Report on two rare *Myostenostomum* species (Platyhelminthes: Catenulida) from the Volga River Basin

Сообщение о двух редких видах *Myostenostomum* (Platyhelminthes: Catenulida) из Волжского бассейна

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Two rare catenulid species, *Myostenostomum vanderlandi* Rogozin, 1992 and *M. bulbocaudatum* Luther, 1960, were found in reservoirs of the Volga-Kama Biosphere Reserve (Middle Volga Basin, Russia) during a survey of microturbellaria in 2013. Both the species were recorded for the first time in the fauna of the Volga Basin, while *M. vanderlandi*, previously known only from water bodies of South America, was first found in the Holarctic. The morphological characters and geographical distribution of the species are discussed.

При проведении исследований в 2013 году, в составе микротурбеллярий водоемов Волжско-Камского природного биосферного заповедника (бассейн Средней Волги, Россия) обнаружены две редкие катенулиды *Myostenostomum vanderlandi* Rogozin, 1992 и *M. bulbocaudatum* Luther, 1960. Оба вида впервые отмечены в фауне Волжского бассейна, при этом *M. vanderlandi,* ранее известный лишь из водоемов Южной Америки, впервые указывается для Голарктики. Обсуждаются особенности морфологии и географического распространения обнаруженных видов.

Key words: Republic of Tatarstan, Volga-Kama Biosphere Reserve, Lake Shatunikha, microturbellarians, *Myostenostomum bulbocaudatum, Myostenostomum vanderlandi*, new records

Ключевые слова: Татарстан, Волжско-Камский заповедник, озеро Шатуниха, микротурбеллярии, *Myostenostomum bulbocaudatum, Myostenostomum vanderlandi*, новые находки

INTRODUCTION

Catenulida is a group of freshwater (with few exceptions) microturbellarians (Platyhelminthes) which reproduce mainly by transverse fission of the body (paratomy) and form chains of two or more zooids. *Stenostomum* Schmidt, 1848 is the largest of the catenulid genera, including more than fifty known species (Noreña et al., 2005, Damborenea et al., 2011). In 1960, A. Luther described a new genus *Myostenostomum* for three species, *Myostenostomum tauricum* (Nasonov, 1923), *M. bulbocaudatum* Luther, 1960, and *M. fasciatum* (Vejdovsky, 1880). The main character of these species distinguishing them from *Stenostomum* is the presence of a muscular gut that is the thickening around the proximal part of the intestine formed by multilayered muscle fibers (Luther, 1960). Based on this character, eight species are currently placed into the genus *Myostenostomum*, and among them five are known from Europe: *M. bulbocaudatum*, *M. fasciatum*, *M. ilmenicum* Rogozin, 1992, *M. lutheri* Rogozin, 1992,

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and *M. lutetianum* (de Beauchamp, 1948). Two species, *M. vanderlandi* Rogozin, 1992 and *M. marcusi* Rogozin, 1992, are known from South America and one, *M. gigerium* (Kepner et Carter, 1931) is recorded for North America (Luther, 1960; Rogozin, 1992, 2012; Artois et al., 2013).

Two representatives of the genus, *M. ilmenicum* and *M. bulbocaudatum*, are known in the fresh waters of Russia in the southern Urals (Rogozin, 1992, 2012). Members of this genus can also be found in the Crimean Peninsula from which N.V. Nasonov (1924) described *M. tauricum*. However, it is difficult to judge to which species the Crimean specimens belong since the name *M. tauricum*, according to Rogozin (1992), should be considered as a nomen dubium.

In 2013, two species belonging to the genus *Myostenostomum*, *M. vanderlandi* and *M. bulbocaudatum*, were found during a survey of microturbellaria in reservoirs of the Volga-Kama State Natural Biosphere Reserve (the Middle Volga Basin, Russia). In this paper, we present the data on findings of these species and discuss their morphological characters and the geographical distribution.

