



The black bullhead (*Ameiurus melas*, Rafinesque 1820) - a new invasive fish species in Someș river, Romania

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Abstract. The black bullhead (*Ameiurus melas*) is an Ictalurid North American fish species with great potential for invading new areas. It was introduced in Europe in the 19th century. Usually mistaken with the brown bullhead (*Ameiurus nebulosus*), the correct identification of this species in Europe has proven to be problematic. Scientific literature has, in some cases, been inaccurate in presenting information regarding the non-native areas of *A. melas* in Europe, mainly because the meristic characteristics of the black bullhead and brown bullhead overlap. In Romania, the black bullhead has been previously reported in Ier, Barcău and Danube rivers and the catchment of the Criș river. In this study, the presence of *A. melas* in Someș river, Romania, is recorded. Six specimens were captured in 2018 and identified based on the pectoral spine morphology and other biological traits. Morphometric measurements were taken, and age determination was made. To our knowledge, this is the first report of *A. melas* in Someș river.

Key Words: *Ameiurus melas*, invasive species, Romania, Ictaluridae, Someș river.

Introduction. The black bullhead *Ameiurus melas* (Ictaluridae: Siluriformes) is a fish species tolerant to adverse environmental conditions, like low oxygen or increased water temperatures. It prefers ponds, low gradient streams and small bodies of water (Campbell & Branson 1978). *A. melas* displays a strong protective parental behavior by guarding the nest (Fowler 1917). It is native to North America (Glodek 1980), but it has been introduced in other areas. The populations are concentrated and formed by dwarf specimens in Europe (Rutkayova et al 2012). The black bullhead is an alien fish species in Europe (EASIN 2018), while IUCN catalogues it as an "invasive alien species" (Zogaris 2017). The EASIN initiative of the Joint Research Centre of the European Commission deems the impact of the species as "low/unknown", but scientific research shows that it impacts native fauna from invaded areas (Kreutzenberger et al 2008), also representing a threat to fisheries and fish-farms (Garcia-de-Lomas et al 2009). Ictalurid species were introduced in France, Belgium, Germany and UK in late 19th century (Horoszewicz 1971; Wheeler 1978), but no distinction between different species was made. In 2010, the species was present in 19 European countries (Rutkayová et al 2012). The potential of the black bullhead for invasiveness is debatable. In UK, there are only a few populations (Wheeler et al 2004), while in France it has an "invasive" legal status (Guevel 1997) and in Finland it presents a medium risk of invasiveness (Puntala et al 2013).

The status of the black bullhead is still unclear in many areas, since it is vastly mistaken with the brown bullhead (*Ameiurus nebulosus*). For example, in France it was misidentified for over 100 years (Nowak et al 2008). The meristic characters of the two species overlap and there is little morphological variety between the two, some authors having considered the European populations of brown bullheads as a new subspecies - *Ictalurus nebulosus pannonicus* (Harka & Pinter 1990). Initially, it was believed that all European specimens of bullhead belonged to the *Ameiurus nebulosus* species. Later, Spillmann (1967) suggested that all specimens belong to *Ameiurus melas* species. Still,

some researchers maintained their belief that the fish species present in Europe at that time was *Ameiurus nebulosus* (Bănărescu 1964). In Romania, a certain moment of black bullhead introduction cannot be yet determined. The first sighting of the black bullhead in Romanian waters was in 1997, in Ier and Barcău rivers (Wilhelm 1998). The fish was introduced in a Hungarian fish farm, in the western part of the country, in the beginning of the 1980s, from where it reached the Danube (Pinter 2002). The fish is probably present in three Criș rivers from Romania, since it reached the Criș river catchment (Harka 1997a). It is presumed that the fish reached Romanian waters by migration. Both Ier and Barcău rivers cross the Romanian western border into Hungary, so this hypothesis is plausible. One specimen of *A. melas* was captured in the Romanian Danube sector in 2005 (Popa et al 2006). There have been other sightings of the species in ponds and lakes, but the scientific literature regarding the black bullhead in Romania is scarce. The aim of this paper is to bring forth new information regarding the non-native areas in which *Ameiurus melas* is present. The fish was found in 2018 in Someș river, Romania.

