

# The alien fish species *Ameiurus nebulosus* in the Romanian scientific literature

<sup>1</sup>I. Claudiu Gavriloaie, <sup>1,2,3</sup>I. Valentin Petrescu-Mag, <sup>4</sup>Sergiu C. Gavriloaie

<sup>1</sup> Bioflux SRL, Cluj-Napoca, Cluj county, Romania; <sup>2</sup> Department of Environmental Engineering and Protection, Faculty of Agriculture, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Romania; <sup>3</sup> University of Oradea, Oradea, Romania; <sup>4</sup> Vertiqua Engineering SRL, Corunca, Mures county, Romania. Corresponding author: I. C. Gavriloaie, claudiugavriloaie@gmail.com

**Abstract.** The brown bullhead *Ameiurus nebulosus* (Lesueur, 1819) (Pisces: Siluriformes: Ictaluridae) is a fish species native to North America, from where it has been introduced in more than 30 countries from Asia, Europe, North America, South America and Oceania. Several countries reported adverse ecological impacts after the introduction of this species. In Europe, *A. nebulosus* was presented for the first time in 1880, at a fishing exhibition in Berlin. In Romania it can be found since 1908 in the Saint Ana Lake, where it was introduced intentionally. He later penetrated naturally in 1934 in the Tisa River and some of its tributaries. In this paper we took in consideration most of the scientific publications available in Romania, dealing much or less with *A. nebulosus*. Along time, in our country there were several researches regarding some aspects of biology of this species: dynamics of growth, diet, its parasites, reproduction, anatomy, physiology, toxicology and behaviour. There are also some studies regarding the popular names for *A. nebulosus* in the western part of the country and some general papers concerning the Romanian ichthyofauna, in which the occurrence of *A. nebulosus* is mentioned as well. Further studies on the physiological and behavioural aspects of this species need to be done. In addition, we do not know which is the real impact of *A. nebulosus* upon our native fish species and we have no comprehensive knowledge on its actual distribution in Romanian waters.

**Key Words:** *Ameiurus nebulosus*, brown bullhead, impact, introduction.

**Introduction.** Brown bullhead (*Ameiurus nebulosus* (Lesueur, 1819) (Pisces: Siluriformes: Ictaluridae) (Figure 1) is a fish species originating to North America, where it has a wide distribution: Atlantic and Gulf Slope drainages from Nova Scotia and New Brunswick in Canada to Mobile Bay in Alabama in USA; St. Lawrence-Great Lakes, Hudson Bay, and Mississippi River basins from Quebec west to southeastern Saskatchewan in Canada, and south to Louisiana, USA (Bănărescu 1964; Page & Burr 2011; Craig et al 2015) (Figure 2). *A. nebulosus* was introduced in Europe first in Berlin (Germany) in 1880; few years later it was introduced also in France, Belgium and Central Europe (Holčík 1991). Beside Europe, it was also introduced in Asia and Pacific islands, like New Zealand (Collier et al 2016) mainly for sport fishing and aquaculture (Dunham 2006; Marković et al 2012; Fobes 2013).

The species reached the inland waters of former Yugoslavia and, also, the affluents on the left side of Tisa River (Ziemiankowski 1947). According to Vasiliu (1959) *A. nebulosus* was introduced in Romania by humans in 1908, in St. Ana Lake. In a natural way reached in 1934 in Tisa River and its following affluents: Someş, Crişuri, Mureş, Bega, then Timiş, Beregsău and Sat-Chinez pools, rivulet Peţea (nearby Oradea), Ineu, lower Danube at Brăila.

The aim of this paper is to provide a comprehensive and up to date information concerning the research on this species in Romania.

**Material and Method.** We took into consideration most of the publications available in Romania to which we had access, dealing much or less with species *A. nebulosus*. We do not pretend that we managed to consider all of the existing papers; however, the most important ones are included in this study. The gathering of the materials needed around 15 years of work in several libraries all over the country, countless correspondence and/or meetings with some of the authors, along with significant bookshop and antique book stores investments.



