DOI: 10.22620/agrisci.2025.45.010

New data on the helminth fauna of *Carassius gibelio* (Bloch, 1782) from the Maritsa River, Bulgaria

Mariya K. Chunchukova*, Dimitrinka B. Kuzmanova

Agricultural University – Plovdiv, Bulgaria
***Corresponding author: m.chunchukova@abv.bg**

Abstract

This study aims to reveal the helminth diversity and infection parameters of the *Prussian carp* (*Carassius gibelio*) from the Maritsa River, Bulgaria. In 2024, fifteen specimens of Carassius gibelio were collected from the Maritsa River and examined for parasites. Sixty percent of the studied hosts harboured parasites. Two species of helminths were identified: one from the class Trematoda (Nicolla skrjabini) and one from the class Nematoda (Raphidascaris acus larvae). Raphidascaris acus larvae were distinguished by their high prevalence and are considered a core parasite species in the helminth communities of Prussian carp. Nicolla skrjabini is a component parasite species in the helminth communities of C. gibelio. Prussian carp is reported for the first time as a host for Raphidascaris acus larvae in the Maritsa River. The freshwater ecosystem of the Maritsa River is also a new locality record for Nicolla skrjabini in Bulgaria.

***Keywords*:** *Carassius gibelio*, *Nicolla skrjabini*, *Raphidascaris acus*, Maritsa River

INTRODUCTION

The Maritsa River (length 539 km) is the longest river on the Balkan Peninsula. Within the territory of Bulgaria, its length is 321.6 km, making it the fourth longest river in the country. The Maritsa River originates from the Maritsa Lakes in the Rila Mountains. Its upper reaches extend from the source to the town of Belovo. The middle reaches cover the section from Belovo to the Bulgarian border at the village of Kapitan Andreevo. After crossing the national border, the river flows through Greece and Turkey and empties into the northeastern part of the Aegean Sea, which constitutes its lower reaches. The Maritsa has an approximately equal number of left and right tributaries. The biodiversity and helminth communities of fish in the river have been surveyed (Margaritov, 1965; Kirin, 2000a, 2000b, 2001, 2006, 2013, 2014; Chunchukova et al., 2019a, 2019b; Kuzmanova et al., 2019, 2023), but only Chunchukova et al. (2023) investigated the endohelminth species biodiversity of *Carassius gibelio*.

The aim of this study is to present new data on helminths and helminth communities of *Prussian carp* from the Maritsa River.

MATERIALS AND METHODS

In the summer of 2024, fifteen *Carassius gibelio* specimens were caught from the Maritsa River in the vicinity of the town of Sadovo and examined for parasites. The fish were caught with fishing rods, and an incomplete parasitological examination for helminths was immediately carried out. The fish name (common and taxonomic) follows Fröse & Pauly (2025). Trematodes were fixed as permanent slides after staining with acetic carmine, differentiation in 70% acid ethanol, dehydration in an increasing ethanol series, clarification in eugenol, and mounting in Canada balsam (Bykhovskaya-Pavlovskaya, 1985; Georgiev et al., 1986). The samples were

counted and identified using the keys of Bauer et al. (1981) and Bykhovskaya-Pavlovskaya (1985). Nematode specimens were studied in glycerine as temporary slides and identified according to Moravec (2013). The analysis of helminth community structure was carried out at the levels of component community and infracommunity. The ecological terms prevalence (P %), mean intensity (MI), and mean abundance (MA) were used based on the terminology of Bush et al. (1997). Based on prevalence, the dominant structure of the component helminth communities was determined (Kennedy, 1993). The parasites were grouped as core (>20), component (<20), and accidental (<10). Infracommunity data were used to calculate the mean number of species and the mean number of helminth specimens (Kennedy, 1993, 1997).

