

The Effect of the Ecology of Toads on the Distribution of Helminths

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Abstract: This paper presents the results of studies on the helminth fauna of the green toad, *Bufo viridis*, in Uzbekistan. Twenty helminth species were identified. The highest diversity of helminths was recorded in toads in the newly-built districts of Tashkent (1966–76). The helminth fauna of the toads inhabiting foothills was less common.

Key Words: amphibian, toad, helminth, fauna, urban areas, infection.

Kara Kurbağası Ekolojisinin Bağırsak Solucanı Yayılışı Üzerine Etkisi

Özet: Bu makalede Uzbekistan'daki yeşil kara kurbağasının (*Bufo viridis*) bağırsak solucanı faunası üzerinde yapılan araştırmanın sonuçları sunulmaktadır. Bağırsak solucanı en büyük çeşitliliğini Taşkent'in son inşa edilen (1966–76) mahallelerinde göstermiştir. Dağ eteklerinde bulunan kara kurbağalarında solucan faunası daha seyrekli.

Anahtar Sözcükler: amfibi, kara kurbağası, bağırsak solucanı, fauna, şehir alanları, bulaşma.

Introduction

The *Bufo viridis* toads are an important component of biocenoses and play an important role in the regulation of the numbers of some groups of arthropod pests of ornamental and agricultural plants.

In addition, they are intermediate, second intermediate and paratenic hosts of many helminth species, which, when mature, parasitize wild and domestic animals.

The study of the distribution, morphology, biology and evolution of the helminths, their interrelations with hosts, revealing their dependence on changes in surroundings and on the behavior and physiological state of the host, provide valuable insight into a number of biological issues.

In spite of the importance of studies on the helminth fauna of amphibians, the helminths of this group of vertebrates have been little studied (1, 2, 3, 4, 5).

As no studies had ever been conducted in urban areas of Uzbekistan, the aim of this study was to further knowledge of the infection of toads by helminths and variations under anthropogenic load.

Material and Methods

Toads captured using the standard technique (6) in various biotopes of Uzbekistan (Tashkent and surrounding areas; the Tashkent, Navoi and Djizak regions; and the areas around the city of Karshi) in spring, summer and autumn (March–November 1980–1990, 1992–1995) were used as material. This material comprised 272 dissected green toad specimens.

To assess the intensity of infection, the index of abundance (the average number of parasites per examined individual) was used, while, to assess the infection rate, the index of the levels of infection was used, expressed as a percentage.

Results and Discussion

The green toad, *Bufo viridis* Pall., is one of the vertebrate species which are widely distributed throughout Uzbekistan. It usually inhabits areas along rivers, plains, foothills, areas cultivated with various crops, and gardens and is encountered in big and small populated settlements and in deserts where there are bodies of water, both temporary and permanent (7).

In big cities, such as Tashkent, and in smaller cities (Karshi), this species is found in ditches, ponds, fountains, cellars and in the hollow spaces of building basements. In the Djizak region, the toads inhabit foothills along streams running down from Nuratau Ridge (Andagin–Sai) and at the foot of Mount Kara–Tash; ditches around Yangi–Kishlak Village; and the shores of a salt waste–water lake, Lake Aidarkul.

In the Tashkent region the most typical inhabited areas are located in foothills; along a stream in Aksak–Ata; and in a small village, Urta–aul. In the Navoi region, this species was found in ponds, and ditches, in ponds on the outskirts of the city, and around small populated areas.

From the material collected, 20 species of parasitic worms were identified: Monogenea, 1 species.; Cestoda, 1; Trematoda, 1; Acanthocephala, 4; and Nematodes, 13 (Table 1).

Table 1. The level of infection of green toads by helminths in Uzbekistan

Helminth species	Index of abundance	Infection percentage
1	2	3
<i>Polistoma integerrimum</i>	0.65	3.7
<i>Nematotaenia dispar</i>	2.53	17.3
<i>Diplodiscus subclavatus</i>	0.02	1.8
<i>Acanthocephalus falcatus</i>	0.007	0.4
<i>Acanthocephalus ranae</i>	6.39	27.6
<i>Pseudoacanthocephalus bufonis</i>	11.55	33.4
<i>Pseudoacanthocephalus bufonicola</i>	0.14	2.2
<i>Hystrichis tricolor</i>	0.004	0.4
<i>Rhabdias bufonis</i>	9.33	70.2
<i>Oswaldocruzia filiformis</i>	0.14	2.9
<i>Oswaldocruzia ukrainaea</i>	0.007	0.7
<i>Oswaldocruzia biolata</i>	1.5	14.7
<i>Cosmocerca commutata</i>	3.77	31.2
<i>Cosmocerca ornata</i>	5.16	29.0
<i>Cosmocerca timophejevoi</i>	3.68	14.3
<i>Ascarops strongylina</i> , larvae	0.02	1.5
<i>Physocephalus sexualatus</i> , larvae	0.11	1.5
<i>Spirocerca lupi</i> , larvae	0.61	4.4
<i>Gongylonema pulchrum</i> , larvae	0.029	1.5
<i>Foleyella duboisi</i>	0.007	0.7

