

SHORT
COMMUNICATIONS

**First Finding of *Ornithodiplostomum scardinii* (Schulman, 1952)
Sudarikov et Kurotschkin, 1968 (Trematoda, Diplostomidae)
in Rybinsk Reservoir**

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Abstract—During a parasitological survey of nonnative fish species—rudd *Scardinius erythrophthalmus*—in the Rybinsk Reservoir, the metacercariae *Ornithodiplostomum scardinii* were found in its brain. This is the first find of this helminth in the Upper Volga basin. The rudd was infected with the prevalence 31.3%, with an intensity of 1–12 parasites per fish. Data on the current distribution of the trematode *O. scardinii* in the Volga River basin are provided.

Keywords: *Ornithodiplostomum scardinii*, invasive species, Trematoda, Diplostomidae, metacercaria, Volga River, Rybinsk Reservoir

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Trematodes of the genus *Ornithodiplostomum* Dubois, 1936, have a three-host life cycle: adult trematodes parasitize the intestines of fish-eating birds, mainly of the genus *Mergus*; metacercariae – in fish; gastropods of the genus *Physa* serve as the first intermediate host. The genus *Ornithodiplostomum* is represented by only two species: *O. ptychocheilus* (Faust, 1917) Dubois, 1936, and *O. scardinii* common in North America and Eurasia, respectively.

The trematode *O. scardinii* shows a rather narrow specificity to the hosts at all life cycle stages. Mergansers *Mergus albellus* (L.) and *M. merganser* (L.) are the definitive hosts; the second intermediate host is the rudd *Scardinius erythrophthalmus* (L.) or, less commonly, other fish species in which metacercariae are localized in the brain; the mollusk *Physa fontinalis* (L.) was recorded as the first intermediate host in the Volga River delta (Sudarikov and Kurochkin, 1968).

In birds *O. scardinii* has been found in the Czech Republic (Sitko and Rząd, 2014), Poland (Kavetska et al., 2008), and Russia (in the Volga River delta (Ivanov, 2002) and the Rybinsk Reservoir (Sudarikov and Kurochkin, 1968)). Metacercariae *O. scardinii* have been noted in fish in waterbodies in the Baltic states, Ukraine, Belarus, Dagestan, Poland, and Hungary (Rautskis, 1988; Sudarikov and Kurochkin, 1968; Dzika, 2005; Kirjušina and Vismanis, 2007; Molnar, 1969). Although metacercariae *O. scardinii* are considered parasites specific to rudd, they have occasionally been found in other fish species, but always in water

bodies where rudd are infected, and with lower infection rates than in rudd. In addition to rudd, *O. scardinii* has been found in silver bream *Blicca bjorkna* (L.) (Ibragimov, 2012; Ivanov, 2002; Dzika, 2005), roach *Rutilus rutilus* (L.) (Rautskis, 1988; Sudarikov, 1971; Kirjušina and Vismanis, 2007), verkhovka *Leucaspis delineatus* (Heckel, 1843) (Rautskis, 1988), tench *Tinca tinca* (L.) (Sudarikov, 1971), blue bream *Ballerus ballerus* (L.) (Ibragimov, 2012), bream *Abramis brama* (L.) (Kirjušina and Vismanis, 2007), Caspian roach *Rutilus caspicus* (Jakovlev, 1870), and ruffe *Gymnocephalus cernuus* (L.) (Sudarikov, 1971).

To study parasites in rudd, an invader in the Rybinsk reservoir, three fish samplings from the Volga reach near the mouth of the Sutka River were studied (Table 1). The standard fish body length was measured. Their infection rate was assessed by the prevalence, mean abundance, and invasion intensity. Metacercariae were killed with hot water, followed by fixation with 70% ethanol, then stained with alum carmine. Total preparation nos. 2/43 (1) and 2/43 (2) are stored in the Collection of Parasites of Aquatic Vertebrate and Invertebrate Animals at the Institute of Inland Water Biology, Russian Academy of Sciences.