RESULTS AND DISCUSSION

In 2024, fifteen Prussian carp were caught from the ecosystem of the Maritsa River in the region of the municipality of Sadovo and examined for parasites. *Carassius gibelio* (Pisces: Cyprinidae) is a freshwater, brackish, benthopelagic, potamodromous fish species (Fröse & Pauly, 2025). The diet of this cyprinid includes plankton, benthic invertebrates, plant material, and detritus. Prussian carp is an untypical and introduced species in aquatic ecosystems in Bulgaria (Stefanov, 2007). *Carassius gibelio* is distinguished by its rapid growth and is a species that is undemanding of environmental conditions (Karapetkova & Zhivkov, 2010). Prussian carp is widely distributed in several tributaries (Topolnitsa, Luda Yana, Stryama, and Chepinska) of the Maritsa River (Kolev, 2020).

Helminth community structure

Helminth parasites were recorded in nine *Prussian carp* specimens (60%) from the Maritsa River. Two parasite species were identified: one trematode species *Nicolla skrjabini* (Ivanitzky, 1928)) and one nematode species *Raphidascaris acus* (Bloch, 1779), larvae (Table 1). *Nicolla skrjabini* is an autogenic species that matures in fish. *R. acus* is an allogenic species that matures in certain predatory fish species such as *Esox lucius*, *Lota lota*, *Salmo trutta*, and others (Moravec, 2013).

Component community

Nematodes were represented by the highest number of specimens in the component community of *C. gibelio* from the Maritsa River (8 specimens). Trematodes were represented by one species and three specimens. *Raphidascaris acus* larvae (P% = 46.67) is a core parasite species in the helminth communities of Prussian carp. *Nicolla skrjabini* (P% = 4.40) is a component parasite species in the helminth communities of *C. gibelio* (Table 1).

Infracomminity

Species richness in the infracommunity of *Prussian carp* ranges from 0 to 1 species. Nine fish hosts (60%) were infected with a single helminth species (60%) (Table 2).

Table 1. Helminth fauna of *Carassius gibelio* from Maritsa River

Helminth species	**Number of examined hosts (N=15)**					
	n	**p**	**P%**	**MI ±SD**	**MA ±SD**	**Range**
Nicolla skrjabini (Ivanitzky, 1928)	2	3	13.33	1.5 ±0.5	0.20 ±0.54	1-2
Raphidascaris acus (Bloch, 1779) larvae	7	8	46.67	1.14 ±0.35	0.53±0.62	1-2

Legend: N – number of examined hosts; n – number of infected hosts; p – number of parasites; P – prevalence; MI – mean intensity; MA – mean abundance;

Table 2. Parameters of the infracommunities of *Carassius gibelio* from Maritsa River

	Number of endohelminth species			
	0	1	Mean ±SD	Range
Carassius gibelio	15	9	0.6 ±0.49	0-1
	Number of endohelminth specimens			
	Total		Mean ±SD	Range
Carassius gibelio	11		0.73 ±0.68	0-3

The largest number of helminth specimens recorded in a single host specimen was 3. The average species richness in the infracommunity of *Prussian carp* was 0.6 ± 0.49 species. The average abundance in these infracommunities was 0.73 ± 0.68 (Table 2). *Nicolla skrjabini* was previously reported mainly from different fish hosts (*Acipenser ruthenus*, *Salmo trutta fario*, *Aspius aspius*, *Abramis brama*, *Abramis ballerus*, *Pelecus cultratus*, *Cyprinus carpio*, *Cobitis aurata balcanica*, *Alburnus alburnus*) in the Danube River (Margaritov, 1966; Margaritov, 1976; Kakacheva-Avramova, 1969; Kakacheva-Avramova, 1977; Kakacheva-Avramova & Menkova, 1978; Chunchukova et al., 2019c) and Lake Srebarna (*Blicca bjoerkna*, Shukerova et al., 2017).

Previously, *Nicolla skrjabini* was reported in *Carassius gibelio* only from the Danube River and the Tundzha River (Kakacheva-Avramova, 1977; Kirin & Chunchukova, 2022). This is the first report of *Nicolla skrjabini* in *Carassius gibelio* from the Maritsa River (Fig. 1).

