

**HELMINTH (NATRIX NATRIX L.)
COMMON SNAKE OF MORDOVIA**

A.B. Ruchin¹, A.A. Kirillov²

¹Мордовский государственный природный заповедник имени П.Г. Смидовича,

²Институт экологии Волжского бассейна РАН

2008 жылы Мордовия Республикасы (Ресей) аймақтарында кәдімгі сарыбас жыланның *Natrix natrix* L. гельминтофаунасы зерттелді. Бауырымен жорғалаушыларда паразиттік құрттардың 15 түрі белгіленіп, оның ішінде 11 түрі Trematoda класына және 4 түрі Nematoda класына жатады. Ересек кезеңінде аса жоғары инвазия экстенсивтілігімен *Macrodera longicollis*, *Astiotrema monticelli*, *Leptophallus nigrovenosus*, *Telorchis assula* (трематодалар) және *Rhabdias fuscovenosus* (нематода) ерекшеленді. Дернәсіл түрлерінің арасында жоғары инвазия экстенсивтілігі *Pharyngostomum cordatum* және *Alaria alata* трематодаларының дернәсіл түрлеріне тән болды. Мордовия фаунасындағы кәдімгі сарыбас жыланның гельминттерінің түр құрамы Еділдің Орта бойындағы басқа аймақтардағы жылан паразитофаунасына ұқсас.

В 2008 году изучена гельминтофауна обыкновенного ужа *Natrix natrix* L. на территории Республики Мордовия (Россия). У рептилии отмечено 15 видов паразитических червей, из которых 11 видов относятся к классу Trematoda и 4 - к классу Nematoda. Из взрослых стадий наибольшей экстенсивностью инвазии

Along with gradual studying parasitofauna of amphibious in the Republics of Mordovia, still not I was are studied in the parasitological relation other not less interesting group – reptiles. The first data on fauna of helminths are provided in this message common snake *Natrix natrix* Linnaeus, 1758 from the territory of Mordovia. This species of reptiles – the most mass and evribiont in the region. It has a wide area, occupies various in character station, preferring to keep the hu-midified places, lives and in an anthropogenous landscape, in the territory of agri-cultural grounds, settlements where can do without reservoirs [1-3].

Material and methods of researches

Material for research was collected in May – July, 2008 in two habitats in the territory of the Republic of Mordovia: 1) The Temnikov area, the item district Pushta (near the forest settlement), 2) the Zubovo-Polyansk area, Tennishevo surrounding former village (the river bank in forest area). In total it is investigated by 31 copies *natrix*. Researches of parasites of reptiles it was carried out by a technique of full parasitological opening [4].

отличались *Macrodera longicollis*, *Astiotrema monticelli*, *Leptophallus nigrovenosus*, *Telorchis assula* (из трематод) и *Rhabdias fuscovenosus* (из нематод). Среди личиночных форм высокая экстенсивность инвазии была характерна для личиночных стадий трематод *Pharyngostomum cordatum* и *Alaria alata*. Видовой состав гельминтов обыкновенного ужа фауны Мордовии сходен с паразитофауной змеи из других регионов Среднего Поволжья.

In 2008 it is investigated helminthofauna of the grass snake *Natrix natrix* L. in territory of the Republic of Mordovia (Russia). 15 species of parasitic worms (from which 11 species concern to class Trematoda and 4 - to class Nematoda) are marked at a reptile. From adult stages the greatest extensiveness of an invasion *Macrodera longicollis*, *Astiotrema monticelli*, *Leptophallus nigrovenosus*, *Telorchis assula* (Trematoda) and *Rhabdias fuscovenosus* (Nematoda) differed. Among larval forms high extensiveness of an invasion was characteristic for larval stages *Pharyngostomum cordatum* and *Alaria alata* (Trematoda). The specific structure of helminths of grass snake from Republic of Mordovia is similar with parasite fauna of the snake from other regions of the Middle Volga region.

Collecting, fixing and cameral processing of a material were carried out by the traditional, standard methods in a domestic helminthology [5-8].

