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VERSITA

The helminth fauna study of European common brown frog (*Rana temporaria* Linnaeus, 1758) in the Volga basin

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Abstract

In this paper we considered information on the helminth fauna of the European common brown frog (*Rana temporaria* Linnaeus, 1758) from 10 regions of the Volga basin. This study includes consolidated data of different authors over the last 30 years, supplemented by the results of our own research. There are reliably known finds of 29 species of helminths: Monogenea – 1, Trematoda – 21, Nematoda – 7. Trematodes *Gorgodera asiatica* Pigulevsky, 1945, *Paralepoderma cloacicola* (Luhe, 1909), mtc. and nematodes *Icosiella neglecta* (Diesing, 1851) were observed for the first time in a given host on the territory of Russia and the Volga Basin. Six species of worms make the basis of helminth fauna: nematodes *Rhabdias bufonis*, *Oswaldocruzia filiformis*, *Neoxysomatium brevicaudatum* and *Cosmocerca ornata*, trematode *Haplometra cylindracea* and monogenea *Polystoma integerrimum*. These six species are the most common and widespread parasites of the brown frog. For each species of helminths there is the following information included: taxonomic position, localization, area of detection, biology, definitive hosts, geographic distribution, the degree of host-specificity.

Keywords

Helminths, monogeneans, trematodes, nematodes, *Rana temporaria*, the Volga basin

Introduction

One of the types of Brown Frogs – European common brown frog (*Rana temporaria* Linnaeus, 1758) – inhabits Europe from the Pyrenees to the Ural and Western Siberia. It is a typical inhabitant of the taiga zone where it populates coniferous, mixed and deciduous forests, waterlogged burned areas and sphagnum bogs, the moist meadows of river valleys and ravines (Kuzmin, 1999). Within the Volga River basin brown frog can be found only in the northern part. The southern boundary of the range here runs to the east across the Voronezh region, then to the north-east through Tambov to Penza and Ulyanovsk regions. In the forest zone it occurs in different habitats: under the forest canopy, in shrubberies, forest glades, dry and waterlogged meadows, bogs and antropogenous landscapes (Kuzmin, 1999; Ruchin, 2012).

Amphibians make an important element of many food webs, they control insect population and also they often become a pray of larger animals, taking part in helminths circulation. In the helminth transmission process amphibians can act as intermediate, reservoir, insert hosts. It is possible for human to get infected with helminths, parasiting amphibians. In addition, helminths' life cycles are closely connected to the host organism, thus they can potentially effect the latter (Ryzhikov *et al*., 1980; Kirillova, 2002).

The aim of the study is to summarize information on the helminth fauna of the European common brown frog populations in the Volga Basin based on our own research and literature analysis.

Materials and Methods

Various authors between 1980 and 2011, that is more than 30 years, performed the complete helminthological autopsy of 1785 specimens of European common brown frogs from 10 regions of the Volga basin: 1) Vologda, Kostroma, Ivanovo, Moscow and Kaluga regions (Upper Volga), 2) Nizhny Novgorod region, the Republic of Mordovia, Tatarstan, Bashkortostan, Perm Krai (Middle Volga).

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Information on the species composition of helminth fauna is taken from 21 publications, concerning 9 regions. This data is supplemented by our own research results from Moscow and Kaluga regions, Mordovia Republic, Perm Krai (see Table I). Of the many publications we used only those containing the exact taxonomic species identification of helminths. Theoretical or experimental papers containing general information on the number of helminths species were not taken into consideration. Also, the analysis did not take into account helminths that were not defined to the species by the authors of publications. In the course of research more than 400 amphibian specimens were examined by the authors of this paper. To determine the helminth we used reports of K. Ryzhikov (Ryzhikov *et al*. 1980) and V. Sudarikov (Sudarikov *et al*. 2002).

When defining helminth to the species we held to the systems developed by K. Skryabin and his students (Skryabin, 1961), taking into account the opinion of A.Walton (Walton, 1933), La Rue (La Rue, 1957), K. Odening (Odening, 1960), S. Prudhoe, R. Bray (Prudhoe and Bray, 1982) and other researchers. In addition, we considered the latest information on the taxonomy of trematodes (Tkach *et al*. 1999, 2000, 2001; Keys to the Trematoda, 2002, 2008) and «Fauna Europaea» site data (http://www.faunaeur.org).

Results and Discussion

In total in European common brown frog in 10 regions of the Volga basin were reliably recorded 29 species of helminths belonging to 23 genera, 14 families, 9 orders and 3 classes: Monogenea – 1, Trematoda – 21, Nematoda – 7 (Table I). 22 species of them are widely specific, polyhostal parasites of amphibians, and 7 – specific, oligohostal for the family Ranidae. Helminth species, narrowly specific to this host were not found.

Among all the found helminths 21 species are parasitic only in the imago stage and use the frogs as definitive hosts. Another 4 species of trematodes (*Paralepoderma cloacicola*, *Strigea sphaerula*, *Strigea strigis*, *Alaria alata*) are found only on larval stage, thus amphibians are insert (mesocercaria), supplementary (metacercaria) and/or reservoir hosts for these helminths. And 4 more species of trematodes (*Gorgoderina vitelliloba*, *Haplometra cylindracea*, *Dolichosaccus rastellus*, *Opisthioglyphe ranae*) combine different stages of development in the same individual or individuals of different ages, and define the role of amphibians as amphixenic, and for the last two species amphibians play part of postcycle hosts.

Below is an annotated list of *R. temporaria* helminths species, with their taxonomic position, localization, place of detection, biology, definitive hosts, geographic distribution. Information about the host-specificity degree of the parasites is also provided. The list of definitive hosts for amphibian parasites in Russia and adjusted territories was made on the basis of literature analysis (Ryzhikov *et al*. 1980; Kuzmin, 1999; Kuzmin and Maslova, 2005; Petrov *et al*. 2007; Odnokurtsev and Sedalischev, 2008; Schepina and Dugarov, 2008; Schepina and Baldanova, 2008, 2010; Kirillov *et al*. 2012; Rezvantseva, 2012). Single findings of a helminth in a given host are marked with "?" as they require further confirmation.

Class Monogenea (van Beneden, 1858)
Order Polystomatidea Lebedev, 1988
Family Polystomatidae Carus, 1863
Genus *Polystoma* Zeder, 1800
***Polystoma integerrimum* (Froelich, 1798)**
Localization: bladder.

Areas of detection: Vologda (Radchenko and Shabunov, 2008), Kostroma (Radchenko and Budalova, 1980), Ivanovo (Kirillova, 2002), Moscow (our data), Kaluga (Chikhlyaev *et al*. 2011), Nizhny Novgorod (Lebedinsky, 1983; Lebedinsky *et al*. 1989; Nosova, 1983, 1985, 1992, 2002) regions, the Republic of Mordovia (our data), Bashkortostan (Bayanov, 1992; Yumagulova, 2000).