The life cycle of *Nicolla skrjabini* is one year long and involves two intermediate hosts. The first is the snail Lithoglyphus naticoides, and the second intermediate hosts are *Gammarus balcanicus*, *Obesogammarus crassus*, and *Dikerogammarus haemobaphes* (Kakacheva-Avramova, 1983). Until now, only three trematode species belonging to two orders (*Plagiorchiida* and *Diplostomida*) have been reported from four fish hosts in the freshwater ecosystem of the Maritsa River in Bulgaria (Table 3). This is the first report of *Nicolla skrjabini* (Order Plagiorchiida) from the freshwater ecosystem of the Maritsa River.

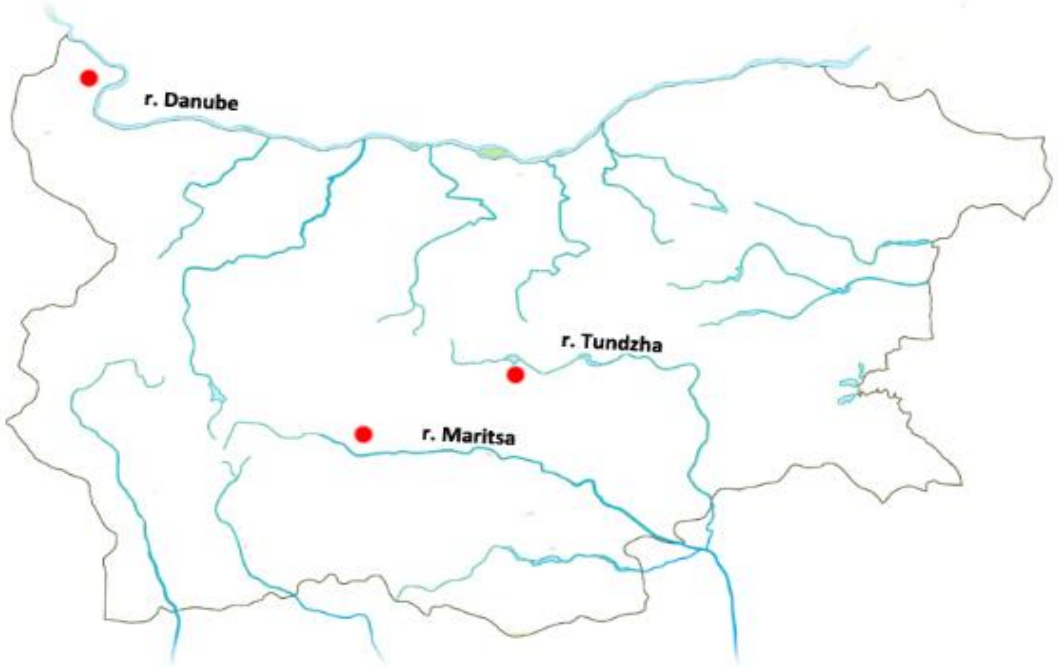

Figure 1. Localities of established *Nicolla skrjabini* with host *Carassius gibelio* in Bulgaria

Raphidascaris acus larvae (third and fourth stage) occur in many fish species from different families, most frequently in cyprinids. Adult *Raphidascaris acus* have been reported from numerous species of piscivorous fishes across various families; however, in Europe, the principal definitive host for this nematode is *Esox lucius* (Moravec, 2013). Until now, four nematode species have been recorded in *Carassius gibelio* in Bulgaria from four freshwater ecosystems (Table 4). This is the first report of *Raphidascaris acus* larvae in *Carassius gibelio* from the Maritsa River.

Raphidascaris acus larvae (once) and adult (twice) were previously reported from the Maritsa River in two fish hosts (Table 5).

