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BRIEF COMMUNICATIONS

Species Diversity of the Leech Fauna (Annelida, Clitellata, and Hirudinea) of Lake Narach (Republic of Belarus)

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Abstract—In this paper, we report on the species diversity of leeches in Lake Narach, the largest lake in Belarus, where a faunistic complex consisting of 21 free-living and parasitic leech species belonging to 2 orders, 5 families and 10 genera has been discovered. Four leech species, including two potentially new ones (*Alboglossiphonia hyalina*, *Erpobdella* sp., *Glossiphonia nebulosa*, and *Glossiphonia* sp.), are first recorded in Belarus.

Keywords: Belarus, Viliya River basin, Lake Narach, Hirudinea, species diversity, faunistic finds, relative species abundance, species occurrence

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INTRODUCTION

The conception of biodiversity underlies the entire complex of biological sciences, in particular, the ecology of fresh waters. The current state of the leech fauna of the European north is still poorly understood, in contrast to the fauna of the central and southern parts. Information about the hirudofauna of Belarus, a significant part of which geographically belongs to the European north, is scarce, and for lake systems they are reduced mainly to three literary sources (Lukin, 1956; Shalapenok, 2003; Moroz and Kormaz, 2005).

Lake Narach is located in the northwest of Belarus (Minsk Region) in the basin of the Viliya River (Fig. 1). Narach is the largest lake in the country; it is part of the eponymous a group of 14 lakes (other large ones being Myastro and Batorino). The Narach lake system was formed ~11 000 years ago after the Pleistocene glaciation. Lake Narach is located at an altitude of 165 m above sea level. The surface area of the reservoir is 79.6 km^2, the coastline is ~40 km, the maximum length is 12.8 km, the maximum depth is 24.8 m, the average depth is 8.9 m, and the volume is 710 million m^3 (Adamovich et al., 2016; Zhukova et al., 2017). The catchment area reaches 279 km^2. Sixteen rivers and streams flow into the lake; in addition to them, the Skema duct flows from the eastern side, originating from Lake Myastro, and only the Narach River, a tributary of Viviya, flows from the southeast (Fig. 1).

Lake Narach, being a typical representative of the nature of the Belarusian north—the Belarusian Lakeland—serves as a haven for a large number of potential hosts for leeches, including 25 species of fish and many waterfowls, including the mute swan, little tern, and little grebe, which are protected at the state level (*Krasnaya ...*, 1994).

Hydroecological research on Lake Narach began in 1946 from the moment the biological station of the Belarusian State University was founded, and year-round monitoring of macrozoobenthos has been carried out since 1997 according to a single scheme at different depths (Makarevich, 2019). Compared to other lakes, a higher taxonomic richness of benthic and phytophilic invertebrates (373 taxa from 26 systematic groups) was revealed here, which is explained by the presence of a wide variety of biocenoses, as well as the increased attention of specialists to this reservoir (Makarevich, 2019).

Although the structural organization of the bottom communities of the lake belongs to the chironomid type (Makarevich, 2019), annelids play an equally significant role here, sometimes reaching an abundance and biomass of >40 and 30%, respectively (Baturina et al., 2018). At present, data on the species composition of the oligochaetes of Lake Narach have been obtained (Baturina et al., 2020), while the species diversity of leeches remains insufficiently studied. However, targeted studies of annelid communities can provide additional information about the structure of macrozoobenthos and the state of the aquatic ecosystem as a whole, as well as assess its prospects in the current period of global changes.

