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RODENT HELMINTHS OF THE ORDER OF NORTH-EASTERN UZBEKISTAN (FAUNA, ECOLOGY, SIGNIFICANCE)

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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.

Introductions. On the basis of scientific results obtained in the study of helminth fauna, ecology and importance of the rodent family (Rodentia) of the Northeastern region of Uzbekistan:

Warehouses of private enterprises and grain warehouses of rodents in Khanka district have been introduced. (reference) The results allowed rodents to achieve 65-70% efficiency when neutralized with Zoocoumarin paste, 70-80% when neutralized with Brodifakum, and 60% when disinfected using traps created by the researcher.

Diagnosis of infectious diseases by rodents and preventive measures with the help of chemical rodenticides "Rodenticides" are introduced into the practice of the Republican Disinfection Station of the Ministry of Health of the Republic of Uzbekistan. Results According to the disinfection stations of Jizzakh, Arnasay and Sharof Rashidov districts, deratization measures have reduced rodent damage by 65-70%.

The scientific results of the dissertation were distributed in the form of practical recommendations for use by people and all farms, veterinarians, students of higher and secondary special educational institutions, researchers. contributed to safety and environmental sustainability. The results made it possible to monitor and reduce the damage of rodent helminths in Tashkent, Syrdarya, Jizzakh and partly in Khorezm regions.

The northeastern region of Uzbekistan occupies a part of the republic lying along the middle course of the Syrdarya River and its tributaries Chirchik and Angren. This wide foothill plain, starting from the western slopes and foothills of the Tien Shan, gently descends to the Syr Darya, passing into the Hungry Steppe. The territory has a favorable geographical position. It is located at the junction of areas of irrigated agriculture and pasture animal husbandry.

The nature of the region is diverse. Here, the foothill plain, which occupies 2/3 of the territory, and powerful mountain structures coexist. The northeast resembles a grandiose amphitheater, open towards the Kyzylkum desert. The climate of the region is more humid. Here falls from 300 to 700 mm of precipitation per year. Atmospheric moisture in the foothills is sufficient for growing cereals and fruits without irrigation. But the climate of the territory also has its "weaknesses": winter is characterized by more severe frosts, frosts end later in spring, they come earlier in autumn.

Material method. Rodents are the most numerous group of mammals in the fauna of the North-East of Uzbekistan. They live in almost all landscape zones. In years favorable for breeding, the population of these animals reaches a very high level. Rodents, one of the most interesting orders of mammals, whose ecological adaptation has reached the widest range - from arboreal, terrestrial, underground to aquatic forms. They are a very convenient object for a parasitologist-faunist, by the example of which the issues of the formation of faunistic complexes of parasitic worms inherent in certain taxonomic host groups can be considered.

In addition, rodents are of great practical importance. Among them there are a number of valuable game animals. Among them belong the muskrat, marmot, squirrel, nutria. The fur of these animals, especially muskrat and nutria, is highly valued.

The negative role of rodents is very significant. It causes great damage to the agro-industrial complex, eating grain, destroying valuable vegetation in fields and gardens, damaging plantings of fruit crops.

Many species of rodents are definitive and intermediate hosts of helminths that cause dangerous diseases in humans and farm animals. Rodents also support foci of a number of infectious diseases.

Rodents of the following families: squirrels - Sciuridae, nutrias - Myocasteridae, false jerboas - Allactagidae, jerboas - Dipodidae, hamsters - Cricetidae, gerbils - Gerbellidae, mice - Muridae were caught using standard live traps, crushers, traps, digging holes and pouring water. They also used the services of local hunters in Tashkent, Syrdarya and Jizzakh regions.

Table 1

Species composition of the studied rodents of North-Eastern Uzbekistan

Family	Species Investigated	specimen.
Sciuridae – Squirrels	*Sciuris vulgaris* L., 1758 – Common squirrel	11
	Spermophilus fulvus Licht., 1823 – Yellow gopher	13
	Spermophilus relictus Kash., 1923 – Relic gopher	25

Myocastoridae - Nutriaceae	*Myocastor coypus* Molina, 1782 – Nutria	105
Allactagidae - False jerboas	*Allactaga major* Kerr, 1792 – Big jerboa	8
	Allactaga severtzovi Vinogradov, 1925 - Jerboa Severtsova	58
Cricetidae - Hamsters	*Ondatra zibethicus* L., 1766 – Muskrat	150
Gerbillidae - Gerbils	*Meriones libycus* Licht., 1823 – Red-tailed gerbil	45
	Meriones meridianus Pallas, 1773 – Midday gerbil	42
	Rhombomys opimus Licht., 1823 – Greater gerbil	156
Muridae - Mouse	*Mus musculus* L., 1758 – House mouse	226
	Rattus norvegicus Berk., 1769 – Gray rat	218
Total		1057

