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IRSTI: 34.33.00, 34.33.23

UDC: 619:616.995.132.6

https://doi.org/10.52269/22266070_2024_2_12

INTESTINAL PARASITES OF THE BROWN BEAR (*URSUS ARCTOS* LINNAEUS, 1758) IN THE EAST KAZAKHSTAN REGION

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The article analyzes the literature data and own research on the distribution and species composition of helminths and eimeria in brown bears in the East Kazakhstan region. The objective of the study was to identify a type of helminth in American black bears (*Ursus americanus*). The relatively low level of parasite detection in this study is in line with expectations for populations of brown bears (*Ursus arctos*) living in large areas. Tasks: to identify and study the type of helminths in the brown bear. On the territory of the Russian Federation, the brown bear has 17 species of helminths (including 3 species of trematodes and 14 species of nematodes) and 2 species of protozoa.

Most of the discovered species of helminths, eimeria, cryptosporidia both in zoos, circuses, and in the natural habitat of brown bears: European, Siberian and Far Eastern parts of Russia have epizootological and epidemiological significance.

For the first time in Kazakhstan, three types of intestinal parasites have been registered in bears: *Eimeria albertensis*, *Mesocostoides lineatus* and *Baylisascaris transfuga*. Protozoa and nematodes are specific parasites of bears and mesocostoids are parasites of many species of domestic and wild animals and humans. Parasites of Kazakhstan identified for the first time in bears are of great medical, social and veterinary importance. Hunters, outdoor enthusiasts and medical and veterinary specialists shall find the research outcomes useful.

Key words: brown bears, helminths, eimeria, zoonoses, East Kazakhstan region.

**КИШЕЧНЫЕ ПАРАЗИТЫ БУРОГО МЕДВЕДЯ (*URSUS ARCTOS* LINNAEUS, 1758)
В ВОСТОЧНО-КАЗАХСТАНСКОЙ ОБЛАСТИ**

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В статье проведен анализ литературных данных и собственных исследований по распространению и видовому составу гельминтов и эймерий у бурых медведей в Восточно-Казахстанской области.

Цель исследования заключалась в выявлении у американских черных медведей (*Ursus americanus*) вид гельминтов. Относительно низкий уровень обнаружения паразитов в этом исследовании соответствует ожиданиям для популяций бурых медведей (*Ursus arctos*), живущих на больших территориях. Задачи: выявить и изучить вид гельминтов у бурого медведя.

На территории Российской Федерации у бурого медведя 17 видов гельминтов (в т.ч. 3 вида трематод и 14 видов нематод) и 2 вида простейших. Большинство обнаруженных видов гельминтов, эймерий, криптоспоридий как в условиях зоопарков, цирков, так и в природных условиях обитания бурых медведей: Европейской, Сибирской и Дальневосточной частях России имеют эпизоотологическое и эпидемиологическое значение.

Впервые нами на территории Республики Казахстан у медведей зарегистрированы три вида кишечных паразитов: *Eimeria albertensis*, *Mesocestoides lineatus* и *Baylisascaris transfuga*. Простейшие и нематоды являются специфическими паразитами медведей и мезоцестоды – паразитами многих видов домашних и диких животных и человека. Выявленные впервые у медведей паразиты Казахстана имеют большое медико-социальное и ветеринарное значение, это необходимо учитывать охотникам, любителям активного отдыха на природе и медицинским и ветеринарным специалистам.

Ключевые слова: бурые медведи, гельминты, эймерий, зоонозы, Восточно-Казахстанская область.

**ШЫҒЫС ҚАЗАҚСТАН ОБЛЫСЫНДАҒЫ ҚОҢЫР АЮДЫҢ ІШЕК ПАРАЗИТТЕРІ
(*URSUS ARCTOS* LINNAEUS, 1758)**

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Мақалада Шығыс Қазақстан облысындағы қоңыр аюлардағы гельминттер мен аймериялардың таралуы мен түрлік құрамы бойынша әдеби деректер мен өзіндік зерттеулерге талдау жасалды. Зерттеудің мақсаты американдық қара аюларда (*Ursus americanus*) гельминт түрлерін анықтау болды. Бұл зерттеуде паразиттерді анықтаудың салыстырмалы түрде төмен деңгейі үлкен аумақтарда тұратын қоңыр аю популяцияларының (*Ursus arctos*) күтулеріне сәйкес келеді. Міндеттері: қоңыр аюдағы Гельминттердің түрін анықтау және зерттеу. Ресей Федерациясының аумағында қоңыр Аюда Гельминттердің 17 түрі (оның ішінде трематодтардың 3 түрі және нематодтардың 14 түрі) және қарапайымдылардың 2 түрі бар. Гельминттердің, аймериялардың, криптоспоридиялардың көптеген түрлері хайуанаттар бағында, цирктерде де, қоңыр аюлардың

