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Helminths Of Rodent In North-East Of Uzbekistan: Fauna, Distribution And Ecology

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Abstract.

This article provides information about helminthological research. We examined 1057 specimens. rodents belonging to 12 species of the following families: Sciuridae - Squirrels, Myocastoridae - Nutriaceae, Allactagidae - False insects, Cricetidae - Hamsters, Gerbillidae - Gerbils and Muridae - Murine. Particular attention was paid to the study of the fauna of rodent helminths, which have a sanitary and epizootic significance. It is known that a number of pathogenic helminthiases in humans, domestic and game animals are spread through rodents - natural reserves of invasions. The total infestation of the studied rodents with helminths was noted in 354 specimens, which amounted to 33.5% (Table 1). Parasitic worm infestation rates of individual rodent species vary widely. The lowest percentage of helminth infestation of natural muskrat populations was 2.7%. high infestation was noted in the populations of gerbils (21.4-41.7%), ground squirrels (24.0-46.1%), Severtsov's jerboa (37.9%), house mice (42.0%) and gray rats (50.4%). The structure of the fauna of rodent helminths in the North-East of Uzbekistan consists of 46 species belonging to 27 genera, 20 families, 9 orders and 4 classes.

Key words: cestodes, nematodes, trematodes, mouse-like family, rodents, synanthropic, Uzbekistan.

Introduction

At present, scientific centers of the world pay great attention to the study of rodent helminths, which are a convenient model object in the field of faunism and population ecology. On their example, many aspects of the formation of faunistic complexes of helminths inherent in certain taxonomic groups of hosts are considered.

In addition, rodents are of great practical importance. Among them there are a number of valuable game animals (muskrat, nutria, marmots, squirrels). The fur of these animals, especially

muskrat and nutria, is highly valued. The negative role of rodents is essential. Most of them cause significant damage to agriculture, eating grain, destroying valuable vegetation on plantations and vegetable gardens, damaging fruit crops. Many rodents are the hosts of helminths - causative agents of dangerous human diseases and economically useful animals. The study of the ecological - faunistic features of rodent parasites in specific regions helps to determine the role of the helminth fauna of micromammalia in the epidemiology and epizootology of helminthiases.

As a result of the research carried out, we currently have information on the species composition of rodent helminths in almost all landscape-geographical zones of the North-East of Uzbekistan.

Materials and methods

The material for this work was the collection of parasitic worms from house mice and a gray rat of North-Eastern Uzbekistan, covering three large administrative regions (Jizzakh, Syrdarya, and Tashkent).

Mouse-like rodents were caught using standard trapping grooves with cylinders and a trap with live traps (Krivopalov, 2011). Helminthological material was collected during 2016-2020. known methods (Skryabin, 1928) of rodent populations of the studied region.

We examined 1057 specimens by the method of complete dissection. rodents belonging to 12 species of the following families: Sciuridae - Squirrels, Myocastoridae - Nutriaceae, Allactagidae - False insects, Cricetidae - Hamsters, Gerbillidae - Gerbils and Muridae - Murine. The collected helminths were studied in the laboratory of General Parasitology of the Academy of Sciences of the Republic of Uzbekistan. The species identification of parasitic worms was carried out in accordance with the keys given in the works of foreign researchers (Ryzhikov et al., 1978, 1979; Anderson, 2000).

When assessing the degree of infection of rodents with parasites, standard parasitological indicators were used: the extensiveness of the invasion - EI (%), the intensity of the invasion - II (specimens).

Results and discussion.

We examined 1057 specimens. rodents belonging to 12 species of the following families: Sciuridae - Squirrels, Myocastoridae - Nutriaceae, Allactagidae - False insects, Cricetidae - Hamsters, Gerbillidae - Gerbils and Muridae - Murine.

Particular attention was paid to the study of the fauna of rodent helminths, which have a sanitary and epizootic significance. It is known that a number of pathogenic helminthiases in humans, domestic and game animals are spread through rodents - natural reserves of invasions.

