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RESEARCH ARTICLE

Overview of Trematodes (Trematoda) of mammals in Uzbekistan

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Abstract

Based on the research and the analysis of literary data, we identified 27 species of trematodes from 19 genera, 12 families and 7 orders, which parasitise mammals in Uzbekistan. The families Brachylaemiidae and Paramphistomatidae, with 6 and 5 species, respectively, showed the highest species diversity. These two families contained 40.7% of all recorded trematode species infecting mammals. The families Fasciolidae and Echinostomatidae include 3 species each, Dicrocoeliidae and Plagiorchidae – 2 species each, with 1 trematode species in each of the remaining 6 families.

Keywords

Trematode fauna, trematodes, mammals, helminths, infection, Uzbekistan

Introduction

Trematodes are common parasites for many species of vertebrates. Some of the flukes cause dangerous infectious diseases in domestic animals and humans. Most of trematodiases important from the medical and veterinary aspects widely circulate in the wild, where they form natural foci (Bear 2005).

Currently, there are more than 5,000 known species of trematodes (Spassky 1996; Gibson 2002) parasitising various ecological groups of vertebrates in terrestrial, freshwater and marine ecosystems. Trematodes are considered as the main components of biodiversity in various biocoenoses. Parasitising all organs and systems in domestic, agricultural and game animals, they cause serious diseases, and in some regions of Uzbekistan this has grave socio-economic consequences. Comprehensive studies of trematodes and their impact on host populations are highly important for the development of scientific methods to prevent trematodiases of animals.

Parasitic diseases, including helminthiases, are factors reducing the fertility of animals. This leads to direct and indirect economic losses, such as those caused by lower milk yield, slower body weight gain by animals, rejection of animals with affected parenchyma at slaughterhouses and slower growth of young animals (Fagbemi, Hillyer 1992). The most dangerous trematodiases include fasciolosis and paramphistomatosis caused by flatworms from the families Fasciolidae and Paramphistomidae (Plathelminthes: Trematoda), respectively. They are widely distributed diseases affecting many species of mammals and are zoonotically important in a number of countries in Europe, America, Asia and Africa (Radfar, Gowhari 2012).

A number of researchers have worked on studying trematodes of mammals in Uzbekistan, including D.A. Azimov (1986), B.M. Ashirmatov (1999), E.B. Shakarboev et al. (2001), M.K. Kozhabaev (2001), D.A.Azimov et al. (2015), A.J. Kaniyazov, E.B. Shakarboev (2023), E.B. Shakarboev, A.S. Berdibaev (2023) and others. However, we could not find generalising works on trematodes of mammals.

The goal of this work is to study the species composition of trematodes of mammals in Uzbekistan and specify the rate of infection with these parasites.

Materials and methods

Helminthological material was collected from mammals in the eastern, north-eastern, central, southern and north-western parts of Uzbekistan. The rate of infection with trematodes in mammals was established by complete and incomplete helminthological necropsy according to K.I. Skryabin (1928). A total of 1,013 mammals were examined by complete helminthological necropsy in 2013–2023. This total includes 310 individual organs delivered from various nurseries and nature reserves, as well as the Tashkent Zoo. The organs were examined through incomplete helminthological necropsy.

Faeces were examined in a number of farms, nurseries and reserves using the scatology method developed by Fulleborn, Kalantaryan, Shcherbovich and Darling, as well as the sequential washing method (Demidov 1987). During the specified period, 870 faecal samples were examined using the coprological study. In addition, our team of researchers studied material on trematodes of wild mammals kindly provided by the Tashkent Zoo staff.

To identify trematode species, we used works by S.N. Boev et al. (1962), M.A. Sultanov et al. (1975), D.A. Azimov (1975), M.M. Tokobaev (1976), M.M. Tokobaev, N.T. Chibichenko (1978), V.M. Ivashkin, S.A. Mukhammadiev (1981), V.M. Ivashkin et al. (1989), D.I. Gibson (2002).

Results and discussion

Based on the research and the analysis of literary data (Kairov 1965; Gekhtin 1967; Gariev 1970; Koshanov 1972; Sultanov et al. 1975; Azimov et al. 2015) we identified 27 species of trematodes from 19 genera, 12 families and 7 orders in the mammals of Uzbekistan. One of the 27 species was identified only to the generic level.