At distribution of types of helminthes on systematic taxon authors consid-

ered the last data on systematization of trematoda [9].

Data on biology and distribution of helminthes are obtained in K.I.Skrybin's multivolume report «Trematoda of animals and the person» [10], works of V.P. Sharpilo [11, 12], A.A. Kirillov [13].

Results and discussion

In total the common snake in Mordovia has 15 species of helminthes (2 species from them aren't identified), relating to the following systematic groups: Trematoda – 11 species (7 - at an adult stage, 4 – on larval), Nematoda – 4 (2 at an adult stage, 2 – on larval).

Phylum Plathelminthes

Class Trematoda Rudolphi, 1808

Family Plagiorchiidae Luhe, 1901

1. *Opisthioglyphe ranae* (Frolich, 1791) Looss, 1899

Localization: intestines.

In Russia it is recorded in the territory of the Volga - Kamsk reserve, the Samara Region and the delta of Volga. Accident it is occurred at common snake and vipers [14-15].

Intermediate hosts are mollusks of the species *Limnaea*, *Galba*, *Radix*, additional host is larvae of mosquitoes, a caddis fly. Metacercaria can be met at amphibious and their larvae.

Final host is amphibian.

Family Leptophallidae Dayal, 1938

Taxonomical reference: V.V.Tkach with coauthors [16-18] allocate the genes *Leptophallus* Lühe,

1909, Paralepoderma Dollfus, Kazakhstan, Uzbekistan, Austria, Great Britain, Bulgaria, Hungary, Germany, Denmark, Iran, Spain, Italy, Poland, Turkey, France, the Czech Republic, Slovakia.

2. Leptophallus nigrovenosus (Bellingham, 1844) Lühe, 1909

Localization: gullet, top department of a stomach.

Typical parasite of common snake. In the territory of Russia it is found in the Voronezh, Kaliningrad and Samara region [14-15]. Outside the country it is recorded in Ukraine, Azerbaijan, Georgia, Great Britain, Bulgaria, Hungary, Germany, Egypt, Italy, Poland, Tunisia, France, the Czech Republic, Slovakia.

Intermediate hosts - mollusks of *Limnaea stagnalis*, *Radix ampla*, *R. peregra* and amphibian (moor, grassy, edible frogs, a bombina, a toad ordinary, a triton edge) and their tadpoles.

Widely specific parasite of common snake and vipers

3. *Macrodera longicollis* (Abildgaard, 1788) Lühe, 1899

Localization: air bag of a lung.

Tightly specific parasite of common snake. It is one of the most ordinary and widespread parasites of *Natrix*. In Russia it is recorded in the Astrakhan, Volgograd, Voronezh, Samara region, the delta of Volga, the Krasnodar and Stavropol edges, Kalmykia [14-15]. It is abroad registered in the territory of Ukraine, Belarus, Azerbaijan, Georgia,

Intermediate hosts - *Planorbis planorbis* mollusk, additional - lake and grassy frogs.

4. *Paralepoderma cloacicola* (Lühe, 1909) Dollfus, 1950

Localization: rectum.

One of the most ordinary and widespread parasites of *Natrix* and some populations of vipers. In the territory of Russia it is found in the Volgograd, Voronezh, Orenburg, Rostov and Samara Region, the delta of Volga, the Volga - Kamsk reserve (Kirillov, Kirillov, 2011; Kirillov, etc., 2012). It is abroad recorded in Ukraine, Belarus, Azerbaijan, Georgia, Kazakhstan, Hungary, Germany, Italy, Morocco, Poland, Romania, France, the Czech Republic, Slovakia.

Intermediate hosts are *Planorbis planorbis* mollusk. Broad specificity parasite of amphibious families Salamandridae, Discoglossidae, Pelobatidae and Ranidae. Repeatedly is met in helminthfauna of grassy, moor and pond frogs, a spadefoot toad within Mordovia [19-21].