MATERIAL AND METHODS

Specimens of the genus *Myostenostomum* were found on Sept. 12, 2013 in Lake Shatunikha (N55°55′44′′, E48°46′29′′), located in the vicinity of Belo-Bezvodnoye Setllm., in the guard zone of the Raifa cluster of the Volga-Kama State Natural Biosphere Reserve. The lake is a drainless basin of suffosive origin with a small area (1.2 ha) and a maximum depth of three m. The lake water belongs to the hydrocarbonate class of the calcium group of waters; the total hardness is characterised as soft. The active reaction of the medium is close to neutral. The quality of water corresponds to the category of "slightly polluted waters" (Unkovskaya et al., 2002). The lake shores in the western and north-western parts are flat and open, used as lands for grazing and a cattle watering place. The opposite shores are covered with trees and bushes; vegetation of the coastal strip is represented here by reedmace (*Typha* sp.).

Microturbellarians were collected manually by washing from aquatic plants growing near the lake shores. Worms were transported to the laboratory, where they were studied under the microscope LOMO MIC-MED–5. Worms were photographed using the ToupTek UCMOS05100KPA C-mount camera. Species identification was carried out on alive specimens using the taxonomic diagnoses of A. Luther (Luther, 1960) and A.G. Rogozin (Rogozin, 1992).

RESULTS

Class **CATENULIDA**

Family **STENOSTOMIDAE**

Genus ***Myostenostomum*** Luther, 1960

Myostenostomum vanderlandi
Rogozin, 1992
(Fig. 1A–D)

Material examined. **Russia**: *Republic of Tatarstan*, Volga-Kama Reserve, Middle Volga Basin, Lake Shatunikha, on coastal vegetation, 12.IX.2013, S.V. Berdnik, R.P. Tokinova leg., one specimen studied alive (11 photos, 2 videos).

Remarks. The first representatives of this species were found by the Dutch zoologist Jacob van der Land in the vicinity of Paramaribo (Suriname, South America) during research on freshwater meiobenthos (Land, 1970). In his paper, the author figured the habitus of *Myostenostomum* sp. but refrained from giving a name to a poorly examined species. The name for the new species and its description was given after a quarter of a century by another researcher. A.G. Rogozin, studying the microturbellarians in the southern Urals, conducted a brief revision of the genus *Myostenostomum* and described the worm depicted in the figure of van der Land as a new species, *M. vanderlandi* (Rogozin, 1992).

Description. The studied specimen without the genital system and consisting of two

