

Rapid Communication**First record of the brown bullhead *Ameiurus nebulosus* (Lesueur, 1819) in the Neman River basin in Belarus**

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OPEN ACCESS**Abstract**

The brown bullhead *Ameiurus nebulosus* (Lesueur, 1819) is recorded for the first time in the Neman river basin in Belarus. In August 2021, 41 specimens were caught in closed reservoir of the Novodvorka River (Novy Dvor village, Shchuchyn district, Grodno region), and 2 specimens were caught from closed reservoir of the Livanka River (Zasulye village, Stolbtsy district, Minsk region). Both rivers belong to the Neman river basin. In our opinion, the main reason for the origin of brown bullhead in the studied reservoirs is associated with intentional release in nature by anglers.

Key words: invasive alien species, Ictaluridae, spread, intentional release, human introduction

Introduction

The brown bullhead *Ameiurus nebulosus* (Lesueur, 1819) is a small catfish, of the family Ictaluridae (Ictaluridae: Siluriformes) (Scott and Crossman 1973). The native range of the brown bullhead is the eastern part of North America. It is successfully established in France (Vivier 1951), Germany (Schindler 1957), Poland (Nowak et al. 2008), the Czech Republic (Lhotský 1995), Hungary (Harka and Pintér 1990), Slovakia (Balon 1966; Koščo et al. 2010; Rutkayová et al. 2013), Ukraine (Ivlev and Protasov 1948). This species is found in lakes, ponds, oxbows, reservoir meliorative canals characterized by dense aquatic vegetation and a muddy bottom. The brown bullhead is a benthic fish and can tolerate low oxygen levels and high water temperatures. This species has been found in Belarus since the end of the 19th century, when it was intentionally introduced into the lakes and ponds of the Malorita region of western Belarus (Makushok 1951). Our previous studies have revealed the widespread distribution of brown bullhead in most areas of the Brest region (Okhremenko and Gajduchenko 2021).

The spread of this species further north from its initial invasion point was noted by Rizevsky and Ermolaeva (2012). Until now, no brown bullhead have been found within the Grodno region. Therefore, any information regarding the research object location, distribution, biology, and ecology in



Figure 1. Sampling sites of *Ameiurus nebulosus*: the initial introduction (shaded green), the Neman River basin shaded blue, red dots – specimens found, white dots – not found.

the aquatic ecosystems of Belarus would make a significant contribution to the understanding of this species outside its natural range.

This article provides information on new records of brown bullhead beyond of the initial intentional introduction.

Materials and methods

In August 2021, water bodies of the Neman River basin were monitored. The brown bullhead was recorded only in two reservoirs of 20 studied. We caught 41 specimens of brown bullhead in the closed reservoir of the Novy Dvor village (53.815266; 24.566339), Grodno region, and 2 specimens in the closed reservoir of the village of Zasulye (53.584707; 26.837159), Minsk region (Figure 1).

Fish were collected using an umbrella-type traps (for crayfish) with a mesh size of 0.5 mm, placed near the coast, at depth of 1.5 m. The brown bullhead specimens were caught in traps mainly at night. We analyzed a total of 29 morphometric and 5 meristic characters. Table 1 shows the main characters with the highest and lowest standard deviation. Morphometric data were expressed as a percentage of the length of the entire fish or the length of the head. The age of the individuals was determined by the growth rings on the vertebrae (Chugunova 1959).

Results

Our morphometric data of brown bullhead is significantly lower than that of other authors for the non-native range (Table 1).

All specimens identified as brown bullheads based on the sharply serrated posterior edges of the pectoral fins (Figure 2). Specimens caught in the reservoir

Table 1. Morphometric characters of brown bullheads from the closed reservoir of Novy Dvor village and Zasulye village.

