



DOI 10.23859/estr-240302

EDN ODZDDW

UDC 597.553.2:595.3(282.2)

*Short communication*

## A find of *Argulus coregoni* (Crustacea: Branchiura) on brook trout in the Western Dvina basin

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**Abstract.** The crustaceans *Argulus coregoni* Thorell, 1864 were found on the body surface of brook trout *Salmo trutta* m. *fario* L., 1758 in the Velesa River (tributary of the Western Dvina River, Tver Oblast, Russia). This is the first finding of *A. coregoni* in the Western Dvina basin, which shows that this species can parasitize on specific hosts in the upper reaches of small rivers.

**Keywords:** Argulidae, ectoparasite, fish parasite, *Salmo trutta* m. *fario*, rare find

**Funding.** The research was performed in the framework of the state assignment of the Ministry of Education and Science of the Russian Federation (No. 124032500016-4 and No. 124032500018-8).

**Acknowledgements.** The authors express their gratitude to Oleg N. Artaev and Aleksey A. Bolotovskiy (Borok, Russia) for their assistance in collecting the studied material. Our special thanks are to Oleg N. Artaev for providing photographs of brook trout and the locality of the Velesa River.

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**To cite this article:** Turbanov, I.S., Zhokhov, A.E., 2024. A find of *Argulus coregoni* (Crustacea: Branchiura) on brook trout in the Western Dvina basin. *Ecosystem Transformation* 7 (3), 3–12. <https://doi.org/10.23859/estr-240302>

Received: 02.03.2024

Accepted: 10.06.2024

Published online: 19.07.2024

DOI 10.23859/estr-240302

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УДК 597.553.2:595.3(282.2)

**Краткое сообщение**

## Находка *Argulus coregoni* (Crustacea: Branchiura) на ручьевой форели в бассейне Западной Двины

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**Аннотация.** Рачки *Argulus coregoni* Thorell, 1864 обнаружены на поверхности тела ручьевой форели *Salmo trutta* m. *fario* L., 1758 в р. Велесе (приток р. Западная Двина, Тверская обл., Россия). Это первая находка *A. coregoni* в бассейне Западной Двины, которая показывает, что данный вид может паразитировать на специфичных хозяевах в самом верхнем течении малых рек.

**Ключевые слова:** Argulidae, эктопаразит, паразит рыб, *Salmo trutta* m. *fario*, редкая находка

**Финансирование.** Исследование выполнено в рамках государственного задания Министерства образования и науки РФ (темы № 124032500016 и № 124032500018-8).

**Благодарности.** Авторы выражают благодарность Олегу Артаеву и Алексею Болотовскому (Борок, Россия) за помощь в сборе изученного материала. Особая благодарность Олегу Артаеву за предоставленные фотографии ручьевой форели и участка на р. Велесе.

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**Для цитирования:** Турбанов, И.С., Жохов, А.Е., 2024. Находка *Argulus coregoni* (Crustacea: Branchiura) на ручьевой форели в бассейне Западной Двины. *Трансформация экосистем* 7 (3), 3–12. <https://doi.org/10.23859/estr-240302>

Поступила в редакцию: 02.03.2024

Принята к печати: 10.06.2024

Опубликована онлайн: 19.07.2024

## Introduction

The ectoparasitic crustacean *Argulus coregoni* Thorell, 1865, one of 138 valid fish lice species of the genus *Argulus* Müller, 1785 (Arguloida: Argulidae) (Walter and Boxshall, 2024), is widely known as a parasite of freshwater salmonids fishes in the Northern (Barskaya and Ieshko, 2004; Dorovskikh, 2000; Hakalahti and Valtonen, 2003; Kennedy, 1974; Mitenev, 2003; Rummyantsev et al., 2005; Yunitsyna et al., 2002) and Central Europe (Moravec, 2001, 2004; Rolbiecki et al., 2009). This species is absent in Siberia (Pugachev, 2004), but it is known from the Amur basin and rivers of the Primorsky Territory (Ermolenko, 1992; Ermolenko and Volkova, 2021), Sakhalin Island (Sokolov et al., 2012), water bodies of China (Wang, 1958) and Japan (Shimura, 1983). However, single findings of *A. coregoni* have been reported on other fish, including Cyprinidae (Dorovskikh, 2000; Kennedy, 1974; Kirjušina and Vismanis, 2007; Nagasawa et al., 2018; Rautskis, 1988; Stammer, 1959), and fish of other families Nemacheilidae, Odontobutidae (Ermolenko and Volkova, 2021), Bagridae and Esocidae (Sokolov et al., 2012). The specificity of *A. coregoni* for salmonids may be associated with a higher sensitivity to oxygen deficiency. Adult specimens of *A. coregoni* live in well-aerated (flowing) waters (Mikheev et al., 2007; Pasternak et al., 2004).