табиғи мекендеу орындарында да кездеседі: еуропалық, Сібір және Ресейдің Қиыр шығыс бөліктерінде эпизоотологиялық және эпидемиологиялық маңызы бар. Біз алғаш рет Қазақстан Республикасының аумағында аюларда тіркелдік.

Түйінді сөздер: қоңыр аюлар, гельминттер, зймерий, зооноздар, Шығыс Қазақстан облысы.

Introduction. There are two subspecies of brown bear in Kazakhstan: the Tianshan brown bear (*U. A. isabellinus*), inhabiting the Tien Shan and Dzungarian Alatau, and the South Siberian brown bear (*U. A. jensiseensis*), inhabiting the Altai region. The Tianshan brown bear is listed in the Red Book of the Republic of Kazakhstan (2010), the South Siberian brown bear is an object of hunting.

In the Kazakh part of Altai, the distribution area of the South Siberian brown bear covers all major ridges and spurs of ridges located here, coming from Russia: Ivanovsky, Ubinsky, Ulbinsky, Kholzun, Listvyaga, Katunsky, Kabinsky, Southern Altai proper, Sarymsakty, Narymsky, Kurchumsky, Azutau, Tarbagatai (Altai) [1, p. 417].

In Kazakhstan, ectoparasites on the Bush Bear are represented by ixodic cells: *Dermacentor pictus*, *Haemaphysalis warburtoni*; fleas: *Arcropsylla tuberculaticeps*. Endoparasites from: *Mesocestoides lineatus*, *Trichinella spiralis*, *Toxascaris transfuga* [2, p. 82].

In Tien Shan in Kyrgyzstan, 2 species of helminths were found in brown bears – the nematode *Baylisascaris* (= *Toxascaris*) *transfuga* and the cestode *Mesocestoides lineatus* [3, pp.43; 53; 65].

To assess infection or exposure to endo- and ectoparasites of Alaska brown bears (*Ursus arctos*), blood and faecal samples were collected during 2013-17 in five locations: Arctic Gate National Park and Preserve; Katmai National Park; Lake Clark National Park and Preserve; Yakut Foothills; and Kodiak Island. Standard centrifugal flotation of faeces was used to detect gastrointestinal parasites, molecular methods were used to test blood for the presence of *Bartonella* and *Babesia* spp., and ELISA was used to detect antibodies to *Sarcoptes scabiei*, a species of mites that recently caused scabies in American black bears (*Ursus americanus*). In the fecal secretions (n=160), we identified the following helminth eggs: *Uncinaria* sp. (n=16, 10.0 %), *Baylisascaris* sp. (n=5, 3.1 %), *Dibothriocephalus* sp. (n=2, 1.2 %) and taenid eggs (n=1, 0.6 %). Molecular screening for intraerythrocyte parasites (*Babesia* spp.) and intracellular bacteria (*Bartonella* spp.) gave a negative result in all tested bears. We found antibodies to *S. scabiei* in six out of 59 (10.2 %) individuals. The relatively low level of parasite detection in this study is in line with expectations for brown bear populations living in large, relatively untouched habitats near the northern boundary of the range. These results provide a modern understanding of parasites in Alaska brown bears and establish baseline levels of parasite presence for monitoring changes over time and relative to environmental changes [4, p. 190].

On the territory of the Russian Federation, the brown bear has 17 species of helminths (including 3 species of trematodes: *Dicrocoelium lanceatum*, *Opistorchis felinus*, *Nanophyetus schikhobalowi* and 14 species of nematodes: *Toxascaris transfuga*, *Toxocara canis*, *Uncinaria stenocephala*, *U. skrjabini*, *Gongylonema pulchrum*, *Dirofilaria ursi*, *D. immitis*, *Capillaria plica*, *Thominx aerophilus*, *Trichinella spiralis*, *Trichocephalus* (= *Trichuris*) *vulpis*, *Crenosoma* sp., *Dioctophyme renale*, *Setaria* sp.) and 2 species of protozoa (*Eimeria* sp., *Cryptosporidium muris*) [5, p. 17].