The total infestation of the studied rodents with helminths was noted in 354 specimens, which amounted to 33.5% (Table 1). Parasitic worm infestation rates of individual rodent species vary widely. The lowest percentage of helminth infestation of natural muskrat populations was 2.7%. high infestation was noted in the populations of gerbils (21.4-41.7%), ground squirrels (24.0-46.1%), Severtsov's jerboa (37.9%), house mice (42.0%) and gray rats (50.4%).

The structure of the fauna of rodent helminths in the North-East of Uzbekistan consists of 46 species belonging to 27 genera, 20 families, 9 orders and 4 classes.

Below is a general list of rodent helminths in a vast region - North-East of Uzbekistan.

Tabl 1 Infection of the studied rodents - Rodentia with helminths in the north-east of Uzbekistan

Species of rodents	Opened, instance	Infected		Number of parasite species			
		ins.	%	Cestodes	Trematodes	Akantosefales	Nematodes
Red Squirrels	11	2	18.2	6	2	1	5
Large Souslik	13	6	46.2	8	2	1	8
Tien ShanSouslik	25	6	24.0	5	1	1	7
Great Jerboa	8	1	12.5	2	-	-	3
JerboaSevertsova	58	22	37.9	2	-	1	4
Nutria	105	19	18.1	1	2	-	1
Muskrat	150	4	2.7	-	2	-	2
Libyan Jird	45	15	33.3	7	-	-	9
Great Gerbil	156	65	41.7	6	-	-	3
Midday Jird	42	9	21.4	9	-	-	5
House Mouse	226	95	42.0	7	2	-	9
Brown or Norway Rat	218	110	50.4	9	-	-	3
Total	1057	354	39.3				

Helminth fauna of rodents of the order Rodentia of the North-East of Uzbekistan

Cestoda

1. Paramoplocephala transversaria (Krabbe, 1879)2. Catenotaenia criceterum Kirschenblatt, 1949
3. Catenotaenia dendritica (Goeze, 1782)
4. Catenotaenia rhombomydis Schulz et Landa, 1934
5. Catenotaenia pusilla (Goeze, 1782)
6. Mathevotaenia symmetrica (Baylis, 1927)
7. Hymenolepis diminuta (Rudolphi, 1819)
8. Hymenolepis horrida (Linstow, 1901)
9. Dipylidium caninum (L., 1758), larvae
10. Taenia hydatigena (Pallas, 1766)
11. Taenia macrocystis (Diesiny, 1850), larvae
12. Taenia pisiformis (Bloch, 1780)
13. Taenia crassiceps (Ledec, 1800), larvae
14. Hydatigera taeniaeformis (Batsch, 1786), larvae
15. Hydatigera krepkogorski Schulz et Landa, 1934, larvae
16. Mesocestoides lineatus (Goeze, 1782), larvae
17. Rodentolepis straminea (Goeze, 1782)

Trematoda

18. Echinostoma armigerum Barker et Irvine, 1915
19. Echinostoma mijagawai Ischii, 1932
20. Brachylaemus aequans (Looss, 1899)
21. Brachylaemus recurvus (Dujardin, 1845)
22. Dicrocoelium dendriticum (Stiles et Hassall, 1896)

Acanthocephala

23. Moniliformis moniliformis (Bremser, 1811)

Nematoda

24. Armocapillaria sadovskajae (Morosov, 1959)
25. Trichocephalus cutcasheni Petrov et Sadichov, 1957
26. Trichocephalus citellorum Kirschenblatt, 1939
27. Trichocephalus muris Schrank, 1788

28. Trichocephalus rhomlomydis Schulz et Landa, 1934
29. Trichocephalus spalacis Petrov et Potechina, 1953
30. Trichocephalus nutria Schulz et Petrov, 1933
31. Heligmosomoides ryjikovi (Nadtochyi et al., 1971)
32. Heligmosomoides polygyrus (Dujardin, 1845)
33. Ganguleterakis spumosa (Schneider, 1866)
34. Aspiculuris schulzi (Popov et Nasarova, 1930)
35. Aspiculuris tetraptera (Nitsch, 1821)
36. Aspiculuris asiatica Schulz, 1927
37. Syphacia obvelata (Rudolphi, 1802)
38. Syphacia stroma (Linstow, 1884)
39. Gongylonema problematicum Schulz, 1924
40. Gongylonema neoplasticum (Fibiger et Ditlovsen, 1914)
41. Streptophiagus kutassi (Schulz, 1927)
42. Subulura citelli Sulimov, 1961
43. Spirocerca fedtschenkoi Davlatov, 1970
44. Physoloptera massino Schulz, 1926
45. Mastophorus muris (Gmelin, 1790)
46. Dipetalonema viteae (Krepkogorskaja, 1933)