Biology: It is a widely specific parasite of anurans, belonging to soil-transmitted helminths. Its development is associated with the aquatic environment. Invermination happens right out of the water and only once in a lifetime – at the tadpoles stage. Hatched larvae of the first generation, settling on the gills of young tadpoles, metamorphose and become branchial form, producing eggs. Neotenic larvae coming out of them, due to the fact that gill slits develop and a fold of skin grows over the external gills, migrate through the cloaca into the bladder, where they complete metamorphosis (Bykhovsky, 1957).

Definitive hosts: *Pelophylax ridibundus* (Pallas, 1771), *Pelophylax lessonae* (Camerano, 1882), *Rana arvalis* Nilsson, 1842, *Rana temporaria* Linnaeus, 1758, *Rana macrocnemis* Boulenger, 1885, *Rana dybowskii* Guenther, 1876, *Pelobates fuscus* (Laurenti, 1768) (?), *Bufo bufo* (Linnaeus, 1758) (?), *Bufo verrucosissimus* (Pallas, 1841), *Pseudepidalea viridis* (Laurenti, 1768)

Distribution: Palaearctic.

Class Trematoda Rudolphi, 1808
Order Fasciolida Skrjabin et Schulz, 1935
Family Gorgoderidae Looss, 1899
Genus *Gorgodera* Looss, 1899
***Gorgodera cygnoides* (Zeder, 1800)**
Localization: bladder.

Areas of detection: Vologda (Radchenko *et al*. 1983; Radchenko and Shabunov, 2008), Ivanovo (Kirillova, 2002) regions, the Republic of Mordovia (our data).

Biology: It is a widely specific parasite of anurans. Intermediate hosts are bivalved molluscs of genera *Cyclas*, *Pisidium* and *Sphaerium*; supplementary – larvae and imagines of dragonflies, cyclopidae *Mesocyclops leuckarti* (Pigulevsky, 1952).

Definitive hosts: *P. ridibundus*, *R. dybowskii*, *Pelophylax nigromaculatus* (Hallowell, 1861), *B. bufo* (sporadically).

Distribution: Palaearctic.

***Gorgodera asiatica* Pigulevsky, 1945**
Localization: bladder.

Area of detection: The Republic of Mordovia (our data). First observed in *Rana temporaria* in Russia and the Volga Basin.

Biology: It is a narrowly specific parasite of marsh frog first noted in *Rana temporaria*. Known intermediate hosts are bivalved molluscs of the genus *Sphaerium*; supplementary – larvae and imagines of dragonflies, caddisflies of the genus *Limnophilus* (Pigulevsky, 1952).

Definitive hosts: *P. ridibundus*, *R. dybowskii*, *P. nigromaculatus*, *B. bufo* (sporadically).

Distribution: Palaearctic. Marsh frog is known as a host (Ryzhikov *et al*. 1980; Chikhlyaev, 2010).

***Gorgodera microovata* Fuhrmann, 1924**
Localization: bladder.

Areas of detection: Nizhny Novgorod region (Nosova, 1992), the Republic of Mordovia (our data).

Biology: It is a specific parasite of anurans family Ranidae. The development cycle has not been studied.

Definitive hosts: *P. ridibundus*, *P. lessonae*, *Pelophylax esculentus* (Linnaeus, 1758), *R. arvalis*, *R. temporaria*, *Rana asiatica* Bedriaga, 1898, *B. bufo*.

Distribution: Europe.

***Gorgodera pagenstecheri* Sinitzin, 1905**
Localization: bladder.

Area of detection: Nizhny Novgorod region (Nosova, 1985, 2002).

Biology: It is a specific parasite of anurans family Ranidae. As intermediate hosts it uses bivalved molluscs *Sphaerium corneum*, *S. lacustre*, *S. rivicola*, *Pisidium amnicum*, *P. fossarium* etc.; supplementary – dragonfly larvae and imagines of different genera and species, caddisflies *Limnophilus flavicornis* (Sudarikov *et al*. 2002).

Definitive hosts: *P. ridibundus*, *P. lessonae*, *R. arvalis*, *R. temporaria*, *R. macrocnemis*.

Distribution: Palaearctic.

***Gorgodera varsoviensis* Sinitzin, 1905**
Localization: bladder.

Area of detection: Vologda region (Radchenko *et al*. 1983; Radchenko and Shabunov, 2008).

Biology: It is a specific parasite of anurans family Ranidae. As an intermediate host it uses bivalved molluscs *Sphaerium corneum*; as supplementary – dragonfly larvae and imagines of different genera and species, caddisflies *Limnophilus flavicornis* (Sudarikov *et al*. 2002).

Definitive hosts: *P. ridibundus*, *P. lessonae*, *P. esculentus*, *R. arvalis*, *R. temporaria*, *R. macrocnemis*.

Distribution: Europe.

Genus *Gorgoderina* Looss, 1902
***Gorgoderina vitelliloba* (Olsson, 1876)**
Localization: bladder.

Areas of detection: Vologda (Radchenko *et al*. 1983; Radchenko and Shabunov, 2008), Nizhny Novgorod (Nosova, 1983, 1985, 1992, 2002) regions, the Republic of Mordovia (our data).

Biology: It is a widely specific parasite of anurans. Intermediate hosts are bivalved molluscs *Sphaerium corneum*, *Sph. drepanaudi*, *Pisidium casertanum* and *Musculium lacustre*; supplementary – the tadpoles of frogs, alderflies *Sialis lutaria* (Pigulevsky, 1953; Lees, 1952). Typically, helminth infects adults who are prone to cannibalism. Amphibians function as amphixenic host of the parasite, separate stages of which use specimens of different ages as supplementary and definitive hosts.

Definitive hosts: *P. ridibundus*, *P. lessonae*, *P. esculentus*, *R. arvalis*, *R. temporaria*, *R. macrocneis*, *Bombina bombina* (Linnaeus, 1761), *B. bufo*.

Distribution: Palaearctic.

Order Hemiurida Skrjabin et Guschanskaja, 1956
Family Halipegidae Poche, 1926

Taxonomic note: A number of researchers (Gibson and Bray, 1979; Gibson in Keys to the Trematoda, 2002), considered a subfamily Halipeginae Poche, 1926 to be a part of the family Derogenidae Nicoll, 1910. K. Skryabin and L. Gushanskaya (Skryabin and Gushanskaya, 1955) consider Derogenidae a synonym for Halipegidae Poche, 1926. We share the opinions of these authors (Kirillov *et al*. 2012) since the issue of subjective validity of taxons appeared, probably, as a result of rules of International Code of Zoological Nomenclature infringement on the ground of disputable identification of type genera *Halipegus* and *Derogenes*, their affinity to each other and to other genera.

Genus *Halipegus* Looss, 1899
***Halipegus ovocaudatus* (Vulpian, 1859)**
Localization: oral cavity.

