

GENETIC DIVERSITY OF THE BROWN BULLHEAD *AMEIURUS NEBULOSUS* (LESUEUR, 1819) (ICTALURIDAE, ACTINOPTERYGII) IN AN INVASIVE RANGE

© 2025 Okhremenko Y.I. (<https://orcid.org/0000-0001-5278-7026>)^{1*},
Gajduchenko H.S.¹ (<https://orcid.org/0000-0001-5648-6028>),
Zhukov M.Y.² (<https://orcid.org/0000-0002-1492-2570>)

¹Scientific and Practical Centre of the National Academy of Sciences of Belarus for Bioresources,
27 Akademicheskaya St, 220072 Minsk, Belarus

²Zoological Institute, Russian Academy of Sciences, Universitetskaya emb., 1, St. Petersburg, 199034 Russia
e-mail: *okhremenko.yulia@yandex.by

Received September 17, 2025; revised November 5, 2025; accepted November 17, 2025

The study shows a wide spread of *A. nebulosus* in Belarus, which also extends its range further to the east into the water bodies of Belarus and Karelian Isthmus, Russia. Analysis of genetic diversity by the *COX* gene showed that all samples from this study belong to the one haplotype. Low genetic diversity in the invasive range confirms a single import of individuals of brown bullhead to Belarus.

Key words: Europe, Belarus, Russia, invasive species, invasive range, spread, bullheads, genetic diversity, *COX*.

DOI: 10.35885/1996-1499-18-4-175-177

Full text of the paper is published in Russian Journal of Biological Invasions. DOI: 10.31857/S207511172104XXXXYY

REFERENCES

- Balon, E. Ryby *Slovenska. Obzor*. Bratislava, 1967.
- Bogutskaya, N.G., Naseka, A.M. Catalogue of agnathans and fishes of fresh and brackish waters of Russia with comments on nomenclature and taxonomy, Moscow: KMK Scientific Press Lt., 2004.
- Copp, G.H., Tarkan, A.S., Masson, G., Godard, M.J., Košco, J., Kováč, V., Novomeská, A., Miranda, R., Cucherousset, J., Pedicillo, G., Blackwell, B.G. A review of growth and life-history traits of native and non-native European populations of black bullhead *Ameiurus melas*. *Rev Fish Biol Fisheries*, 2016, 26, pp. 441–469. <https://doi.org/10.1007/s11160-016-9436-z>
- Copp, G.H., Bianco, P.G., Bogutskaya, N.G., Eros, T., Falka, I., Ferreira, M.T., Fox, M.G., Freyhof, J., Gozlan, R.E., Grabowska, J., Kováč, V., Moreno-Amich, R., Naseka, A.M., Peñáz, M., Povž, M., Przybylski, M., Robillard, M., Russell, I.C., Stakenas, S., Šumer, S., Vila-Gispert, A., Wiesner, C. To be, or not to be, a non-native freshwater fish? *Journal of Applied Ichthyology*, 2005, 21, 242–262. <https://doi.org/10.1111/j.1439-0426.2005.00690.x>
- Crivelli, A.J. Are fish introductions a threat to endemic freshwater fishes in the northern Mediterranean region? *Biol. Conservation*, 1995, 72, 311–319.
- Drummond, A.J., Rambaut, A. BEAST: Bayesian evolutionary analysis by sampling trees. *BMC Evolutionary*, 2007, 7, 214.
- Dyldin, Y.V., Hanel, L., Fricke, R., Orlov, A.M., Romanov, V.I., Plesnik, J., Interesova, E.A., Vorobiev, D.S., Kochetkova, M.O. Fish diversity in freshwater and brackish water ecosystems of Russia and adjacent waters, *Publ. Seto Mar. Biol. Lab.*, 2020, 45, 47–116. <https://doi.org/10.5134/251251>
- Edgar, R.C. MUSCLE: Multiple sequence alignment with high accuracy and high throughput. *Nucleic Acids Research*, 2004, 32(5), 1792–1797. <https://doi.org/10.1093/nar/gkh340>
- Freyhof, J., Kottelat, M. Handbook of European freshwater fishes. Cornol: Publ., Kottelat, XIII, 2007
- Gandolfi, G., Zerunian, S., Torricelli, P. and Marconato, A. (eds.) I pesci delle acque interne italiane. Ministero dell'Ambiente e Unione Zoologica Italiana. Istituto Poligrafico e Zecca dello Stato, Roma, 1991.
- Harka, A., Pintér, K. Systematic status of Hungarian bullhead pout: *Ictalurus nebulosus pannonicus* ssp. *Tiscia*, 1990, 25, 65–73.
- Ivanova, N.V., Zemlak, T.S., Hanner, R.H., Hebert, P.D.N. Universal primer cocktails for fish DNA barcoding. *Molecular Ecology Notes*, 2007, 7(4), 544–548. <https://doi.org/10.1111/j.1471-8286.2007.01748.x>
- Ivlev, V.S., Protasov, A.A. Amerikanskiy som v ozeroakh Volynskoy oblasti [American catfish in the lakes of Volyn region]. *Priroda*, 1948, 8, 67–68.
- Kalinowska, K., Ulikowski, D., Traczk, P., Rechulicz, J. Changes in native fish communities in response to the presence of alien brown bullhead (*Ameiurus nebulosus*) in four lakes (Poland). *Biological Invasions*, 2003, 25, 2891–2900. <https://doi.org/10.1007/s10530-023-03079-3>
- Keith, P., Allardi, J. The introduced freshwater fish of France: status, impacts and management. *Stocking and*