Class Monogenoidea (Beneden) Eychowsky, 1937

Polistoma integerrimum (Frohlic, 1798). Individuals of this species were recorded in 10 toads collected from

the Tashkent, Djizak and Navoi regions in spring. The number of parasites recorded in the urinary bladders of the toads ranged from 7 to 34. This is an obligatory parasite of amphibians.

Class Cestoda Rudolphi, 1808

Nematotaenia dispar (Goeze, 1782). These helminths were recorded in the small intestines of 47 toads from all the regions studied, irrespective of the type of habitat, mainly in summer and autumn. The number of the helminths per toad ranged from 1 to 43 individuals.

Class Trematoda Rudolphi, 1808

Diplodiscus subclavatus (Pall., 1760). Five individuals of this trematode were detected in the intestine of a toad collected from the densely populated Yunus–Abad district of Tashkent in summer. This parasite was first recorded in the amphibians of Uzbekistan.

Class Acanthocephala Rudolphi, 1808

Acanthocephalus falcatus (Frohlich, 1788). Two individuals of this parasite were recorded in the intestine of a toad collected from Tashkent (in a part of Tashkent known as medgorodok or Medical City).

Acanthocephalus ranae (Schrank, 1788). These individuals were recorded in the small intestines and stomachs of 75 toads from all the biotopes studied, in all seasons but to a greater extent in early spring and autumn. The number of these parasites ranged from 1 to 94 in any single toad.

Pseudoacanthocephalus bufonis (Schiplely, 1903). Individuals of this species were recorded in 91 toads within the city of Tashkent and in the Tashkent, Djizak and Kashkadarya regions, where there was intensive urban construction. The number of the parasites in the intestine of a single toad ranged from 2 to 117 individuals.

Pseudoacanthocephalus bufonicola (Kostylew, 1941). Individuals of this species were recorded in 6 toads collected from three densely populated districts. Prior to the present study, this species had been reported in the Ferghana Valley, Uzbekistan.

Class Nematoda Rudolphi, 1808

Hystrichis tricolor (Dujardin, 1845), larvae. This nematode was recorded in the rectum of a toad captured in a newly built district of Tashkent. The larvae of *H. tricolor* had been recorded in frogs in Bukhara (Uzbekistan). Mature helminths parasitize birds. Amphibians appear to be paratenic hosts of this helminth.

Rhabdias bufonis (Schrank, 1788). This species was the most widespread helminth species, found in 191 toads throughout all biotopes, irrespective of the level of

urban development. The intensiveness of infection ranged from 1 to 51 individuals, the latter affecting the lungs.

Oswaldocruzia filiformis (Goeze, 1782). Eight toads were infected by this nematode. The toads were collected from Tashkent. The helminths, numbering 2–9 individuals, parasitized the intestine.

Oswaldocruzia ukrainae (Ivanitzkyi, 1928). Single individuals were recorded in the intestines of two toads collected from Tashkent (Vuzgorodok—the part of the city where most of the higher education institutes are located, and Yunus–Abad).

Oswaldocruzia biolata (Molin, 1980). Forty of the toads studied were infected by this nematode species. The infection ranged from 1 to 40 individuals; this species was recorded in the intestines of toads collected in the Tashkent and Djizak regions.

Cosmocerca commutata (Diesing, 1851). The helminths of this species were recorded in toads throughout all the biotopes studied, irrespective of the level of anthropogenic load. The infection ranged from 1 to 109 individuals. The toads were most heavily infected in autumn.

Cosmocerca ornata (Dujardin, 1845). The helminths of this species were recorded in 79 toads from all the regions surveyed. Mature individuals parasitized the rectum, and the larvae parasitized various organs and tissues, mainly in the mouth.