Trematodes were described according to R.S. Shultz, E.V. Gvozdev (1970), D.A. Azimov (1970, 1975), V.Ya. Panin (1984), L.V. Filimonova (1985), T.A. Krasnolobova (1987), and taking into account the latest updates made by Uzbek and foreign researchers.

Parasite-Host checklist of trematodes from mammals in Uzbekistan

Phylum Plathelminthes Schneider, 1873

Class Trematoda Rudolphi, 1808

Subclass Prosostomidea Skrjabin et Guschanskaja, 1962

Order Fasciolida Skrjabin et Guschanskaja, 1962

Family Fasciolidae Railliet, 1895

1. *Fasciola hepatica* Linnaeus, 1758

Definitive hosts: *Ovis aries* Linnaeus, 1758, *Bos taurus* Linnaeus, 1758, *Capra hircus* Linnaeus, 1758, *Ovis ammon* (Linnaeus, 1758), *Ovis vignei* Blyth, 1841, *Gazella subgutturosa* (Güuldenstaedt, 1780), *Cervus elaphus* Linnaeus, 1758, *Capreolus pygargus* (Pallas, 1771).

Localization: bile ducts, gallbladder.

Prevalence of infection: *Ovis aries* – 4.7-100%, *Capra hircus* – 3-34.8%, *Bos taurus* – 29-74.4%, *Equus caballus* –10-12.5%, *Sus domesticus* – 0.9-1.5%.

Intensity range: from 21 to 75 individuals.

Intermediate hosts: freshwater molluscs from the genus *Lymnaea*.

Discovery area: we have registered the species in almost all regions of Uzbekistan, except Khorezm and the Republic of Karakalpakstan.

2. *Fasciola gigantica* (Cobbold, 1855)

Definitive hosts: *Ovis aries* Linnaeus, 1758, *Bos taurus* Linnaeus, 1758, *Capra hircus* Linnaeus, 1758, *Ovis ammon* (Linnaeus, 1758), *Cervus elaphus* Linnaeus, 1758, *Capreolus pygargus* (Pallas, 1771).

Localization: bile ducts, gallbladder.

Prevalence of infection: 16.3% in *Ovis aries* (46 of 283 examined individuals) and 23.1% in *Bos taurus* (52 of 225 individuals).

Intensity range: from 12 to 59 individuals of parasites.

Intermediate hosts: freshwater molluscs from the genus *Lymnaea*.

Discovery area: we recorded this trematode in *Ovis aries* and *Bos taurus* in the north-west and south of Uzbekistan.

3. *Fasciola indica* Varma, 1953

Definitive hosts: *Ovis aries* Linnaeus, 1758, *Bos taurus* Linnaeus, 1758.

Localization: bile ducts.

Intermediate hosts: the biology of this species has not been studied; probably, intermediate hosts are the same as for other *Fasciola* species.

Discovery area: eastern part of Uzbekistan (Gariev 1970).

Family Mesotretidae Poche, 1925

4. *Mesotretes peregrinus* Braun, 1900

Definitive hosts: *Pipistrellus pipistrellus* (Schreber, 1774).

Localization: small intestine.

Prevalence of infection: *Pipistrellus pipistrellus* – 1,8-2,5%

Intensity range: 3-8 individuals.

Discovery area: Tashkent region (Koshanov 1972).

Family Echinostomatidae Dietz, 1909

5. *Echinostoma armigerum* Barker& Irvine, 1915

Definitive hosts: *Ondatra zibethicus* (Linnaeus, 1766).

Localization: duodenum.

Discovery area: lower reaches of the Amu Darya (Kairov 1965).

6. *Echinochasmus perfoliatus* (Ratz,1908)

Definitive hosts: *Vulpes vulpes* (Linnaeus, 1758), *Canis aureus* Linnaeus, 1758.

Localization: small intestine.

Prevalence of infection: 1 of 11 examined foxes (9.1%) was infected with 23 trematode individuals.

Discovery area: we found this trematode in foxes in Kungrad District of the Republic of Karakalpakstan.

7. *Mesorchis denticulatus* (Rudolphi, 1802)

Definitive hosts: *Vulpes vulpes* (Linnaeus, 1758).

Localization: small intestine.

Prevalence of infection: 9 out of 62 examined foxes (14.5%) were infected with trematodes.

Intensity range: 2-16 individuals.

Intermediate hosts: freshwater molluscs.