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

Cestoda – Cestodes:

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 – Trematodes:

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)

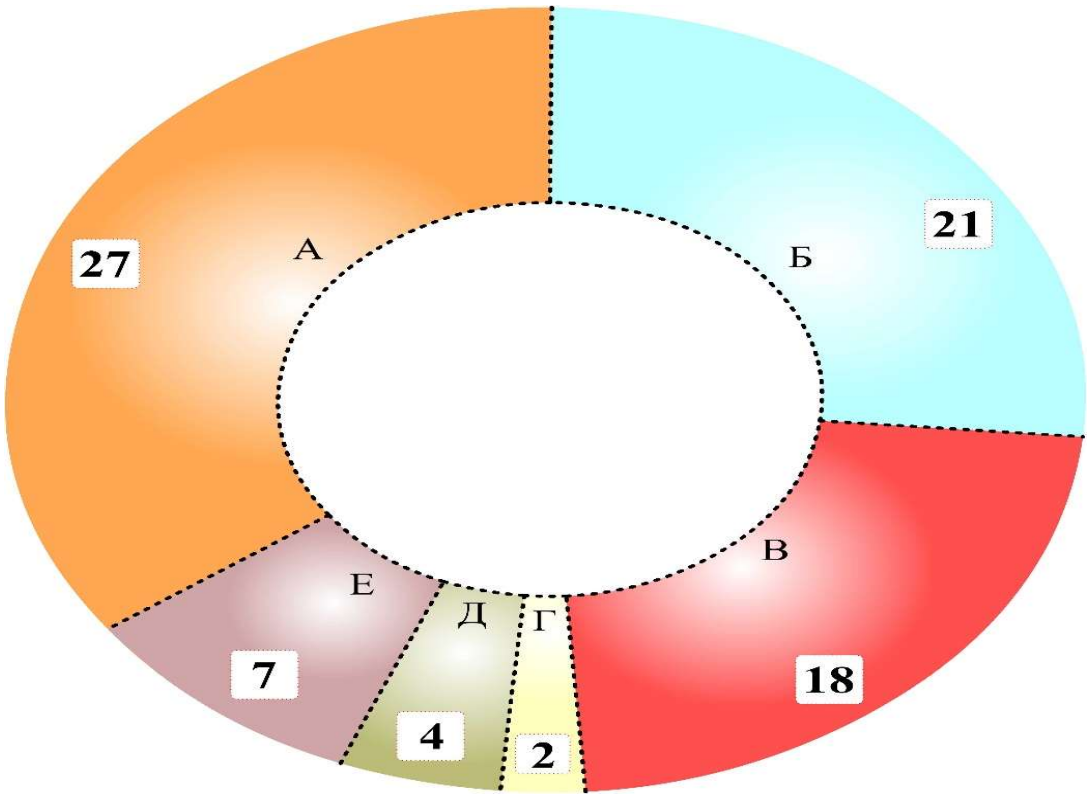
Acanthocephala – Skrebni:

23. *Moniliformis moniliformis* (Bremser, 1811)

Nematoda – Nematodes:

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 noted for the first time for the fauna of helminths of rodents of the study area of Uzbekistan. 9 types of helminths: *Catenotaenia rhombomydis, Hydatigera krepkogorski, Moniliformis moniliformis, Trichocephalus rhombomydis, Trichocephalus muris, Streptophiagus kutassi, Aspiculuris schulzi, Syphacia obvelata* and *Dipetalonema viteae* were previously registered in rodents of Jizzakh and Syrdarya regions



Picture. 1. Specific weight of the helminth fauna of individual families of rodents: А– squirrel, Б – mouse, В – gerbil, Г – nutri, Д – hamster,
Е – False jerboas (original).

