

## Rapid Communication

## The first report of the brown bullhead *Ameiurus nebulosus* (Le Sueur, 1819) in the Dniester River drainage, Ukraine

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### Abstract

Eight individuals of the brown bullhead, *Ameiurus nebulosus* (Lesueur, 1819), were caught in an artificial pond in the city of Lviv, Ukraine, in September 2017. This is the first report of this alien invasive species in the Dniester River basin. It indicates its expansion in Ukraine and also, generally, in Europe.

**Key words:** alien fishes, Ameiuridae, city of Lviv, invasive species

### Introduction

The expansion of non-indigenous fauna is one of the major threats to biodiversity worldwide (Leppäkoski et al. 2002; Hirsch et al. 2016). The introduction of aquatic organisms, such as fish, is rarely restricted by the political borders of countries (Copp et al. 2005). Recent geopolitical changes in Central and Eastern Europe have provoked a new wave of biological invasions (Roche et al. 2013). In Ukraine, the list of successfully naturalized newcomers includes 19 fish species, and seven of these can be considered as invasive with expanding ranges and negative influence on the native fauna (Kvach and Kutsokon 2017).

Three ictalurid catfish species, the brown bullhead, *Ameiurus nebulosus* (Le Sueur, 1819), the black bullhead, *Ameiurus melas* (Rafinesque, 1820), and the yellow bullhead, *Ameiurus natalis* (Le Sueur, 1819), have been introduced to Europe (Carlander 1977; Walter et al. 2014). While *A. natalis* was introduced in 1906 and formed self-sustaining populations only

in Italy, the other two species have widely dispersed throughout the continent (Wilhelm 1999; Rutkayová et al. 2013). The black bullhead is widely distributed in Europe (Rutkayová et al. 2013). In Ukraine it was reported for the first time in 2004, only from the Tisza River, Transcarpathia (Koščo et al. 2004). It is now spreading very quickly and is considered an invasive species in Ukraine (Markovych and Kutsokon 2012; Movchan et al. 2014; Kvach and Kutsokon 2017, Supplementary material Table S1).

The brown bullhead originated from the river drainages of the Eastern part of North America, from Canada to Florida (Scott and Crossman 1973). In Europe, it was first introduced to a pond near Stettin (then Germany, now the territory of Poland) in 1885 as an ornamental fish (Schindler 1957; Nowak et al. 2010). In 1871 it was reported for the first time from France; however, this record should be attributed to the black bullhead, released into the River Seine (Vivier 1951; Rutkayová et al. 2013). Later, it was found as an ornamental fish in garden ponds everywhere in France, and also recorded in natural waters

(Kunstler 1908; Vivier 1951). Now it is found in fresh waters of many European countries, and considered one of the most successful invaders of North-American origin (Froese and Pauly 2017; Rutkayová et al. 2013).

In Central Europe it is now common in many lowland rivers, including the Vistula drainage, i.e. Rivers San and Bug, which are close to the Ukrainian border (Grabowska et al. 2010). In addition to the first introduction in Poland (1885: Nowak et al. 2008, 2010) old populations are from the Třeboň aquaculture pond in Czech Republic (since 1890: Lhotský 1995); Hungary (since 1902) and Romania (since 1910) (Harka and Pintér 1990; FAO 2010). From Hungary it has penetrated the neighbouring Slovakia since 1926 (Balon 1966; Koščo et al. 2010; Rutkayová et al. 2013) while in Belarus it has spread, since 1935, and is now found in several oxbow lakes along the Bug (Vistula basin) and Prypyat (Dnieper basin) rivers (Mastitsky et al. 2010; Semenchenko et al. 2011; Supplementary material Table S2).

In Ukraine, the brown bullhead has invaded the Shatsk Lakes, Vistula River drainage since 1937, and the waterbodies of the Danube basin in Transcarpathia since 1954 (Ivlev and Protasov 1948; Movchan 1988). The Shatsk population originated from the Prypyat River in Belarus. Recently, the brown bullhead has been reported from the Prypyat basin in northern Ukraine, near the Ukraine-Belarus border, near the city of Rivne (Bigun and Afanasyev 2011; Hrokhovska et al. 2012). In all the reported sites in Ukraine, the brown bullhead has become rather common, forming stable local populations (Markovych and Kutsokon 2012; Movchan et al. 2014; Kvach and Kutsokon 2017). In the Transcarpathian Ukraine, the species has spread very fast, invading almost all water bodies of the Pannonian steppes (Latorica, Uzh, Borzhava, Tisza basins, mainly floodplains lakes, channels, reservoirs, ponds) over the 8 years since its first occurrence (Movchan 1988). With these exceptions, the brown bullhead has rarely been reported from the Ukrainian sector of the Danube delta (Salnikov 1966) and it was not detected there in a recent study (Movchan 2011). Another unconfirmed record in Ukraine from 2004 comes from local fishermen working on the Dnieper Reservoir (Bulakhov et al. 2008).