Material and Method. The black bullhead was first observed in Someș River in June 2018, when local sport fishermen caught some fish and misidentified them either with the brown bullhead, or with the wels catfish (*Silurus glanis*) near Letca village, Salaj county.

Sampling points. Following these reports, three sampling points were selected near the initial sighting area, in Lemniu, Letca and Cuciulat villages (Figure 1). Each location was sampled two times, from July to September 2018, each time consisting of 8 hours of fishing. Each site had different environmental characteristics (Table 1).

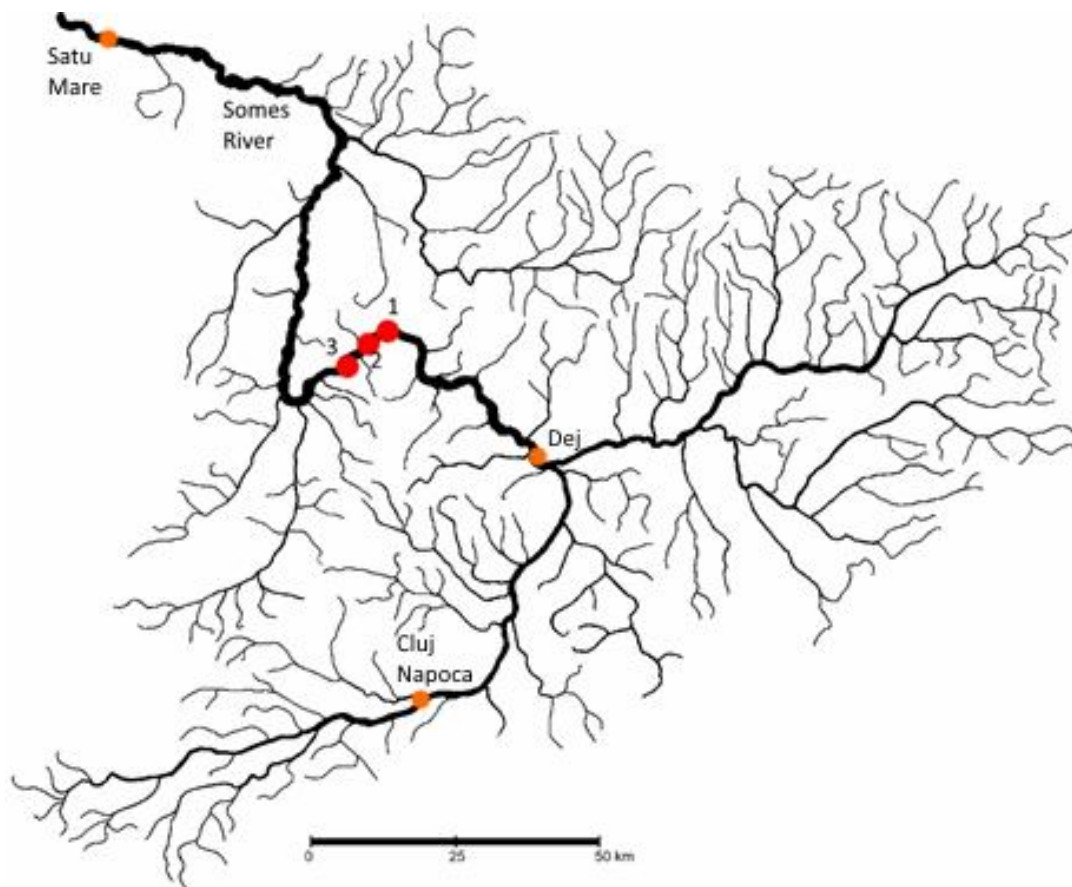


Figure 1. Sampling points: 1 - Lemniu; 2 - Letca; 3 - Cuciulat (original).