This article is devoted to the hirudofauna of Lake Narach. With this study, the authors continue a series

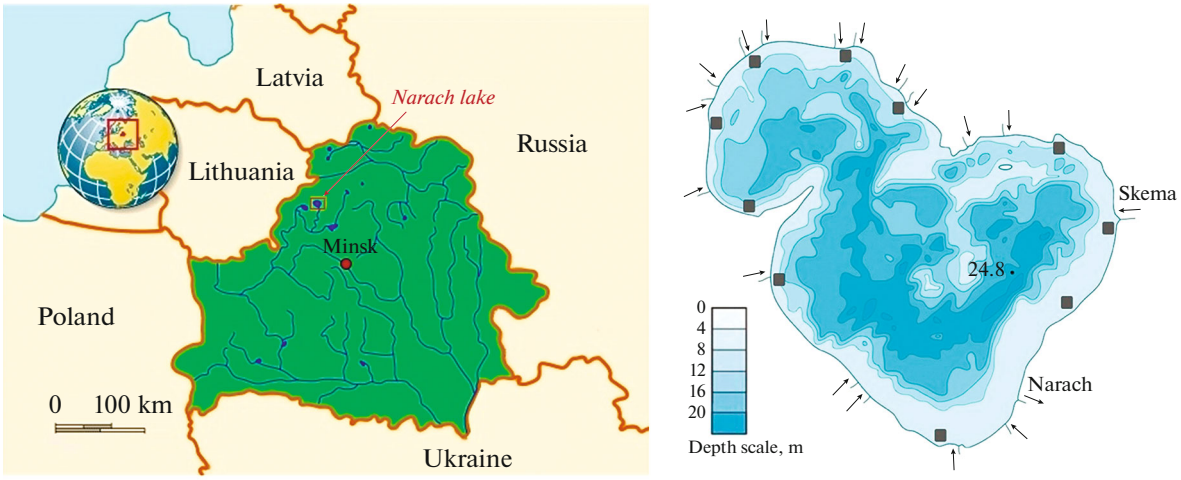

Fig. 1. The geographical position of the Narach lakes is shown by the red arrow (left). The relief of the bottom of Lake Narach with an indication of the deepest point, tributaries, and runoff (T. Bladynets, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=70761739) and ten sampling points of leeches (right) are given.

of studies aimed at filling the gap in knowledge about the biodiversity of annelids in this lake.

Special faunistic collections of leeches were carried out along the coastline of Lake Narach in June 2018. Samples of biological material were taken at depths from the water's edge to 0.8 m, mainly in thickets of higher aquatic vegetation (bulrush, elodea, telorez, hornwort, and pondweed). A hydrobiological scraper (Zinchenko et al., 2014) was used for sampling on soft and gravel substrates the trawling distance was ~1 m, and the material was also collected manually from macrophytes and hard objects submerged in water—stones, snags, tree trunks, etc. A total of 29 samples were taken from ten points along the coastline of the lake (Fig. 1). Biological material was fixed with 80% ethanol. In addition, the authors used a collection of leeches fixed with 4% formalin taken from quantitative samples of zoobenthos collected by employees of the Belarusian State University in different years (1997, 1998, 2002, 2004, 2005, and 2009) during hydrobiological observations on Lake Narach.

Morphological analysis of the samples was performed using a LOMO MSP-2 var. 2. Although leech species were identified using available taxonomic keys (Lukin, 1976; Nesemann and Neubert, 1999), all taxa names are given in accordance with the current classification system (https://www.itis.gov). The material is deposited in the collection of the Limnological Institute of the Siberian Branch of the Russian Academy of Sciences (Irkutsk, Russia). The quantitative characteristics of the fauna are calculated based on the materials obtained in 2018.

As a result, the modern species list of leeches from Lake Narach is significantly expanded when compared to previously obtained data (Shalapenok, 2003). At present, 21 species belonging to two orders have been identified. Jawless leeches (Rhynchobdellida) are represented by 14 species belonging to two families—Glossiphoniidae and Piscicolidae. Among gnathic or jaw leeches (Arhynchobdellida), seven species representing three families Erpobdellidae, Haemopidae, and Hirudinidae were found. The summary list of species includes representatives of ten Hirudinea genera. A species from the genus *Hirudo* was first identified in Lake Narach.