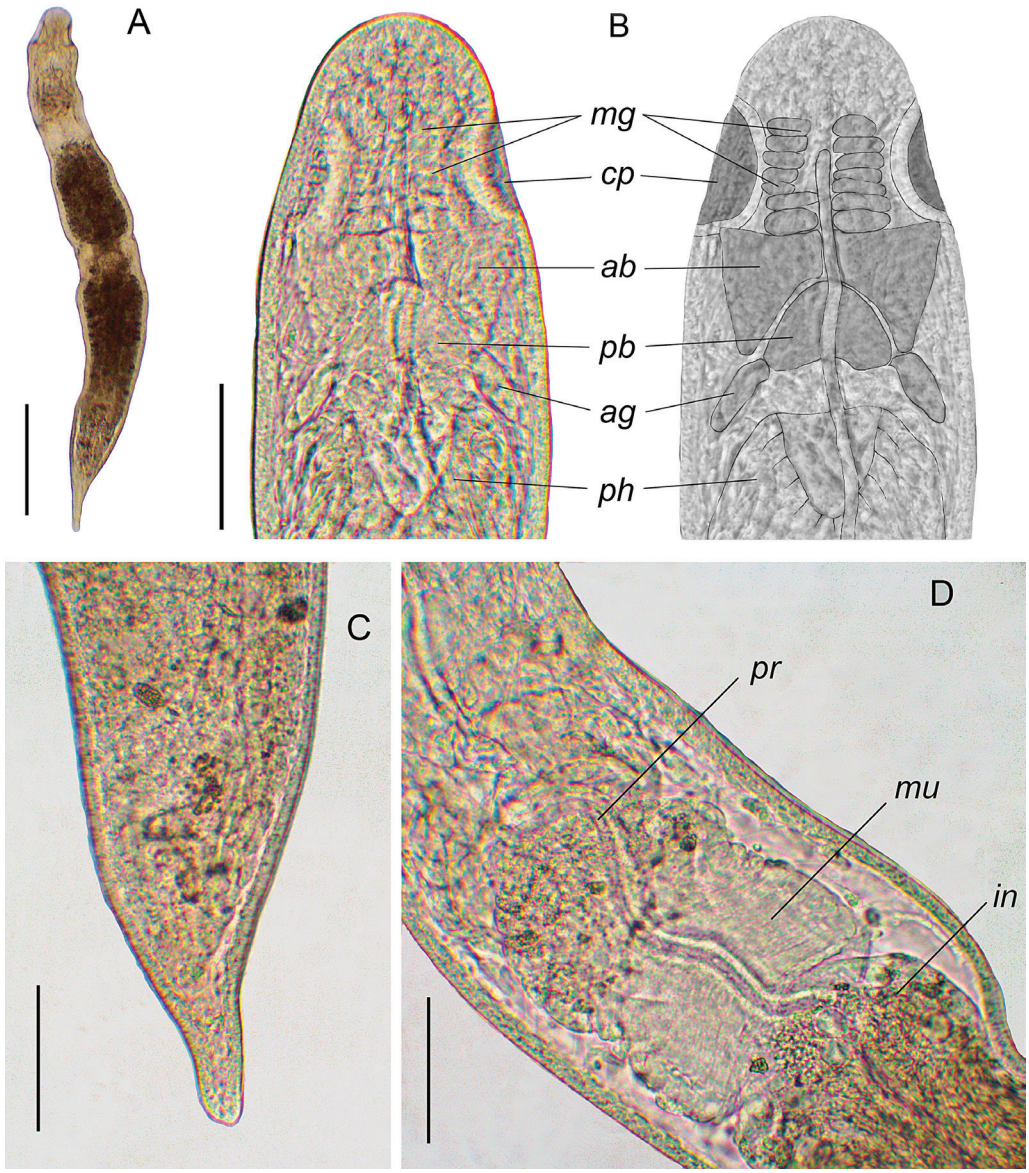

Fig. 1. *Myostenostomum vanderlandi* Rogozin, 1992. **A**, habitus of alive specimen; **B**, anterior end of body (arrangement of brain lobes is shown on the right); **C**, posterior end of body; **D**, muscular gut region. For abbreviations see text. Scale bars: 200 μm (A), 50 μm (B, C, D).

zooids. By the main structural features, it is similar to van der Land's figure of *Myostenostomum* sp. in thin and vermiformly elongated body with caudal appendage. Body colouration light brown, except for colourless muscular gut. Body length reaching 1.3 mm in motion, while tail length 65 μm (Fig. 1A, 1C). Ciliated pits (*cp*) 35 μm in width. Muscular gut [or 'Muskeldarm' by Luther (1960)] (Fig. 1D) well developed, 45 μm long in anterior zooid and not yet formed in posterior zooid.

Pharynx (*ph*) well separated from anterior part of intestine (*i*) ['Darm' by Luther

(1960)], 60 μm in length. Protonephridium (*pr*) terminating in nephridiopore on tail base. According to Rogozin (1992), the brain structure is the most reliable feature for the recognition of the *Myostenostomum* species. Brain in studied specimen generally corresponding to structure of *M. vanderlandi* brain (Fig. 1B). Divided anterior lobes (*ab*) of trapezoidal shape; seven metameric ganglia (*mg*) in lateral chains adjoining to them anteriorly. Posterior lobes shaped like unpaired triangular ganglia (*pb*) with apex directed anteriad and adjoining to anterior lobes. Small elongated additional ganglia (*ag*) adjoining to lateral angles of posterior ganglia. Refractile bodies absent.