Table 1

Fishing sites - GPS coordinates, dates, number of *A. melas* captured, hydrological conditions, other species captured and observations

	<i>Sampling site</i>		
	<i>Lemniu</i>	<i>Letca</i>	<i>Cuciulat</i>
GPSc	47°20'43.174"N- 23°29'9.51"E	47°20'7.449"N- 23°28'22.157"E	47°18'33.192"N- 23°25'3.975"E
Date	1-2.09.2018	4-5.08.2018	28-29.07.2018
n	0	5	1
Hc	Low turbidity, 0.5-1 m water depth, gravel substrate, high water flow.	High turbidity, 0.8-1.5 m water depth, muddy substrate, low water flow.	High turbidity, 1.5-2 m water depth, gravel and sand substrate, medium water flow.
OS	<i>Alburnoides bipunctatus</i> , <i>Gobio gobio</i> , <i>Squalius cephalus</i> , <i>Alburnus alburnus</i> , <i>Chondrostoma nasus</i>	<i>Alburnoides bipunctatus</i> , <i>Gobio gobio</i> , <i>Silurus glanis</i> , <i>Ballerus sapa</i> , <i>Neogobius fluviatilis</i>	<i>Barbus barbus</i> , <i>Vimba vimba</i> , <i>Silurus glanis</i> , <i>Alburnoides bipunctatus</i> , <i>Gobio gobio</i> , <i>Cyprinus carpio</i>
Obs	Water vegetation was present.	All black bullhead specimens were captured in the afternoon, close to the flooded bank. The water level was high, following heavy rains.	The specimen was caught close to shore, after schneiders stopped feeding.

GPSc - GPS coordinates; n - number of black bullheads caught; Hc - hydrological conditions; OS - other fish species captured; Obs - observations.

Sampling method. The sampling method consisted in angling, being a less invasive method (Willis et al 2000). Small barbless hooks were used in two stationary fishing techniques, feeder fishing with picker rods and bolognese float fishing. High protein commercial feeds were used as attractants and house fly maggots (*Musca domestica*), redworms (*Eisenia fetida*) and earthworms (*Lumbricus terrestris*) were used as hook baits.

Species determination was made *in situ*, based on scientific literature meristic and biological characteristics. The number of dorsal fin rays (DFR) and anal fin rays (AFR) was recorded. Captured fish were measured with an electronic caliper and weighted with an electronic scale to determine a series of morphometric values: the total length (TL), standard length (SL) and body weight (BW). Fulton's condition factor (K) was calculated. Age was later determined based on literature correlations between total length and age (Pedicillo et al 2008). No statistical test was performed, since the number of captured specimens was low.

Results and Discussion. Six black bullhead specimens were captured and studied, five from Letca and one from Cuciulat, while no black bullheads were captured from Lemniu. Out of these six individuals, four were caught by us and the other two were captured by an angler using the same techniques, fishing a swim close to our stand at Letca fishing site. At our request, the two fish could be identified and measured. Most fish were captured in murky water, with a slow flow and muddy substrate, near the bank. The water depth was 0.8 to 1.5 m. Fast flow and shallow water conditions seem to be less preferred by *A. melas*. Even if it is considered a nocturnal feeder (Darnell & Meierotto 1965), the specimens were captured during the day. Usually, schneiders (*Alburnoides bipunctatus*) and gudgeons (*Gobio gobio*) were the first to respond to our baits, larger species appearing later. The *A. melas* specimens were captured when other medium and large size species were feeding, like chub (*Squalius cephalus*), wels catfish juveniles (*Silurus glanis*), silver eyed bream (*Ballerus sapa*) or vimba bream (*Vimba vimba*). It seems that the black bullhead is a candidate for the same benthic food sources as these species. The available food reduction of other species due to black bullhead feeding

behavior was also observed by other authors (Kreutzenberger et al 2008). The captured specimens preferred housefly maggots (*Musca domestica*). The species displayed an aggressive behavior when taking the bait, all the black bullheads swallowing the hook. One individual regurgitated a freshwater mussel (*Unio* genus), the studied Someș river area being rich in *Unio* genus mussels, a food source for chub, common carp (*Cyprinus carpio*), wels catfish and other fish species. Two possible causes for the habitation of the black bullhead in Someș river exist. The first one is that the fish migrated from Tisza river, Hungary, where the fish has been present since the 1990s (Pintér 1991; Harka 1997b), Someș being an affluent of Tisza. The other cause could be accidental introductions with other species when restocking nearby fish-farms or sport fishing ponds, from where it escaped in natural waters.