Figure 1. Individual of *Ameiurus nebulosus* (Bucharest, 2003)  
(Photo by Claudiu Gavriiloaie).

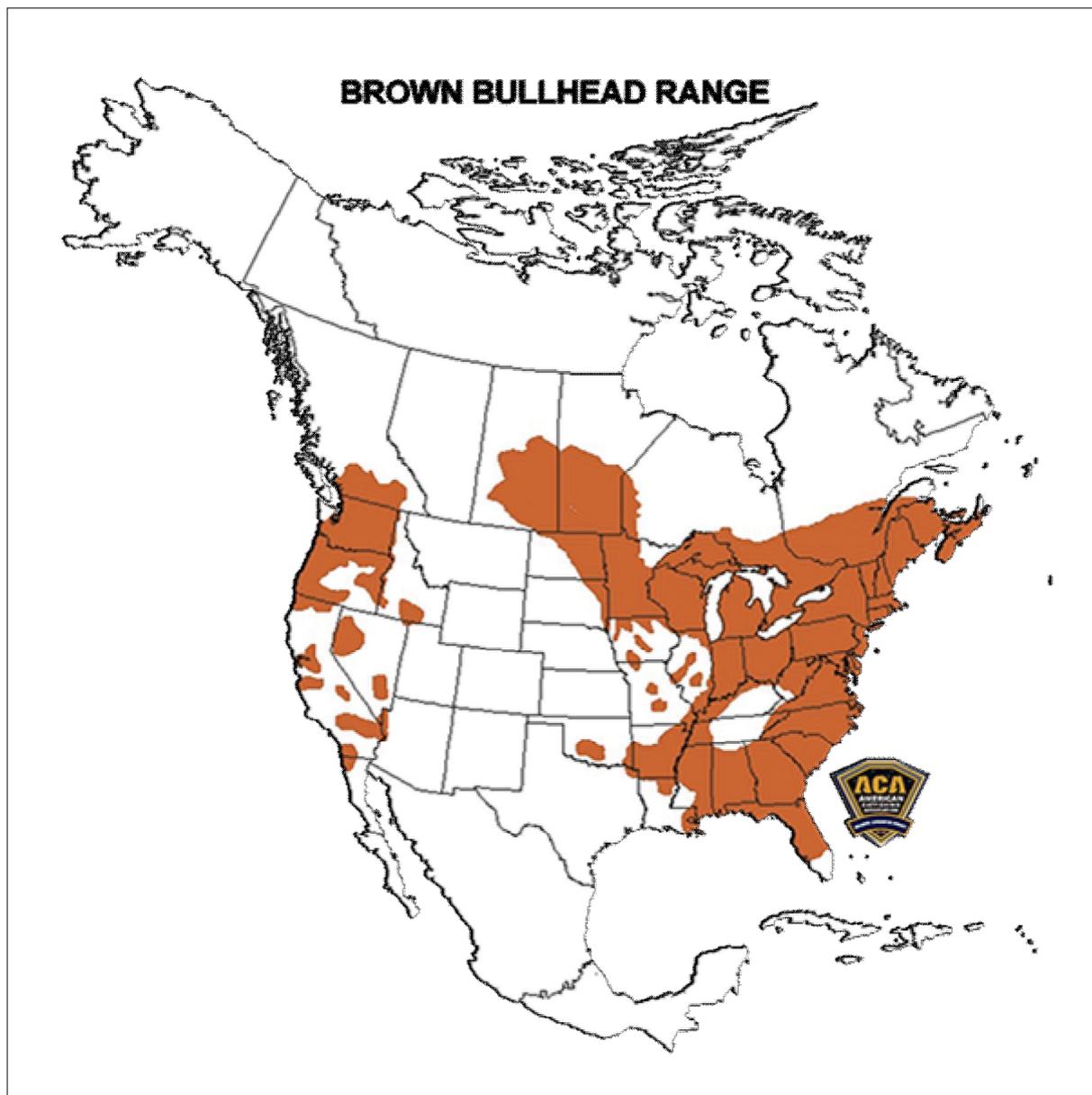


Figure 2. The native range of *Ameiurus nebulosus*  
(Source: <https://tm.americancatfishingassociation.com>).