The epizootological significance of helminths and cryptosporidia of brown bears is especially significant in zoos and circuses, as this is expressed in a decrease in immunity, which contributes to the occurrence of infectious diseases and increased aggressiveness of circus bears towards service personnel and trainers, and even the death of bears.

In nature, weakened cubs die from both concomitant diseases and starvation, as invasive diseases contribute to reducing the growth and adaptation of animals to hunting roe deer, moose and other large game, as well as sick animals become easy prey for other predators.

Most of the discovered species of helminths, eimeria, cryptosporidia both in zoos, circuses, and in the natural habitat of brown bears: European, Siberian and Far Eastern parts of Russia have epizootological and epidemiological significance.

When analyzing the scientific literature and veterinary reports, we did not find information on the brown bear parasitofauna in the East Kazakhstan region, so it was decided to investigate this issue, which is relevant today, both for residents of the East Kazakhstan region and neighboring regions.

Purpose, tasks. The purpose of the research was to study the fauna of intestinal parasites of the brown bear living in the East Kazakhstan region. To achieve this goal, the following tasks are set: to identify the qualitative and quantitative composition of the fauna of protozoa and helminths of the brown bear.

Materials and methods. The material for the study was obtained during expeditions in the Glubokovsky district of the East Kazakhstan region, in the period from May 2 to May 15, 2023. A survey of local residents (hunters) was conducted about the presence of bear tracks, then a field trip took place, followed by access to the animal's trail.

Fecal samples (5 g) were collected from the bear beds. Feces were collected in plastic jars and preserved with a 2.5% solution of potassium bicarbonate for subsequent processing in the nystitut laboratory. Lifetime parasitological studies of bear faeces were carried out using the methods of Fulleborn and O.Berkinbay [6, pp. 5-6]. The feces were thoroughly rubbed in a porcelain cup with 15-20 ml of

ammonium nitrate solution with a density of 1.3. They were maintained for 45 minutes. Then the upper film was removed from the liquid with a wire loop, applied to a slide, drops of distilled water were added, covered with a cover glass and microscoped.

The species identity of eimeria was established on the basis of morphological features of oocysts (shape, size, color, thickness and structure of the shell, presence of micropyle, polar cap, residual body and refractive bodies), sporocysts (shape, size, presence of residual body and styd bodies), sporozoites (shape, size, presence of refractive bodies) and time sporulation of oocysts. At the same time, the data of J.D.Hair and J.L. Mahrt were also taken into account [7, p. 663].

When determining helminth eggs, the shape, size, color, thickness and structure of the shells were taken into account; the presence of caps on one of the poles, miracidia or eggs with yolk, tubercle or thorn, filaments in trematodes; pear-shaped apparatus with oncosphere in cestodes; corks at the poles, crushing balls or larvae in the center of nematodes.