Of the 46 species of parasitic worms, 36 species were first noted by us for the fauna of rodent helminths of the studied region of Uzbekistan. 9 types of helminths Catenotaeniarhombomydis, Hydatigerakrepkogorski, Moniliformismoniliformis, Trichocephalusrhombomydis, Trichocephalusmuris, Streptophiaguskutassi, Aspiculurisschulzi, SyphaciaobvelataandDipetalonemaviteaewere previously registered in rodents of the Jizzakh and Syrdarya regions.

The species diversity of rodent helminths in the North-East of Uzbekistan turned out to be quite rich, consisting of representatives of flat and round worms.

The class Cestoda is represented on the territory studied by us by 17 species of the genera Paramoplocephala Lühe, 1910; Catenotaenia Ianicki, 1904; Mathevotaenia Akhumian, 1946; Hymenolepus Weinland, 1858; Rodentolepis Spassky, 1954; Dipylidium Lenckart, 1863; Taenia Linnaeus, 1758; Hedatigera Lomarck, 1816; Mesocestoides Vaillant, 1863 - from the order Cyclophyllida Braun, 1900.The families Catenotaenidae Spassky, 1950 (5 species) and Taeniidae Ludwig, 1886 (6 species) are characterized by the greatest species diversity.

The cestodes noted by us in the mature stage live in the intestines of rodents, which are the final hosts of flatworms. Most of the cestode species are Dipylidium caninum (L., 1758), Taenia hydatigena (Pallas, 1766), Taenia macrocystis (Diesiny, 1850), Taenia pisiformis (Bloch, 1780), Taenia crassiceps (Ledec, 1800), Hydatigera taeniaformis (Batsch , 1786), Hydatigera krepkogorski Schulz et Landa, 1934, and Mesocestoides lineatus (Goeze, 1782) in the larval stage live in various organs of rodents serving as reservoir hosts.

From the Trematoda class in the studied area, we observed 5 species of flukes in rodents: Echinostoma armigerum Barker et Irvine, 1915, Echinostoma mijagawai Ischii, 1932, Brachylaemus aequans (Looss, 1899), Brachylaemus recurvus (Djardin, 1845), 1896). The last two species were previously found in rodents in other regions of Uzbekistan.