Participation of individual groups of animals in the circulation of rodent helminths

Genus	Number of species	Hosts		
		Intermediate	**reservoir**	**Final**
Cestodes:				
Paramoplocephala	1	Oribatid mites	-	rodents
Catenotaenia	4	Oribatid mites	-	rodents
Mathevotaenia	1	beetles	-	rodents
Hymenolepis	2	beetles, fleas, springtails	-	rodents
Dipylidium	1	fleas	rodents	Dogs, cats
Rodentolepis	1	beetles, orthopterans	-	rodents
Taenia	4	rodents	-	Predatory carnivores

Hydatigera	2	rodents	-	Predatory carnivores
Mesocestoides	1	Oribatid mites	Amphibians, reptiles, birds, mammals (rodents)	Predatory mammals
Trematodes:				
Echinostoma	2	aquatic clams	Amphibians, fish	Birds, rodents
Dicrocoelium	1	Land snails, ants	-	Mammals
Brachylaemus	2	Land snails, ants	-	rodents
Skrebni:				
Moniliformis	1	beetles	-	rodents
Nematodes:				
Armocapillaria	1	Oligahets	-	rodents
Gongylonema	2	beetles	-	rodents
Abreviata	1	beetles	-	rodents
Mastophorus	1	beetles	-	rodents
Spirocerca	1	beetles	Amphibians, reptiles	rodents
Streptophiagus	1	beetles	-	rodents
Physoloptera	1	beetles	-	rodents
Dipetalonema	1	Diptera	-	rodents

Table 2 provides information on the intermediate, reservoir and definitive hosts of rodent helminths registered in the biocenoses of the North-East of Uzbekistan. In the absence of data on the biology of helminths that parasitize rodents, we judged them by analogy with closely related forms.

Animals of many groups (invertebrates and vertebrates, Table 2) participate in the circulation of rodent helminths. Below we briefly review the role of each of them.

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

Aquatic mollusks serve as intermediate hosts for two species of trematodes of the genus Echinostoma: E. arnigerum Barker et Irvine, 1915 and E. mijagawai Ischi, 1932. Rodents become infected by eating mollusks infested with metacercariae, which serve as the second intermediate host. This also includes reservoir hosts such as amphibians and reptiles.

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

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

Oribatid mites. Considering the importance of oribatid mites, it should be noted that according to numerous publications, they are registered as intermediate hosts of a number of species of cestodes - parasites of mammals. In our material, they are intermediate hosts for 6 species of cestodes - Paramoplocephala transversaria (Krabbe, 1879), Catenotaenia cricetorum Kirschenblatt, 1949, Catenotaenia dendritica (Gaeze, 1782), Catenotaenia rhombomydis Schulz et Landa, 1934, Catenotaenia pusilla (Goeze, 1782). Rodents become infected by ingesting 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, springtails 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 (Goeze, 1782) and Dipylidium caninum (L., 1758). For the latter species of cestodes, rodents act as a reservoir host.Жуки также участвуют в жизненных циклах целого ряда видов нематод отряда Spirurida и скребня *Moniliformis moniliformis* (Bremser, 1811) (табл. 2).

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 of the studied region of Uzbekistan.

Fish, amphibians, and reptiles are of great importance as reservoir hosts for rodent helminths.

Fish are involved in the life cycles of two trematode species, amphibian and reptile—two trematode species, one cestode species, and one nematode species as a reservoir host (Table 2).

Mammals - 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 predatory order.

Thus, out of the total number of 46 species that are obligate and facultative parasites of rodents, 19 species are infected by eating intermediate or reservoir hosts, which is 42.2%. Eggs or larvae of helminths enter the host organism as a mechanical admixture 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 feeding (blood) on the final host, which is 2.2%.

The helminth fauna of rodents is dominated by parasites associated with hosts by topical and tropical relationships, 53.3 and 42.2%, respectively. The ecological links between rodents and helminths, which infect hosts by topical and trophic routes, probably determined the formation of the helminth fauna of the studied animals in the northeast of Uzbekistan.

It seems to us extremely important to determine the relationship between the helminth fauna of rodents and vertebrates of other orders and classes (Fig. 3.3).

As the data in Fig. 3.3 fish are parasitized by 2 species of trematodes of the genus Echinostoma in the metacercariae stage. 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 noted, 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.*