- introductions of fish / ed. I. G. Cowx. Oxford, 1998, 153–166.
- Košćo, J., Baláz, P., Ivanec, O., Kovalcuk, A., Manko, P., Terek, J. Príspevok k poznaniu rýb tokov Zakarpatskej oblasti Ukrajiny. Acta Facultatis Studiorum Humanitatis et Naturae Universitatis Presoviensis (Prirodne védy), 2004, 40, 138–152.
- Košćo, J., Košuthová, L., Košuth, P., Pekárik, L. Non-native fish species in Slovak waters: Origins and present status. Biologia, 2010, 65(6), 1057–1063. <https://doi.org/10.2478/s11756-010-0114-7>
- Kumar, S., Stecher, G., Li, M., Nkayaz, C., Tamura, K. MEGA X: Molecular evolutionary genetics analysis across computing platforms. Molecular Biology and Evolution, 2018, 35(6), 1547–1549. <https://doi.org/10.1093/molbev/msy096>
- Leigh, J.W., Bryant, D. PopART: Full-feature software for haplotype network construction, Methods Ecological Evolution, 2015, 6, 1110–1116. <https://doi.org/10.1111/2041-210X.12410>
- Lodge, D.M., Taylor, C.A., Holdich, D.M., Skurdal, J. Non-indigenous crayfishes threaten North American freshwater biodiversity: Lessons from Europe. Fisheries, 2000, 25(8), 7–20. [https://doi.org/10.1577/1548-8446\(2000\)025<0007:NCTNAF>2.0.CO;2](https://doi.org/10.1577/1548-8446(2000)025<0007:NCTNAF>2.0.CO;2)
- Mack, R.N., Simberloff, D., Lonsdale, W.M., Evans, H., Clout, M., Bazzaz, F.A. Biotic invasions: Causes, epidemiology, global consequences, and control. Ecol. Appl., 2000, 10, 689–710. <https://doi.org/10.2307/2641039>
- Makushok, M.E. Dwarf catfish, its economic importance and biological characteristics. – Minsk: Publishing house of the Academy of Sciences of the BSSR, 1951.
- Mastitsky, S.E., Karatayev, A.Y., Burlakova, L.E., Adamovich, B.V. Non-native fishes of Belarus: Diversity, distribution, and risk classification using the fish invasiveness screening kit (FISK). Aquatic Invasions, 2010, 5, 103–114. <https://doi.org/10.3391/ai.2010.5.1.12>
- Mieczan, T., Płaska, W., Adamczuk, M., Toporowska, M., Bartkowska, A. Effects of the Invasive Fish Species *Ameiurus nebulosus* on Microbial Communities in Peat Pools. Water, 2022, 14(5), 815. <https://doi.org/10.3390/w14050815>
- Movchan, Y.V., Talabishka, E.M., Velikopolskiy, I.J. Fishes of the genus *Ameiurus* (Ictaluridae, Siluriformes) in the Transcarpathian water bodies. Vestnik Zoologii, 2014, 48(2), 149–156. <https://doi.org/10.2478/vzoo-2014-0015>
- Nowak, M., Košćo, J., Popek, W., Epler, P. First record of the black bullhead *Ameiurus melas* (Teleostei: Ictaluridae) in Poland. Journal of Fish Biology, 2010, 76: 1529–1532. <https://doi.org/10.1111/j.1095-8649.2010.02601.x>
- Okhremenko, Y.I., Gajduchenko, H.S. Modern distribution of the alien species of the brown bullhead *Ameiurus nebulosus* (Lesueur, 1819) in Europe. Zoological research in Kazakhstan in the 21st century: results, problems and prospects. Collection of articles from the international scientific conference dedicated to the 90th anniversary of the Institute of Zoology of the Republic of Kazakhstan, 2023a, Almaty, 329–333.
- Okhremenko, Y.I., Gajduchenko, H.S. Genetic diversity of the brown bullhead *Ameiurus nebulosus* (Lesueur, 1819) based on the variability of the mitochondrial COI gene. Molecular and Applied Genetics: collection of scientific papers / Institute of Genetics and Cytology of the NAS of Belarus: A.V. Kilchevsky (ed.-in-chief) [and others], 2023b, Minsk: Institute of Genetics and Cytology of the NAS of Belarus, 35, 53–63.