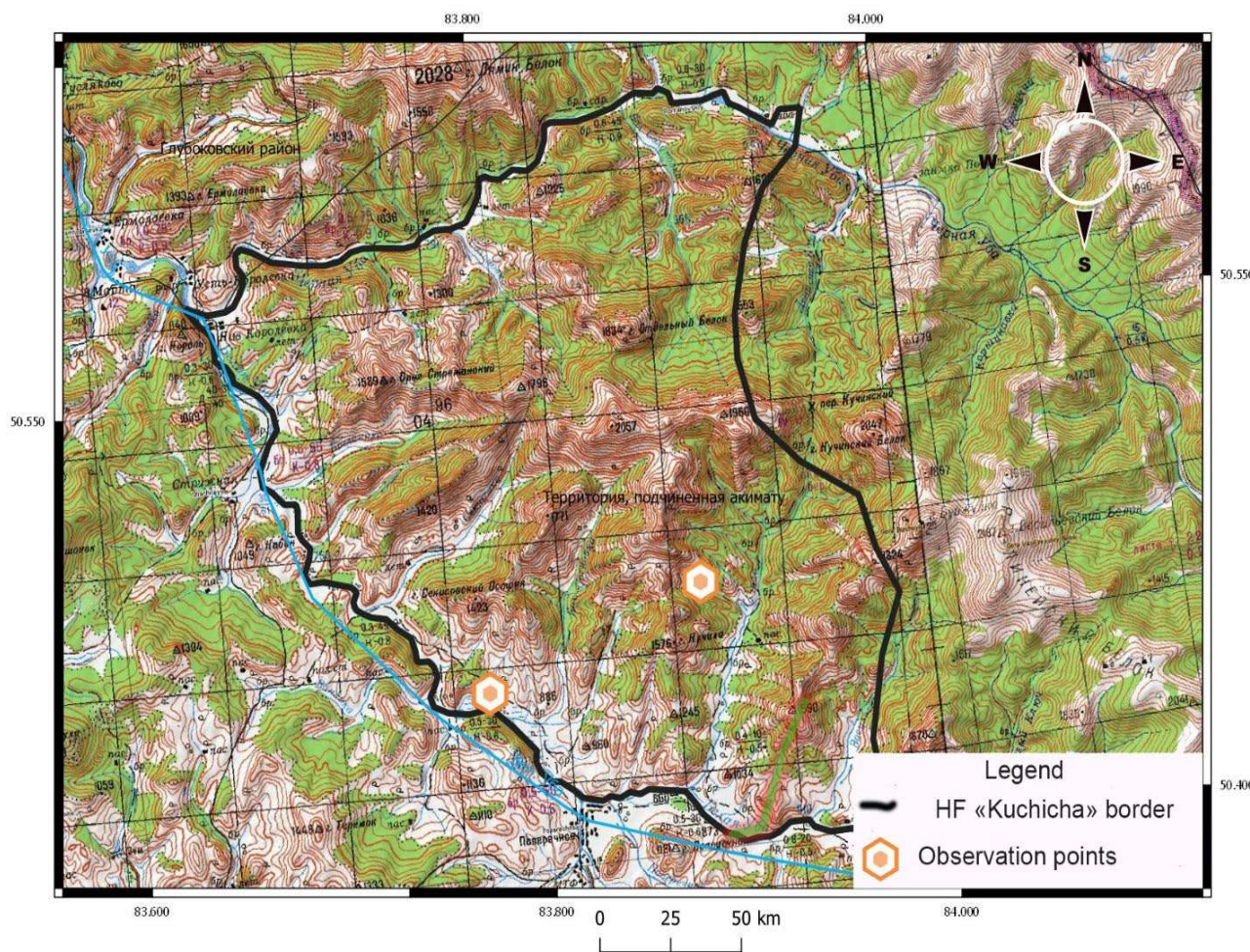


Figure 1. – Places of collection of material: Hunting farm "Kuchikha", Vasilyevo tract of Glubokovsky district of East Kazakhstan region

The intensity of infection was determined by counting the number of oocysts of eimeria and helminth eggs in 20 fields of view of the microscope.

For research on trichinosis, muscle samples were taken from the legs of the diaphragm, from part of the intercostal, cervical, masticatory, lumbar, calf muscles, flexors and extensors of the pastern, as well as the muscles of the tongue, esophagus and larynx during the cutting of the bear carcass. From various sections of each sample, 12 pieces the size of an oat grain were cut out with curved scissors along the muscle fibers closer to the tendon part and crushed between the glasses of the compressor to such an extent that a newspaper text could be read through a layer of flattened muscle tissue in passing light. The half-prepared preparation (a compressor with 24 sections from one carcass) was viewed using an optical device – a trichine microscope.

The species belonging of helminths was determined by morphological features using definitional tables with verification of correctness according to the diagnosis of suborders and families, then according to the table of genera, for which classical determinants and monographs were used [8, p. 81].

Results. As a result of the study, 3 species of parasites were registered in bears living in the Glubokovsky district of the East Kazakhstan region: 1 species of protozoa: *Eimeria albertensis*, 1 species of cestodes: *Mesocestoides lineatus* and 1 nematode species: *Baylisascaris transfuga*.

Domain: Eukaryota Chatton, 1925, 1937/1938, Chadeffaud, 1960.

Clade: Diaphoretickes Adl et al., 2012.

Clade: SAR (лат., от Stramenopiles + Alveolata + Rhizaria) Burki et al., 2008 emend Adl et al., 2012.