Reservoir hosts: metacercariae were found in the muscles and fins of fish (ide) (Shakarboev 2009; Shakarboev, Berdibaev 2023).

Discovery area: I.Kh. Kairov (1965) recorded mature individuals of *M. denticulatus* in the intestines of 28.3% of examined red foxes in the Karakalpak part of the Ustyurt Plateau, as well as in silver-black foxes and blue morphs of the Arctic fox in the Muynak fur farm at the Amudarya muskrat farm.

Family Gastrodiscidae (Stiles et Goldberger, 1910)

8. *Gastrodiscoides hominis* (Lewis et McConnall, 1876)

Definitive hosts: *Sus scrofa* Linnaeus, 1758.

Localization: large intestine and caecum.

Prevalence of infection: 1 of 15 examined *Sus scrofa* (6.7%) was infected with 18 individuals of parasites.

Discovery area: this species is recorded in the floodplains of the Amu Darya and Syr Darya rivers.

Order Paramphistomida Skrjabin et Schulz, 1937

Family Paramphistomatidae Fischoeder, 1901

9. *Paramphistomum ichikawai* Fukui, 1922

Definitive hosts: *Ovis aries* Linnaeus, 1758, *Bos taurus* Linnaeus, 1758.

Localization: paunch, more rarely honeycomb.

Prevalence of infection: 27 of 225 examined head of *Bos taurus* (12.0%) were infected with parasites from this genus.

Intensity range: from 157 to 315 individuals.

Intermediate hosts: freshwater molluscs of the family Planorbidae.

Discovery area: north-western, north-eastern, eastern and southern Uzbekistan.

10. *Liorchis scotiae* (Willmott, 1950) Velichko, 1966

Definitive hosts: *Bos taurus* Linnaeus, 1758.

Localization: paunch, more rarely honeycomb.

Prevalence of infection: 4 of 225 examined head of *Bos taurus* (1.7%) were infected.

Intensity of infection: up to 270 individuals.

Intermediate hosts: freshwater molluscs of the family Planorbidae.

Discovery area: central and north-western Uzbekistan.

11. *Calicophoron calicophorum* (Fishoeder, 1901)

Definitive hosts: *Ovis aries* Linnaeus, 1758, *Bos taurus* Linnaeus, 1758.

Localization: paunch.

Prevalence of infection: 58 of 225 examined head of *Bos taurus* (25.8%) were infected.

Intensity range: from 260 to 642 individuals.

Intermediate hosts: freshwater molluscs – *Planorbis planorbis* (Linnaeus, 1758), *Anisus spirorbis* (Linnaeus, 1758), *Anisus septemgyratus* (Rossmässler, 1835).

Discovery area: this species was recorded in north-western, eastern and southern Uzbekistan.

12. *Calicophoron erschowi* (Fishoeder, 1901)

Definitive hosts: *Ovis aries* Linnaeus, 1758, *Bos taurus* Linnaeus, 1758.

Localization: paunch.

Prevalence of infection: 8 of 283 examined individuals of *Ovis aries* (2.8%) were infected.

Intensity range: from 12 to 29 individuals of parasites.

Intermediate hosts: freshwater molluscs of the family Planorbidae.

Discovery area: this species was recorded in the southern part of Uzbekistan.

13. *Cotylophoron cotylophorum* (Fishoeder, 1901)

Definitive hosts: *Ovis aries* Linnaeus, 1758, *Bos taurus* Linnaeus, 1758.

Localization: paunch.

Prevalence of infection: 2 of 225 examined head of *Bos taurus* (0.9%) were infected with this trematode.

Intensity range: up to 25 individuals.

Intermediate hosts: freshwater molluscs of the family Planorbidae.

Discovery area: this species was registered in *Bos taurus* in the Republic of Karakalpakstan (Gekhtin 1967).

Family Gastrothylacidae Stiles et Goldberger, 1910

14. *Gastrothylax crumenifer* (Creplin, 1847)

Definitive hosts: *Ovis aries* Linnaeus, 1758, *Bos taurus* Linnaeus, 1758, *Capra hircus* Linnaeus, 1758,

Localization: paunch.

Prevalence of infection: 17 of 225 head of examined *Bos taurus* (7.5%) were infected.

Intensity range:382 to 887 trematode individuals.

Intermediate hosts: freshwater molluscs of the family Planorbidae.

Discovery area: north-eastern, central, north-western and southern parts of Uzbekistan.