**Results and Discussion.** The species was mentioned for the first time in Romania by Antonescu (1934) in his work „Inlandwater fishes of Romania”.

Antonescu (1938) referred to this species again in an article published in „Grigore Antipa, Hommage à son oeuvre”. The paper focused on the morphology and biology of the species, but also discussed about the introduction of *A. nebulosus* in Europe and the occurrence of this fish in Romania, which was present at that time only in some of the large rivers in Transylvania.

Ziemiankowski (1944), in his work „Fishes of Bucovina” described the morphology and ecology of *A. nebulosus* and talked about the introduction of this species in Europe. He also mentioned that this species had recently appeared (for that time) in Romania and it was present only in the Mureş River; in Bucovina it was introduced accidentally in the fisheries from Iujineţi and Stăuceni, along with the crucian carp (*Carrasius carassius*) from the former Yugoslavia. However, the species did not establish in those waterbodies at that time.

Băcescu (1947), in his well known book „Fishes, as seen by the Romanian fisherman” beside the occurrence of the species in Romania, also presented the common names of this fish from different regions of the country.

Cărăuşu (1952), in „Treaty of Ichthyology” summarized the data available on this fish in the Romanian literature.

Ghelase (1956) described the morphology and ecology of *A. nebulosus*, and added new data on the occurrence of the species in Romania. He also referred to the angling of this species and he underlined the fact that this fish should not be introduced in fisheries.

Antonescu (1957) mentioned the species in his work „Fishes of R.P.R.”.

Vasiliu (1959) presented briefly the morphology and distribution of the species in Romania, and sustained that *A. nebulosus* was introduced in Romania for the first time in 1908, in the St. Ana Lake.

Rădulescu & Suceveanu (1959) published an article on the diet and parasites of *A. nebulosus*. They studied 34 individuals from the Cefa Fisheries (Bihor county) and the Timiş River. The authors found mostly invertebrates in the diet of this fishes, in case of only 3 individuals there were fish remains in the gastro-intestinum, and only in case of a single individual there were remains of a frog. Diatomea and filamentous algae seemed to be the most abundant in the food of vegetal origin. The authors identified a specific parasite of the species (*Ancyrocephalus pricei*), which is also native to North American waters, the other parasites were common ones among the native freshwater fishes of Romania.

Bera (1961) mentioned for the first time the species from the southern regions of Romania, in a fish pond west from Câmpulung-Muscel. In this paper we can also find some observations regarding the behaviour of *A. nebulosus* in captivity.

Buşniţă & Alexandrescu (1963) mentioned the species in „The Atlas of Fishes from R.P.R.”.

Bănărescu (1964) described in details the species in his work on the fish fauna of Romania: the morphology, ecology, economic value and distribution of the species in our country.

Bănărescu (1968) discussed the taxonomy of the species and (mis)concluded that in fact the species present in Romanian waterbodies may be *Ameiurus melas*, not *A. nebulosus*.

Ionescu (1968) mentioned the species in his book „Vertebrates of Romania”.

Oroş & Stăncioiu (1968) studied the metabolism of the species in the cold season. They found the metabolism of this species to be significantly slower like in case of native freshwater species

Wilhelm (1973) studied the growth of *A. nebulosus* in the Criş and Beretău basins.

Wilhelm (1975) published some biometric data on this species from Criş and Beretău basins.

Wilhelm (1979) published papers regarding the reproduction of the species in the Criş and Barcău basins. The author considered the species to be less prolific but highly viable, due to the lack of natural enemies and the care of offsprings.