During the last decade several new findings of the brown bullhead have been reported from the Transcarpathian and Northern Ukraine (Gryb et al. 2012; Markovych and Kutsokon 2012). However, it has never been found in the Dniester River basin (Movchan et al. 2014; Khudyi 2016). Our paper presents new findings of the non-indigenous brown bullhead from the upper part of the Dniester River drainage in the city of Lviv, Ukraine.



**Figure 1.** Sampling site in the city of Lviv, Ukraine. Photography by Ihor Dykyy.



**Figure 2.** A – *Ameiurus nebulosus*, caught in a pond in the city of Lviv, Ukraine (current sampling); B – *Ameiurus melas*, caught in oxbow of the River Latorica, Transcarpathia, Ukraine, 24.04.2011 (sample No 8949, National Natural history museum of NAS of Ukraine, Kyiv). Photography by Iuliia Kutsokon.

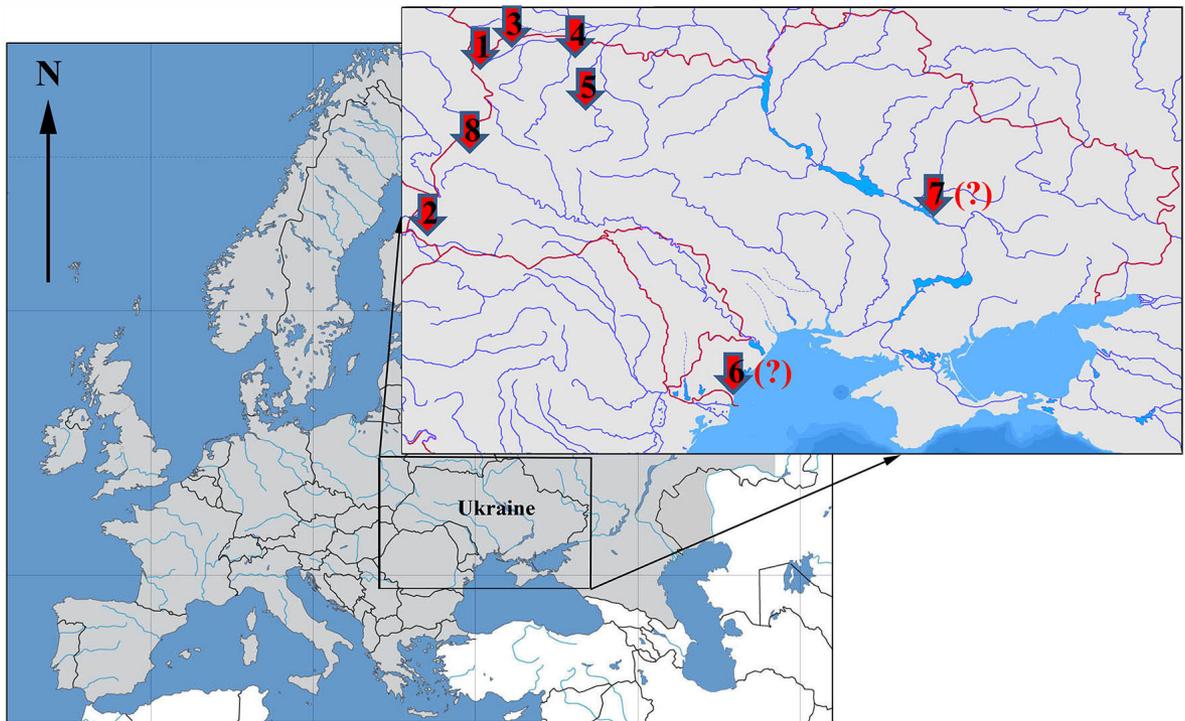
## Material and methods

The fish were caught in an artificial pond, in the densely inhabited southwestern part of the city of Lviv (49°48'02.9"N; 24°00'58.1"E) on September 21<sup>st</sup>, 2017. The water body is located in the Zubria River drainage, Dniester River basin. It is about 2.5–3 m deep with a total surface area of 17233 m<sup>2</sup>. It is characterized by a muddy bottom, partially covered by aquatic plants: *Ceratophyllum*, *Phragmites*, *Potamogeton*, *Typha* (Figure 1). The pond is used by amateur anglers and is highly polluted with litter. Fish sampling was performed using a 0.5 m long dipnet, 0.5 cm mesh size down to 1 m depth.