Table 3. Trematode species registered from Maritsa River in Bulgaria

Species diversity	Fish host	Reference
Bunodera luciopercae (Müller, 1776)	*Esox lucius*	Chunchukova & Kirin (2023)
Allocreadium isoporum (Looss, 1984)	*Vimba melanops*	Kuzmanova et al. (2023)
Allocreadium isoporum (Looss, 1984)	*Alburnus alburnus*	Chunchukova et al. (2019b)
Allocreadium isoporum (Looss, 1984)	*Squalius cephalus*	Kirin (2001)
Clinostomum complanatum (Rudolphi, 1814) Braun, 1899		
Allocreadium isoporum (Looss, 1984)	*Squalius cephalus*	Margaritov (1965)

Table 4. Overview of nematoda species of *Carassius gibelio* registered in Bulgaria

Nematoda species	Reference				
	Shukerova, (2005)	Kirin & Chunchukova, (2022)	Chunchukova et al., (2023)	Zaharieva et al., (2023)	Current study
Raphidascaris acus (Bloch, 1779) larvae	●				●
Contracaecum microcephalum (Rudolphi, 1809), larvae	●				
Contracaecum sp., larvae		●			
Pseudocapillaria tomentosa (Dujardin, 1843)			●	●	
Locality	Srebarna Lake	Tundzha River	Maritsa River	Danube River	Maritsa River

Table 5. Fish hosts of *Raphidascaris acus* recorded from the Maritsa River in Bulgaria

***Raphidascaris acus* development stage**	**Fish host**	**Reference**
larvae	*Chondrostoma nasus*	Margaritov, (1965)
adult	*Esox lucius*	Kirin, (2013)
adult	*Esox lucius*	Chunchukova & Kirin, (2023)

CONCLUSIONS

As a result of this study on helminths and helminth communities of *C. gibelio* from the Maritsa River, two species were identified: one trematode species (*Nicolla skrjabini*) and one nematode species (*Raphidascaris acus*, larvae). *Raphidascaris acus* larvae (P% = 46.67) is a core parasite species in the helminth communities of *Prussian carp*. *Nicolla skrjabini* (P% = 4.40) is a component parasite species in the helminth communities of *C. gibelio*. This is the first report of *Prussian carp* as a host for *Raphidascaris acus* larvae from the Maritsa River. The freshwater ecosystem of the Maritsa River is a new locality record for *Nicolla skrjabini* in Bulgaria.

REFERENCES

Bauer, O.N., Musselius, V.A. & Strelkov, Yu.A. (1981). *Bolezni prudovyih ryb* [*Diseases of pond fish*]. Legkaya Pishchevaya Promishlenost [Light and food industry]. 320 pp. Moscow (In Russian).

Bush, A., Lafferty, K., Lotz, J. & Shostak A. (1997). Parasitology meets ecology on its own terms. *Journal of Parasitology*, 83, 575–583

Bykhovskaya-Pavlovskaya, I. (1985). *Parasites of fish*. [Manual on study], Leningrad, RU: Nauka, (In Russian).

Chunchukova, M. & Kirin, D. (2023). New data for helminth fauna of *Esox lucius* (Linnaeus, 1758) from Maritsa river, Bulgaria. *Scientific Papers. Series D. Animal Science*, LXVI, 2, 592-597.

Chunchukova, M., Kirin, D. & Kuzmanova, D. (2019b). New data for helminth communities of *Alburnus alburnus* (Linnaeus, 1758) from Maritsa River, Bulgaria. *Scientific Papers. Series D. Animal Science*. LXII, 1, 439-444.

Chunchukova, M., Kirin, D., & Kuzmanova, D. (2019b). Biodiversity of the helminth communities of *Scardinius erythrophthalmus* (Linnaeus, 1758) from Maritsa River, Bulgaria. *Scientific Papers. Series D. Animal Science*, LXII, 1, 445–450.

Chunchukova, M., Kirin, D. & Kuzmanova, D. (2019c) Gastrointestinal helminth fauna and helminth communities of bleak (*Alburnus alburnus*, L. 1758) from lower section of Danube River, Bulgaria. *Bulg J Vet Med 22*(3), 344–352

Chunchukova, M., Kuzmanova, D., & Kirin, D. (2023). Biodiversity of the helminth communities of *Carassius gibelio* (Bloch, 1782) from Maritsa River, Bulgaria. *Scientific Papers. Series D. Animal Science*, LXV, 1, 532-537.