Our knowledge about the distribution of *Argulus coregoni* in fish in the rivers of the central part of European Russia is very limited due to the fact that the specific hosts of this parasite, salmonids fishes (Actinopterygii: Salmonidae), are rare in this region and represented by only two species – brook trout *Salmo trutta* m. *fario* L., 1758 and European grayling *Thymallus thymallus* L., 1758. Both of these salmonid species are included in the regional Red Data Book of Tver Oblast, Russia (Kirillov and Nezdolij, 2013a, b).



**Fig. 1. A – A** – Brook trout *Salmo trutta* m. *fario* from the body surface of which *Argulus coregoni* were collected; **B** – a site on the Velesa River where brook trout were caught (N 56°23'00.2" E 32°19'53.4"). Photos by O.N. Artaev.

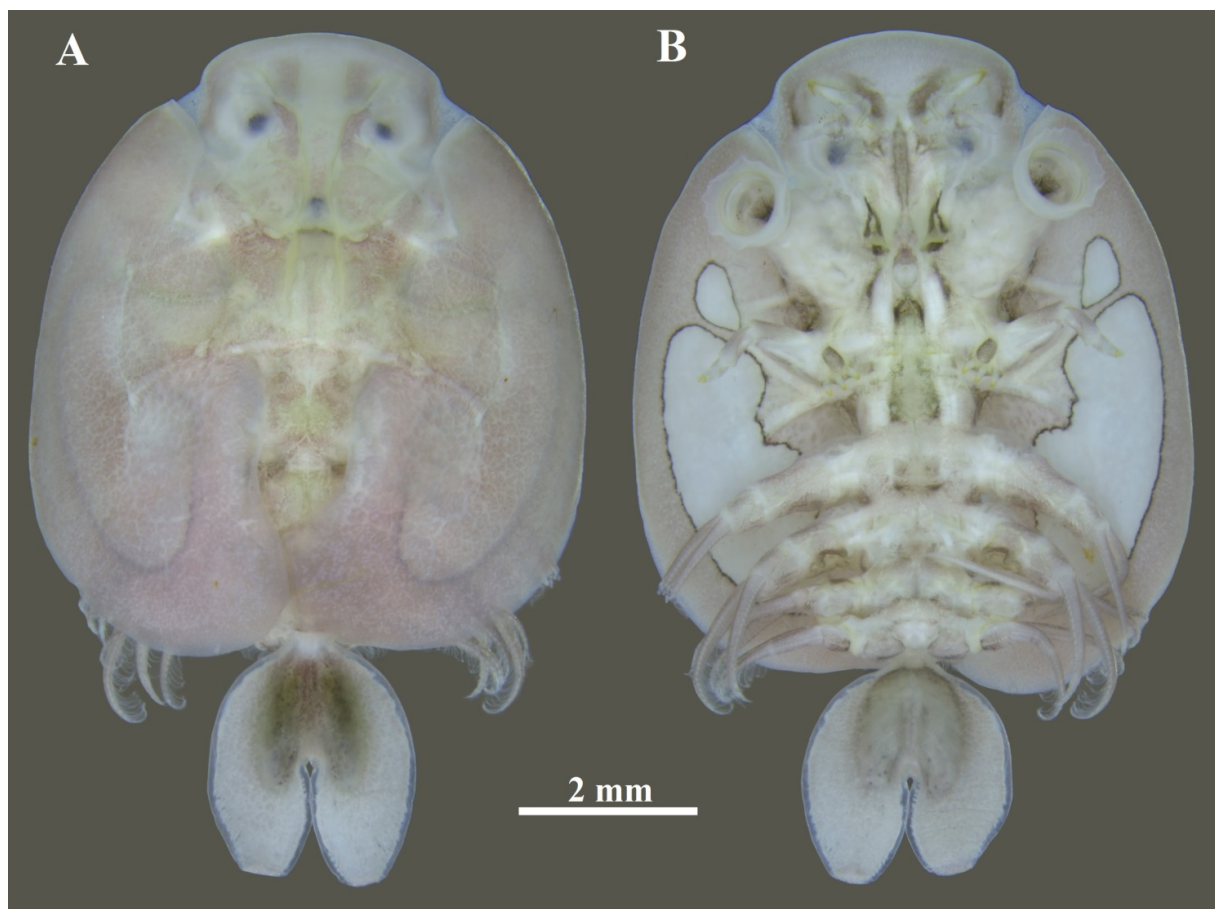
## Material and methods

The studied specimen of brook trout (Fig. 1A) was caught on a spinning rod with baubles in July 2021 in the Velesa River, a tributary of the Western Dvina River (Fig. 1B). Immediately after capture, the fish were visually examined for the presence of skin parasites; found *A. coregoni* individuals were carefully collected with tweezers and fixed in 96% ethanol. Voucher samples of *A. coregoni* (wet preparation No. 3/50) are stored in the Collection of Parasites of Aquatic Vertebrates and Invertebrates (Papanin Institute for Biology of Inland Waters RAS, Borok, Russia). Immediately after catching, the fish were photographed in an aquarium with artificial lighting using a Nikon D5300 camera equipped with a Nikkor 60 mm f/2.8G lens. The photographs of habitus and morphological structures of *A. coregoni* were taken with a Leica M165C stereo microscope on a Leica MC170 HD (12 MPs) digital camera using the extended focus technology. The final image was compiled from multiple layers using Helicon Focus 7.7.4. All figures were processed using Adobe Photoshop CS6 (ver. 13.0.1.3). Identification of crustaceans was based on morphological descriptions (Everts and Avenant-Oldewage, 2009; Gusev, 1987).

## Results and discussion

*Argulus coregoni* Thorell, 1865 (Fig. 2)

The examined material includes 8 females on the body surface of *Salmo trutta* m. *fario*, (Russia, Tver Oblast, Zapadnodvinsky District, near Sheverdino, Velesa River, N 56°23'00.2" E 32°19'53.4", 17.VII.2021, I.S. Turbanov leg.)



**Fig. 2.** Habitus of fish lice *Argulus coregoni*, female (**A** – dorsal view; **B** – ventral view) from the body surface of *Salmo trutta* m. *fario* from the Velesa River, a tributary of the Western Dvina River (Tver Oblast, Russia). Sample is fixed in 96% ethanol. In the pictures of whole crustaceans, the ends of the urosomes are slightly curved.



**Fig. 3.** Urosoma of the female fish louse *Argulus coregoni*, dorsal view.