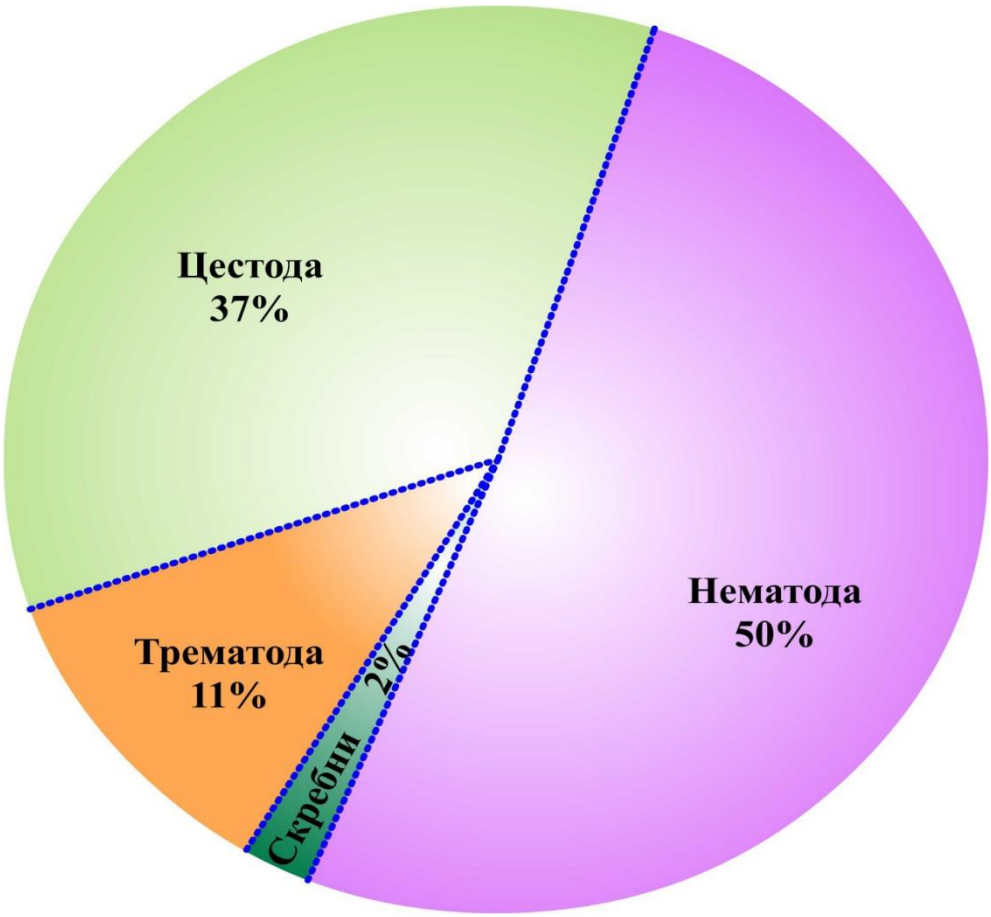
The above mentioned trematode species were found by us in the following species of rodents, muskrats and house mice of northeastern Uzbekistan.

In the studied region, we found the only representative of the class Acanthocephala - Moniliformis moniliformis (Bremser, 1811) - in the common squirrel, yellow and relict ground squirrels, and Severtsov's jerboa.The Nematoda class is represented by 23 species from the orders Trichocephalida, Rhabditida, Oxyurida, and Spirurida.

The order Spirurida is characterized by the greatest species diversity in the North-East of Uzbekistan - we have noted 9 species of nematodes in various rodent species.

The noted nematode species turned out to be mainly parasites of the digestive system (22 species).

The species diversity of helminths at the class level in the studied rodents is unequal, which probably depends on the natural and ecological conditionsof the study area.

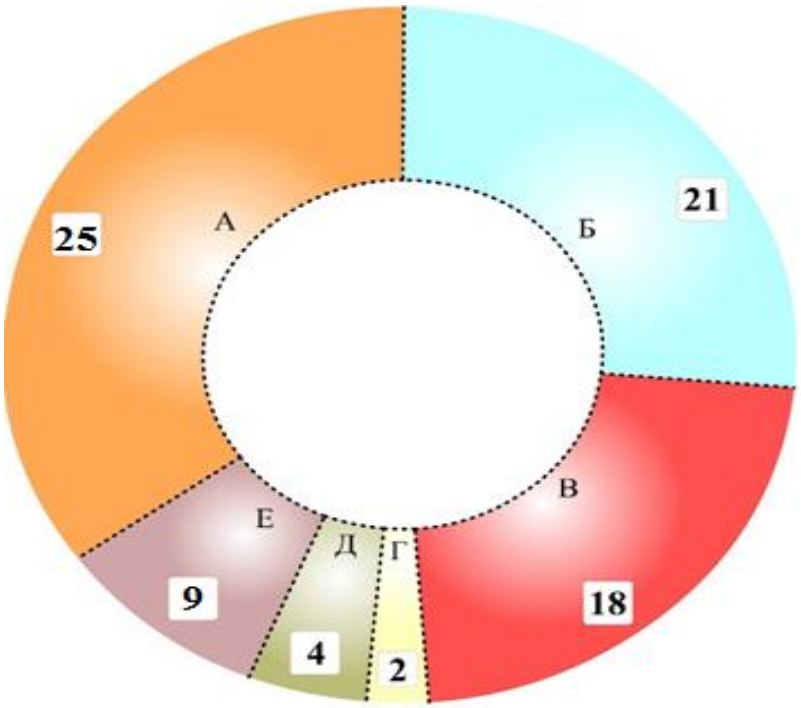


Picture. 1. The ratio of taxonomic groups of helminths in the North-East of Uzbekistan (original)

According to the results of the experiments, it became clear that the ratio of helminths of certain species and groups of rodents differs (Pic. 2).