Distribution. Republic of Suriname (Land, 1970), Russia [Republic of Tatarstan, Volga-Kama Biosphere Reserve (**new record**)].

Myostenostomum bulbocaudatum
Luther, 1960
(Fig. 2A–E)

Material examined. **Russia**: *Republic of Tatarstan*, Volga-Kama Reserve, Middle Volga Basin, Lake Shatunikha, on coastal vegetation, 12.IX.2013, S.V. Berdnik, R.P. Tokinova leg., two specimens studied alive (25 photos, 4 videos).

Description. Both the examined specimens without the genital system and consist of two zooids. Length of worms in motion reaching 1.5 mm (specimen 1) and 2.0 mm (specimen 2). Colour light brown, excepting colourless muscular gut (Fig. 2A, 2B). Body of cylindrical shape, somewhat narrowed and rounded at anterior end. Posteriorly body ends with dorsal caudal appendage of 65 (specimen 1) to 200 (specimen 2) μm long. Tail narrowing distally, with base conically widened (Fig. 2C, 2D). In

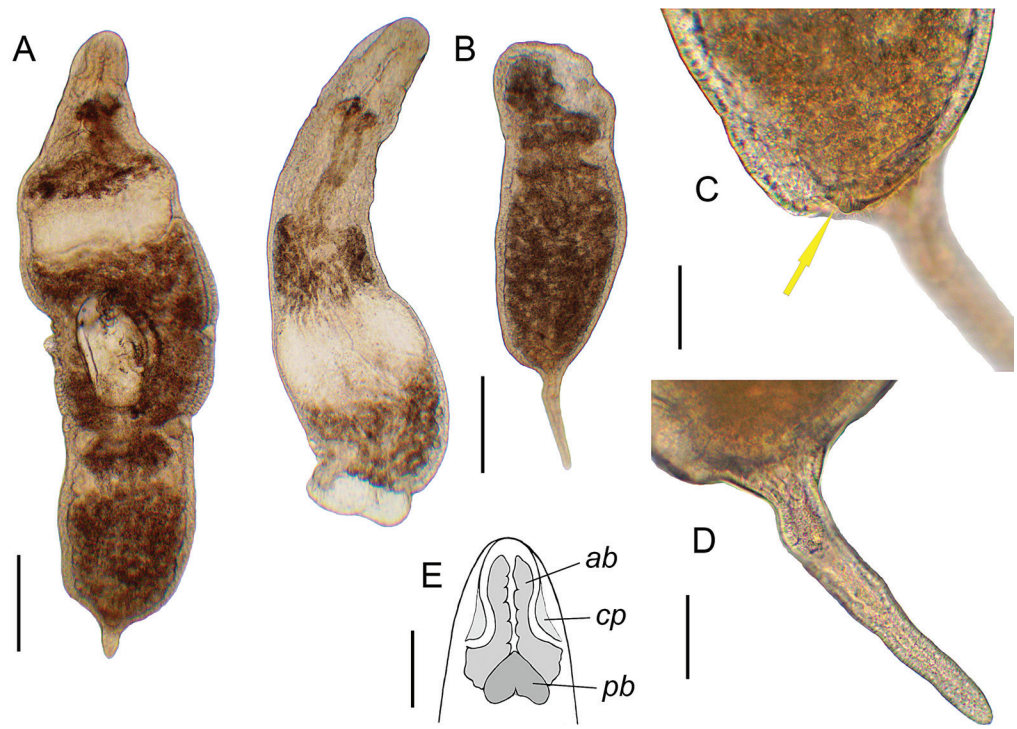

Fig. 2. *Myostenostomum bulbocaudatum* Luther, 1960. **A**, habitus of alive specimen 1; **B**, divided alive specimen 2; **C**, **D**, posterior end of body with ventral protuberance [indicated by arrow] (C) and dorsal caudal appendage (D); **E**, scheme of brain structure. For abbreviations see text. Scale bars: 200 μm (A, B), 50 μm (C, D), 100 μm (E).