Area of detection: The Republic of Mordovia (our data). First registered in brown frog among Russian fauna and the Volga Basin.

Biology: It is a widely specific parasite of anurans. The trematode has tetraxenic life cycle. As an intermediate host they use gastropods *Planorbis planorbis* and *P. marginatus*; as supplementary – cyclopoidae of the genus *Macrocyclops* (Kechemir, 1976). Amphibians become infected by eating an-

other supplementary hosts – the larvae and imagines of dragonflies *Agrion* (= *Calopteryx*) *virgo*, species of the genera *Lestes*, *Sympetrum*, *Ischnura*, *Coenagrion* and *Libellula*.

Definitive hosts: *P. ridibundus*, *P. lessonae*, *R. arvalis*, *R. temporaria*, *B. bombina*, *Triturus cristatus* (Laurenti, 1768) (rarely).

Distribution: Europe.

Order Paramphistomida Skrjabin et Schulz, 1937
Family Diplodiscidae Cohn, 1904
Genus *Diplodiscus* Diesing, 1836
***Diplodiscus subclavatus* (Pallas, 1760)**
Localization: straight intestine, small intestine.

Areas of detection: Vologda (Radchenko *et al*. 1983; Radchenko and Shabunov, 2008), Ivanovo (Kirillova, 2002) regions, the Republic of Mordovia (our data).

Biology: It is a widely specific parasite of amphibians. Intermediate hosts are gastropods of the genus *Planorbis*; less often – *Anisus vortex*, *A. spirorbis*, *A. leucostomus*, *Viviparus viviparus* and *Segmentina nitida*. Supplementary hosts are absent. Left out of the body of gastropods cercariae encyst, sometimes even on shells of molluscs and integument of amphibians, becoming adolescariae. Amphibians accidentally become infected by swallowing invasive adolescariae of the parasite with water, mud, food and/or epidermis (Skryabin, 1949).

Definitive hosts: *P. ridibundus*, *P. lessonae*, *P. esculentus*, *R. arvalis*, *R. temporaria*, *R. macrocnemis*, *Rana amurensis* Boulenger, 1886, *R. dybowskii*, *P. nigromaculatus*, *B. bombina*, *P. fuscus*, *Hyla arborea* (Linnaeus, 1758), *Hyla orientalis* Bedriaga 1890, *B. bufo*, *P. viridis*, *Lissotriton vulgaris* (Linnaeus, 1758), *T. cristatus*.

Distribution: cosmopolite.

Order Plagiorchiida La Rue, 1957
Family Plagiorchiidae Luhe, 1901
Genus *Haplometra* Looss, 1899
***Haplometra cylindracea* (Zeder, 1800)**
Localization: Lungs.

Areas of detection: the Vologda (Radchenko *et al*. 1983; Radchenko and Shabunov, 2008), Kostroma (Radchenko and Budalova, 1980), Ivanovo (Kirillova, 2002), Moscow (our data), Kaluga (Chikhlyaev *et al*. 2011), Nizhny Novgorod regions (Lebedinsky, 1983; Lebedinsky and Golubeva, 1990; Lebedinsky *et al*. 1989; Nosova, 1983, 1985, 1992, 2002), the Republic of Mordovia (our data), Perm Krai (Chikhlyaev and Fayzulin, 2009).

Biology: It is a specific parasite of anurans family Ranidae. The gasteropods *Lymnaea ovata* and *L. palustris* are intermediate hosts; supplementary – tadpoles of frogs (Dobrovolsky and Raikhel, 1973; Grabda-Kazubska, 1970). Amphibians get infected directly with the cercariae of parasite. Excystation of metacercariae and their subsequent migration to the site of localization in lungs and maritogony happen within the same specimen. There is a possibility of cercariae invasion, omitting the stage of metacercariae (Grabda-Kazubska, 1974). Amphibians function as amphixenic hosts for this helminth, separate stages of which use the same frog specimen as supplementary and definitive host.

Definitive hosts: *P. ridibundus*, *P. lessonae*, *R. arvalis*, *R. temporaria*, *R. macrocnemis*, *R. amurensis*, *B. bombina* (?), *P. viridis*.

Distribution: Palaearctic.

Genus *Dolichosaccus* Johnston, 1912

Taxonomic note: V. Tkach *et al*. (Tkach *et al*. In Keys to the Trematoda, 2008) on the basis of molecular analysis refer genus *Dolichosaccus* Johnston, 1912 to the family Telorchiidae Looss, 1899 rather than to the family Plagiorchiidae Luhe, 1901. According to the A. Kirillov (Kirillov *et al*. 2012), morphological features of cercariae and life cycles do not allow to assign this taxon to this family.

***Dolichosaccus rastellus* (Olsson, 1876)**
Localization: small intestine.

Area of detection: Kostroma region (Radchenko and Budalova, 1980).

Biology: It is a specific parasite of anurans family Ranidae. Intermediate hosts are gastropods of the genus *Lymnaea*; supplementary – tadpoles. Amphibians get infected with cercariae through oral or nasal cavity, then parasites encyst in the lungs, liver, on the mesenteries and gills. Maritogony occurs in the same host specimen, and excystated metacercariae migrate to the site of localization in the gut (Kalabekov, 1976; Grabda-Kazubska, 1969). Infection also occurs as a result of cannibalism, in this case even the mature helminths survive. Amphibians are supplementary, definitive, amphixenic and postcycle hosts for *D. rastellus.*

Definitive hosts: *P. ridibundus* (?), *P. lessonae* (?), *R. arvalis*, *R. temporaria*, *R. macrocnemis*, *R. asiatica*, *R. amurensis*, *R. dybowskii.*

Distribution: Palaearctic.

Genus *Opisthioglyphe* Looss, 1899

Taxonomic note: V. Tkach *et al*. (Tkach *et al*. In Keys to the Trematoda, 2008), on the basis of their own research refer genus *Opisthioglyphe* Looss, 1899 of the family Plagiorchiidae Luhe, 1901 to the family Telorchiidae Looss, 1899. As in the case of the genus *Dolichosaccus* Johnston, 1912, cercariae life cycle and morphological features do not allow to refer the genus *Opisthioglyphe* Looss, 1899 to the family Telorchiidae Looss, 1899 (Kirillov *et al*. 2012).

***Opisthioglyphe ranae* (Frohlich, 1791)**
Localization: small intestine.

Areas of detection: Vologda (Radchenko and Shabunov, 2008), Kostroma (Radchenko and Budalova, 1980), Nizhny Novgorod (Lebedinsky, 1983; Nosova, 1983, 1985, 1992, 2002) regions, the Republic of Bashkortostan (Yumagulova, 2000).

Biology: It is a widely specific parasite of amphibians. Intermediate hosts are gastropods of the genus *Lymnaea*; supplementary – gastropods of the family Lymnaeidae, as well as juvenile amphibians (Dobrovolsky, 1965b; Grabda-Kazubska, 1969). Development cycle is similar to that of *D. rastellus*. Invasion occurs by eating shellfish and cannibalism, in this case even sexually mature helminths are transmitted. Metacercariae are capable of maritogony in the same host specimen. Amphibians combine the functions of supplementary and definitive, amphixenic and postcycle hosts for *O. ranae*.