The level of infestation by helminths in rodent families in the study differs, i.e. In squirrels, infection was recorded with 25 species, in mice - 21, in gerbils - 18, in false insects - 9, in nutria and hamsters - 6 species of helminths. Various invertebrates and vertebrates are of great importance as intermediate and reservoir hosts of helminths.

Rodents are one of the most interesting orders of mammals, the ecological adaptation of which has reached a wide range - from aquatic to arboreal forms. They inhabit almost all landscape zones of our country and are associated with components of biological diversity - communities of flora and fauna of the region under study. The biological connections of rodents and their parasites contributed to the formation of the modern appearance of the fauna of parasitic worms in specific territories.



Pic. 2. The specific gravity of the helminth fauna of individual families of rodents: А - Squirrel, Б - Mouse, В - Gerbil, Г - Nutrious, Д - Hamster,

Е - False snuff (original).

Also, in this section, the significance of various relationships of rodents and ways of transmission of helminths during the circulation of the invasion is studied.

Many groups of animals (invertebrates and vertebrates) are involved in the circulation of rodent helminths.

Oligochaetes participate in the life cycle of the nematode Apmocapillaria sadovskajae (Morosov, 1959) as an intermediate host. Infection of rodents occurs only when they eat earthworms invaded by the larvae of this nematode.

Aquatic molluscs serve as intermediate hosts of two species of trematodes of the genus Echinostoma: E. arnigerum Barker et Jrvine, 1915 and E. mijagawai Jschi, 1932. Rodents become infected by eating mollusks infested with metacercariae, which serve as a second intermediate host. Reservoir hosts are also included, which are played by Prectimenus amphibians.

Terrestrial mollusks of a number of species are established as intermediate hosts for two Brachylaemus species: B. aequanus (Looss, 1899) and B. recurvus (Dujardin, 1845). Rodents become infected by eating molluscs infested by the larvae of these trematodes.

For the trematode Dicrocoelium dendriticum (Stiles et Hassaall, 1816), terrestrial mollusks act as the first and ants as the second intermediate hosts. Rodents become infected by eating ants infested with fluke metacercations.

Oribatid mites. Considering the importance of oribatid ticks, it should be noted that, according to numerous publications, they are registered as intermediate hosts of a number of cestode species - mammalian parasites. In our material, they are intermediate hosts for 6 cestode species - Paramoplocephala transversaria (Krabbe, 1879), Catenotaenia cricetorum Kirschenblatt, 1949, Catenotaenia dendritica (Gaeze, 1782), Catenotaenia rhombomydis Schulz, Cnotatea, 1934. Rodents become infected by swallowing ticks along with food (plants). As for another cestode - Mesocestoides lineatus (Goeze, 1782), this includes reservoir hosts - amphibians, reptiles, birds, mammals (including rodents). In this case, rodents act as a reservoir host.

A number of species of beetles, orthoptera, collembolans, and fleas turned out to be intermediate hosts for representatives of cestodes - Mathevotaenia symmetrica (Baylis, 1927), Hymenolepus diminuta (Rudolphi, 1819), Hymenolepus horrida (Linstow, 1901), Rodentolepis straminea) (Dipeze caninium) (L., 1758). For the latter type of cestodes, rodents act as a reservoir host.

Beetles are also involved in the life cycles of a number of nematode species of the order Spirurida and the worm Moniliformis moniliformis (Bremser, 1811).

Diptera insects turned out to be carriers of the nematode Dipetalonema viteae (Krepkogorskaja, 1933), the mature forms of which parasitize in the body of rodents in the studied region of Uzbekistan.

Fish, amphibians, reptiles are of great importance as reservoir hosts for rodent helminths. Fish participate in the life cycles of two species of trematodes, amphibians and reptiles - two species of trematodes, one species of cestodes, and one species of nematodes as a reservoir host.