Below is a taxonomic list of leech species found in Lake Narach.

Order **Rhynchobdellida** Blanchard, 1894
Family **Glossiphoniidae** Vaillant, 1890
Genus ***Alboglossiphonia*** Lukin, 1976
1. *A. heteroclita* (Linnaeus, 1761)
2. *A. hyalina* (Müller, 1774)
Genus ***Glossiphonia*** Johnson, 1817
3. *G. nebulosa* Kalbe, 1964
4. *G. complanata* (Linnaeus, 1758)
5. *G. concolor* (Aphathy, 1888)
6. *G. verrucata* (Müller, 1844)
7. *Glossiphonia* sp.
8. *G. paludosa* (Carena, 1824)
Genus ***Hemiclepsis*** Vejdovský, 1884
9. *H. marginata* (Müller, 1774)
Genus ***Helobdella*** Blanchard, 1896
10. *H. stagnalis* (L., 1758)
Genus ***Placobdella*** Blanchard, 1893
11. *P. costata* (Müller, 1846)
Genus ***Theromyzon*** Philippi, 1867
12. *T. maculosum* (Rathke, 1862)
13. *T. tessulatum* (Müller, 1774)
Family **Piscicolidae** (Johnston, 1865)
Genus ***Piscicola*** de Blainville, 1818

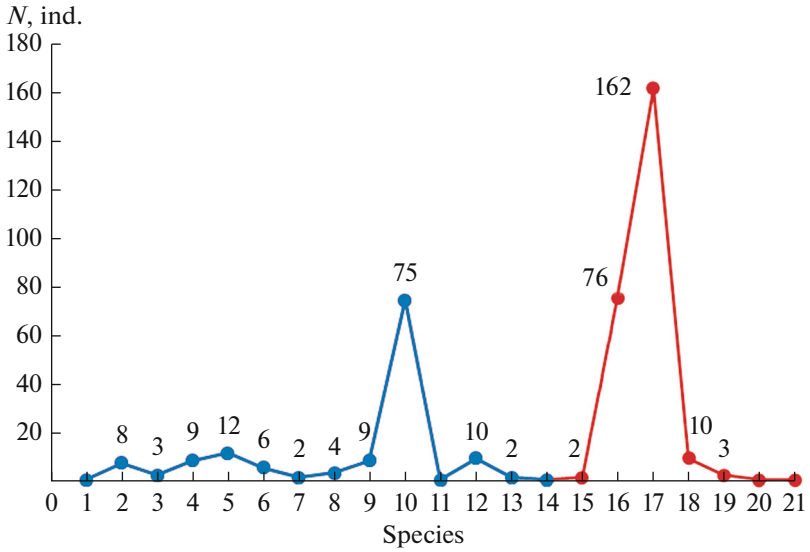

Fig. 2. Ratio of the number of individuals (N) of different species of leeches from Lake Narach. The numbering of the species corresponds to the taxonomic list presented in the text: nos. 1–14, Rhynchobdellida and nos. 15–21, Arhynchobdellida. Species 1, 11, 14, 20 and 21 are occasional.

14. *P. geometra* L., 1761

Order **Arhynchobdellida** Blanchard, 1894

Family **Erpobdellidae** Blanchard, 1894

Genus ***Erpobdella*** de Blainville, 1818

15. *E. monostriata* (Lindenfeld et Pietruszynski, 1890)

16. *E. nigricollis* (Brandes, 1900)

17. *E. octoculata* (L., 1758)

18. *E. testacea* (Savigny, 1822)

19. *Erpobdella* sp.

