



**THE FAUNA AND ECOLOGY OF NEMATODES FROM THE FAMILY CYPRINIDAE,  
ORDER SPIRURIDA, IN ARTIFICIAL AND NATURAL BODIES OF WATER IN  
UZBEKISTAN**

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**Fauna and ecology of nematodes of the order Spirurida of carp fishes of artificial and natural reservoirs of Uzbekistan**

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The modern species diversity of nematodes from the family Cyprinidae, order Spirurida, in Uzbekistan was studied. The studied fish order is represented by three suborders: Spirurata (8 species), Camallanata (7), Gnathostomata (1). The total number of studied species in the order was 16. The life cycles of the nematodes in question develops with the participation of intermediate, paratenic and definitive hosts. The first include representatives of the orders Copepoda, Ephemeroptera, the second and third – Cyprinidae fish. The evolution of the transmission of infections by intermediate hosts to definitive ones resulted in the development of different types of parasitic system.

**KEYWORDS:** Spirurida, Spirurata, Camallanata, Gnathostomata, Insecta, Copepoda, Ephemeroptera, Cyprinidae, Uzbekistan.

**INTRODUCTION**

Spirurida are the largest and most specialised order of the class Nematoda. Unlike most other groups, these nematodes live in a wide variety of habitats and other signs of biological progress. A significant portion of Spirurida adapted to parasitising in vertebrates, including humans. According to most of the parasitologists, the animal and human diseases they cause are referred to as global problems of social and economic importance. Therefore, it is extremely important to study the species diversity of Spirurida in individual groups of host animals in specific areas. In this connection, a comprehensive study of the ecological and faunal features of nematodes from the order Spirurida in the vertebrates of Uzbekistan is an important task for modern parasitology. These approaches are progressive for the development of environmental and parasitological studies.

To date, many natural and artificial bodies of water formed by the Amu Darya, Syr Darya and Zeravshan have been poorly studied or not studied at all. All this requires highly integrated ichthyoparasitological research into bodies of water against the modern ecological background. The demand for such studies is based on the

necessity to improve the methods of diagnosis and prevention of diseases caused by nematodes from the order Spirurida.

**MATERIALS AND METHODS**

This work is based on the materials of field and experimental studies conducted during 2010-2018 in the laboratory of general parasitology at the Institute of Zoology, Academy of Sciences of the Republic of Uzbekistan.

Parasites of carps were collected in the Republic of Karakalpakstan and 12 provinces of Uzbekistan. The rate of infection with Spiruridae in fish was established through helminthological dissection and study of their organs using common methods.<sup>[1, 2, 6]</sup> A total of 2635 individuals of fish were studied. Species of Spiruridae in fish were identified using conventional parasitological methods.<sup>[3]</sup>

About 40,000 individuals of aquatic invertebrates in the natural and artificial water bodies of the Syrdarya and Zeravshan river basins were studied for infection with Spiruridae larvae. The detected nematode larvae were

put in 1.5-2.0% formalin. Most of the larvae were examined live.

Gnathostomata - were recorded in the studied representatives of fish.

## RESULTS AND DISCUSSION

The mature and larval phases of 16 species of parasites from three suborders - Spirurata, Camallanata and

**Table: The species diversity of Spirurida - parasites of Cyprinidae in Uzbekistan.**

<b>Parasites of Cyprinidae fish</b>	
<b>Spirurata</b>	
<b>Rhabdochonidae</b>	
<i>Rhabdochona gnedini</i> Skrjabin, 1946	+
<i>Rh. chodukini</i> Osmanov, 1957	+
<i>Rh. denudata</i> (Dujardin, 1845)	+
<i>Rh. sulaki</i> Saidov, 1953	+
<i>Rh. longicauda</i> Dzhililov, 1964	+
<i>Rh. fortunatovi</i> Dinnik, 1933	+
<i>Rh. hillidi</i> (Šramek, 1901)	+
<b>Desmidocercidae</b>	
<i>Desmidocercella numidica</i> Seurat, 1920	+ Larval form
<b>Camallanata</b>	
<b>Camallanidae</b>	
<i>Camallanus lacustris</i> (Zoega, 1776)	+
<i>C. truncates</i> (Rudolphi, 1814)	+
<i>Spirocamallanus siluri</i> Osmanov, 1964	+
<b>Phylometridae</b>	
<i>Phylometra obturans</i> (Prenant, 1886)	+
<i>Ph. ovata</i> (Zeder, 1803)	+
<i>Ph. abdominalis</i> Nybelin, 1928	+
<i>Ph. intestinalis</i> Dogiel et Bychowsky, 1934	+
<b>Gnathostomata</b>	
<b>Gnathostomidae</b>	
<i>Gnathostoma hispidum</i> Fedtchenko, 1872	+ Larval form