Morphometrics	reservoir of Novy Dvor village (n = 31 for age group 1+, n = 10 for 2+)					reservoir of Zasulye village (n = 1 for age group 1+, n = 1 for 2+)	
	mean	SE	min	max	SD	data	
Total length (mm)	<u>115.50</u>	<u>1.52</u>	<u>92.98</u>	<u>133.87</u>	<u>8.44</u>	<u>106.45</u>	
	129.60	1.21	125.30	136.74	3.82	135.70	
Standart length (mm)	<u>93.98</u>	<u>1.36</u>	<u>68.65</u>	<u>107.11</u>	<u>7.59</u>	<u>89.07</u>	
	107.81	0.71	104.2	112.25	2.25	106.00	
Body weight (g)	<u>16.29</u>	<u>0.49</u>	<u>11.81</u>	<u>24.55</u>	<u>2.76</u>	<u>8.79</u>	
	21.97	1.38	18.32	30.07	4.37	15.92	
<i>in % of SL</i>							
Minimum	<u>10.96</u>	<u>0.25</u>	<u>8.28</u>	<u>14.58</u>	<u>1.38</u>	<u>8.72</u>	
body depth	9.96	0.38	8.71	12.17	1.21	9.58	
Minimum	<u>4.24</u>	<u>0.14</u>	<u>2.45</u>	<u>5.92</u>	<u>0.76</u>	<u>2.35</u>	
body width	4.01	0.42	1.62	5.37	1.34	4.18	
V - A distance	<u>15.53</u>	<u>0.33</u>	<u>12.26</u>	<u>19.59</u>	<u>1.82</u>	<u>15.52</u>	
	14.38	0.62	11.53	17.93	1.96	17.27	
Dorsal fin length	<u>21.76</u>	<u>0.66</u>	<u>9.31</u>	<u>28.49</u>	<u>3.66</u>	<u>15.15</u>	
	22.42	0.88	18.23	26.30	2.77	20.11	
Ventral fin depth	<u>15.11</u>	<u>0.33</u>	<u>9.93</u>	<u>19.56</u>	<u>1.86</u>	<u>14.45</u>	
	15.42	0.62	11.99	17.57	1.95	14.76	
<i>in % of HL</i>							
Head width	<u>69.68</u>	<u>0.99</u>	<u>55.46</u>	<u>80.00</u>	<u>5.54</u>	<u>67.75</u>	
	73.51	2.19	64.20	82.26	6.94	72.57	
Preorbital distance	<u>46.05</u>	<u>2.69</u>	<u>23.67</u>	<u>70.07</u>	<u>14.95</u>	<u>29.00</u>	
	56.02	5.24	37.31	78.17	16.58	34.81	
Postorbital distance	<u>50.45</u>	<u>0.67</u>	<u>43.64</u>	<u>55.86</u>	<u>3.75</u>	<u>50.43</u>	
	52.68	3.88	41.35	83.25	12.28	48.47	
Head depth	<u>51.25</u>	<u>0.70</u>	<u>44.90</u>	<u>61.26</u>	<u>3.92</u>	<u>45.94</u>	
	58.14	3.05	47.79	71.12	9.63	46.86	
Interorbital distance	<u>43.89</u>	<u>0.85</u>	<u>35.32</u>	<u>56.92</u>	<u>4.72</u>	<u>42.19</u>	
	52.64	2.23	45.01	68.29	7.05	47.65	

Note: SE – standart error, SD – standart deviation, TL – total length, SL – standart length, HL – head length, V – ventral fin, A – anal fin, above line – age 1+, under line – age 2+.

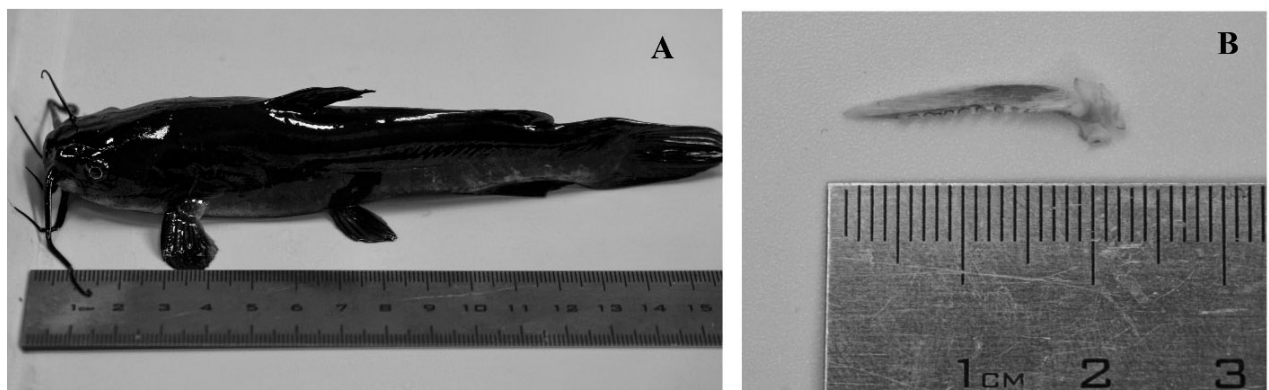


Figure 2. Brown bullhead specimens collected in the reservoir of Novy Dvor. Detail of an adult specimen (A); pectoral fin ray (B). Photographs by Helen Gajduchenko.