Cosmocerca timophejevoi (Skarbilovitsch, 1950). These helminths were found in the large intestines of 39 toads in all seasons in the Tashkent and Djizak regions.

Ascarops strongylina (Rud., 1819), larvae. Capsules with the larvae of these helminths were recorded on the walls of the stomach, intestine, spleen and liver of four toads collected from Tashkent. The infection level was 1 or 2 individuals.

Phisocephalus sexalatus (Molin, 1860), larvae. This nematode was recorded in four toads collected from the area around Tashkent. The helminths parasitized the walls of the stomach, the liver and kidney, their number ranging from 1 to 14 individuals.

Spirocerca lupi (Rud., 1819), larvae. These helminths parasitized the inner organs of 12 toads collected from newly built districts of Tashkent. 1 to 24 helminths were isolated from individual toads. The cysts were numerous and had the appearance of manna–croup.

Gongylonema pulchrum (Molin, 1875), larvae. These helminths were recorded in four specimens during surveys in Tashkent, their number ranging from 1 to 3 individuals. The larvae were isolated from the body, the walls of the stomach and the liver.

Foleyella duboisi (Gedoelst, 1916). Single helminths were found in the large intestine of one toad and the rectum of another, the latter collected from Tashkent in summer.

Conclusion

Of 20 helminth species found in green toads in Uzbekistan, 11 are biohelminths, i.e. their development involves molluscs, crustaceans, beetles, other invertebrates and some vertebrates; for four of them the frog is a paratenic host; the other 9 species are geohelminths.

The nematode *Rhabdias bufonis* is a dominant species. There are two subdominant groups: the nematodes *C. commutata* and *C. ornata*, as well as the *Acanthocephala* *A. ranae*, *P. bufonis* from the first group; the cestodes *N. dispar*, nematodes *O. biolata* and *C. timophejevoi* belong to the second. After these come Monogenea, *P. integeremum*, the larvae of the nematode *S. lupi* and the nematode *Os. filiformis*; the other helminths, identified in the toads of Uzbekistan are rare. Such a composition is natural and adequately reflects the ecological features of the toads and the frequency of their infection by helminths. However, the helminth fauna of the toads in different key areas is different both qualitatively and quantitatively.

Our studies enabled us to determine that toads inhabiting different districts of the city of Tashkent were infected with 11–14 helminth species, whereas in areas with lower population, i.e. with lower anthropogenic load, only 5–6 helminth species were recorded (Yangi–Kishlak Village and a brook at the foot of Mount Kara Tash). It is interesting to note that, 10 helminth species were recorded in the salt waste–water Lake Aidarkul.

Individuals not infected with helminths were found to be extremely rare (about 3 %).

It was observed that the helminth fauna was a little richer in males (19 spp.) than in females (16 spp.).

No female *Acanthocephalus falcatus*, *Hystriochis tricolor*, *Gongylonema pulchrum* or *Foleyella duboisi* individuals were recorded and no male *Diplodiscus subclavatus* individuals were found.

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References

1. Yakimov V.Ya. Arkhiv veterinarnykh nauk. v.10. pp. 1257–1276. 1916. [In Russian].
2. Belyaev K. V., Kobylkova P.F., Kabaidova L.P. K faune paraziticheskikh chervei Rana ridibunda Pall. iz okrestnostei Tashkenta. Tr. SAGU, ser. 12, "A", zoolog. nauki, vip. 32, Tashkent. pp. 3–7. 1938. [In Russian].
3. Siddikov B.H. Gelminty amphibi. Ecologia parazitov zivotnih severo–vostoka Uzbekistana. Publishers FAN UzSSR. Tashkent. Pp. 63–65. 1984. [In Russian].
4. Siddikov B.H., Vashetko E.V. On ecology of helminths of toads in Tashkent and vicinity. Eighth Intern. Congress of parasitology. Ismir–Turkey. P. 329.1994.
5. Vashetko E.V., Siddikov B.H., Khodzhaeva L.F. Parasite fauna of Amphibians in Uzbekistan. Abstract of the Second Asian Herpetological Meeting. Ashgabat. P. 57. 1995.
6. Demidov N.V. Gelmintozhi zivotnykh. Spravochnik. Publishers Agropromizdat. Moscow. Pp. 32–36. 1987. [In Russians].
7. Bogdanov O. P. Fauna Uzbekskoi SSR. T.1. Zernovodnye i presmykayshchiesya. Tashkent. Publishers FAN UZ SSR, Pp. 16–18 1960. [In Russian].