Definitive hosts: *P. ridibundus*, *P. lessonae*, *P. esculentus*, *R. arvalis*, *R. temporaria*, *R. macrocnemis*, *R. amurensis*, *B. bombina*, *P. fuscus*, *H. arborea*, *H. orientalis*, *B. bufo*, *P. viridis*, *L. vulgaris*, *T. cristatus*, *Lissotriton montandoni* (Boulenger, 1880), *Salamandrella keyserlingii* Dybowski, 1870.

Distribution: Palaearctic.

Family Leptophallidae Dayal, 1938
Genus *Paralepoderma* Dollfus, 1950

Taxonomic note: V. Tkach *et al*. (Tkach *et al*. 1999, 2000, 2001), on the basis of molecular analysis and comparison of the morphology of cercariae refer genus *Paralepoderma* Dollfus, 1950 of the family Plagiorchiidae Luhe, 1901 to the family Leptophallidae Dayal, 1938.

***Paralepoderma cloacicola* (Luhe, 1909), mtc.**
Localization: kidneys.

Area of detection: The Republic of Mordovia (our data). First discovered in a given host in Russia and the Volga Basin.

Biology: At the stage of metacercariae it is a widespread parasite of amphibians, which serve as its supplementary hosts. Intermediate hosts are gastropod molluscs *Planorbis planorbis* and *Planorbarius corneus* (Dobrovolsky, 1969; Grabda-Kazubska, 1975), definitive – water snakes. Metacercariae of the parasite are prone to progenesis.

Definitive hosts: *Natrix natrix* (Linnaeus, 1758), *Natix tessellata* (Laurenti, 1768); *Vipera renardi* (Christoph, 1861) (rarely).

Distribution: Palaearctic. Host range is quite wide, it includes: the smooth and the northern crested newts, fire-bellied toad, common spadefoot, pool, moor and common brown frogs (Ryzhikov *et al*. 1980; Ruchin and Chikhlyaev, 2009, 2012). However, in the common brown frog of the Volga basin this parasite was detected for the first time.

Family Haematoloechidae Freitas et Lent, 1939
Syn.: Pneumonoecidae Mehra, 1937; Haematoloechidae Odening, 1964

Genus *Pneumonoeces* Looss, 1902
Syn.: *Haematoloechus* Looss, 1899

Taxonomic note: In 1902, the founder of the genus Looss (Looss) was forced to change the name *Haematoloechus* to a new – *Pneumonoeces*, since the taxon was preoccupied by Stal (Stal) back in 1874 for the name of one of the Hemiptera insects (Skryabin and Antipin, 1962).

***Pneumonoeces variegatus* (Rudolphi, 1819)**
Syn.: *Haematoloechus variegatus* (Rudolphi, 1819)
Localization: Lungs.

Areas of detection: Vologda (Radchenko and Shabunov, 2008), Kostroma (Radchenko and Budalova, 1980), Ivanovo (Kirillova, 2002), Nizhny Novgorod (Nosova, 1985) regions, the Republic of Tatarstan (Gorshkov and Smirnova, 1986; Smirnova *et al*. 1987), Bashkortostan (Yumagulova, 2000).

Biology: It is a widely specific parasite of anurans. Intermediate hosts are gastropod molluscs of different species; supplementary – larvae and adults of dipterans *Anopheles maculipennis*, *Culex pipiens* and *C. territans*, dragonflies *Agrion* (= *Calopteryx*) *virgo*, *Sympetrum sanguineum* (Skryabin and Antipin, 1962; Thiel, 1930).

Definitive hosts: *P. ridibundus*, *P. lessonae*, *P. esculentus*, *R. arvalis*, *R. temporaria*, *R. asiatica*, *R. amurensis*, *B. bombina*, *P. fuscus* (rarely), *B. bufo*, *P. viridis* (rarely).

Distribution: Palaearctic.

***Pneumonoeces asper* (Looss, 1899)**
Syn.: *Haematoloechus asper* Looss, 1899
Localization: Lungs.

Areas of detection: Vologda (Radchenko *et al*. 1983; Radchenko and Shabunov, 2008), Kostroma (Radchenko and Budalova, 1980), Nizhny Novgorod (Lebedinsky, 1983; Nosova, 1983, 1985, 1992; Lebedinsky *et al*. 1989) regions, the Republic of Tatarstan (Gorshkov and Smirnova, 1986; Smirnova *et al*. 1987).

Biology: It is a specific parasite of amphibians families Ranidae. Intermediate host is a gastropod *Planorbis planorbis*; supplementary – the larvae and adults of dragonflies *Agrion* (= *Calopteryx*) *virgo*, *A. pulchellum* and *Lestes fuscus* (Dobrovolsky, 1965a).

Definitive hosts: *P. ridibundus*, *P. lessonae*, *P. esculentus*, *R. arvalis*, *R. temporaria*, *B. bombina*.

Distribution: Europe.

Genus *Skrjabinoeces* Sudarikov, 1950
***Skrjabinoeces similis* (Looss, 1899)**
Syn. *Skrjabinoeces volgensis* Sudarikov, 1950
Localization: Lungs.

Taxonomic note: This species of trematodes can be characterized by a broad individual variability. Taking this fact into consideration, K. Odening (Odening, 1958, 1960) and V. Sharpilo,

N. Iscova (Sharpilo and Iscova, 1989) refer species *Skrjabinoeces volgensis* Sudarikov, 1950 to the subspecies *S. similis*.

Areas of detection: Vologda (Radchenko and Shabunov, 2008), Nizhny Novgorod (Nosova, 1985, 1992; Lebedinsky *et al*. 1989) regions, the Republic of Tatarstan (Gorshkov and Smirnova, 1986; Smirnova *et al*., 1987).

Biology: It is a specific parasite of anurans of the family Ranidae. As its intermediate hosts were registered gastropod molluscs *Planorbis planorbis*, *Anisus contortus*, *A. vortex*, *A. spirorbis* and *Coretus corneus*; supplementary – dragonfly larvae and adults of different genera and species (Grabda, 1960).

Definitive hosts: *P. ridibundus*, *P. lessonae*, *P. esculentus*, *R. arvalis*, *R. temporaria*.

Distribution: Palaearctic.

Family Pleurogenidae Looss, 1899
Genus *Pleurogenes* Looss, 1896
***Pleurogenes claviger* (Rudolphi, 1819)**
Localization: small intestine.

Areas of detection: Vologda (Radchenko *et al*. 1983; Radchenko and Shabunov, 2008), Ivanovo (Kirillova, 2002), Nizhny Novgorod (Lebedinsky, 1983; Nosova, 1983, 1985, 1992, 2002), the Republic of Mordovia (our data), Perm Krai (Chikhlyaev and Fayzulin, 2009).