Family **Haemopidae** Richardson, 1969

Genus ***Haemopis*** Savigny, 1822

20. *H. sanguisuga* (L., 1758)

Family **Hirudinidae** Whitman, 1886

Genus ***Hirudo*** L., 1758

21. *H. medicinalis* L., 1758

Despite the higher taxonomic diversity of jawless leeches (14 species), their occurrence in Lake Narach is not that high. Quantitatively, rhynchobdellidids and archinchobdellidids account for 36 and 64% of the total number of leeches, respectively (Fig. 2). The most numerous are the predatory species *Helobdella stagnalis* (Fig. 2: no. 10) and two nonparasitic (macrophagous) species *Erpobdella nigricollis* (Fig. 2: no. 16) and *E. octoculata* (Fig. 2: no. 17), which in total reach 79% in our collection; the occurrence of other species is much lower. Single finds of *Alboglossiphonia heteroclita*, *Placobdella costata*, *Piscicola geometra*, *Haemopis sanguisuga*, and *Hirudo medicinalis* indicate a significant sparseness of leech populations in Lake Narach, which is not surprising, considering their lifestyle and ecological relationships. These species belong to large leeches that parasitize vertebrates (*Placobdella costata* and *Hirudo medicinalis*) or lead a predatory lifestyle, sucking the whole prey (*Haemopis sanguisuga*). The small fish leeches *Piscicola geometra* are difficult to detect outside the spawning period of their hosts. The low abundance and rare occurrence of the small flat leech *Alboglossiphonia heteroclita* seems to be associated with ecological suppression (oppression) by the sister species *A. hyalina* due to their indirect competition for a similar ecological niche.

The presence of a faunistic complex consisting of 12 species in Lake Narach (*Alboglossiphonia heteroclita, Glossiphonia companata, G. concolor, Hemiclepsis marginata*, *Helobdella stagnalis, Theromyzon maculosum, T. tessulatum, Piscicola geometra, Erpobdella octoculata, E. nigricollis, E. testacea,* and *Haemopis sanguisuga*), previously mentioned by Shalapenok (2003), was confirmed by our study. *Alboglossiphonia hyalina, Glossiphonia nebulosa, G. paludosa, G. verrucata, Placobdella costata, Erpobdella monostriata,* and *Hirudo medicinalis* have been recorded in the region for the first time. The species *Glossiphonia nebulosa* is more common in flowing water bodies (Nesemann and Neubert, 1999); despite this, its presence in Lake Narach is not accidental. The habitats of *G. nebulosa* are located in the zone of influence of tributaries, such as the Skema River, which flows into the lake in the east, and small tributaries in the north of the lake (Fig. 1). In addition, specimens of *Glossiphonia* sp. and *Erpobdella* sp., whose morphological features are different from currently known species, are found. With a high of probability, these forms are potentially new species. At the same time, the species *Dina lineata* (Müller, 1774) was not found in the studied collections, although it was reported earlier in the lake (Shalape-

nok, 2003). We do not exclude a misidentification in this case, since the author took as diagnostic features the presence of dark stripes on the dorsal side and the position of the eyes, i.e., characters that vary most in erpobdellids. This conclusion is confirmed by data of the Museum of Natural History (Berlin, Germany), according to which *D. lineata* is absent in Belarus (website: https://fauna-eu.org, accessed April 14, 2021).

Thus, the updated list of the hirudofauna of Lake Narach is represented by 21 species. This diversity includes nine species of leeches first found in Lake Narach, two of which (*Placobdella costata* and *Glossiphonia verrucata*) were previously found in lakes of the Berezinsky Reserve, Belarus (Moroz and Kormaz, 2005), and one (*Hirudo medicinalis*) was recently found in the Neman River (Moroz and Lipinskaya, 2017). Consequently, four species, including two morphotypes new to science (*Alboglossiphonia hyalina, Glossiphonia nebulosa, Glossiphonia* sp., and *Erpobdella* sp.), were first recorded in Belarus.

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ADDITIONAL INFORMATION

The information underlying this article is part of a dataset available through GBIF.org starting from November 9, 2020. https://doi.org/10.15468/4ajykm.

COMPLIANCE WITH ETHICAL STANDARDS

Conflict of interest. The authors declare that they have no conflicts 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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