Fröse, R. & D. Pauly (Eds.), 2025. FishBase. World Wide Web electronic publication, www.fishbase.org (28 January 2025, date last accessed)

Georgiev, B., Biserkov V. & Genov T. (1986). In toto staining method for cestodes with iron acetocarmine. *Helminthologia, 23*, 279–281.

Kakacheva-Avramova, D. & Menkova, I. (1978). Izsledvane na helminti u ribi ot yazovir Iskar[Research of helminths in fish from reservoir Iskar]. II. Helminti u ribi ot reka Palakariya [Helminths in fish from the Palakaria River]. *Helmintologya* [*Helminthologia*] *5*, 39-46. (In Bulgarian).

Kakacheva-Avramova, D. (1969). Helminti po ribi na Zapadna Stara planina [Helminths by fish from rivers of western Stara planina mountain]. II. Trematoda, Cestoda, Acanthocephala, Nematoda. *Izvestiya na TSHL* [*Notifications of the CHL*], XIII, 61-74. (In Bulgarian).

Kakacheva-Avramova, D. (1977). Izsledvane helmintite na ribi ot Balgarskiya uchastak na r. Dunav [Investigation of fish helminthes from Bulgarian Danube River section]. *Helmintologya* [*Helminthologia*], *3*, 20-43. (In Bulgarian)

Kakacheva-Avramova, D. (1983). *Helminti na sladkovodnite ribi v Balgaria* [*Helminths of freshwater fishes in Bulgaria*]. Sofia, BG: Balgareska Akademiya na naukite [Bul. Acad. Sci.] (in Bulgarian).

Karapetkova, M. & Zhivkov, M. (2010). Ribite v Balgaria [*Fishes in Bulgaria*]. Sofia, BG: GeaLibris [GeaLibris] (In Bulgarian)

Kennedy, C. (1993). The dynamics of intestinal helminth communities in eels Anguilla anguilla in a small stream: long-term changes in richness and structure. *Parasitology*, 107, 71–78.

Kennedy, C. (1997). Freshwater fish parasites and environmental quality, an overview and caution. *Parassitologia, 39*, 249–254.

Kirin, D. & Chunchukova, M. (2022). Biodiversity and structure of the helminth communities of *Carassius gibelio* (Bloch, 1782) from the Tundzha River, Bulgaria. *Scientific Papers. Series D. Animal Science*, LXV, 1, 601-606.

Kirin, D. (2001). Biodiversity and ecology of helminths fauna in *Leuciscus cephalus* from Maritsa river, Bulgaria. *Trav. Sci. Univ. Plovdiv, 37*(6), 79-84

Kirin, D. (2006). Biodiversity of the helminth species and helminth communities *of Esox lucius* L., 1758 from Maritsa River, Bulgaria. *The 35th International Scientific Communications Session of the Faculty of Animal Science*, Bucharest, Romania, 135–140.

Chunchukova, M., Kirin, D., & Kuzmanova D. (2019a). New data for helminth communities of *Alburnus alburnus* (Linnaeus, 1758) from Maritsa River, Bulgaria. *Scientific Papers. Series D. Animal Science*, LXII, 1, 439–444.

Kirin, D. (2013). Helminth communities and ecological appraisal for the condition of the Maritsa River, Bulgaria. *AgroLife Scientific Journal*, 2 (1)1, 197-202

Kirin, D. (2014). Helminth communities and heavy metal contamination in macedonian vimba and fish parasites of the Maritsa River, Bulgaria. *Scientific Papers. Series D. Animal Science*, LVII, 284–289.

Kirin, D. A. (2000a). Biodiversity and ecological assessment of the status of freshwater ecosystems from the Maritsa River. *Nauchni Trudove na Sayuza na Uchenite v Bulgaria, Smolyan,* 1, 82–85. (In Bulgarian).