Order Plagiorchida La Rue, 1957

Family Plagiorchidae Luhe, 1901

15. *Plagiorchis elegans* (Rudolphi, 1802)

Definitive hosts: Obligate parasite of Passeriformes birds; dog, *Canis lupus* familiaris Linnaeus, 1758, *Vulpes vulpes* (Linnaeus, 1758), *Canis aureus* Linnaeus, 1758, *Vulpes corsac* (Linnaeus, 1768), *Ondatra zibethicus* (Linnaeus, 1766), *Sylvaemus uralensis* Pallas, 1811, *Mus musculus* Linnaeus, 1758 are the facultative hosts of the species.

Localization: small intestine.

Secondary intermediate hosts: representatives of three classes of invertebrates – Insects, crustaceans and molluscs (Krasnolobova 1987).

Prevalence of infection: 11 out of 62 *Vulpes vulpes* (17.7%), 9 out of 91 *Canis aureus* (9.8%) were found to be infected.

Intensity range: 1-11 trematode individuals.

Intermediate hosts: freshwater molluscs of the family Lymnaeidae.

Discovery area: A. Murtazaev (1965) and I.K. Kairov (1966) found *Plagiorchis massino* Petrov et Tichonov, 1927 in the jackal. However, a number of researchers (Krasnolobova 1987; Odening 1959) consider it a synonym of *P. elegans*.

Plagiorchis massino does not differ morphologically from *P. elegans* and is thus quite rightly identified by Stychinskaya-Yurevich (1962; cited: Krasnolobova 1987) as a synonym of the latter species. This opinion was experimentally confirmed by Genov and Somnaliyev (1984; cited: Krasnolobova 1987). According to the above-mentioned researchers, the species *P. massino* in size and morphology corresponds to adult trematode of *P. elegans* 5 to 10 days old detected in *Mus musculus* Linnaeus, 1758.

16. *Plagiorchis vespertilionis* (Müller, 1780)

Definitive hosts: *Myotis blythii* (Tomes, 1857), *Myotis mystacinus* (Kuhl, 1819), *Plecotus auratus* (Linnaeus, 1758), *Pipistrellus pipistrellus* (Schreber, 1774), *Eptesicus serotinus* Schreber, 1774.

Localization: small intestine.

Prevalence of infection: *Plagiorchis vespertilionis* – 1,8%, *Myotis mystacinus* – 1,3%.

Prevalence of infection: 1-7 individuals.

Intermediate hosts: freshwater molluscs.

Secondary intermediate hosts: insects.

Discovery area: throughout Uzbekistan (Koshanov 1972).

Family Dicrocoeliidae Odhner, 1911

17. *Dicrocoelium dendriticum* (Rudolphi, 1819)

Definitive hosts: *Ovis aries* Linnaeus, 1758, *Bos taurus* Linnaeus, 1758, *Capra hircus* Linnaeus, 1758, *Ovis ammon* (Linnaeus, 1758), *Ovis vignei* Blyth, 1841, *Capra sibirica* (Pallas, 1776), *Capra falconeri* (Wagner, 1839), *Cervus elaphus* Linnaeus, 1758, *Capreolus pygargus* (Pallas, 1771), *Equus caballus* Linnaeus, 1758.

Localization: bile ducts, gallbladder.

Prevalence of infection: 33.9-100.0% in *Ovis aries*, 21.5-67.6% in *Capra hircus*, 16.1-87.6% in *Bos taurus* and 1.5-15.0% in *Equus caballus*.

Intensity range: 1-16,137 individuals.

Intermediate hosts: terrestrial molluscs of the genera *Xeropicta*, *Agriolimax*, *Bradybaena* and *Subzebrinus*.

Secondary intermediate hosts: ants of the genera *Formica* and *Proformica*.

Discovery area: Throughout Uzbekistan, except in the north-west of the country.

18. *Eurytrema pancreaticum* Janson, 1889

Definitive hosts: *Ovis aries* Linnaeus, 1758, *Bos taurus* Linnaeus, 1758, *Capra hircus* Linnaeus, 1758, *Equus caballus* Linnaeus, 1758, *Sus scrofa*, Linnaeus, 1758, *Camelus bactrianus* Linnaeus, 1758, *Capreolus pygargus* (Pallas, 1771), *Cervus elaphus* Linnaeus, 1758, *Oryctolagus cuniculus* (Linnaeus, 1758).