Widely specific parasite of common snake and vipers

Family Telorchidae Looss, 1899

5. *Telorchis assula* (Dujardin, 1845) Dollfus, 1957

Localization: intestines.

One of the most ordinary and widespread parasites of *Natrix*, meeting practically within all area of hosts. In Russia it is found in the delta of Volga, the Volga - Kamsk reserve, the Volgograd, Voronezh, Kaliningrad, Moscow, Rostov, Samara, Saratov Region, Kalmykia, Karelia, Dagestan [14-15]. It is abroad registered in the territory of Ukraine, Belarus, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Uzbekistan, Turkmenistan, Great Britain, Bulgaria, Hungary, Germany, Italy, Poland, Romania, France, Slovakia, the Czech Republic.

Intermediate hosts are tadpoles of lake and grassy frogs.

Tightly specific parasite of common snakes.

Family Pleurogenidae Looss, 1899

6. *Pleurogenes claviger* (Rudolphi, 1819) Looss, 1896

Localization: intestines.

Casual parasite of ordinary *Natrix*.

In the territory of Russia it is noted in the Samara Region [14]. Abroad – Ukraine.

Intermediate hosts are mollusks of genus *Planorbis*.

Obligate final hosts are amphibians (lake, moor frogs, a green toad) [22]. Common *natrix* is facultative hosts [15, 22].

Family Strigeidae Railliet, 1919

7. *Strigea strigis* (Schrank, 1788) Abildgaard, 1790, larvae

Localization: mesentery, fatty tissue, body cavity.

At this stage of development ordinary and widespread parasite of snakes of Russia. At other reptiles the metacercariae is met seldom.

In the territory of Russia it is recorded in the Astrakhan, Volgograd, Leningrad, Samara and Saratov Region, the delta of Volga, the Volga-Kamsk reserve, Kalmykia, Khabarovsk territory [14-15]. Outside Russia it is found in Ukraine, Belarus, Georgia, Uzbekistan, Germany, Poland.

Final hosts – day birds of prey and owls.

8. *Strigea sphaerula* (Rudolphi, 1803), Szidat, 1928, larvae

Localization: mesentery, fatty tissue.

As well as *S. strigis* *Strigea sphaerula* at a metacercariae stage is an ordinary parasite of snakes (especially *natrix*). In Russia it is found in the delta of Volga, the Volgograd and Samara Region [14-15]. It is abroad found in Ukraine, Belarus, Poland, the Czech Republic, Slovakia.

Final hosts are corvidae birds (the gray crow, Common Magpie).

Family Alariidae Hall et Wigdor, 1918

9. *Alaria alata* (Goeze, 1782), Krause, 1914, larvae

Localization: fatty tissue, body cavity.

One of the most widespread and numerous parasites of snakes. In Russia

it is recorded in the delta of Volga, the Volga-Kamsk reserve, Vologda, Voronezh, Ryazan, Samara and the Tver region, Dagestan, Kalmykia, the lake of Kunashir [15]. It is noted also in the territory of Ukraine, Belarus, Azerbaijan, Georgia, Armenia, Uzbekistan, in Hungary, Germany, Poland, Romania, France, Czechoslovakia.

Final hosts are representatives of dog families (a fox, raccoon-like and domestic dogs, etc.) and marten (the American mink). Various batrachophages – reptiles and mikromammaliya act as the reservoir host of the 1st order [11, 23, 24].

10. *Pharyngostomum cordatum* (Diesing, 1850) Ciurea, 1922, larvae

Localization: fatty tissue, serous covers of an internal.

At a metacercariae stage it is ordinary and widespread parasite of snakes of fauna of Russia. It is found in the delta of Volga, the Volgograd and Samara Region [14-15], is marked out in Belarus, Ukraine, Kazakhstan, Germany, Romania, India, Burma, Vietnam, the People's Republic of China, Japan.

Final hosts - predatory mammals of cat's and dog families.

Common matrix is reservoir hosts of a parasite [8, 11, 25].