Novy Dvor village has a wider range of the number of rays in the dorsal, pectoral, ventral and anal fins compared to specimens from their native range and in the number of rays in the dorsal and ventral fin compared to the non-native range. The meristic characters of specimens from the reservoir Zasulye village fall within the range of variations in the number of rays in the fins for both the native and non-native ranges and have a wider range only in the number of rays in the caudal fin (Table 2). Furthermore, individuals from their native range has a broader range of the number rays in the anal fin.

Table 2. Meristic characters of brown bullheads from the closed reservoir of Novy Dvor village and Zasulye village.

Region		D	P	V	A	C	References
Native range	North America	I 6–7	I 8	8	21–24	18–19	(Scott and Crossman 1973)
Non-native range	Czech Republic	I 6	I 7–8	8–9	18–22	17–19	(Rutkayová et al. 2013)
	Ukraine, Transcarpathian region	I 6–7	I 7–9	–	18–22	–	(Movchan 2014)
	closed reservoir of the Novy Dvor village n = 41	I 6–8	I 7–8	7–8	19–22	18–19	Our data
	closed reservoir of Zasulye village n = 2	I 7	I 7–8	8	21	19–20	Our data

Number of rays in: D – dorsal fin; P – pectoral fin; V – ventral fin; A – anal fin; C – caudal fin.

Discussion

Information on the invasion history of brown bullhead was presented by Rutkayová et al. (2013). Until this time, no brown bullhead has been found in the Neman river basin (Fish Base 2023). It is also known, that the spread of brown bullhead can go through canals between lakes and other river systems. However we caught the brown bullhead specimens in closed reservoirs that have no connection with the Pripyat River basin and the Bug River basin, where the species was previously confirmed to exist. Therefore, we assume that the appearance of brown bullhead in these water bodies is associated with human introduction (intentional release, use of live bait, etc.). Probably a risk of spread of this species in the Belarusian part of the Neman River basin and outside Belarus is exists.

The brown bullhead is a well-adapted species for widespread dispersal and rapid colonization of new areas. Taking into account the high rate of spread of brown bullhead in Belarus (Okhremenko and Gajduchenko 2021) we can predict its further expansion into the Neman River basin in the next few years.

The continuation of the spread of this species is extremely undesirable, due to the rapid increase of this species abundance when it established in a new water body, and the difficulty to predict the results of invasion. It is known that the brown bullhead is characterized by rapid adaptation to new environment, increasing of population size for short time and competition with native fish species (Mieczan et al. 2022). At the same time, this species has no natural enemies among native fish species due to its sharp spines in the dorsal and pectoral fins. The brown bullhead is a host of parasites that can cause new diseases in native fish species (Grabowska et al. 2010). Also the brown bullhead quickly becomes the dominant component of the fish community in some water bodies due to predation on the eggs of native fish species (Kornijów 2001; Kornijów et al. 2003; Rechulicz and Plaska 2018). However, it does not reach large sizes in the reservoirs of its non-native range. In Florida waters it reaches a length more than 50 cm and weight of up to 3 kg (Scott and Crossman 1973), while in Central Europe the average size of this species is 20–25 cm and a weight of 250 g (Kapusta et al. 2010).

We continue further studies on the spread of the brown bullhead on the territory of Belarus to monitor and assess the impact of this invasive alien species on the local ichthyofauna.

Furthermore, in order to mitigate the widespread dissemination of brown bullhead in new water bodies in Belarus, we actively engage with local community. This involves notifying of nature conservation authorities, design and installation of informative signage regarding alien and invasive alien species along with their impacts on native species in proximity to water reservoirs, and maintaining a dialog with local fishermen. The containment of the brown bullhead expansion can only be achieved through the collaborative efforts involving government authorities, researchers and local community.

Authors' contribution

HG – research conceptualization; HG, YO – sample design and methodology; HG, YO – investigation and data collection; HG, YO – data analysis and interpretation; HG, YO – ethics approval; YO – funding provision; YO – roles/writing – original draft; HG, YO – writing – review and editing.