Biology: It is a widely specific parasite of amphibians. Intermediate hosts are – gastropods *Bithynia tentaculata*; supplementary – dragonflies, caddis flies, beetles of different genera and species, mayflies *Ephemera vulgata* and *Cloeon dipterum*, alderflies *Sialis lutaria*, as well as aquatic sow bug *Asellus aquaticus*, amphipods *Gammarus pulex* and *Pontogammarus robustoides* (Khotenovsky, 1970; Grabda-Kazubska, 1971).

Definitive hosts: *P. ridibundus*, *P. lessonae*, *P. esculentus*, *R. arvalis*, *R. temporaria*, *R. macrocnemis*, *B. bombina*, *P. fuscus*, *H. arborea*, *H. orientalis*, *B. bufo*, *P. viridis*, *L. vulgaris*, *T. cristatus*, *L. montandoni.*

Distribution: cosmopolite.

Genus *Pleurogenoides* Travassos, 1921
***Pleurogenoides medians* (Olsson, 1876)**
Localization: small intestine.

Areas of detection: Vologda (Radchenko and Shabunov, 2008), Nizhny Novgorod (Nosova, 1985, 1992) regions, Perm Krai (Chikhlyaev and Fayzulin, 2009).

Biology: It is a widely specific parasite of anurans. Intermediate hosts are gastropods *Bithynia tentaculata*, *Lymnaea limosa*, *L. stagnalis* and *Planorbarius corneus*; supplementary – larvae and adults of aquatic arthropods: dragonflies, caddisflies, mayflies, beetles of different genera and species, alderflies *Sialis flavilatera*, dipterans of genera *Chironomus* and *Tendipes*, amphipods, water sow bug *Asellus aquaticus* (Khotenovsky, 1970; Neuhaus, 1940).

Definitive hosts: *P. ridibundus*, *P. lessonae*, *P. esculentus*, *R. arvalis*, *R. temporaria*, *R. amurensis*, *B. bombina*, *P. fuscus*, *H. arborea*, *H. orientalis*, *B. bufo*, *P. viridis*, *L. vulgaris*, *T. cristatus.*

Distribution: Palaearctic.

Genus *Prosotocus* Looss, 1899
***Prosotocus confusus* (Looss, 1894)**
Localization: the stomach, small intestine.

Areas of detection: Vologda (Radchenko and Shabunov, 2008), Nizhny Novgorod (Nosova, 1992) regions.

Biology: It is a widely specific parasite of anurans. As its intermediate hosts were registered gastropod molluscs *Bithynia tentaculata* and *Codiella leachi*; supplementary – larvae and adults of aquatic arthropods: dragonflies, beetles, caddisflies, mayflies of different genera and species, alderflies of the genus *Sialis*, amphipods *Gammarus lacustris* (Shevchenko and Vergun, 1961). Metacercariae are prone to progenesis.

Definitive hosts: *P. ridibundus*, *P. lessonae*, *P. esculentus*, *R. arvalis*, *R. temporaria*, *B. bombina*, *P. fuscus*, *B. bufo*, *P. viridis.*

Distribution: Palaearctic.

Order Strigeidida (La Rue, 1926) Sudarikov, 1959
Family Strigeidae Railliet, 1919
Genus *Strigea* Abildgaard, 1790
***Strigea sphaerula* (Rudolphi, 1803), mtc.**
Localization: serous coat of inner organs, pericardium, musculature.

Areas of detection: Vologda (Radchenko and Shabunov, 2008), Moscow (our data) regions, the Republic of Mordovia (our data).

Biology: At the stage of mesocercariae and metacercariae it is a widely specific parasite of anurans. The latter act as insert, less commonly – as supplementary or reservoir hosts. The intermediate hosts are gastropod molluscs *Planorbis planorbis*, *Anisus vortex*, *A. leucostomus* and *Segmentina nitida*. Definitive hosts are corvids (Sudarikov, 1960; Odening, 1966a).

Definitive hosts: Corvidae (*Corvus cornix* Linnaeus, 1758, *Pica pica* (Linnaeus, 1758), *Corvus monedula* Linnaeus, 1758, *Corvus frugilegus* Linnaeus, 1758); *Columba livia* Gmelin, 1789, *Anas platyrhynchos* Linnaeus, 1758, *Buteo buteo* (Linnaeus, 1758) (sporadically).

Distribution: Europe.

***Strigea strigis* (Schrank, 1788), mtc.**
Localization: serous coat of inner organs, mesenteries, musculature.

Areas of detection: The Republic of Mordovia (our data), Perm Krai (Chikhlyaev and Fayzulin, 2009).

Biology: At larval stage it is a widely specific parasite of anurans, which can be insert, supplementary or reservoir hosts. Intermediate host is a gastropod *Planorbis planorbis*. Marita

complete their development in owls (Sudarikov, 1960; Odening, 1966b).

Definitive hosts: Strigidae (*Bubo bubo* (Linnaeus, 1758), *Asio otus* (Linnaeus, 1758), *Asio flammeus* (Pontoppidan, 1763), *Strix aluco* Linnaeus, 1758, *Strix uralensis* Pallas, 1771, *Athene noctua* (Scopoli, 1769), *Tyto alba* (Scopoli, 1769)); Falconiformes (rarely).

Distribution: Palaearctic.

Family Alariidae (Hall et Wigdor, 1918) Tubangui, 1922

Taxonomic note: K. Niewiadomska (K. Niewiadomska in Keys to the Trematoda, 2002), reduced the status of the family Alariidae (Hall et Wigdor, 1918) Tubangui, 1922 to the subfamily Alariinae Hall et Wigdor, 1918, within the family Diplostomidae Poirier, 1886. We do not share this opinion and keep the status of the family (Kirillov *et al*., 2012), as Alaridae family is an independent and progressive branch of Diplostomidae, host-adapted to mammals. The most prominent morphological feature is a non-hollow Brandes' organ of typical for Alariidae III morphological type. Diplostomidae, host-adapted to birds don't have the Brandes' organ of this morphological type. These circumstances, to our opinion, prevent the system Diplostomidae sensu lato from categorical acceptance.

Genus *Alaria* Schrank, 1788
***Alaria alata* (Goeze, 1782), msc.**
Localization: musculature, mesenteries, serous coat of the internal organs.

Areas of detection: Vologda (Radchenko and Shabunov, 2008), Moscow (our data) regions, the Republic of Mordovia (our data), Perm Krai (Chikhlyaev and Fayzulin, 2009).

Biology: It is a widely specific parasite of anurans, occurring only at the stage of mesocercariae. Amphibians are insert and reservoir hosts. Intermediate hosts are gastropods of genera *Planorbis* and *Anisus*; definitive – canine mammals (Potekhina, 1950; Sudarikov, 1959).