14 species were specific parasites. Fish is an intermediate host for *Desmidocercella numidica* and *Gnathostoma hispidum*. Therefore, mature forms of these nematodes parasitise in fish-eating birds and mammals.<sup>[6]</sup>

Thus, the core of Spirurida fauna in the Cyprinidae of Uzbekistan are representatives of the suborder Spirurata, which are followed by Camallanata and Gnathostomata.

The life cycles of the studied representatives of the order Spirurida are characterised by the change of hosts – they belong to the group heteroxenous parasites. Species of the suborder Spirurata are characterised by the following biological features. The parasite's eggs secreted by the definitive host into the external environment contain a formed first-stage larva. The egg is swallowed by the intermediate host. The latter is represented by insects, inhabitants of aquatic or terrestrial ecosystems. These include numerous species from the orders Copepoda, Ephemeroptera,<sup>[4, 5, 9]</sup> The life cycles of known species from the family Rhabdochonidae, Desmidocercidae develop following this pattern. This scheme includes fish, the paratenic hosts of the parasites. This cycle is typical of *Desmidocercella numidica* – a parasite of

birds. Here Cyprinidae play the role of a paratenic host for this nematode.

In this case the paratenic host is the food of the definitive host. In the body of the definitive host the infective larva develops into the imago - a mature Mature stage of the parasite. Unlike Spirurida, Camallanata mainly parasitise in fish (Camallanidae, Phylometridae). The larvae are emitted into water. In water, the larvae are swallowed by cyclops, their intermediate hosts. Once in the cyclops' digestive tube, the larvae shed their coat twice to become infective and infect their vertebrate hosts. The vertebrates are infected in two ways: when they swallow infected cyclops with water or when they eat Cyprinidae fish - paratenic hosts containing the larvae of Camallanata that penetrate together with Cyclops.<sup>[5, 9]</sup>

The life cycle patterns of representatives of Gnathostomata are characterised by females laying eggs released into the environment with animal excrement. The larva develops in the egg within a few days. The larva leaves the egg, the larvae can survive in water for up to 20-30 days. To develop further the larvae of Gnathostomata must be swallowed by cyclops. Once in the digestive tube of the cyclops, the Gnathostomata larva

actively penetrates into the former's body, where it sheds the coat twice and in 10-12 days reaches the infective stage. According to Golovin (1954), paratenic hosts can also be involved in the life cycle of *G. hispidum*. In our research the paratenic host of this nematode were carps.<sup>[6, 8]</sup>

Pigs, the definitive host, are infected with Gnatostomata in two ways – when they swallow infected cyclops or when they eat paratenic hosts (fish), infected with the parasite's larvae.

### CONCLUSION

The comparative parasitological analysis of the results of field and experimental studies of nematodes from the order Spirurida reveals some ways of formation of the latter's fauna in the studied species of in Uzbekistan. The order includes representatives of three suborders – Spirurata, Camallanata and Gnathostomata. The total number of Spirurida species is 16. The suborder Spirurata is represented by 8 species; Camallanata - 7; Gnathostomata – 1. The core of the Spirurida fauna in the ecosystems of the studied area is composed of representatives of the suborder Spirurata, which are common in fish populations.

The life cycles of the studied species of Spirurida involve numerous groups of invertebrates, mainly those from the orders Copepoda and Ephemeroptera, which act as intermediate hosts. In the course of our research carps were identified as paratenic hosts for some species.

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