus arctos*). Journal of Wildlife Diseases **59**, 186–191.

Hwang M-H, Chin T-W, Yu P-H. 2021. Endoparasites of Formosan black bears (*Ursus thibetanus formosanus*) during acorn season in Yushan National Park, Taiwan. Journal of Wildlife Diseases **57**, 345–356.

Inukai T, Yamashita J. 1934. On an occurrence of *Ascaris* in the intestine of a bear, *Ursus arctos yesoensis* Lyd. Transactions of the Sapporo Natural History Society **13**, 324–325.

Kéler S. 1938. Baustoffe zu einer Monographie der Mallophagen. I. Teil: Überfamilie der Trichodectoidea. Nova Acta Leopoldina Carol **5**, 395–467.

Kılınç ÖO, Goz Y, Yilmaz AB, Aslan L. 2015. First report on heavy *Uncinaria (Dochmoides)* sp. (Nematoda: Ancylostomatidae) infection in brown bear (*Ursus arctos*) cub in Van Province, Eastern Anatolian Region of Turkey. Kafkas Üniversitesi Veteriner Fakültesi Dergisi **21**, 295–297.

Kırman R, Akyüz M, Doğan V. 2023. *Trichodectes pinguis* (Phthiraptera: Ischnocera: Trichodectidae) and *Haemaphysalis erinacei* (Acari: Ixodida: Ixodidae) infestation on brown bears in Erzurum province. Veterinary Journal of Kastamonu University **2**(1), 39–43.

Ohta S, Hirata H, Maruyama Y, Ishinazaka T, Asakawa M. 2021. Prevalence of *Dibothriocephalus nihonkaiensis* of brown bears (*Ursus arctos*) in the Shiretoko Peninsula, Hokkaido, Japan. Bulletin of the Biogeographical Society of Japan **76**, 48–50.

Orosová T, Goldová M, Ciberej J, Strkolcová G. 2016. Parasitofauna of brown bear (*Ursus arctos*) in the protected landscape area CHKO—Polona. Folia Veterinaria **60**(4), 20–24.

Paillard L, Jones KL, Evans AL, Berret J, Jacquet M, Lienhard R, Bouzelboudjen M, Arnemo JM, Swenson JE, Voordouw MJ. 2015. Serological signature of tick-borne pathogens in Scandinavian brown bears over two decades. Parasites & Vectors **8**, 398.

Price RD, Hellenthal RA, Palma RL, Johnson KP, Clayton DH. 2003. *The chewing lice: World checklist and biological overview*. Illinois Natural History Survey Special Publication, 501 pp.

Rausch RL, Krechmar AV, Rausch VR. 1979. New records of helminths from the brown bear, *Ursus arctos* L., in the Soviet Far East. Canadian Journal of Zoology **57**, 1238–1243.

Reichert NS, Mathieu D, Katz CJ, Hatch KA. 2024. Exposure of American black bears (*Ursus americanus*) to ticks, tick-borne diseases, and intestinal parasites in Wisconsin. Diversity **16**(9), 537.

Remesar S, Busto C, Díaz P, Rivas O, López-Bao JV, Ballesteros F, García-Dios D. 2024. Presence of gastrointestinal and bronchopulmonary parasites in Cantabrian brown bears. European Journal of Wildlife Research **70**, 23.

Samuel WM, Pybus MJ, Kocan AA. 2001. Parasitic diseases of wild mammals, 2nd edition. Iowa State University Press, Iowa City, IA, USA, pp. 301–341.

Sapp SGH, Gupta P, Martin MK, Murray MH, Niedringhaus KD, Pfaff MA, Yabsley MJ. 2017. Beyond the raccoon roundworm: The natural history of non-raccoon *Baylisascaris* species in the New World. International Journal for Parasitology: Parasites and Wildlife **6**, 85–99.

Sasaki M, Ishinazaka T, Nose T, Asakawa M, Nakao M. 2019. *Dibothriocephalus nihonkaiensis* infection in *Ursus arctos* in Shari, Hokkaido, Japan. Journal of Japanese Zoo and Wildlife Medicine **24**, 123–126.

Sato H, Une Y, Kawakami S, Saito E, Kamiya H, Akao N, Furuoka H. 2005. Fatal *Baylisascaris* larva migrans in a colony of Japanese macaques kept by a safari-style zoo in Japan. Journal of Parasitology **91**, 716–719.

Segawa T, Yonezawa T, Mori H, Akiyoshi A, Allentoft ME, Kohno A, Tokanai F, Willerslev E, Kohno N, Nishihara H. 2021. Ancient DNA reveals multiple origins and migration waves of extinct Japanese brown bear lineages. Royal Society Open Science **8**(8), 210518.

Seguel M, Gottdenker N. 2017. The diversity and impact of hookworm infections in wildlife. International Journal for Parasitology: Parasites and Wildlife **6**, 177–194.

Shaw M, Kolba N, Huffman JE. 2015. *Babesia* spp. in *Ursus americanus* (black bear) in New Jersey. Northeastern Naturalist **22**(3), 451–458.

Shirane Y, Jimbo M, Yamanaka M, Nakanishi M, Mori F, Ishinazaka T, Sashika M, Tsubota T, Shimozuru M. 2021. Dining from the coast to the summit: Salmon and pine nuts determine the summer body condition of female brown bears on the Shiretoko Peninsula. Ecology and Evolution **11**, 5204–5219.

Skinner D, Mitcham JR, Starkey LA, Noden BH, Fairbanks WS, Little SE. 2017. Prevalence of *Babesia* spp., *Ehrlichia* spp., and tick infestations in Oklahoma black bears (*Ursus americanus*). Journal of Wildlife Diseases **53**(4), 781–787.

Strkolcová G, Goldová M, Snábel V, Spakulová M, Orosová T, Halán M, Mojžišová J. 2018. A frequent roundworm *Baylisascaris transfuga* in overpopulated brown bears (*Ursus arctos*) in Slovakia: A problem worthy of attention. Acta Parasitologica **63**, 167–174.