The *Ameiurus* catfish was identified using the characters proposed by Nowak et al. (2010), who summarised a number of diagnostic features proposed in earlier works (Scott and Crossman 1973; Kottelat and Freyhof 2007). Standard length (SL, mm) was measured and each fish was weighted (m, g). The age of fish was estimated in accordance to its weight and length following Movchan (1988), who provided such data for Ukrainian water bodies.

**Table 1.** Diagnostic characters of *Ameiurus melas* and *Ameiurus nebulosus* (characters taken from Nowak et al. 2010) compared with the data obtained from the examined specimens.

Character	<i>Ameiurus melas</i>	<i>Ameiurus nebulosus</i>	Examined specimens (n = 8)
Anal-fin base enlargement	Yes	No	Weakly
Anal-fin membrane pigmentation	Black or dark	Lacking pigment	Lacking pigment
Body coloration	Plain	Mottled	Bit spotty
Anal-fin rays (total)	17–21	21–24	21–23
Caudal-fin rays	15–18	18–19	18–20
Dorsal-fin branched rays	5–6	6–7	6–7
Serrations on pectoral-fin spine	Poorly developed or absent; always absent near tip	Well-developed along full length, saw-like	Well-developed along full length, saw-like, but sometimes absent near tip



**Figure 3.** The occurrences of *Ameiurus nebulosus* in Ukraine: 1 – Shatsk Lakes, since 1937 (Ivlev and Protasov 1948); 2 – Transcarpathia, since 1954 (Movchan 1988); 3 – lakes Turske and Orikhovske, Prypiat River drainage, since 2008 (Bigun and Afanasyev 2011), 4 – Ukrainian Polesie, Prypiat River drainage, since 2000s (Hrokhovska et al. 2012); 5 – Ustyia River drainage, since 2000s (Hrokhovska et al. 2012); 6 – Danube delta, unconfirmed data, 1960s (Salnikov 1966); 7 – Dnieper Reservoir, unconfirmed data, 2004 (Bulakhov et al. 2008); 8 – a pond in Lviv, Upper Dniester basin, 2017 (current data) (Supplementary material Table S1).

## Results

Only three fish species were present in the pond: Chinese sleeper, *Perccottus glenii* Dybowski, 1877, brown bullhead, *A. nebulosus*, and Northern pike, *Esox lucius* L., 1758. The Chinese sleeper, an invasive East Asian species, dominated in the catch with approximately 100 individuals, while the pike was represented by only three individuals. Eight specimens of *Ameiurus* bullhead (SL = 61.6–78.9 mm, m = 6.86–11.30 g) were caught (Figure 2). According to weight and length the fish were 0+ or 1+.

The main meristic and diagnostic features of two *Ameiurus* species and the currently sampled fish are presented in Table 1. Following this, the 8 *Ameiurus* were identified as the brown bullhead, *A. nebulosus*. For example, the anal-fin membrane was lacking pigmentation as in *A. nebulosus*, while *A. melas* is characterised by a black or dark anal-fin membrane. Serrations on pectoral-fin spine were well-developed along full length, saw-like, as in *A. nebulosus*. In smaller individuals, the serrations of the spiny ray of the pectoral fin were poorly developed (Scott and Crossman 1973).

## Discussion

We provide a first report of the brown bullhead in the Dniester River drainage (see Figure 3); the first record for the Ukrainian sector of the Dniester River (Movchan et al. 2014; Khudyi 2016). It is also absent from Moldova (Bulat et al. 2014), and from the Strwiąż River (Dniester River drainage) in Poland (Grabowska et al. 2010). However, the Strwiąż River flows through the Bieszczady Mountains, therefore the absence of the limnophilic brown bullhead is not surprising: in the neighbouring San River it is present only in the middle and lower run and absent from the upper sector (Kotusz 2008). The population in Lviv is the third confirmed finding of the brown bullhead in Ukraine, after Shatsk Lakes and Transcarpathia, ignoring the unconfirmed site in the Danube delta (Figure 3).