Genera insertae sedis

Taxonomical reference: Traditionally all researchers included

Astiotrema Looss, 1900 to *Plagiorchis*. S. Prudkho and R.A.Brey [26] stated opinion that *Astiotrema* represents a combined genus. V.V.Tkach researches with coauthors [18], P. D. Olson with coauthors [27] showed that *Astiotrema monticelli* Stossich, 1904 wasn't related to *Plagiorchis*. Recent researches of parasites of the *Astiotrema* species - *A. monticelli*, *A. reniferum* (Looss, 1898) and *A. turneri* Bray, van Oosterhout, Blais et Cable, 2006 found their communication with heterophyes while *A. trituri* Grabda, 1959, on the contrary, is close to *Plagiorchis*. For *A. trituri* V.V.Tkach offered the new genus *Neoastiotrema* Tkach, 2008 [9].

Now the genus *Astiotrema* Looss, 1900 belongs to taxon with not clear systematic situation [9].

11. *Astiotrema monticelli* Stossich, 1904

Localization: intestines

Typical parasite of Common matrix. In Russia it is noted in the Voronezh, Volgograd, Rostov and Samara Region, the delta of Volga, the Volga-Kamsk reserve [14-15]. It is abroad found in Ukraine, Hungary, Italy, Romania, France.

Intermediate hosts are *Codiella* (*Bithynia*) *leachi* mollusk, tadpoles and adult individuals of a spadefoot, an moor and lake frog [28].

Tightly specific parasite of snakes. Viper snakes are marked out by as casual hosts.

Table 1. Helminthes of grass snake *Natrix natrix* in Mordovia

Parasite	Pushtha			Tenishevo		
	EI, %	II, exemplar	IAP, exemplar	EI, %	II, exemplar	IAP, exemplar
Trematoda						
<i>Opisthiolepis ranae</i>	6,3±6,2	5	0,3±0,3	-	-	-
<i>Astiotrema monticelli</i>	75,0±11,2	1-29	9,1±2,4	100	3-39	15,3±3,4
<i>Leptophallus nigrovenosus</i>	62,5±12,5	1-12	3,4±1,0	100	2-39	15,6±3,4
<i>Macrodera longicollis</i>	93,8±6,2	1-9	3,2±0,7	85,7±9,7	1-24	5,4±2,2
<i>Paralepoderma cloacicola</i>	6,3±6,2	12	0,8±0,8	57,1±13,7	8-19	7,6±2,0
<i>Telorchis assula</i>	50,0±12,9	2-54	12,3±4,8	100	8-124	52,3±12,6
<i>Pleurogenes claviger</i>	-	-	-	28,6±12,5	4-8	1,7±0,8
<i>Strigea strigis</i> , larvae	62,5±12,5	1-32	6,5±2,4	57,1±13,7	1-5	1,3±0,5
<i>S. sphaerula</i> , larvae	31,3±11,9	1-22	1,8±1,4	-	-	-
<i>Alaria alata</i> , larvae	87,5±8,5	3-455	65,0±28,1	100	10-121	45,7±11,4
<i>Pharyngostomum cordatum</i> , larvae	87,5±8,5	3-1850	480,6±136,8	71,4±12,5	5-36	12,4±3,3
Nematoda						
<i>Rhabdias fuscovenosus</i>	75,0±11,2	1-22	3,4±1,5	85,7±9,7	2-145	31,3±13,4
<i>Strongyloides mirzai</i>	12,5±8,5	1	0,13±0,09	42,9±13,7	1-13	2,9±1,3
Nematoda sp., larvae	12,5±8,5	1-5	0,4±0,3	14,3±9,7	1	0,10±0,08
Nematoda sp.1	-	-	-	14,3±9,7	1	6,7±6,6
In total species		14			13	

Note: EI – extensiveness of an invasion (%), II – intensity of an invasion (exemplar); IAP – an index of abundance of a parasite (exemplar).