Wilhelm (1980) presented data on the diet and growth dynamic of *A. nebulosus* in the natural waterbodies and the fisheries of Bihor county. He also offered some data on the behavior of *A. nebulosus*.

Wilhelm (1981) published new data on the growth of this species from the Criș and Barcău Basins.

Wilhelm (1983) published some data on the diet of *A. nebulosus* from Bihor county. He found that *A. nebulosus* had a wide trophic spectrum, a fact which allows it to use a wide range of nutrients. The author also discovered that there was a low level of intraspecific competition between the different age classes. The fishes found in the diet of *A. nebulosus* were of small size, without economic value.

Bănărescu (2004) discussed about the taxonomic status of *A. nebulosus* in Romania. The author mentioned that the species was initially considered by himself in a previous paper (Bănărescu 1968) as being *Ameiurus melas*, which proved to be a mistake. *A. melas* entered the Romania waters much later.

In 2004, the presence of *A. nebulosus* has been mentioned by various authors in different waterbodies: in Tisa basin (Harka et al 2004), in Maramureș county (Ardelean & Béres 2004), in Homorod rivulet, Satu-Mare county (Wilhelm et al 2004), Ecedea marsh and Crasna river (Wilhelm & Gavril 2004).

Telcean et al (2005) mentioned the presence of *A. nebulosus* on few sites in Crișul Repede river.

Falka & Bud (2006) studied the morphology and phenotypic variability of *A. nebulosus* and its possible impacts on native fish species.

Petrescu & Mag (2006) studied the stomach content and the feeding behaviour of *A. nebulosus*, both in a fish pond from Ariniș fish farm (Maramureș county), and in aquaria in the laboratory at USAMV Cluj-Napoca. It was observed that, in fish pond, the fish ingested more than 70% vegetable food and only 30% of other components like cyprinid fish juveniles and invertebrates. In the second experiment, small individuals of *A. nebulosus* were raised together with three poeciliid species for three month. The species showed aggressive behaviour and preyed on the companion species. At first it preyed the males of the smallest species, in the end of experiment all the individuals from the other three species being completely consumed by *A. nebulosus*. This shows a potential threat on native fish fauna in waters where *A. nebulosus* is present.

Gavriloaie (2008) studied the fish fauna from few lakes in Bucharest city and mentioned the presence of *A. nebulosus* in the lake from State Circus Park (Parcul Circului de Stat). It seemed that the species has been introduced intentionally by an aquarium hobbyist.

Gavriloaie et al (2011) discussed about the alien fish species from natural waters of Bistrița-Nășăud county. They only found out that Rössler (2002) mentioned that the first report of *A. nebulosus* in the county was made in 1965 for Someș river.

Stănescu & Gavriloaie (2011) studied the vegetation and fauna from Colentina river along its course within the Buharest city. The authors mentioned the presence of *A. nebulosus* in some of the lakes from the Colentina river's course, namely Herăstrău (Figure 3), Floreasca, Tei and Plumbuita, where the anglers mostly captured this species, and rarely other species like *Carassius gibelio*, *Cyprinus carpio*, and very rarely species like *Perca fluviatilis*, *Sander lucioperca*, *Silurus glanis*, and *Abramis brama*, which used to be common only few years ago.

Bănăduc et al (2013) noticed the presence of *A. nebulosus* in Timiș river, on the locations Topolovățu Mare, Șag and Cebza.

Telcean et al (2014) searched on the fish fauna from Carei Plain natural protected area, mentioning the presence of *A. nebulosus* in a stream within the Urziceni Forest. The authors stated that the presence of this species on the research area is alarming due to the potential negative impact on the native fish fauna.

Popescu et al (2015) studied the topography of the internal organs of *A. nebulosus*. The authors sampled 5 individuals from Stejeriș Lake, Cluj county.

