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THE FIRST RECORD OF NON-NATIVE LARGEMOUTH BLACK BASS, *MICROPTERUS SALMOIDES* (ACTINOPTERYGII: PERCIFORMES: CENTRARCHIDAE), IN BOSNIA AND HERZEGOVINA

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Abstract. This paper describes the first record of the largemouth black bass, *Micropterus salmoides* (Lacepède, 1802)—a non-native fish species—in the freshwaters of Bosnia and Herzegovina. A single specimen was captured in the Sava River near the small town of Kaoci (northern Bosnia and Herzegovina) in December 2014. The origin of this introduction is not known, but most probably it was a dispersal from neighbouring freshwater habitats from other parts of the Sava River basin in Croatia and the Danube River in Serbia.

Keywords: fish introduction, exotic species, competition, Sava River basin, Balkan Peninsula

Bosnia and Herzegovina is characterized by a high number of freshwater fish species, including many endemics (Sofradžija 2009). This ichthyofauna, however, needs a thorough systematization, which has been emphasized by Tutman et al. (2012, 2013). The state of current knowledge of inland non-native freshwater fishes of this country lags far behind the knowledge on fishes in other countries of the Mediterranean basin (Ribeiro and Leunda 2012). Currently, there are approximately 21 non-native fish species recorded in freshwaters of Bosnia and Herzegovina (Tutman and Hamzić, unpublished data), and the list is still expanding. These species experienced different fates; some of them have established self-sustaining populations, including pumpkinseed, *Lepomis gibbosus* (Linnaeus, 1758); topmouth gudgeon, *Pseudorasbora parva* (Temminck et Schlegel, 1846); and sunbleak, *Leucaspius delineatus* (Heckel, 1843) (see Sofradžija 2009), while some other fish species experienced different scenarios (Glamuzina et al. 2017).

As a valuable freshwater sport fish, the largemouth black bass, *Micropterus salmoides* (Lacepède, 1802), has been widely introduced outside its native range into many countries of temperate and tropical climates (e.g., the United States, large areas of Europe, southern Africa, South America, parts of Asia, and many oceanic islands) (Heidinger 1976). Data on the distribution of largemouth black bass in the neighbouring countries are remarkably scarce and are based only on general notes from the Danubian watershed in Serbia (Maletin 1988, 1992) and Croatia (Mrakovčić et al. 2006). Good quality records with the specimen description were published only for the Croatian part of the lower Neretva River (Dulčić et al. 2017). Nevertheless, *M. salmoides* has previously been mentioned as a member of fish fauna of Bosnia and Herzegovina (Bogut et al. 2006). The present paper constitutes the first reliable record and extends the known distribution range of this species into river basins of the latter country.

A single specimen of *Micropterus salmoides* (Fig. 1) was captured on 28 November 2014 by a trammel net of a local fisherman (mesh size 40 mm) on the Sava River (Danube watershed) near the town Kaoci (45°06′21.28″N, 17°35′38.81″E), northern Bosnia and Herzegovina (Fig. 2) deployed at a depth of 2.5–4.0 m over a muddy bottom habitat. The temperature at the location of capture was 8.2°C. The specimen has been stuffed and deposited in the ichthyological collection of the Centre for Ichthyology and Fisheries (CIR) of the Faculty of Natural Sciences (PMF) in Sarajevo (catalogue number CIR-PMF-MS-2014).

The newly-reported specimen was identified, as *Micropterus salmoides*, according to Kottelat and Freyhof (2007) based on meristic features; 58–68 lateral line scales

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Fig. 1. The largemouth black bass, *Micropterus salmoides*, 360 mm TL caught in the Sava River in Bosnia and Herzegovina (photo by Zoran Mitrović, November 2014)

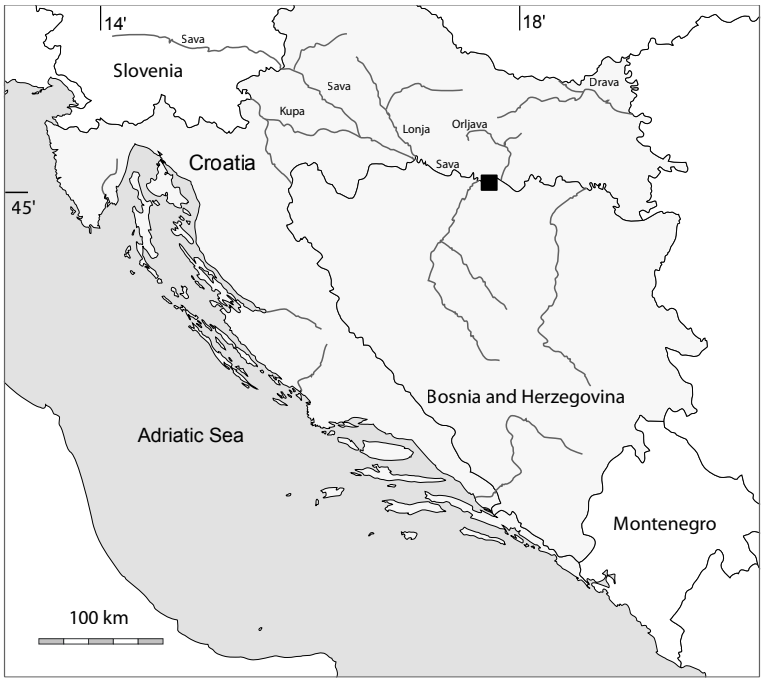

Fig. 2. Geographic location of recorded catch of the largemouth black bass, *Micropterus salmoides*, in the Sava River (■), northern Bosnia and Herzegovina