Phylum Nematelminthes
Class Nematoda Rudolphi, 1808
Family Rhabdiasidae Railliet, 1915
12. *Rhabdias fuscovenosus* (Railliet, 1899)

Localization: lung.

Is one of the most ordinary and widespread parasites of the natrix [29]. In our country it is noted in the Astrakhan, Volgograd, Voronezh, Kaliningrad, Ros-tov, Samara and Saratov Region, Dagestan, Kalmykia. Abroad - in Ukraine, Belarus, Georgia, Kazakhstan, Uzbekistan, Great Britain, Hungary, Italy, Canada, Poland, Romania, the USA, France, the Czech Republic, Slovakia.

Tightly specific parasite of the natrix. In other species of snakes it is found by accident.

Family Strongyloididae Chitwood et McIntosh, 1934

13. *Strongyloides mirzai* Singh, 1954

Localization: intestines.

In Russia it is registered in the Samara Region [13]. It is abroad noted in the territory of Ukraine, Armenia, Azerbaijan, Uzbekistan, India.

It is tightly specific parasite of Natrix snakes.

At the adult stages *Macrodera longicollis*, *Astiotrema monticelli*, *Leptophallus nigrovenosus*, *Telorchis assula* (from Trematoda) and *Rhabdias fuscovenosus* (from Nematoda) have the greatest extensiveness of an invasion.

Among larval forms high extensiveness of an invasion was characteristic for larval stages of Trematoda – *Pharyngostomum cordatum* and *Alaria alata* (tab. 1). Thus, the common natrix in the two studied areas of Mordovia has helminthes typically for other regions of the Central Volga Area [13, 15, 22].

LIST OF REFERENCES

1. Анашьева Н.Б., Боркин Л.Л., Даревский И.С., Орлов Н.Л. Земноводные и пресмыкающиеся. Энциклопедия природы России. М.: АБФ, 1998. 575 с.
2. Аниканова В.С., Бугмырин С.В., Иешко Е.П. Методы сбора и изучения гельминтов мелких млекопитающих. Петрозаводск: Карельский НЦ РАН, 2007. 145 с.
3. Быховская-Павловская И.Е. Паразиты рыб. Руководство по изучению. Л.: Наука, 1985. 121 с.
4. Кириллов А.А. Фауна гельминтов пресмыкающихся Самарской области // Известия Самарского НЦ РАН. 2000. Т. 2. Вып. 2. С. 324-329.
5. Кириллов А.А. Паразитирование у пресмыкающихся Поволжья гельминтов, свойственных другим животным // Вестник СамГУ. Ест.-науч. серия. 2010. № 6 (80). С. 196-205.
6. Кириллов А.А., Кириллова Н.Ю. Трематоды (Trematoda) пресмыкающихся Среднего Поволжья // Известия Самарского НЦ РАН. 2011. Т. 13. Вып. 5. С. 139-147.
7. Кириллов А.А., Кириллова Н.Ю., Чихляев И.В. Трематоды наземных позвоночных Среднего Поволжья. Тольятти: Кассандра, 2012. 330 с.
8. Потехина Л.Ф. Цикл развития возбудителя аляриоза лисиц и собак // Тр. Всесоюз. ин-та гельминтологии. 1950. Т. 4. С. 7-17.
9. Ручин А.Б., Лукиянов С.В., Рыжов М.К., Чихляев И.В. Биология остромордой лягушки *Rana arvalis* в Мордовии. Сообщение 3. Гельминты и хищники // Биологические науки Казахстана. 2008а. № 3. С. 20-29.
10. Ручин А.Б., Рыжов М.К. Амфибии и рептилии Мордовии: видовое разнообра-

зие, распространение, численность. Саранск: Изд-во Мордов. ун-та, 2006. 160 с.

11. Ручин А.Б., Рыжов М.К., Лобачев Е.А. Распространение и морфометрическая характеристика обыкновенного ужа из Мордовии // Змеи Восточной Европы: Мат. междунар. конф. Тольятти, 2003. С. 70-72.