Cocan et al (2018) studied the effects of thermal stress on hematological and metabolic profiles of *A. nebulosus*. They studied 150 individuals captured from Stejeriș Lake, Cluj county and concluded that this species has great plasticity and adaptability

regarding the environmental conditions. The fish showed no pathologic state in a wide range of temperature, from 6 to 31°C, which is astonishing. The fish only showed changes in behaviour, being rather lethargic at the lowest and highest temperatures.



Figure 3. Juveniles of *Ameiurus nebulosus* on Herăstrău lake (photo by Stelian Stănescu).

Ionescu et al (2019) evaluated the bioaccumulation of heavy metals in six fish species, including *A. nebulosus*, from Argeş river and three lakes from Colentina river (namely Mogoşoaia, Herăstrău and Pantelimon). It was noted that this species was able to accumulate relatively high amounts of Cu, Ni, Cd, Pb, Cr, Zn and Hg. The authors concluded that contamination with potentially toxic elements such as heavy metals in the aquatic ecosystems is a major problem since they accumulate in the trophic chains

Cocan et al (2020) investigated the venomous glands of *A. nebulosus* through magnetic resonance imaging, which were present at the base of the hard rays (spines) of dorsal fin and pectoral fins respectively. These spines form a mechanism of protection when in erect position, thus increasing the dimensions of the body over the ingestion capability of predators (Rojo 2013), which can be other fish species or birds, turtles and otters (Jackmann et al 1999; Rojo 2013).

Iftime & Iftime (2021) wrote an extended review on alien fish, amphibian and reptile species in Romania, including *A. nebulosus*. The authors presented some data about its introduction in our country; concerning the species occurrence, the authors focused mainly on Bucharest city and its surroundings. They also added some remarks about the species impact on the environment and on the native fish fauna.

Besides the above mentioned publications, there are few inventories on the ornamental and non-native fish species in Romania in which the species *A. nebulosus* is mentioned: Bud et al (2006), Gavrioloaie (2007), Petrescu & Mag (2007), Iacob & Petrescu-Mag (2008), Gavrioloaie & Berkesy (2013)

**Conclusions.** Along time, in our country there were several researches regarding some aspects of biology of brown bullhead (*Ameiurus nebulosus*). It is necessarily to be studied better the physiological and behavioural aspects of brown bullhead' s biology. Also, we do not know yet which is the real impact of this species upon our native fish species and we still have limited information about its actual occurrence in Romania.