Clade: Alveolata Cavalier-Smith, 1991

Phylum: Apicomplexa Levine, 1970

Class: Conoidasida Levine, 1988

Subclass: Coccidiasina Leuckart, 1879

Order: Eucoccidiorida Leger et Dubosca, 1910

Suborder: Eimeriorina Léger, 1911

Family: Eimeriidae Minchin, 1903

Genus: *Eimeria* Schneider, 1875

Species: *Eimeria albertensis* Hair et Mahrt 1970. The extent of eimeric invasion of bears in the Glubokiv district of the East Kazakhstan region is 28.57 %, and the intensity of the invasion is 13 ±4 oocysts.

Phylum: Platyhelminthes Gegenbaur, 1859

Subphylum: Rhabditophora Ehlers, 1985

Superclass: Neodermata Ehlers, 1985

Class: Cestoidea Rudolphi, 1808

Subclass: Eucestoda Southwell, 1930

Order: Cyclophyllidea Van Beneden, 1900

Family: Mesocestoididae Perrier, 1897

Genus: *Mesocestoides* Vaillant, 1863

Species: *Mesocestoides lineatus* (Goeze, 1782). The extent of mesocystoid invasion of bears in the Glubokiv district of the East Kazakhstan region is 42.86 %, and the intensity of invasion is 26±9 eggs.

Phylum: Nematelminthes Schneider, 1866

Class: Chromadorea Inglis, 1932

Order: Rhabditida Pearse, 1942

Family: Ascarididae Baird, 1853

Genus: *Baylisascaris* Sprent, 1968

Species: *Baylisascaris transfuga* Oshmarin, 1963. The extent of the baylisascariasis invasion of bears in the Glubokiv district of the East Kazakhstan region is 28.57 %, and the intensity of the invasion is 33.5± 4.5 eggs.

Discussion. All the examined bears were infected with certain types of parasites, that is, there were no animals free from invasion.

The registered species have different specificity. *Eimeria albertensis* is strictly specific and parasitizes only bears.

Table 1. – Parasites registered in bears in the East Kazakhstan region

№№	Age and gender of the bears	Parasites, the number of		
		<i>Eimeria albertensis</i>	<i>Mesocestoides lineatus</i>	<i>Baylisascaris transfuga</i>
1	An adult female	–	–	28
2	Bear cub	9	–	–
3	Bear cub	17	–	–
4	An adult male	–	11	–
5	An adult male	–	–	39
6	An adult male	–	26	–
7	An adult male	–	41	–
The intensity of the invasion, in instances		13±4	26±9	33,5±4,5
The extent of the invasion, in %		28,57	42,86	28,57

Mesocestoides lineatus (Goeze, 1782) is not a specific species, it is found in other animals (dog, cat, fox, arctic fox, raccoon, sable, korsak, wolf, jackal, steppe cat, reed cat, dune cat, badger, stone marten, ermine, bandaging) and humans. This parasite is of great medical, social and veterinary importance, as it

can infest humans and domestic animals at the larval stage, which must be taken into account by hunters, outdoor enthusiasts and veterinary specialists.

Baylisascaris transfuga Oshmarin, 1963 a specific species of bears, except for Kazakhstan, the parasite has been registered in bears in America [9, p. 25; 10, p. 274; 11, p. 620] and in Europe [12, p. 170.], including in Russia [13, p. 100]. *Bailisascariasis* has been recorded not only in the wild, but also in bears kept in captivity (zoo and circus) [13, p. 100]. This type of helminth not only negatively affects the health of a specific host, but can also be potentially dangerous for other animals and, importantly, for humans.

As a result of the study of muscle samples for trichinosis, parasites were not detected.

Conclusion. For the first time in Kazakhstan, in East Kazakhstan, three types of intestinal parasites have been registered in bears: *Eimeria albertensis*, *Mesocestoides lineatus* and *Baylisascaris transfuga*. *Eimeria* and *bailisascaridium* are specific parasites of bears and mesocestides are parasites of many species of domestic and wild animals and humans. Identified for the first time in bears of Kazakhstan have great medical, social and veterinary importance, this must be taken into account by hunters, outdoor enthusiasts and medical and veterinary specialists.

Information about financing. The work was carried out within the framework of program-targeted financing on the topic: BR18574058-OT-23 «Development of the Red Data Book of Animals of Kazakhstan and an electronic database of rare and endangered animals».

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