12. Ручин А.Б., Чихляев И.В., Лукиянов С.В., Рыжов М.К. О гельминтах обыкновенной чесночницы – *Pelobates fuscus* (восточная форма) в поймах некоторых рек Среднего и Нижнего Поволжья // Поволж. экол. журн. 2008б. № 1. С. 48-54.

13. Ручин А.Б., Чихляев И.В., Лукиянов С.В. Изучение гельминтофауны обыкновенной чесночницы *Pelobates fuscus* (Laurenti, 1768) и остромордой лягушки *Rana arvalis* Nilsson, 1842 (Amphibia: Anura) при их совместном обитании // Паразитология. 2009. Т. 43. Вып. 3. С. 240-247.

14. Савинов В.А. Особенности развития *Alaria alata* (Goeze, 1782) в организме дефинитивного и резервуарного хозяев // Работы по гельминтологии. М.: Изд-во АН СССР, 1953. С. 611-616.

15. Скрябин К.И. Метод полных гельминтологических вскрытий позвоночных, включая человека. М.: Изд-во МГУ, 1928. 45 с.

16. Судариков В.Е. Новая среда для просветления препаратов // Вопросы биологии гельминтов и их взаимоотношений с хозяевами: Тр. ГЕЛАН СССР. 1965. Т. 15. С. 156-157.

17. Судариков В.Е., Ломакин В.В., Семенова Н.Н. Трематода *Pharyngostomum cordatum* (Alariidae, Hall et Wigdor, 1918) и её жизненный цикл в условиях дельты Волги // Гельминты животных. М.: Наука, 1991. С. 142-147.

18. Судариков В.Е., Шигин А.А., Курочкин Ю.В. и др. Метацеркарии трематод – паразиты пресноводных гидробионтов Центральной России. Т. 1. М.: Наука, 2002. 298 с.

19. Шарпило В.П. Паразитические черви пресмыкающихся фауны СССР. Киев: Наукова Думка, 1976. 286 с.

20. Шарпило В.П., Искова Н.И. Фауна Украины. Трематоды. Плагиорхиаты (Plagiorchiata). Т. 34. Вып. 3. Киев: Наукова Думка, 1989. 280 с.

21. Шевченко Н.Н., Вергун Г.И. Расшифровка цикла развития трематоды *Astiotrema monticelli* Stossich, 1904 // Докл. АН СССР. 1960. Т. 130. № 4. С. 949-952.

22. Keys to the Trematoda. Vol. 3. (Eds. R.A. Bray, D.I. Gibson and A. Jones). CABI Publishing, Wallingford, UK and The Natural History Museum, London, 2008. pp. 848.

23. Olson P.D., Cribb T.H., Tkach V.V., Bray R.A., Littlewood D.T.J. Phylogeny and classification of the Digenea (Platyhelminthes: Trematoda) // International J. of Parasitol. 2003. V. 33. P. 733-755.

24. Prudhoe S., Bray R.A. Platyhelminth parasites of the Amphibia. London: British Museum (Natural History) and Oxford Univ. Press, 1982. 217 pp.

25. Tkach V.V., Grabda-Kazubska B., Pawlowski J., Swiderski Z. Molecular and morphological evidence for close phylogenetic affinities of the genera *Macrodera*, *Leptophallus*, *Metaleptophallus* and *Paralepoderma* (Digenea, Plagiorchiata) // Acta Parasitol. 1999. V. 44. P. 170-179.

26. Tkach V.V., Pawlowski J., Mariaux J. Phylogenetic analysis of the suborder Plagiorchiata (Plathelminthes, Digenea) based on partial 28S rDNA sequences // International J. Parasitol. 2000. Vol. 30. P. 83-93.

27. Tkach V.V., Pawlowski J., Mariaux J., Swiderski Z. Molecular phylogeny of the suborder Plagiorchiata and its position in the system of Digenea // Interrelations of the Platyhelminthes (Eds Littlewood D.T.J., Bray R.A.). London, Taylor&Francis. 2001. P. 186-193.