Mammals are unpaired and artiodactyls, rodents are intermediate hosts of 6 species of cestodes of the genera Taenia and Hydatigera, which in their mature form parasitize in the intestines of representatives of the order of carnivores.

Thus, of the total number of 46 species - obligate and facultative parasites of rodents, 19 species are infested by eating intermediate or reservoir hosts, which is 42.2%. eggs or larvae of helminths enter the host's body as a mechanical impurity to feed or water. Such types of helminths in rodents account for 24 or 53.0% of the total number of helminth fauna. Only the nematode Dipetalonema viteae (Krepkogorskaja, 1933) is transmitted by the intermediate host when fed (blood) on the final host, which is 2.2%.

It seems to us extremely important to determine the relationship between the helminth fauna of rodents and vertebrates of other orders and classes. As the data in Fig. 3 in fish parasitize 2 species of trematodes of the genus Echinostoma at the stage of metacercaria. Here fish act as a second

intermediate or reservoir host. Amphibians are involved in the transmission of helminths of 4 species of the following genera - Mesocestoides (1 species), Echinostoma (2), Spirocerca (1). Common to rodents and reptiles are 2 species from the genera (Mesocestoides and Spirocerca).

In birds, 3 species of helminths of the genera Echinostoma (2 species) and Mesocestoides (1 species) were recorded, which are common parasites of rodents.

In mammals of other orders, 9 species of rodent helminth fauna have been recorded. They are represented by the following genera - Taenia, Mesocestoides, Dipylidium, Dicrocoelium, Moniliformis, Spirocerca.

Helminths of most of these genera were found in the artiodactyla of the order Artiodactyla. Some species of the indicated genera of helminths have also been recorded in mammals of the orders - equids, calluses, lagomorphs, and insectivores (Ryzhikov et al., 1978, 1979).

Summarizing the above materials on the relationship of the helminth fauna of rodents with other classes and orders of animals, it can be noted that it is quite close with the group - artiodactyls. The relationships between the helminths of the studied rodents are also quite pronounced with representatives of other classes (fish, amphibians, reptiles, birds) and other orders of mammals that are involved in the realization of the life cycles of parasites and the circulation of invasions in the biocenoses of northeastern Uzbekistan.

Thus, the distribution of parasites among vertebrate hosts can be explained by the fact that the host is the radiation of certain species and groups of helminths, as a result of which they transfer to systematically unrelated animals living in the same biocenoses. Probably, such radiation is one of the important factors in the formation of faunistic complexes of parasitic worms.

The characteristic of the species composition of cestodes, trematodes, worms and nematodes contains detailed data for each type of helminths. Information concerning their hosts, localization, place of detection, biology, distribution, indicators of infection - the extensiveness and intensity of invasion and their position in the modern system of classes Cestoda, Trematoda, Acanthocephala and Nematoda are given.

The structure of the modern fauna of helminths of the studied rodents, widespread in the North-East of Uzbekistan, consists of representatives of 4 classes belonging to three types of invertebrates.

The Cestoda class is represented by 17 species (34.7%). They belong to 9 genera, 7 families, and 4 suborders of the order Cyclophyllida. By the nature of life cycles, all noted cestodes develop with the participation of intermediate hosts. Most rodents act as intermediate hosts.

The Trematoda class consists of 5 species (10.8%) belonging to 3 genera, 3 families, and 3 orders of flukes. The life cycles of the noted trematodes involve aquatic, terrestrial mollusks and ants.

The most widely represented are representatives of the Nematoda class - 23 species (50%), which are united in 15 genera, 12 families, 5 suborders and 4 orders. The life cycles of the noted nematodes are characterized by the fact that some groups develop without an intermediate host, while others with the obligatory participation of an intermediate host.

The Acanthocephala class is represented by one species; the life cycle occurs with the participation of an intermediate host.

Many types of rodent helminths in the studied region of Uzbekistan are also causative agents of invasive diseases of productive animals (domestic and commercial) and humans, therefore, parasites, on the one hand, are a natural component of natural ecosystems, and on the other, a factor of biological pollution of the environment. Rodents living next to humans participate in the circulation of a significant number of helminth species that are of great epizootological and epidemiological significance. With a high number of rodents and their parasites, there is a significant accumulation of invasive elements in the environment.