## References

- Antonescu C. S., 1934 Peștii apelor interioare din România. Monitorul Oficial și Imprimeriile Statului, București. [in Romanian]
- Antonescu C. S., 1938 Elemente nouă în fauna apelor dulci din România. Volumul jubiliar „Gr. Antipa, Hommage à son oeuvre”, pp. 85-91. [in Romanian]
- Antonescu C. S., 1957 Peștii din apele R. P. R. Editura Agro-Silvică de Stat, București. [in Romanian]
- Ardelean G., Béres I., 2004 Structura și zona ihtiofaunei Maramureșului potrivit cercetărilor recente. *Studia Universitatis Vasile Goldiș, Arad. Seria Științele Vieții* 14:49-50. [in Romanian]
- Băcescu M., 1947 Peștii, așa cum îi vede pescarul țaran român. I. C. P., Monogr. Nr. 3. [in Romanian]
- Bănăduc D., Stroilă V., Curtean-Bănăduc A., 2013 The fish fauna of the Timiș River (Banat, Romania). *Transylvanian Review of Systematical and Ecological Research* 15:145-172.
- Bănărescu P., 1964 Pisces-Osteichthyes (pești ganoizi și osoși). *Fauna R. P. R.*, vol. 13, Editura Academiei R. P. R., București. [in Romanian]
- Bănărescu P., 1968 Poziția sistematică a somnului pitic american aclimatizat în apele României. *Studii și Cercetări de Biologie, Seria Zoologie* 20(3):261-263. [in Romanian]
- Bănărescu P., 2004 Situația actuală a ihtiofaunei de apă dulce a României sub aspect faunistic, taxonomic și al protecției. *Studia Universitatis Vasile Goldiș, Arad. Seria Științele Vieții* 14:7-11. [in Romanian]
- Bera A., 1961 Prezența somnului pitic (*Amiurus nebulosus* (Raf.)) în fauna ihtiologică a raionului Muscel, regiunea Argeș. *Natura, Seria Biologie* 13(6):51-52. [in Romanian]
- Bud I., Mag I. V., Petrescu R. M., 2006 Speciile invadatoare de pești din apele dulci ale României și impactul lor asupra mediului acvatic. *Environment & Progress* 7:15-21. [in Romanian]
- Bușniță T., Alexandrescu I., 1963 Atlasul peștilor din apele R. P. R.. Editura Științifică, București. [in Romanian]
- Cărăușu S., 1952 *Tratat de ichtiologie*. Editura Academiei R. P. R., București. [in Romanian]
- Cocan D., Popescu F., Lațiu C., Uiuu P., Coroian A., Răducu C., Coroian C. O., Mireșan V., Kokkinakis A., Constantinescu R., 2018 Effects of thermal stress on hematological and metabolic profiles in brown bullhead, *Ameiurus nebulosus* (Lesueur, 1819). *AgroLife Scientific Journal* 7(1):33-41.
- Cocan D., Mireșan V., Popescu F., Constantinescu R., Coroian A., Lațiu C., Turcu R. V. F., Fărcășanu A. Ș., Martonos C., 2020 MRI investigations on venomous glands of brown bullhead, *Ameiurus nebulosus* (Lesueur, 1819) (Actinopterygii: Ictaluridae). *Pakistan Journal of Zoology* 52(4):1347-1354.
- Collier K. J., Leathwick J. R., Rowe D. K., 2016 Assessing vulnerability of New Zealand lakes to loss of conservation value from invasive fish impact. *Aquatic Conservation: Marine and Freshwater Ecosystems* 27(2):534-546.
- Craig C. A., Vaughn C. R., Ruppel D. S., Bonner T. H., 2015 Occurrence of *Ameiurus nebulosus* (brown bullhead) in Texas. *Notes of Southeastern Naturalist* 14(2):35-37.
- Dunham R. A., 2006 History of catfish breeding and its application in the United States: lessons to be learned? *The Israeli Journal of Aquaculture - Bamidgeh* 58(4):251-256.
- Falka I., Bud I., 2006 Contributions to the morphology and phenotypic variability of *Ictalurus nebulosus* and its possible impacts on native fish species. 41st Croatian and 1st International Symposium on Agriculture. Proceedings, pp. 519-520.
- Fobes M. C., 2013 Controlled spawning of white catfish, *Ictalurus catus*, and brown bullhead catfish, *Ameiurus nebulosus*, using carp pituitary extract and LHRHa. Master of Science thesis, Auburn University, Alabama, USA.