Definitive hosts: Canidae (*Canis lupus* (Linnaeus, 1758), *Vulpes vulpes* (Linnaeus, 1758), *Nyctereutes procyonoides* (Grey, 1834).

Distribution: cosmopolite.

Class Nematoda Rudolphi, 1808
Order Rhabditida Chitwood, 1933
Family Rhabdiasidae Railliet, 1915
Genus *Rhabdias* Stiles et Hassal, 1905
***Rhabdias bufonis* (Schrank, 1788)**
Localization: Lungs.

Area of detection: Vologda (Radchenko *et al*. 1983; Radchenko and Shabunov, 2008), Kostroma (Radchenko and Budalova, 1980), Ivanovo (Kirillova, 2002), Moscow (our data), Kaluga (Chikhlyaev *et al*. 2011), Nizhny Novgorod (Lebedinsky, 1981, 1983; Lebedinsky *et al*. 1989; Lebedinsky and Golubeva, 1990; Nosova, 1983, 1985, 1992, 2002) regions, the Republic of Mordovia (our data), Tatarstan (Gorshkov and Smirnova, 1986; Smirnova *et al*., 1987), Bashkortostan (Yumagulova, 2000), Perm Krai (Chikhlyaev and Fayzulin, 2009).

Biology: It is a widely specific soil-transmitted parasite of anurans. Infection of amphibians occurs through active (percutaneous) penetration of invasive larvae from the soil, which then migrate with the lymph and blood flow to the site of localization – to the lungs (Hartwich, 1975), less often through the reservoir hosts – oligochaetes and molluscs (Savinov, 1963).

Definitive hosts: *P. ridibundus*, *P. lessonae*, *R. arvalis*, *R. temporaria*, *R. macrocnemis*, *R. amurensis*, *Rana pirica* Matsui, 1991, *B. bombina*, *P. fuscus*, *H. arborea*, *H. orientalis*, *B. bufo*, *P. viridis*, *B. verrucosissimus*, *Bufo eichwaldi* Litvinchuk *et al*., 2008, *Bufo raddei* Strauch, 1876.

Distribution: Holarctic.

Family Trichostrongylidae Leiper, 1912
Genus *Oswaldocruzia* Travassos, 1917
***Oswaldocruzia filiformis* (Goeze, 1782)**
Syn.: *Oswaldocruzia bialata* (Molin, 1860)
Syn.: *Oswaldocruzia goezei* Skrjabin et Schulz, 1952
Localization: small intestine.

Taxonomic note: According to the priority of the first audited, the species of nematode Travassos (Travassos, 1937) and, in accordance with the current opinion (Moravec and Vojtkova, 1975) that we share, the species *Oswaldocruzia goezei* Skrjabin et Schulz, 1952 and *Oswaldocruzia bialata* (Molin, 1860) are the synonyms for *Oswaldocruzia filiformis* (Goeze, 1782).

Areas of detection: Vologda (Radchenko *et al*. 1983; Radchenko and Shabunov, 2008), Kostroma (Radchenko and Budalova, 1980), Ivanovo (Kirillova, 2002), Moscow (our data), Kaluga (Chikhlyaev *et al*., 2011), Nizhny Novgorod (Lebedinsky, 1981, 1983; Lebedinsky *et al*. 1989; Lebedinsky and Golubeva, 1990; Nosova, 1983, 1985, 1992, 2002) regions, the Republic of Mordovia (our data), Tatarstan (Gorshkov and Smirnova, 1986; Smirnova *et al*., 1987), Bashkortostan (Yumagulova, 2000), Perm Krai (Chikhlyaev and Fayzulin, 2009).

Biology: It is a widely specific parasite of amphibians, soil-transmitted helminth. Infection occurs through incidental contact between the host and infective larvae on land (Hendrix, 1983).

Definitive hosts: *P. ridibundus*, *P. lessonae*, *P. esculentus*, *R. arvalis*, *R. temporaria*, *R. macrocnemis*, *R. amurensis*, *B. bombina*, *Bombina orientalis* (Boulenger, 1890), *P. fuscus*, *H. arborea*, *H. orientalis*, *B. verrucosissimus*, *Pelodytes caucasicus* Boulenger, 1896, *B. bufo*, *P. viridis*, *B. verrucosissimus*, *B. raddei*, *L. vulgaris*, *Salamandra salamandra* (Linnaeus, 1758).

Distribution: Palaearctic.

Order Ascaridida Skrjabin et Schulz, 1940
Family Cosmocercidae Travassos, 1925
Genus *Aplectana* Railliet et Henry, 1916
***Aplectana acuminata* (Schrank, 1788)**
Localization: the intestine.

Areas of detection: Vologda (Radchenko *et al*. 1983; Radchenko and Shabunov, 2008), Kostroma (Radchenko and Budalova, 1980), Ivanovo (Kirillova, 2002) regions, the Republic of Tatarstan (Gorshkov and Smirnova, 1986; Smirnova *et al*. 1987).

Biology: It is a widely specific parasite of the larvae, less often – of adult amphibians. It is a soil-transmitted helminth. Infection is associated with the aquatic environment.

Definitive hosts: *P. ridibundus*, *P. lessonae*, *P. esculentus*, *R. arvalis*, *R. temporaria*, *B. bombina*, *P. fuscus*, *H. arborea*, *H. orientalis*, *B. bufo*, *P. viridis*, *B. raddei*, *T. cristatus*.

Distribution: Europe.

Genus *Cosmocerca* Diesing, 1861
***Cosmocerca ornata* (Dujardin, 1845)**
Localization: Rectum.

Areas of detection: Vologda (Radchenko *et al*. 1983; Radchenko and Shabunov, 2008), Kostroma (Radchenko and Budalova, 1980), Ivanovo (Kirillova, 2002), Moscow (our data), Kaluga (Chikhlyaev *et al*. 2011), Nizhny Novgorod (Lebedinsky, 1981, 1983; Lebedinsky *et al*. 1989; Lebedinsky and Golubeva, 1990; Nosova 1992, 2002) regions, the Republics of Mordovia (our data), Tatarstan (Gorshkov and Smirnova, 1986; Smirnova *et al*. 1987), Perm Krai (Chikhlyaev and Fayzulin, 2009).

Biology: It is a widely specific parasite of amphibians. It is a soil-transmitted helminth. Infection is associated with the aquatic environment where the helminth's eggs get into the host organism.

Definitive hosts: *P. ridibundus*, *P. lessonae*, *P. esculentus*, *R. arvalis*, *R. temporaria*, *R. amurensis*, *Rana pirica*, *B. bombina*, *P. fuscus*, *H. arborea*, *H. orientalis*, *B. bufo*, *P. viridis*, *B. verrucosissimus*, *B. raddei*, *L. vulgaris* (?).

Distribution: Europe.

Genus *Neoxysomatium* Ballesteros Marquez, 1945
***Neoxysomatium brevicaudatum* (Zeder, 1800)**
Syn. *Oxysomatium brevicaudatum* (Zeder, 1800)
Localization: straight intestine.