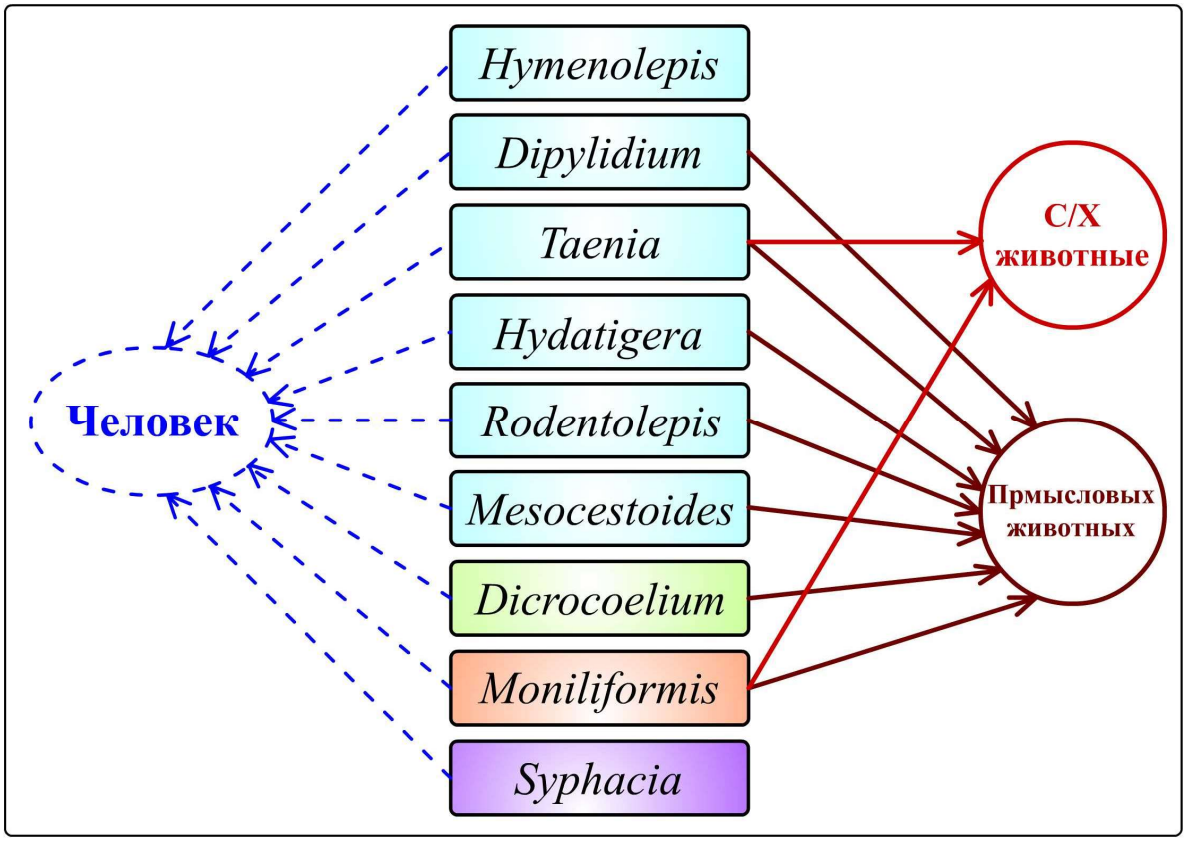
It has been established that wild animals in natural conditions are carriers and reservoirs of many parasitic diseases of farm animals and humans. Many species of rodent helminths in the studied region of Uzbekistan are also pathogens of invasive diseases of productive animals (domestic and commercial) and humans, therefore parasites, on the one hand, are a natural component of natural ecosystems, and, on the other hand, are a factor in biological pollution of the environment. Rodents that live near humans are involved in the circulation of a significant number of helminth species 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.

Table 3

Helminths of rodents common to agricultural, game animals and humans

Species	Agricultural animals	Commercial animals	Human
Cestodes:			
Hymenolepis diminuta	-	-	+
Dipylidium caninum	-	-	+
Taenia hydatigena	+	+	+
Taenia macrocystis	-	+	-
Taenia pisiformis	-	+	-
Taenia crassiceps	-	+	-
Hydatigera taeniaeformis	-	+	+
Hydatigera krepkogorski	-	+	-
Rodentolepis straminea	-	-	+
Mesocestoides lineatus	-	+	+
Trematodes:			
Dicrocoelium dendriticum	+	+	+
Skrebni			
Moniliformis moniliformis	-	+	+
Nematodes:			
Syphacia obvelata	-	-	+

In the urbanized ecosystems of North-Eastern Uzbekistan, 13 species (28.2%) of helminths of medical and veterinary importance have been recorded in rodents. This includes some representatives of cestodes (10 species), trematodes (1), acanthocephalans (1) and nematodes (1), which corresponds to the known data



Rice. 2. Types of rodent helminths common to agricultural, commercial animals and humans in the North-East of Uzbekistan (original). 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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