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References

- Balon E (1966) Ryby Slovenska. Obzor, Bratislava, 413 pp
- Chugunova NI (1959) Rukovodstvo po izucheniyu rosta i vozrasta ryb [Guidelines for the study of the age and growth of fish]. Publishing house Academia Sciences of the USSR, Minsk, 164 pp [in Russian]
- Grabowska J, Kotusz J, Witkowski A (2010) Alien invasive fish species in Polish waters: an overview. *Folia Zoologica* 59: 73–85, <https://doi.org/10.25225/fozo.v59.i1.a1.2010>
- Harka Á, Pintér K (1990) Systematic status of Hungarian bullhead pout: *Ictalurus nebulosus panmonicus* ssp. n. *Tiscia* 25: 65–73
- Ivlev VS, Protasov AA (1948) Amerikanskiy som v ozeroakh Volynskoy oblasti [American catfish in the lakes of Volyn region]. *Priroda* 8: 67–68 [in Russian]
- Kapusta A, Morzuch J, Partyka K, Bogacka-Kapusta E (2010) First record of brown bullhead, *Ameiurus nebulosus* (Lesueur), in the Łyna River drainage basin (northeast Poland). *Fisheries & Aquatic Life* 18: 261–265, <https://doi.org/10.2478/v10086-010-0030-z>
- Kornijów R (2001) Reasons for successful colonisation of Polish fresh waters by brown bullhead, *Ictalurus nebulosus* Le Sueur, 1819. *Przegląd Zoologiczny* 55:113–119
- Kornijów R, Rechulicz J, Halkiewicz A (2003) Brown bullhead (*Ictalurus nebulosus* Le Sueur) in ichthyofauna of several Polesie lakes differing in trophic status. *Acta Scientiarum Polonorum. Piscaria* 2: 131–140
- Koščo J, Košuthová L, Košuth P, Pekárik L (2010) Non-native fish species in Slovak waters: origins and present status. *Biologia* 65: 1057–1063, <https://doi.org/10.2478/s11756-010-0114-7>
- Lhotský O (1995) Pět století rybníčního hospodářství v Třeboni. Carpio. Třeboň, 212 pp
- Makushok ME (1951) Karlikovyy somik, yego khozyaystvennoye znachenie i biologicheskiye osobennosti [The brown bullhead: its economic significance and biological traits]. Academia Nauk BSSR Press, Minsk 64 pp [in Russian]

- Mieczan T, Płaska W, Adamczuk M, Toporowska M, Bartkowska A (2022) Effects of the invasive fish species *Ameiurus nebulosus* on microbial communities in peat pools. *Water* 14: 815, <https://doi.org/10.3390/w14050815>
- Movchan YV (2014) Fishes of the genus *Ameiurus* (Ictaluridae, Siluriformes) in the Transcarpatian water bodies. *Vestnik zoologii* 48: 149–156, <https://doi.org/10.2478/vzoo-2014-0015>
- Nowak M, Szczerbik P, Tatoj K, Popek W (2008) Non-native freshwater fishes in Poland: an overview. *Aquaculture, Aquarium, Conservation & Legislation Bioflux* 1(2): 173–191
- Okhremenko YI, Gajduchenko HS (2021) Svedeniya o rasprostraneniі invazivnogo vida somika amerikanskogo *Ameiurus nebulosus* (Lesueur, 1819) v vodoemah Belarusi [Information on the distribution of the invasive species of brown bullhead *Ameiurus nebulosus* (Lesueur, 1819) in the water bodies of Belarus]. In: Karaevsky AE (ed), (2021) Actual problems of ecology: collection of articles. Grodno, Belarus, September 22–24, 2021. Ministry of Education Republic of Belarus, Grodno State University named after Yanka Kupala, Grodno, Belarus, pp 43–44 [in Russian]
- Rechulicz J, Płaska W (2018) The invasive *Ameiurus nebulosus* (Lesueur, 1819) as a permanent part of the fish faunain selected reservoirs in Central Europe: long-term studyof three shallow lakes. *Turkish Journal of Zoology* 42: 464–474, <https://doi.org/10.3906/zoo-1710-16>
- Rizevsky VK, Ermolaeva IA (2012) Neaborigennyye ryby Belarusi [Alien species of fish in Belarus]. In: Titok VV (ed), (2012) Problems of biodiversity conservation and use of biological resources. Minsk, Belarus, October 22–26, 2012. Minsktipproekt, Minsk, Belarus, pp 495–497 [in Russian]
- Rutkayová J, Biskup R, Harant R, Šlechta V, Koščo J (2013) *Ameiurus melas* (black bullhead): morphological characteristics of new introduced species and its comparison with *Ameiurus nebulosus* (brown bullhead). *Reviews in Fish Biology and Fisheries* 23: 51–68, <https://doi.org/10.1007/s11160-012-9274-6>
- Schindler O (1957) *Freshwater Fishes* (English translation). Thames & Hudson, London, 243 pp
- Scott WB, Crossman EJ (1973) *Freshwater fishes of Canada*. Fisheries Research Board of Canada, Bulletin N 184, Ottawa, 996 pp
- Vivier P (1951) Poissons et crustacés d'eau douce acclimates en France en eaux libres depuis le début du siècle. *Terre Vie* 98: 57–82, <https://doi.org/10.3406/revoc.1951.3242>

Websites and online databases

- Fish Base (2023) A global information system on fishes. Species profile *Ameiurus nebulosus*. <https://www.fishbase.se/> (accessed March 2023)