Taxonomic note: According to the K. Skryabin (Skryabin *et al*. 1961), the occurrence of the gubernaculum and two equal spicules in the reproductive system of males does not allow to relate this species of nematodes to the genus *Oxysomatium* Railliet et Henry, 1913 and indicates the membership of the genus *Neoxysomatium* Ballesteros Marquez, 1945.

Areas of detection: Vologda (Radchenko *et al*. 1983; Radchenko and Shabunov, 2008), Kostroma (Radchenko and Budalova, 1980), Ivanovo (Kirillova, 2002), Moscow (our data), Kaluga (Chikhlyaev *et al*. 2011), Nizhny Novgorod (Lebedinsky, 1981, 1983; Lebedinsky *et al*. 1989; Lebedinsky and Golubeva, 1990; Nosova, 1983, 1985, 1992, 2002) regions, the Republics of Mordovia (our data), Tatarstan (Gorshkov and Smirnova, 1986; Smirnova *et al*. 1987), Bashkortostan (Yumagulova, 2000), Perm Krai (Chikhlyaev and Fayzulin, 2009).

Biology: It is a widely specific soil-transmitted parasite of amphibians. Infection is associated with the terrestrial environment where the helminth's eggs get into the host organism.

Definitive hosts: *P. ridibundus*, *P. lessonae*, *R. arvalis*, *R. temporaria*, *R. macrocnemis*, *B. bombina*, *P. fuscus*, *B. bufo*, *P. viridis*, *L. vulgaris* (rarely).

Distribution: Holarctic.

Genus *Neoraillietnema* Ballesteros Marquez, 1945
***Neoraillietnema praeputiale* (Skrjabin, 1916)**
Syn. *Aplectana praeputialis* (Skrjabin, 1916)
Localization: Rectum.

Taxonomic note: According to the K. Skryabin (Skryabin *et al*. 1961), the absence of gubernaculum in males and the amphidelphic position of the uterus in the female's body does not allow to refer this species of nematodes to the genus *Aplectana* Railliet et Henry, 1916 and indicates the membership of the genus *Neoraillietnema* Ballesteros Marquez, 1945.

Areas of detection: Vologda (Radchenko and Shabunov, 2008), Kostroma (Radchenko and Budalova, 1980) regions.

Biology: It is a widely specific parasite of anurans. It is a soil-transmitted helminths. Infection is associated with the terrestrial environment where the helminth's eggs get into the host organism.

Definitive hosts: *P. ridibundus*, *P. lessonae*, *R. arvalis*, *R. temporaria*, *R. macrocnemis*, *B. bombina*, *H. arborea*, *H. orientalis*, *B. bufo* (?), *P. viridis.*

Distribution: Europe.

Order Spirurida Chitwood, 1933
Family Oswaldofilariidae Sonin, 1966
Genus *Icosiella* Seurat, 1917
***Icosiella neglecta* (Diesing, 1851)**
Localization: muscles, subcutaneous tissue.

Area of detection: The Republic of Mordovia (our data). First observed in the common frog of Russian fauna.

Biology: It is a specific parasite of amphibians family Ranidae. Biohelminth. Unlike other species of nematode it infects the host organism by percutaneous penetration of infective larvae from the water (Dubinina, 1950) after the death of their intermediate hosts – dipterans *Forcipomyia velox* and *Sycorax silacea* (Desportes, 1942).

The larvae of this species (microfilariae) are blood parasites of dipterans.

Definitive hosts: *P. esculentus*, *P. ridibundus*, *P. lessonae*.

Distribution: cosmopolite. This species of nematodes was found in other representatives of the genus *Rana* and *Pelophylax* (*esculentus*, *ridibundus*, *lessonae*, *perezi*) in Western Europe, Ukraine, Kyrgyzstan, as well as in Tambov and Samara regions (Starzynska, 1958; Barta *et al*. 1989; Jimenez *et al*. 2001, Malysheva, 2009; Chikhlyaev *et al*. 2009; Rez-

Table I. Common frog helminths in different regions of Volga basin

Helminths species	VR	KsR	IR	MR	KlR	NR	RM	RT	RB	PK
Class MONOGENEA (van Beneden, 1858)										
Order Polystomatidea Lebedev, 1988										
Family Polystomatidae (Carus, 1863)										
Polystoma integerrimum (Froelich, 1791)	+	+	+	+	+	+	+		+	
Class TREMATODA Rudolphi, 1808										
Order Fasciolida Skrjabin et Schulz, 1937										
Family Gorgoderidae Looss, 1899										
Gorgodera cygnoides (Zeder, 1800)	+		+				+	+		
Gorgodera asiatica Pigulewski, 1943							+			
Gorgodera microovata Fuhrmann, 1924						+	+			
Gorgodera pagenstecheri Sinitzin, 1905						+				
Gorgodera varsoviensis Sinitzin, 1905	+									
Gorgoderina vitelliloba (Olsson, 1876)	+					+	+			
Order Hemiurida Skrjabin et Guschanskaja, 1956										
Family Halipegidae Poche, 1926										
Halipegus ovocaudatus (Vulpian, 1858)				+			+	+		
Order Paramphistomida Skrjabin et Schulz, 1937										
Family Diplodiscidae Cohn, 1904										
Diplodiscus subclavatus (Pallas, 1760)	+		+				+			
Order Plagiorchiida La Rue, 1957										
Family Plagiorchiidae Luhe, 1901										
Haplometra cylindracea (Zeder, 1800)	+	+	+	+	+	+	+			+
Dolichosaccus rastellus (Olsson, 1876)		+								
Opisthioglyphe ranae (Frohlich, 1791)	+	+				+			+	
Family Haematoloechidae Freitas et Lent, 1939										
Pneumonoeces variegatus (Rudolphi, 1819)	+	+	+			+		+	+	
Pneumonoeces asper (Looss, 1899)	+	+				+		+		
Skrjabinoeces similis (Looss, 1899)	+					+		+		
Family Pleurogenidae Looss, 1899										
Pleurogenes claviger (Rudolphi, 1819)	+		+			+	+			+
Pleurogenoides medians (Olsson, 1876)	+					+				+
Prosotocus confusus (Looss, 1894)	+					+				
Family Leptophallidae Dayal, 1938										
Paralepoderma cloacicola (Luhe, 1909), mtc.							+			
Order Strigeidida (La Rue, 1926) Sudarikov, 1959										
Family Strigeidae Railliet, 1919										
Strigea sphaerula (Rudolphi, 1803), mtc.	+			+			+			
Strigea strigis (Schrank, 1788), mtc.							+			+
Family Alariidae (Hall et Wigdor, 1918) Tubangui, 1922										
Alaria alata (Goeze, 1782), msc.	+			+			+	+		+
Class NEMATODA Rudolphi, 1808										
Order Rhabditida Chitwood, 1933										
Family Rhabdiasidae Railliet, 1915										
Rhabdias bufonis (Schrank, 1788)	+	+	+	+	+	+	+	+	+	+
Family Trichostrongylidae Leiper, 1912										
Oswaldocruzia filiformis (Goeze, 1782)	+	+	+	+	+	+	+	+	+	+