- Okhremenko, Y., Gajduchenko, H. First record of the brown bullhead *Ameiurus nebulosus* (Lesueur, 1819) in the Neman River basin in Belarus. Bioinvasion Records, 2024a, 13(1), 209–214. <https://doi.org/10.3391/bir.2024.13.1.18>
- Okhremenko, Y.I., Gajduchenko, E.S. Brown Bullhead *Ameiurus nebulosus* (Siluriformes: Ictaluridae) – A New Species in the Neman River Basin. Russ J Biol Invasions, 2024b, 15, 203–211. <https://doi.org/10.1134/S2075111724700085>
- Popov, I., Kotova, A. Brown bullhead *Ameiurus nebulosus* – new fish species for Russia, Biol. Commun., 2020, 65(3), 238–243. <https://doi.org/10.21638/spbu03.2020.303>
- Rabitsch, W., Milasowszky, N., Nehring, S., Wiesner, C., Wolter, C., Essl, F. The times are changing: Temporal shifts in patterns of fish invasions in central European fresh waters. Journal of Fish Biology, 2013, 82(1), 17–33. <https://doi.org/10.1111/j.1095-8649.2012.03457.x>
- Rambaut, A. FigTree v.1.4.4., 2018, <http://tree.bio.ed.ac.uk/software/figtree> (accessed: May 2025).
- Reshetnikov, Y.S. Atlas of Russian freshwater fishes (Vol. 2). Nauka, 2003.
- Rizevskiy, V.K., Plyuta, M.V., Leshchenko, A.V. New fish species in the fauna of Belarus. Reports of the National Academy of Sciences of Belarus, 2009, 53(3), 95–97.
- Rozas, J., Ferrer-Mata, A., Sánchez-DelBarrio, J.C., Guirao-Rico, S., Librado, P., Ramos-Onsins, S.E., Sánchez-Gracia, A. DnaSP 6: DNA sequence polymorphism analysis of large data sets. Molecular biology and evolution, 2017, 34 (12), 3299–3302. <https://doi.org/10.1093/molbev/msx248>
- Rutkayová, J., Biskup, R., Harant, R., Slechta, V., Košćo, J. *Ameiurus melas* (black bullhead): Morphological characteristics of new introduced species and its comparison with *Ameiurus nebulosus* (brown bullhead). Reviews in Fish Biology and Fisheries, 2013, 23(1), 51–68. <https://doi.org/10.1007/s11160-012-9274-6>
- Scott, W.B., Grossman, E.I., Freshwater fisher of Canada. Channel catfish, *Ictalurus punctatus* (Rafinesque). Bull. of the Fisheries Research Board of Canada, 1973, 184, 604–610.
- Semenchenko, V.P., Pugachevsky, A.V. The problem of alien species in the fauna and flora of Belarus. Science and Innovation, 2006, 44, (10), 15–20.
- Semenchenko, V., Grabowska, J., Grabowski, M., Rizevsky, V., Pluta, M. Non-native fish in Belarusian and polish areas of the European central invasion corridor. Oceanological and Hydrobiological Studies, 2011, 40(1), 57–67. <https://doi.org/10.2478/s13545-011-0007-6>
- Vinogradov, V.K., Voropaev, N.A., Danchenko, A.I. Migrants from America, *Ictalurus* catfish. Fish farming and fishing, 1974, 5, 10–11.
- Wilhelm, S.A. Berettyóés Ér folyók fekete törpeharcsa (*Ictalurus melas*, Rafinesque, 1820) állományának bio-

- metriai vizsgálata. Múzeumi Füzetek Kolozsvár, 1999, 7, 131–134.
- Yurtseva, A.O., Zhukov, M.Y. Morphological Characteristics of the Nonindigenous Brown Bullhead *Ameiurus nebulosus* (Le Sueur, 1819) in Lakes of the Karelian Isthmus (Northwestern Europe). Contemporary Problems Ecology, 2024, 17, 201–207. <https://doi.org/10.1134/S1995425524020148>
- Zhukov, P.I. Fishes of Belarus. Minsk: Science and Technology, 1965.