Various populations of the brown bullhead in Europe have different origins. In Western, and partly in Central, Europe it was first introduced as an ornamental fish to aquaria and garden ponds (Kunstler 1908; Vivier 1951). Given the confusion in distinguishing brown and black bullheads (see Nowak et al. 2008, 2010; Rutkayová et al. 2013), their invasion routes in Europe are not clear. Both *Ameiurus* species were probably introduced together, maybe even at the same time (Nowak et al. 2010). Kunstler (1908) reports the wide usage of the brown bullhead as an ornamental fish in garden ponds. This probably resulted in its wide distribution in France; by the beginning of the 20<sup>th</sup> century it was already common in all French major drainages (Vivier 1951). In Eastern Europe it was intentionally introduced in 1935 to the Prypyat River drainage in Belarus, then, in 1937, to the Shatsk Lakes in Ukraine (Ivlev and Protasov 1948). Bullhead was probably just a “hitchhiker” introduced along with commercially important fishes (Grabowska et al. 2010; Kvach and Kutsokon 2017). Bullhead findings in Belarus are located mainly along the central part of the “Central Corridor” of aquatic invasions in Europe (Panov et al. 2009), suggesting its further distribution was most probably via this route. This fish has apparently penetrated Eastern Poland, where has been known since the 1940s (Adamczyk 1975).

Brown bullhead has been reported from the whole of Eastern Europe, including the Kuban and Volga river drainages (Kottelat and Freyhof 2007). However, the presence of this fish in Russia is not confirmed (Bogutskaya and Naseka 2004). The Dniester basin was commonly included in the species range maps without particular localities (Reshetnikov 2002; Kotusz 2008). Indeed, this species is absent from most of Ukraine, with the exception of Volyn (Shatsk Lakes and Prypyat basin) and Transcarpathia (Movchan et al. 2014). The origin of the newly found population

is unknown. Apart from the Ukrainian populations, the closest occurrences come from the Vistula basin in Poland (Kotusz 2008; Rechulicz et al. 2015). However, all these localities are about 150–200 km from the city of Lviv. Therefore, the most plausible vector of species introduction is its translocation by local anglers or aquarists. The illegal release of commercially unprofitable and unwanted organisms to urban waters is rather common in Ukraine. For example, the ornamental Chameleon goby, *Tridentiger trigonocephalus* (Gill, 1859), has been found in the Black Sea waters, while the marbled crayfish, *Procambarus fallax* (Hagen, 1870), has recently been reported from fresh waters (Novitsky and Son 2016; Kvach and Kutsokon 2017).

The city of Lviv is located on the watershed of two big rivers: the Dniester River (Black Sea basin), in the south and southwest, and the Bug River (Baltic Sea), in the north and northeast (Andrianov 1951). The territory of the city is characterized by a high number of small ponds and reservoirs. This is a good opportunity for invasive fish species to penetrate through basin boundaries. For example, the population of the invasive Chinese sleeper, *P. glenii*, in the Dniester drainage in the city of Lviv was a source for the population in the Vistula basin (Reshetnikov 2013; Kvach et al. 2016). Similarly, human-aided range expansion of the invasive calico crayfish, *Orconectes immunitus* (Hagen, 1870) between different watersheds has already occurred in Germany and possibly in France (Chucholl and Dehus 2011; Collas et al. 2011).

We assume two most likely distribution routes for the brown bullhead in Ukraine. First is the penetration of this fish to the Zubrya River and further spread to the main Dniester flow. This is a route used in the past by the invasive Chinese sleeper, which is now common in the upper and middle Dniester River drainage (Kutsokon 2017). For movement of brown bullhead to water bodies in the north-western part of the city of Lviv, its further invasion to the Poltva River and then to upper Bug River drainage (Vistula drainage, Baltic basin), is plausible. If there are further findings of the brown bullhead in Ukraine its status could be invasive.

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### Supplementary material

The following supplementary material is available for this article:

**Table S1.** Records of *Ameiurus nebulosus* in Ukraine.

**Table S2.** First records of *Ameiurus nebulosus* in neighbouring countries.

**Appendix 1.** List of references for annotated checklist.

This material is available as part of online article from:

[http://www.reabic.net/journals/bir/2018/Supplements/BIR\\_2018\\_Kutsokon\\_et\\_al\\_SupplementaryTables.xlsx](http://www.reabic.net/journals/bir/2018/Supplements/BIR_2018_Kutsokon_et_al_SupplementaryTables.xlsx)