Localization: pancreas.

Prevalence of infection 9.7% in *Ovis aries*.

Intensity range: 9-162 individuals.

Intermediate hosts: terrestrial molluscs of the family Bradybaenidae.

Secondary intermediate hosts: orthopterans – grasshoppers from the genera *Conocephalus*, *Phaneroptera* and *Platycleis*, and crickets *Oecanthus longicaudus* Matsumura, 1904.

Discovery area: eastern part of Uzbekistan.

Some national literary sources refer to *Eurytrema coelomaticum* (Giard & Billet, 1892) as an valid species (Sultanov et al. 1975; Dadaev 1997). Based upon a revision of the genus *Eurytrema*, V.Ya. Panin (1984) claims that *E. coelomaticum* is identical to *E. pancreaticum*. This corresponds to the opinions of other researchers (Pryadko 1962; Dvoryadkin 1975). We agree with Panin and consider *E. coelomaticum* synonymous to *E. pancreaticum*.

Order Strigeidida (La Rue, 1926)

Family Alariidae Tubangui, 1922

19. *Alaria alata* (Goeze, 1782)

Definitive hosts: *Vulpes vulpes* (Linnaeus, 1758), *Vulpes corsac* (Linnaeus, 1768), *Canis aureus* Linnaeus, 1758, *Canis lupus* Linnaeus, 1758, *Mustela eversmanii*, Lesson, 1827.

Localization: small intestine.

Prevalence of infection: 1 of 8 examined jackals (12.5%) and 1 of 11 foxes (9.1%) were infected with this trematode.

Intensity range:1-19 individuals.

Intermediate hosts: molluscs of the family Planorbidae.

Secondary intermediate hosts: amphibians and reptiles.

Discovery area: throughout Uzbekistan.

Order Brachylaimida La Rue, 1960

Family Brachylaimidae Stiles et Hassal, 1898

20. *Brachylaemus aequans* (Looss, 1899)

Definitive hosts: *Rattus turkestanicus* (Satunin, 1903).

Localization: small intestine.

Prevalence of infection: 4 of 53 examined individuals of *Rattus turkestanicus* (7.5%) were infected.

Intensity range: 1-18 individuals of this parasite

Discovery area: throughout Uzbekistan.

21. *Brachylaemus recurvus* (Dujardin, 1845)

Definitive hosts: *Mus musculus* Linnaeus, 1758, *Sylvaemus uralensis* Pallas, 1811, *Rattus turkestanicus* (Satunin, 1903).

Localization: small intestine.

Prevalence of infection: 3 of 46 examined individuals of *Mus musculus* (6.5%) and 2 of 53 individuals of *Rattus turkestanicus* (3.7%) were infected with this trematode.

Intensity range: up to 16 individuals.

Discovery area: mountainous regions in the north-eastern part of Uzbekistan.

22. *Brachylaemus suis* Balozet, 1936

Definitive hosts: *Sus scrofa* Linnaeus, 1758.

Localization: small intestine.

Prevalence of infection:

Intensity range:

Discovery area: Samarkand region (Tokobaev 1976).

23. *Brachylaemus* sp. Delanova, 1958

Definitive hosts: *Canis lupus familiaris* Linnaeus, 1758.

Localization: intestine.

Prevalence of infection:

Intensity range:

Discovery area: this species was recorded in the small intestine of a dog in Parkent District of Tashkent region (Sultanov et al. 1975).

24. *Hasstilesia ovis* (Orloff, Erschof & Badanin, 1937)

Definitive hosts: *Ovis aries* Linnaeus, 1758, *Capra hircus* Linnaeus, 1758, *Capra sibirica* (Pallas, 1776).

Localization: small intestine.

Prevalence of infection: 12 of 283 examined individuals of *Ovis aries* (4.2%) were infected with this trematode.

Intensity range: from 3 to 102 individuals.

Intermediate hosts: terrestrial molluscs. Soboleva (1985) and Osipovskaya (1985) identified the terrestrial molluscs *Pupilla* (*Pupilla*) *muscorum* (Linnaeus, 1758) and *Vallonia* (*Vallonia*) *costata* (O.F.Müller, 1774) as intermediate hosts of *H. ovis* in Kazakhstan.

Secondary intermediate hosts: same molluscs.

Discovery area: southern and eastern Uzbekistan.