- Gavriloaie I. C., 2007 Survey on the alien freshwater fish species entered into Romania's fauna. *Acta Ichthyologica Romanica* 2:69-78.
- Gavriloaie I. C., 2008 Contributions to the knowledge of Bucharest city ichthyofauna. *AAFL Bioflux* 1:21-26.
- Gavriloaie C., Berkesy C., 2013 Specii americane de pești dulcicoli introduse în fauna ihtiologică a României. *Ecoterra* 37:51-60. [in Romanian]
- Gavriloaie I. C., Berkesy C., Cotuțiu M., Rusu C., Stănescu S., 2011 Review concerning the alien fish species in natural waters of Bistrița-Năsăud county. *Studii și Cercetări, Biology* 16:59-65.
- Ghelase G. I., 1956 Somnul pitic. *Vânătorul și pescarul sportiv* 9:2. [in Romanian]
- Harka Á., Sallai Z., Wilhelm S., 2004 Modificări intervenite în ihtiofauna bazinului Tisei. *Studia Universitatis Vasile Goldiș, Arad. Seria Științele Vieții* 14:43-47. [in Romanian]
- Holčík J., 1991 Fish introduction in Europe with particular reference to its central and Eastern part. *Canadian Journal of Fisheries and Aquatic Sciences* 48(1):13-23.
- Iacob M., Petrescu-Mag I. V., 2008 Inventarul speciilor non-native de pești din apele dulci ale României. *E. Bioflux, Cluj-Napoca*, 89 pp. [in Romanian]
- Iftime A., Iftime O., 2021 Alien fish, amphibian and reptile species in Romania and their invasive status: a review with new data. *Travaux du Muséum National d'Histoire Naturelle „Grigore Antipa”* 64(1):131-186.
- Ionescu P., Radu V. M., Deak G., Ciobotaru I. E., Marcu E., Diacu E., Pipirigeanu M., 2019 Bioaccumulation of potentially toxic elements in fish species from aquatic environments located in crowded areas of southern Romania. *Technium* 1:53-58.
- Ionescu V., 1968 Vertebratele din România. Editura Academiei R. S. R., București. [in Romanian]
- Jackman R. E., Hunt W. G., Jenkins J. M., Detrich P. J., 1999 Prey of nesting bald eagles in Northern California. *Journal of Raptor Research* 41(3):202-211.
- Marković G. S., Ćirković M. A., Maletin S. A., 2012 The role of allochthonous (non-native) fish species in Serbian aquaculture. *Journal of Central European Agriculture* 13(3):539-544.
- Oroș I., Stăncioiu S., 1968 Aspecte metabolice la somnul pitic (*Amiurus nebulosus*) în sezonul rece. *Studia Universitatis Babeș-Bolyai, Series Biologia* 2:133-138. [in Romanian]
- Page L. M., Burr B. M., 2011 A field guide to freshwater fishes of North America north of Mexico. Houghton Mifflin Harcourt, Boston, 663 pp.
- Petrescu R. M., Mag I. V., 2006 Non-native biological invaders: *Ictalurus (Ameiurus) nebulosus* (Lesueur, 1819). *Acta Ichthyologica Romanica* 1:221-234.
- Petrescu R. M., Mag I. V., 2007 Non-native ornamental fish in Romanian freshwaters. *Acta Ichthyologica Romanica* 2:189-196.
- Popescu F., Lațiu C., Cocan D., Mireșan V., 2015 Topography of the internal organs of the brown bullhead (*Ameiurus nebulosus*) Lesueur, 1819 (Actinopterygii: Ictaluridae). *Bulletin USAMV Animal Science and Biotechnology* 72(2):262-263.
- Rădulescu I., Suceveanu N., 1959 Contribuții la cunoașterea hranei și parazitofaunei somnului pitic (*Ameiurus nebulosus* La Sueur) din apele noastre. *Buletinul Institutului de Cercetări Piscicole* 18(3):71-74. [in Romanian]
- Rojo A., 2013 Osteological atlas of the brown bullhead (*Ameiurus nebulosus*) from Nova Scotia waters: a morphological and biometric study. Curatorial Report Number 100, Nova Scotia Museum, Halifax, 151 pp.
- Rössler R., 2002, Die ichthyofauna des Regierungsbezirkes Bistritz-Nassod in siebenbürgen. *Complexul Muzeal Bistrița-Năsăud, Studii și Cercetări, Biologie* 7:143-170.
- Stănescu S. V., Gavriloaie C., 2011 Aspecte privind vegetația și fauna râului Colentina pe traseul din municipiul București. *EcoTerra* 27:49-52. [in Romanian]
- Telcean I., Cupșa D., Covaciu-Marcov S. D., Sas I., 2005 Study about the fish fauna changes in the organic polluted stretches of Crișul Repede river (Bihar county, western Romania). *Universitatea din Bacău: Studii și Cercetări. Biologie* 10:83-86.