Metacercariae *Ornithodiplostomum scardinii* localized in the brain of fish are enclosed in large transparent cysts with a thin fibrous membrane. Composite cysts were encountered, combining up to four separate cysts. Metacercariae stained with the preparations had the following dimensions (µm): body length 468–612

Table 1. Infection rate of *Scardinius erythrophthalmus* by metacercariae *Ornithodiplostomum scardinii* in Rybinsk Reservoir

Collection date	Station	Coordinates N, E	N	SL, mm	P.I., %	A. I., ind.	I.I.
15.IX.2014	Channel	58°02'45", 38°15'10"	8	110–145	0	0	0
26.IX.2018	Ild River	58°00'32", 38°14'57"	16	120–140	31.3	1.6	1–12
11.X. 2018	Sunozhka Creek	58°02'45", 38°14'29"	4	83–84	0	0	0

SL, fish body length (min–max); P.I., prevalence; A.I., mean abundance; I.I., invasion intensity (min–max). N – number of infected fish.

(average 558), maximum body width 225–288 (252.3), length of anterior segment of body 438–570 (486), length of posterior segment of body 15–117 (74), oral sucker 26–33 × 22–35 (31.2 × 29), pharynx 33–37 × 15–22 (35 × 18), ventral sucker 15–26 × 20–26 (22.5 × 23), Brandes organ 55–73 × 88–112 (65 × 99).

Earlier, in the Volga River basin metacercaria *Ornithodiplostomum scardinii* were found in rudd in the delta and in the Saratov and Gorky reservoirs (Molodozhnikova and Zhokhov, 2007). The trematode *O. scardinii* is a new species for the Rybinsk reservoir, which, together with rudd, should be considered invaders expanding their ranges in the Volga River Basin. Previously, rudd lived in lakes and waterbodies of the Molo-Sheksninskaya floodplain, but after it was flooded when the Rybinsk Reservoir was created, it disappeared. It first began to occur in the reservoir in 2011. It is believed that rudd entered the Volga reach from the Ivankovo reservoir (Gerasimov et al., 2015). Apparently, *O. scardinii* had also been found in the Molo-Sheksninskaya interfluvium, since adult trematodes were found in the small merganser *Mergus albellus* in the Darwin Reserve (Sudarikov and Kurochkin, 1968).

A life cycle study of *Ornithodiplostomum scardinii* revealed a number of interesting facts on the relation of the ranges of the definitive and intermediate hosts for this trematode. Greater and lesser mergansers have almost equal nesting ranges, which cover the forest zone from Scandinavia to Kamchatka. Birds nest in the hollows of trees near waterbodies. Both species are listed in the International Red Book; the southern boundary of the breeding ranges of both species runs along the Rybinsk Reservoir (Golubev and Rusinov, 2015). In winter, birds migrate to the coasts of the Baltic and North seas, waterbodies in Central and Southern Europe, and the coastal regions of the Black, Azov, and Caspian seas. Rudd is ubiquitous in Europe east of the Iberian Peninsula, in Transcaucasia, and in the Aral Sea basin, but it has no continuous distribution like, e.g., roach; its range is characterized by significant gaps. This thermophilic species is most abundant in waterbodies in the southern part of the range. Mollusks and fish are infected by trematodes mainly

from mergansers, which winter in waterbodies in the southern part of the rudd's range, and not from local nesting birds, which are very few in number (Golubev and Rusinov, 2015). In waterbodies where they winter, mergansers form rather dense aggregation, which facilitates infection of mollusks. It is important to note that for wintering, birds fly in and out during the time physids also hibernate and are inactive. It can be suggested that trematode eggs do not develop in winter and mollusk infection occurs in spring. Such a hypothesis was earlier proffered by Sudarikov and Kurochkin (1968). In many waterbodies in the central and, especially, northern parts of the rudd's range, fish are not infected by *O. scardinii* due to the absence, low abundance, or dispersion of definitive hosts (Golubev and Rusinov, 2015). This is characteristic of the Vychegda River, Lake Seliger, Lake Glukhoe on Valaam Island, Lake Siver in Latvia, Lake Nero in Yaroslavl oblast, and Lake Lozsko-Azatskoe in Vologda oblast, where parasitological studies of rudd were carried out. The revealed population of *O. scardinii* in the Rybinsk Reservoir is possible the northernmost at present.

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COMPLIANCE WITH ETHICAL STANDARDS

Conflict of interests. The authors declare that they have no conflict of interest.

Statement on the welfare of animals. All applicable international, national, and/or institutional guidelines for the care and use of animals were followed.

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