25. *Hasstilesia ochotonae* Gvosdev, 1962

Definitive hosts: *Ochotona rutile* (Severtzov, 1873).

Localization: small intestine.

Prevalence of infection: 1 of 48 examined individuals of *Ovis aries* (2,1%) were infected with this trematode.

Intensity range: 12 individuals.

Discovery area: mountainous regions in the north-eastern part of Uzbekistan (Tokobaev 1976).

Order Notocotylida Skrjabin et Schulz, 1933

Family Notocotylidae Lühe, 1901

26. *Quinqueserialis quinqueserialis* (Barker&Laughlin, 1911)

Definitive hosts: *Ondatra zibethicus* (Linnaeus, 1766).

Localization: caecum and colon.

Prevalence of infection: 2 of 21 examined individuals of *Ondatra zibethicus* (9.5%) were infected.

Intensity range: with 2 and 6 individuals of this fluke recorded in each case.

Discovery area: lower reaches of the Amu Darya River and Jizzakh region.

Order Schistosomatida (Skrjabin et Schulz, 1937) Azimov, 1970

Family Schistosomatidae Stiles et Hassall, 1898

27. *Schistosoma turkestanicum* (Skrjabin,1913)

Definitive hosts: *Bos taurus* Linnaeus, 1758, *Ovis aries* Linnaeus, 1758, *Capra hircus* Linnaeus, 1758, *Camelus bactrianus* Linnaeus, 1758, *Camelus dromedarius* Linnaeus, 1758, *Saiga tatarica* (Linnaeus, 1766), *Capreolus pygargus* (Pallas, 1771), *Equus caballus* Linnaeus, 1758, *Equus asinus* Linnaeus, 1758, *Mus musculus* Linnaeus, 1758, *Sus scrofa* Linnaeus, 1758, *Rattus turkestanicus* (Satunin, 1903).

Localization: mesenteric arteries, portal veins.

Prevalence of infection: 43.7% in *Bos taurus*, 20.9% in *Ovis aries*, 12.2% in *Capra hircus*, 8.4% in *Camelus bactrianus* and 5.0% in *Sus scrofa*.

Intensity range: up to 110,000 individuals.

Intermediate hosts: molluscs *Lymnaea tenera* (Küster, 1863), *Lymnaea* (*Radix*) *auricularia* (Linnaeus, 1758), *Lymnaea* (*Peregriana*) *peregra* (O.F. Müller, 1774) and *Lymnaea gedrosiana* (Annandale, Prashad, 1919).

Discovery area: north-western and north-eastern regions of Uzbekistan.

Therefore, a total of 27 species of trematodes from 19 genera, 12 families and 7 orders were recorded in mammals in Uzbekistan (Table 1, Fig.1). One of the 27 species was not identified.

The families Brachylaemiidae and Paramphistomatidae, with 6 and 5 species, respectively, showed the highest species diversity. They comprise 40.7% of all trematode species recorded in mammals.

The families Fasciolidae and Echinostomatidae include 3 species each, the families Dicrocoeliidae and Plagiorchidae – 2 each, and the remaining 6 families – 1 species each.

The family Paramphistomatidae showed the highest generic diversity (4 genera). 6 species of trematodes from the family Brachylaemidae are grouped into two genera, and 3 species of the family Echinostomatidae belong to 3 different genera.

At the level of orders, the order Fasciolida is represented by the largest number of species – 8 (29.6%). The orders Brachylaimida and Paramphistomida include 6 species each (22.3%). As for the other orders, Plagiorchida is represented by 4 species (14.8%), and Strigeidida, Notocotylida and Schistosomatida by 1 species each (3.7%).

Table 1. Taxonomy of trematodes of mammals in Uzbekistan

No	Family	Number of species	% of total number of species	Number of genera	% of total number of genera
1	Brachylaemidae	6	22.2	2	10.5
2	Paramphistomatidae	5	18.6	4	21.1
3	Fasciolidae	3	11.1	1	5.3
4	Echinostomatidae	3	11.1	3	15.8
5	Dicrocoeliidae	2	7.4	2	10.5
6	Plagiorchidae	2	7.4	1	5.3
7	Mesotretidae	1	3.7	1	5.3
8	Gastrodiscidae	1	3.7	1	5.3
9	Gastrothylacidae	1	3.7	1	5.3
10	Alariidae	1	3.7	1	5.3
11	Notocotylidae	1	3.7	1	5.3
12	Schistosomatidae	1	3.7	1	5.3
	Total	**27**	**100%**	**19**	**100%**

The trematode *Echinostoma revolutum* uses birds as obligate hosts and mammals as accidental ones.