specimen 2, ventral surface of body inferiorly base of tail with small protuberance indicating second small tail. Muscular gut most powerfully developed in anterior zooids, its length reaching 140 μm (specimen 1) and 250 μm (specimen 2), whereas it looking like narrow ring in posterior zooids. Ciliated pits large, 80 μm (specimen 1) and 110 μm (specimen 2) in length, lying dorsolaterally on anterior end of body. Mouth opening rounded, with folded margins. Pharynx well developed, cone-shaped. Short anterior part of intestine better developed in specimen 2. Anterior brain lobes (*ab*) dentate and adjacent to ciliated pits (*cp*). Posterior lobes and transverse cerebral commissure fused, forming arcuate ganglion (*pb*) with vertex directed anteriad and adjacent to anterior lobes (Fig. 2E). Refractile bodies absent.

Anomopods from the family Chydoridae (Crustacea: Branchiopoda: Cladocera) was found in the intestine of worms.

Distribution. Southern Finland (Luther, 1960); Russia [Chelyabinsk Prov., Lake Baraus (Rogozin, 2012); Republic of Tatarstan, Volga-Kama Biosphere Reserve, Lake Shatunikha **(new record)**].

DISCUSSION

The catenulids species *M. vanderlandi* and *M. bulbocaudatum* found in the Volga-Kama Reserve (Lake Shatunikha) were recorded for the first time in the fauna of the Volga River Basin. *M. vanderlandi*, previously recorded only once from Suriname (the Atlantic coast of South America), was first found in the Holarctic. Any species common for two or more zoographical regions were previously unknown among the *Myostenostomum*. The remoteness of the newly identified species population from the former natural habitat of *M. vanderlandi* can be explained by the poverty and geographical heterogeneity of knowledge about the microturbellarians taxonomic diversity in the world. We also do not exclude the possibility that another species morphologically resembling to *M. vanderlandi* can hide under the form from Lake Shatunikha. This can be concluded, for example, from the following characters. Our specimen has seven pairs of metameric ganglia instead of five to six pairs of ganglia in the figure of van der Land; the anterior paired lobes have a trapezoidal shape instead of an elongated oval-triangular shape. Unfortunately, it is difficult to judge whether the revealed differences fit the range of intraspecific variability of *M. vanderlandi* brain structures because the only one specimen is available. As for another species, all the listed morphological features clearly indicate that the studied worms belong to *M. bulbocaudatum* described by Luther (1960) from Southern Finland. We consider it is possible to comment the recent new record of *M. bulbocaudatum* for Ukraine by Kanana (2016). Apparently, the species identification in this paper is dubious by reason of the presence in the brain of the Ukrainian specimens of two anterior chains with ten metameric ganglia which are actually absent in *M. bulbocaudatum*. This feature in the structure of the brain, as well as the presence of the caudal appendage, brings these specimens closer to *M. vanderlandi*. However, the available data are not sufficient to identify it exactly with any known representative of *Myostenostomum*. Therefore, obtaining sufficient amount of material for comparison and searching for the most informative criteria for the reliable recognition of *Myostenostomum* species are important tasks. Molecular techniques can prove to be extremely promising tools to overcome taxonomic problems in the recognition of *Myostenostomum*.

ACKNOWLEDGMENTS

We would like to thank A.G. Rogozin for his support with the identification of species.

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Received 2 May 2017 / Accepted 5 Dec. 2017
Editorial responsibility: D.A. Gapon