Kirin, D. A. (2000a). Bioraznoobrazie i ekologichna otsenka na sastoyanieto na sladkovodnata ekosistema na reka Maritsa [Biodiversity and ecological assessment of the status of freshwater ecosystems from the Maritsa River]. *Nauchni Trudove na Sayuza na Uchenite v Bulgaria, Smolyan,* 1, 82–85. (In Bulgarian).

Kirin, D. A. (2000b). Ekologofaunistichno izsledvane na helmintologichnite saobshtestva na *Leuciscus cephalus* L. ot reka Maritsa [Ecologofaunistical study of the helminthological communities of *Leuciscus cephalus* L. from Maritsa River]. *Nauchni Trudove na Sayuza na Uchenite v Bulgaria, Plovdiv, 1*, 405–408 (In Bulgarian).

Kolev, V. (2020). Alien Fishes in Some Tributaries of the Maritsa River in Bulgaria. *Ecologia Balkanica, 12*(1), 94-102.

Kuzmanova, D., Chunchukova, M. & Kirin, D. (2019). Helminths and helminth communities of perch (*Perca fluviatilis* Linnaeus, 1758) as bioindicators for ecosystem condition of the Maritsa River. *Scientific Papers. Series D. Animal Science*, LXII, 1, 463–468.

Kuzmanova, D., Chunchukova, M. & Kirin, D. (2023). Helminths and helminth communities of *Perca fluviatilis* (Linnaeus, 1758) and *Vimba melanops* (Heckel, 1837) from Maritsa River, Bulgaria. *Scientific Papers. Series D. Animal Science*, LXVI, 1, 590-595.

Margaritov, N. (1966). Helminti ot hranosmilatelnata sistema i telesnata praznina na ribite ot Balgarskiya uchastak

na r. Dunav [Helminths of the digestive systems and the body cavity of the fish from the Bulgarian section of the Danube River]. *Izvestiya na zoologicheskiya institute s muzey* [*Notifications from the Zool. Ins. Museum*], *XX*, 157-173. (In Bulgarian)

Margaritov, N. (1976). Paraziti i bolezni karpa v Gosudarstvenih ribovadnih hoziyastvah Bolgarii [Parasites and carp diseases in public fish farms in Bulgaria]. *Proceedings of the State Research Institute of Lake and River Fish Farming, 105*, 40-44. (In Russian).

Margaritov, N.M. (1965). Chrevni helminti na ribi ot srednoto techenie na reka Maritsa I pritocite I [Intestinal helminths of fishes of the middle reaches of the R. Maritsa and tributaries]. *Godishnik na Sofiyskiya universitet Biologicheski fakultet* [*Godshnik na Sofiyskia universitet Biologicheski fakultet*], *58*, 129-150. (In Bulgarian)

Moravec, F. (2013). *Parasitic Nematodes of Freshwaterfishes of Europe*. Praha, CZ Academia.

Shukerova S., Kirin D., Chunchukova M., Kuzmanova D. (2017). Helminth fauna of white bream (*Blicca bjoerkna*) (Linnaeus, 1758), from the Srebarna biosphere reserve, Bulgaria. *Scientific Papers. Series D. Animal Science*, LX, 366-371.

Shukerova, S. (2005). Helminth fauna of the Prussian carp, *Carassius gibelio* (Bloch, 1782), from the Srebarna biosphere reserve. *Trakia Journal of Sciences, 3*, 33–40.

Stefanov, T. (2007). Fauna and distribution of fishes in Bulgaria. In: Fet V. & Popov A. (Eds.): *Biogeography and Ecology of Bulgaria*. Dordrecht: Springer, 109–139

Zaharieva, R., Zaharieva, P., & Kirin, D. (2023). Ecoparasitological study of six species of fish from the Bulgarian section of the Danube River. *Scientific Papers. Series D. Animal Science*, LXVI, 1, 666-671