- Telcean I., Cupşa D., Sas-Kovács I., Cicort-Lucaciu A. Ş., Covaciu-Marcov S. D., 2014 Some data upon the fish fauna from Carei Palin natural protected area obtained with herpetological methods. North-Western Journal of Zoology 10(1):135-140.
- Vasiliu G. D., 1959 Peştii apelor noastre. Editura Ştiinţifică, Bucureşti. [in Romanian]
- Wilhelm A., 1973 Date privind ritmul de creştere la somnul pitic (*Ictalurus nebulosus* Le Sueur 1819) din apele bazinului Crişurilor şi Beretăului. Nymphaea 1:35-39. [in Romanian]
- Wilhelm A., 1975 Date privind biometria somnului pitic (*Ictalurus nebulosus* Le Sueur 1819) din apele bazinului Beretăului şi Crişurilor. Nymphaea 3:117-122. [in Romanian]
- Wilhelm A., 1979 Date cu privire la reproducerea somnului pitic (*Ictalurus nebulosus* Le Sueur 1819) din apele bazinului Crişurilor şi Barcăului. Nymphaea 7:439-445. [in Romanian]
- Wilhelm A., 1980 Dinamica nutriţiei şi ritmul de creştere la somnul pitic (*Ictalurus nebulosus* Le Sueur) din ape naturale şi amenajate. Teză de doctorat, Institutul de Ştiinţe Biologice, Bucureşti. [in Romanian]
- Wilhelm A., 1981 Date noi referitoare la creşterea somnului pitic (*Ictalurus nebulosus* Le Sueur) din bazinul Barcăului şi Crişurilor. Nymphaea 8-9:457-474. [in Romanian]
- Wilhelm A., 1983 Date privind nutriţia somnului pitic (*Ictalurus nebulosus* Le Sueur) din apele judeţului Bihor. Buletin de Cercetări Piscicole 36(1-2):49-58. [in Romanian]
- Wilhelm S., Ardelean G., 2004 Cercetări ihtiologice în zona propusă pentru reamenajare şi protecţie a mlaştinii Ecedea. Studia Universitatis Vasile Goldiş, Arad. Seria Ştiinţele Vieţii 14:59-61. [in Romanian]
- Wilhelm S., Ardelean G., Marian I., 2004 Fauna ihtiologică a pârâului Homorod (judeţul Satu-Mare). Studia Universitatis Vasile Goldiş, Arad. Seria Ştiinţele Vieţii 14:51-52. [in Romanian]
- Ziemiankowski V. D., 1947 Fauna peştilor din Bucovina. Analele Institutului de Cercetări Piscicole al României 3:115-220. [in Romanian]
- \*\*\* [https://tm.americancatfishingassociation.com/usr/img/range-brown\\_bullhead-600px-transparent\\_09152559.png](https://tm.americancatfishingassociation.com/usr/img/range-brown_bullhead-600px-transparent_09152559.png). Accessed: May, 2021.

Received: 20 April 2021. Accepted: 20 May 2021. Published online: 30 June 2021.

Authors:

Ionel-Claudiu Gavriloaie, SC Bioflux SRL, Cluj-Napoca, Romania, 54 Ceahlau Street, Cluj-Napoca 400488, Cluj county, Romania, e-mail: claudiugavriloaie@gmail.com

Ioan Valentin Petrescu-Mag, SC Bioflux SRL, Cluj-Napoca, Romania, 54 Ceahlau Street, Cluj-Napoca 400488, Cluj county, Romania, e-mail: zoobiomag2004@yahoo.com

Sergiu Cristian Gavriloaie, Vertiqal Engineering SRL, 547367 Corunca, no. 397G, Mures county, Romania, e-mail: csgavriloaie@gmail.com

This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

How to cite this article:

Gavriloaie I. C., Petrescu-Mag I. V., Gavriloaie S. C., 2021 The alien fish species *Ameiurus nebulosus* in the Romanian scientific literature. Ecoterra 18(2):28-35.