The species can be easily mistaken with the brown bullhead. In Europe, it has been often misidentified (Nowak et al 2008). One concluding biological trait is the pectoral spine (Figure 2). The pectoral spine of the black bullhead usually lacks serrations, or if denticles exist, they are small and underdeveloped, while the brown bullhead has a higher number of deep serrations on the posterior aspect of the pectoral spine (Rutkayova et al 2012). Another species introduced in Europe (Popa et al 2006) which the black bullhead can be mistaken with is the yellow bullhead (*Ameiurus natalis*). One distinctive feature of *A. natalis* is the color of the submandibular barbels, these being completely white (Minckley 1971). In our case, all the bullheads had dark barbels. All fish identified had mild or no serrations on the pectoral spine. Other biological traits that distinguish *A. melas* from *A. nebulosus* are the lack of pattern or darker specks on the body, a small median caudal notch and dark membranes between fin rays, all of which were present in the Someș river individuals (Figure 3). Another trait reported by some authors (Etnier & Starnes 2001) is the blackish coloration of all the barbels, for both species. The captured specimens presented a dark coloration of the barbels.

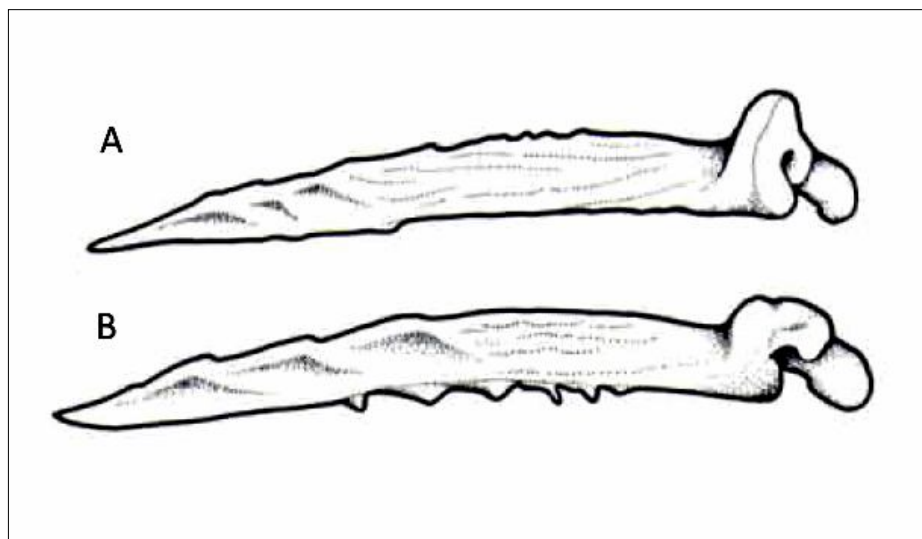


Figure 2. *A. melas* (A) and *A. nebulosus* (B) pectoral spine (Jenkins & Burkhead 1994).