Order Ascaridida Skrjabin et Schulz, 1940										
Family Cosmocercidae Travassos, 1925										
Aplectana acuminata (Schrank, 1788)	+	+	+					+		
Cosmocerca ornata (Dujardin, 1845)	+	+	+	+	+	+	+	+		+
Neoxysomatium brevicaudatum (Zeder, 1800)	+	+	+	+	+	+	+	+	+	+
Neoraillietnema praeputiale (Skrjabin, 1916)	+	+								
Order Spirurida Chitwood, 1933										
Family Oswaldofilariidae Sonin, 1966										
Icosiella neglecta (Diesing, 1851)							+			
Species in total	**21**	**12**	**11**	**9**	**6**	**16**	**18**	**11**	**6**	**9**
Monogenea	1	1	1	1	1	1	1	–	1	–
Trematoda	14	5	5	4	2	11	12	6	2	5
Nematoda	6	6	5	4	4	4	5	5	3	4
Examined, specimens	**469**	**112**	**138**	**30**	**76**	**680**	**120**	**75**	**66**	**19**

Notes
VR – Vologda region (Radchenko *et al*., 1983; Radchenko and Shabunov, 2008)
KsR – Kostroma region (Radchenko and Budalova, 1980)
IR – Ivanovo region (Kirillova, 2002)
MR – Moscow region (Ryzhikov *et al*., 1980, our data)
KlR – Kaluga region (Chikhlyaev *et al*., 2011, our data)
NR – Nizhny Novgorod region (Lebedinsky, 1981, 1983; Lebedinsky, Golubeva, 1990; Lebedinsky *et al*., 1989; Nosova, 1983, 1985, 1991, 1992, 2002)
RM – The Republic of Mordovia (our data)
RT – The Republic of Tatarstan (Ryzhikov *et al*., 1980; Gorshkov, Smirnov, 1986; Smirnova *et al*., 1987)
RB – Republic of Bashkortostan (Bayanov, 1992; Yumagulova, 2000)
PK – Perm Krai (Chikhlyaev, Fayzulin, 2009)

vantseva, 2012). The place of localization of adult stages are muscles of the hind limbs (we have found them in the muscles of the legs and tongue).

Helminth fauna of amphibians is closely related to their way of life and it was formed depending on the time spent on land and in water, biotopical confinement and food spectrum. The composition of helminths in the common frog within the Volga basin for approximately 75% (21 species) is represented by trematodes, most of which occur sporadically. It happens due to a short-term connection of amphibians to water bodies, "breeding-fasting" and eating terrestrial invertebrates. Nematodes are inferior to trematodes in the number of species (7), but some of them are much more common in the habitat of the host and are usual (background) species of helminths in common frog. It is explained by terrestrial life of amphibians in wet habitats.

The greatest diversity of helminths species in common frogs is reported in Vologda region (21 species), in the Republic of Mordovia (18), and in Nizhny Novgorod region (16), the lowest – in Kaluga region and the Republic of Bashkortostan (6 species) (Table I). These differences are primarily of biotopical nature, defined by the set of abiotic and biotic factors (the availability of water bodies nearby, humidity, composition of intermediate, supplementary and definitive hosts, food spectrum) and are typical for amphibians with the terrestrial mode of life.

The composition of helminths in common frog varies considerably in certain regions of the Volga basin. Out of the 29 species, only 3 are observed in all samples (100% occurrence), they are roundworms *Rh. bufonis*, *O. filiformis* and *N. brevicaudatum*. Very close to them is nematode *C. ornata*, registered in 9 regions out of 10 studied. Flatworms in this amphibian species are less common. Monogenea *P. integerrimum* and trematode *H. cylindracea* are found in 8 regions; *P. variegatus* and *P. claviger* – in 6 and 5 (50% occurrence), respectively. Other species, mainly trematodes, or over 70% the helminths composition, are present in less than half of the regions, and 7 of them have a specific regional confinement (Table I).

Of 29 discovered helminth species only 6 make the core of brown frog helminth fauna in the Volga basin: nematodes *Rh. bufonis*, *O. filiformis*, *N. brevicaudatum* and *C. ornata*, trematode *H. cylindracea* and monogenea *P. integerrimum*. For the latter this amphibian species is an obligate definitive host, determining the state of parasite population in forest biocenosis. All the mentioned species are the most common amphibian parasites and they can often be found in other amphibian species.

According to the aggregate data of L. Vojtkova and V. Roca (Vojtkova and Roca, 1994, 1996) brown frog (disregarding data collected in former USSR) can be the host for 63 species of helminths from 5 classes: Cestoda – 1, Trematoda – 41 (1 species on the stage of meso- and 15 – metacercaria; 2 – sp.), Nematoda – 15 (3 species on larva stage; 3 – sp.), Acanthocephala – 3 (1 species on cystacanth stage) and Hirudinea – 3. In Belarus there are 29 helminths species registered in brown

frog: monogenea – 1 species, trematoda – 18, nematoda – 8, cestoda – 2 and acanthocephalans – one species (Shimalov, 2009). In Ukraine in this species are registered 23 helminths species: monogenea – 1 species, trematoda – 14, nematoda – 7, and acanthocephalans – one species (Mazurmovich, 1951; Iskova *et al*. 1995). According to these literature sources helminth fauna of brown frog is sufficiently wide and differs throughout the areal. However, the same 6 species of parasites which made the core of helminth fauna for brown frog in Volga basin are the most common for this amphibian in other parts of its range. Thus we can say that helminth fauna of brown frog in Volga basin is rather typical and closely approximated by helminths composition to those of other populations.

A characteristic feature of helminth fauna of common frog is a small number of helminths species (4), parasitic in the larval stage, for which it is an insert, supplementary and/or reservoir host. According to K. Ryzhikov (Ryzhikov *et al*. 1980) on the territory of the former USSR are known only 5 species of metacercariae and mesocercaria of trematodes. In their recent summaries A. Kirillov (Kirillov *et al*. 2012) and V. Chikhlyaev (Chikhlyaev *et al*. 2012) mention observing of metacercariae of *S. strigis* in this species of amphibians in the Middle Volga region. For the first time in common frog of Russian fauna and the Volga basin are found 3 species of helminths: trematodes *Gorgodera asiatica*, *Paralepoderma cloacicola*, mtc. and nematode *Icosiella neglecta*. There is a possibility that nematoda *I. neglecta*, which was earlier common to the west and south of Volga basin, is now starting to include in its life-cycle amphibians which have much more northerly range, like European common brown frog. It happens probably due to the general warming of a world's climate.

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