6 of 12 families of flukes – Fasciolidae, Paramphistomatidae, Gastrothylacidae, Mesotretidae, Alariidae and Schistosomatidae – are strictly host-specific to mammals, while the other are found in a wide range of different hosts.

Therefore, 27 species of trematodes are recorded in the mammals of Uzbekistan. It should also be kept in mind that the Central Asian trematode fauna of wild mammals, according to M.M. Tokobaev, N.T. Chibichenko (1978), is represented by 37 species. This indicates the relative diversity of the trematode fauna of mammals in Uzbekistan.

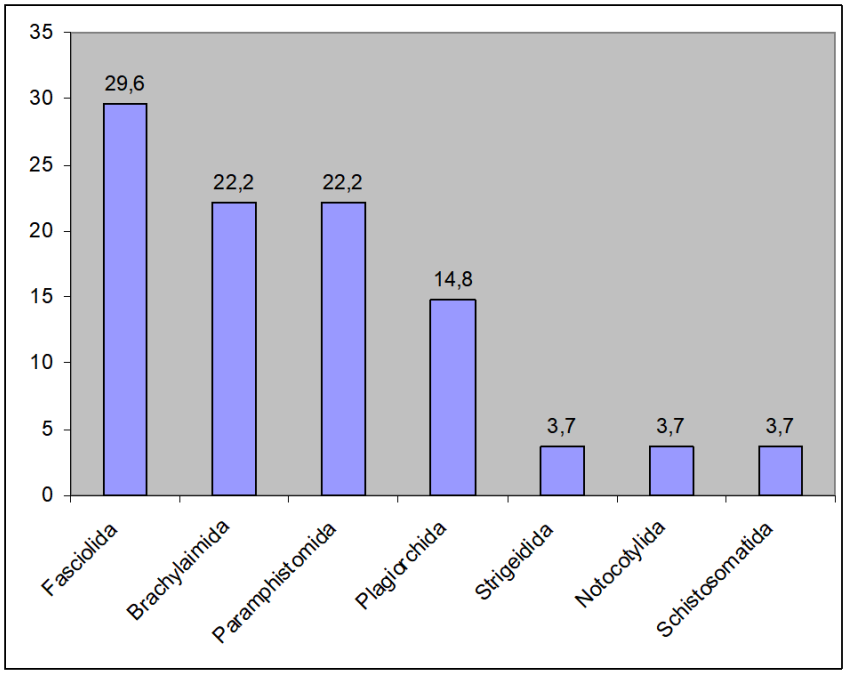

Figure 1. Trematodes of mammals in Uzbekistan.

The trematode *Schistosoma turkestanicum* (Skrjabin, 1913) from the family Schistosomatidae, whose cercariae cause 'non-specific cercarial dermatitis' in humans, is also recorded in Uzbekistan. The cercariae of these trematodes are able to penetrate through human skin, when people swim, work in water, and fish in flowing and stagnant fresh water bodies with abundant aquatic vegetation inhabited by molluscs from the family Lymnaeidae, which are intermediate hosts to Schistosomatidae. Our data on this issue corresponds to the studies of other researchers (Brant, Loker 2005; Soldanová et al. 2013; Morley 2015). Foci of cercarial dermatitis have been registered in the Republic of Karakalpakstan and in Khorezm and Tashkent regions.

Conclusion

Our research resulted in the identification of 27 species of trematodes in the mammals of Uzbekistan, including 7 species host-specific to domestic mammals and 12 species to wild ones. 6 species of trematodes proved common for domestic and wild mammals and are therefore important from the epidemiological and epizootological aspects.

The trematodes' life cycles involve two, three and four hosts. Therefore, trematodes of mammals have dixenous, trixenous and tetraxenous life cycles.

In Uzbekistan, cercarial dermatitis develops in foci primarily associated with the habitats of freshwater molluscs – trematodes' intermediate hosts. Cercarial dermatitis is caused by the cercariae of trematodes from the family Schistosomatidae released by molluscs from the family Lymnaeidae. Cercariae appear in water bodies in June, with the peak of occurrence in July and August. People are infected in summer and early autumn, usually while bathing and during other water-related activities.

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