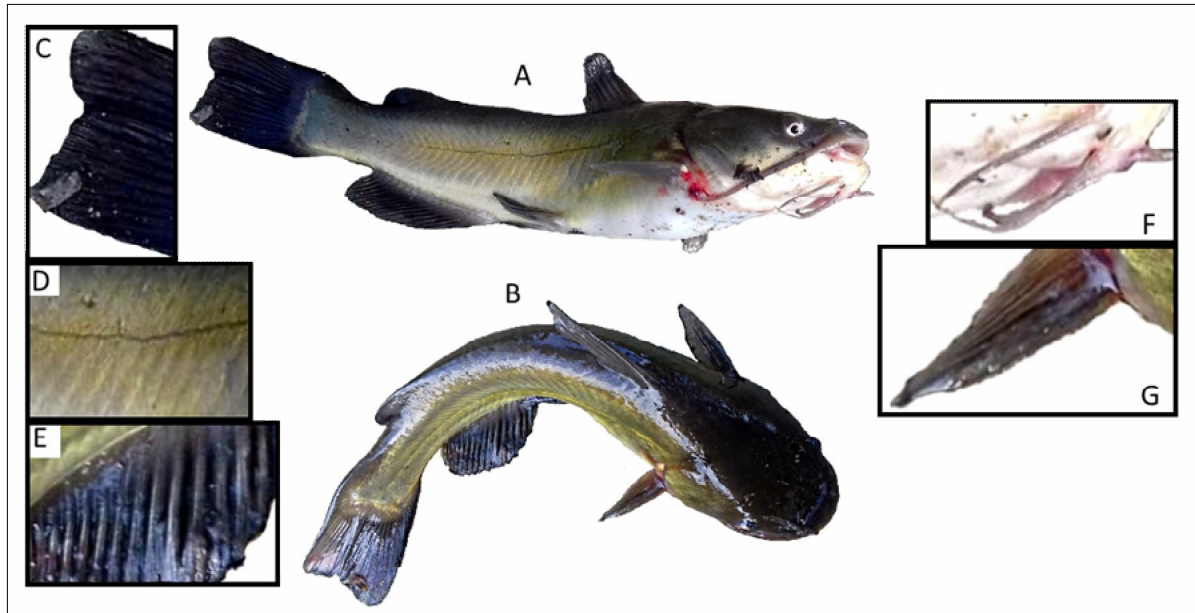


Figure 3. Black bullhead distinctive traits: A - black bullhead lateral view; B - black bullhead superior view; C - caudal notch; D - flank with no pattern; E - dark colored membrane between anal fin rays; F - dark colored barbels; G - pectoral spine (original).

One fish was caught in Cuciulat, the smallest one, 7.36 cm, at about half a meter from the bank. The fish can be grouped in three age categories, 0+, 1+ and 2+. Age 3+ is the age of sexual maturity for *A. melas*, but this aspect has not yet been studied for Someș river. Two larger individuals were captured from Letca, with the TL of 16.05 and 15.64 cm. The number of dorsal fin rays and anal fin rays coincide with those reported by other authors (Cvijanovic et al 2012), 1(5)-1(6) and 19-22 respectively. However, in the case of black bullhead, meristic characters are not necessarily an ideal differentiating factor when identifying the species, due to the wide range of results recorded by other authors. Page & Burr (1991) find that *A. melas* has 19 to 23 rays in the anal fin, Scott & Crossman (1973) observe 17 to 21 rays in the same fin and other studies indicate a higher number of rays in the same fin, up to 25 (Etnier & Starnes 2001). Regarding the gill rakers, the same situation appears. Research results indicate a range between 15-20 gill rakers for black bullhead (Etnier & Starnes 2001; Kottelat & Freyhof 2007). The Fulton condition factor is above 1.3 for all Someș river specimens, with a high of 1.45, the values being similar with those obtained by other authors (Copp et al 2016). The morphometric and meristic values, as well as Fulton's condition factor are presented in Table 2.

Table 2
Morphometric and meristic characteristics of black bullheads from Someș river

No.	TL (cm)	SL (cm)	BW (g)	K	Age (years)	DFR	AFR
1	11.39	9.66	20.1	1.36	1+	1(5)	19
2	15.64	13.22	54.1	1.41	2+	1(6)	21
3	7.68	6.54	6.3	1.39	0+	1(5)	20
4	16.05	13.67	57.5	1.39	2+	1(5)	19
5	11.69	10.04	22	1.37	1+	1(5)	22
6	7.36	6.31	5.8	1.45	0+	1(6)	20

TL - total length; SL - standard length; BW - body weight; K - Fulton's condition factor; DFR - number of dorsal fin rays; AFR - number of anal fin rays.

Conclusions. Six specimens of black bullhead (*Ameiurus melas*) were captured in 2018 from Someș river, Romania. To our knowledge, this is the first sighting of this species in Someș river. Morphometric and meristic values are similar to existing information in scientific literature. This non-native species is generally mistaken with the brown

bullhead (*Ameiurus nebulosus*). The only clear morphological trait that distinguishes the two species is the serrations of the pectoral spine. Scientific literature is currently trying to correctly present the status of *A. melas* in Europe, this paper bringing new information regarding its presence in Eastern Europe. Further studies are necessary to monitor and assess the impact of this invasive non-native fish on local fish populations.

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