on body; one bold irregular midlateral stripe or series of closely set blotches; 3 anal spines; mouth large, upper jaws length greater than eye diameter. Measurements were taken on the left side of specimen using a mechanical calliper to the nearest 0.01 mm. A total of 18 morphometric and six meristic characters were determined and they are presented in Table 1. The captured specimen had a total length of 360 mm and a total weight of 370 g. The maximum length recorded for the species is 970 mm and the maximum weight 10.1 kg, but specimens usually captured are approximately 400 mm in length and 900 g in weight (Froese and Pauly 2017).

The morphological description and meristic counts match well with the distinctive characters of *Micropterus salmoides* (see Kottelat and Freyhof 2007) and confirms the first reliable record of this species for Bosnia and Herzegovina freshwaters.

The knowledge on the distribution and dispersal mechanism patterns of non-native species is crucial for their early detection and latter management. It is obvious that only reliable information about the distribution pathways of those species can result in accurate management actions intended to control or limit their spread (Gago et al. 2016). In the presently described new

record there is still some doubt regarding to the origin of the captured specimen (natural dispersal vs. human-mediated introduction). There are no published data on the distribution of *M. salmoides* in neighbouring countries, especially in Croatia, considering high invasive potential of this fish (Heidinger 1976). The only exception is the record provided by Mrakovčić et al. (2006), but without a precise area of distribution. On the other hand, the relevant sport-fishermen records available on the Internet vastly outnumber the confirmed occurrences of *M. salmoides* in the scientific literature. The data from the anglers' web forum provide useful information on the distribution and dispersal patterns of other non-native fish, and this source can be potentially applicable, preliminary assessment tool (Banha et al. 2015, Gago et al. 2016).

The presence of *M. salmoides* was reported in the 1950s and 1960s from Hungary along the Drava River, and now this fish is present in the Drava River in north-western Croatia*. Some of the new records of *M. salmoides* provided by anglers in Croatia** (e.g., Lake Petnja near Sibinj, Slavonski Brod, Croatian Sava River basin) are very close (less than 30 km) to the location of the presently reported first record in the Sava River within the borders of Bosnia and Herzegovina. The earlier mentioned Croatian waters drain into the Sava River, so this would explain the hypothesis about a natural dispersal.

Table 1

Morphometric measurements (in mm) and meristic counts of the largemouth black bass, *Micropterus salmoides*, from the Sava River in Bosnia and Herzegovina

Parameter	Morphometric measurement [mm]	Meristic count
Total length	360	
Standard length	320	
Predorsal length	140	
Preanal length	210	
Preventral length	120	
Prepectoral length	120	
I Dorsal fin length	30	
II Dorsal fin length	60	
Anal fin length	45	
Pectoral fin length	45	
Ventral fin length	40	
Caudal fin length	40	
Body depth (max)	92	
Body depth (min)	35	
Head length	120	
Ocular diameter	15	
Interorbital width	25	
Preorbital length	80	
I Dorsal fin rays		IX
II Dorsal fin rays		I + 13
Anal fin rays		III + 11
Pectoral fin rays		14
Ventral fin rays		I + 5
Caudal fin rays		II + 16

* *http://ribolov-koprivnica.com/old_web/BASS.htm.*

** *http://www.posavskahrvatska.hr/Novost.aspx?kat=22&id=22_2008022992646.*

Unfortunately, the problem of fish introduction in Bosnia and Herzegovina has not been controlled by the fish management authorities at any level and almost nothing has been done to for the public awareness, fish monitoring, and implementation of suitable management practices. The Sava River is the main waterway connecting Croatia, Bosnia and Herzegovina, and Serbia. The Sava River with its tributaries constitutes a major drainage basin of the south-eastern Europe, covering the total area of approximately 97 713 km^2 and represents 12% of the Danube River basin area (Jukić 2008). The Sava River has already been exposed to different anthropogenic stressors (Simonović et al. 2017), including organic and nutrient pollution from agriculture and industry (Ogrinc et al. 2015, Ščančar et al. 2015), hydromorphological degradation of habitats (Paunović et al. 2016), and expansion of non-indigenous Ponto–Caspian gobies (Piria et al. 2016). Consequently, introduction of non-native species might have socio-economic and environmental implications. Hence, there is an urgent need for additional effort in the recording, studying spatial distribution and impact of non-native species, as well as their control. To achieve the desired goals it is strongly recommended to monitor the spread of *Micropterus salmoides* and its potential effect on the environment and the local fishery in Bosnia and Herzegovina.

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