The size of the caught brook trout is SL = 27.4 cm. Eight specimens of *A. coregoni* were collected from the surface of the trout's body, represented exclusively by females. The body length of the crustaceans was on average 9.1 mm (6.9–10 mm), width – 7.3 mm (5.1–9.1 mm). The three largest individuals of *A. coregoni* had eggs in their egg chambers. The main morphological character that distinguishes *A. coregoni* from the closely related species *A. foliaceus* (L., 1758) is the shape of the urosoma. In *A. coregoni*, the ends of the urosoma lobes are pointed and devoid of spines, and the posterior notch extends beyond its middle (Everts and Avenant-Oldewage, 2009; Gusev, 1987). The structure of the urosome in the studied crustaceans (Fig. 3) clearly indicates that they belong to the species *A. coregoni*. The crustaceans of this species with *Thymallus thymallus*, obtained in Arkhangelsk Oblast (Russia), were slightly smaller in size, 7–8 mm (Yunitsyna et al., 2022). Females of *A. coregoni* from masu salmon *Oncorhynchus masou* (Brevoort, 1856) (Actinopterygii: Salmonidae) in Japan reached a maximum length of 10.5 mm (Shimura, 1983). The nonspecific host ayu sweetfish *Plecoglossus altivelis altivelis* (Temminck et Schlegel, 1846) (Actinopterygii: Plecoglossidae) from Japan had smaller crustaceans, i.e. 6.4–8.1 mm (Nagasawa et al., 2018).

Brook trout studied for ectoparasites were caught in the uppermost reaches of the Western Dvina River (Tver Oblast, Russia), in its left tributary – the Velesa River (length – 114 km, basin area – 1420 km<sup>2</sup>, average water discharge – 13.4 m<sup>3</sup>/s, average bed slope – 0.8 m/km), the sources of which are located on the Valdai Hills (Domnin, 2018). In the Tver Oblast, brook trout is known from the rivers Toropa and Mezha of the Western Dvina basin, as well as from the rivers of the Neva basin – Pola, Tsna, Msta,

Kunya and Serezha (Kirillov and Nezdoliy, 2013a). Our data expands the list of rivers in Tver Oblast where brook trout are found.

The Western Dvina River flows through the territories of Russia, Belarus, Latvia and flows into the Gulf of Riga, the Baltic Sea. In Latvia, brook trout parasites were studied from the rivers Līčupe and Western Dvina, grayling parasites from the rivers Gauja and Venta and their tributaries (Kirjušina and Vismanis, 2007). *Argulus coregoni* was found in the Atlantic herring *Clupea harengus membras* L., 1758 (Actinopterygii: Clupeidae) in the Gulf of Riga (Kirjušina and Vismanis, 2007). Thus, this is the first find of *A. coregoni* in the Western Dvina basin, showing that this species is found on specific low abundant hosts in the upper reaches of small rivers and in conditions of pronounced flow where riffles alternate with shallow reaches in the river.

## Conclusion

The results obtained expand the range of the ectoparasitic crustacean *Argulus coregoni* in Eastern Europe since it is the first discovery of this species in the Western Dvina River basin. They also complement the data on brook trout *Salmo trutta* m. *fario*, previously known solely from the rivers Toropa and Mezha of the Western Dvina basin.

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