In the urbanized ecosystems of northeastern Uzbekistan, 13 species (28.2%) of helminths were recorded in rodents, which are of medical and veterinary importance. This includes some representatives of cestodes (10 species), trematodes (1), side-scrapers (1) and nematodes (1), which is consistent with the known data (Davlatov, 1970; Sultanov et al., 1975; Bronshtein and Tokmalaev, 2004; Azimov et al. , 2015). As a result of studying the helminth fauna of rodents in the North-East of Uzbekistan, taking into account the known data on the biology of the noted 13 species of parasitic worms, it can be stated that at a certain stage of development they can parasitize in various organs of agricultural, hunting - game animals, as well as humans.

We briefly outlined the general situation on the role of rodents in the circulation of several species of parasitic worms in the biocenoses of the studied region. Many species of rodents in natural and synanthropic conditions turned out to be infected with helminths common to animals and humans. This should include representatives of rodents: yellow and relict ground squirrels, common squirrel, large jerboa, Severtsov's jerboa, red-tailed, great and midday gerbils, house mouse and gray rat. They live in landscapes of different types, where agricultural, wild and hunting - game animals are grazed. There is regular contact between these groups of animals, where helminths are likely to be exchanged. Here, admittedly, rodents, as reserves of the corresponding parasitic worms, play an important role in maintaining natural foci of invasion. Contaminated objects of the external environment (water bodies, pastures) with invasive elements of helminths serve as sources of infection for other groups of animals and humans and the occurrence of parasitic diseases.

Conclusion.

Based on the research carried out on the work, the following conclusions are presented:

1. The faunistic structure of rodent helminths in the North-East of Uzbekistan was determined, consisting of 46 species belonging to 4 classes - cestodes - 17 species, trematodes - 5 species, acanthocephalus - 1 species and nematodes - 28 species. The richness of parasitic worms is supported by a high species diversity of squirrel, mouse, and sand lance rodents, determined by the diversity of biotopes in the study area.

2. The helminth fauna of the rodent-squirrel complex is distinguished by a high spectrum of species diversity, which includes 27 species or 39.2% of the total number of rodent parasite fauna. For the first time, the helminth fauna of the common protein was determined in Uzbekistan, where 11 species of parasitic worms were identified.

3. For the first time, 30 species of helminths belonging to the fauna of parasitic worms have been identified in the study area. The predominant species of helminths are parasitic worms that develop with the participation of intermediate and reservoir hosts.

4. The peculiarity of species diversity in synanthropic mouse rodents (house mouse and gray rat) of the North-East of Uzbekistan has been determined. Noted. That the mouse helminth fauna consists of 21 species belonging to 3 classes: cestodes, trematodes and nematodes.

5. In the helminth fauna of rodents in the studied region, parasites prevail, entering into topical and trophic connections with the hosts, which account for 53.3% and 42.2%, respectively. Only the nematodes Dipetalonema viteae are transmitted by the intermediate host (mosquito) when feeding on the final host, which is 2.2%.

6. Biocenotic connections of helminths found in rodents of the North-East of Uzbekistan with other groups of animals determined the modern appearance of helminth fauna.

7. It has been established that out of the general fauna of rodent helminths (46 species) in the North-East of Uzbekistan, 13 species of parasitic worms at a certain stage can parasitize in various agricultural, wild game animals and humans. These include some representatives of the genera: Hymenolepis, Dipylidium, Taenia, Hydatigera, Rodentolepis, Mesocestoides, Moniliformis, Dicrocoelium, and Syphacia. They are of medical and veterinary importance.

8. The taxonomic characteristics of the detected rodent helminths in biogeocenoses of the North-East of Uzbekistan are presented. Information is given for each species with the definition of the extensiveness and intensity of invasion and their position in the modern class system - Cestoda, Trematoda, Acanthocephala and Nematoda.

9. The tactics of carrying out preventive measures against anthropozoonotic helminthiasis of animals in the conditions of the North-East of Uzbekistan have been substantiated.

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