



Received: 29 Nov. 2016
Accepted: 4 Jan. 2017
Editor: R. Causse

The largemouth black bass (*Micropterus salmoides*): first record in the Neretva River delta, Adriatic drainage system of Croatia

by

Jakov DULČIĆ, Branko DRAGIČEVIĆ, Pero UGARKOVIĆ & Pero TUTMAN (1)

Résumé. – L'achigan à grande bouche (*Micropterus salmoides*) : premier signalement dans l'estuaire de la rivière Neretva, système de drainage adriatique de Croatie.

Le 10 octobre 2016, un spécimen de *Micropterus salmoides* a été capturé au trémail dans la rivière Neretva (système de drainage adriatique de Croatie). C'est le premier signalement de l'achigan à grande bouche dans cette rivière, et par conséquent dans le système hydrographique drainé vers l'Adriatique.

Key words. – Centrarchidae - *Micropterus salmoides* - Adriatic drainage system - Mala Neretva River - First record.

The largemouth black bass *Micropterus salmoides* (Lacepède, 1802) is native to the St. Lawrence-Great Lakes, Hudson Bay (Red River) and Mississippi River basins from southern Quebec to Minnesota and south to Texas, the Gulf Coast and southern Florida, including Atlantic drainages from North Carolina to Florida and Gulf drainages from southern Florida to northern Mexico (Page and Burr, 1991). Due to its appeal as a sport fish and for its tasty flesh, *M. salmoides* has been introduced throughout the United States, southern Canada, and much of the world (large areas of Europe, southern Africa, South America, parts of Asia and many oceanic islands) (Gratwicke and Marshall, 2001). It inhabits warm, quiet and low turbid waters, soft bottoms, and beds of aquatic plants. Typical habitats include farm ponds, swamps, lakes, reservoirs, sloughs, creek pools, and river coves and backwaters. Many of the largest populations are in mesotrophic to eutrophic lakes or reservoirs.

The largemouth bass was introduced along with pumpkinseed (*Lepomis gibbosus* L.) into Europe at the end of the 19th century. In 1883, it was imported into Germany and, then, into Czechoslovakia, with the first record in the open waters of the Danube dating back to 1957. In the *Red Book of Freshwater Fish*, a list of 19 alien species that had colonised the mainland waters of Croatia was published and one of them is *M. salmoides*, but only for the Black Sea drainage system (Mrakovčić *et al.*, 2006). The present contribution describes the first record of the largemouth black bass from the Mala Neretva River and consequently for the Adriatic drainage system as a whole.

MATERIAL AND METHODS

On 10 October 2016, one immature specimen of largemouth black bass (total length, TL = 22.6 cm; weight, W = 181 g) (Fig. 1) was captured by trammel net (mesh size 20 mm) near the town Opuzen, Croatia (43°00'30.59"N; 17°32'40.19"E) (Fig. 2) at a depth of 1.5 m on a muddy bottom. The salinity at the location of capture was 0.6 ppt, while temperature was 11.7°C. The specimen



Figure 1. – *Micropterus salmoides* (22.6 cm TL) from Mala Neretva River (catalogue number MS-IOR 101016).



Figure 2. – Catch location of *M. salmoides* (near Opuzen, Neretva River delta, Adriatic drainage system of Croatia).

was deposited (preserved in 95% alcohol) in the ichthyological collection of the Institute of Oceanography and Fisheries in Split, Laboratory of Ichthyology and Coastal Fishery (catalogue number MS-IOR 101016).

Description of the Mala Neretva specimen

The identification key of Scott and Crossman (1973) was used. Specimen has: dorsal fin rays X+13; anal fin rays III+11; pectoral fin rays 14; ventral fin rays I+5; lateral line scales 57; branchiostegal rays 6; separate gill membranes; standard length 1.2 times into total length; base of anal fin 1.9 times into base of dorsal fin; greatest depth 3.3 times into length from tip of snout to end of scales;

(1) Institute of Oceanography and Fisheries, PO Box 500, 21000 Split, Croatia. [brankod@izor.hr] [tutman@izor.hr]

* Corresponding author [dulcic@izor.hr]

preorbital length 3.3 times into head length; ocular diameter into head length 4.9 times; upper jaw extending beyond the eyes; connection between dorsal fins lower; shortest posterior spine less than one-half the longest; pelvic fins not joined by a membrane; membrane connecting fins to body obvious.

DISCUSSION

No scientific publication has previously reported *M. salmoides* in the Mala Neretva and Neretva River watershed, nor in any other rivers of the Adriatic drainage system of Croatia. Although there are notes suggesting the freshwaters of Bosnia and Herzegovina as a potential distribution area for *M. salmoides*, this data are based only on species lists, which lack detailed species descriptions and localities (Bogut *et al.*, 2006) making the data unreliable. The only possible explanation for such record in the study area is a not sufficiently controlled introduction (in this case of a non-native species).

The largemouth black bass has been probably introduced to the Mala Neretva River and now represents potential threat, especially in case of establishing a population, to the natural equilibrium of their community. In some places where it was introduced, it has already affected populations of small native fish through predation, sometimes resulting in the decline or extinction of such species (Jackson, 2002). Its diet includes fish, crayfish, amphibians and insects. Marković *et al.* (1996) reported that the largemouth bass as a predatory species can become a food competitor for autochthonous predators like pike (*Esox lucius* L.). There is also evidence that largemouth black bass consume salmonids, especially when juveniles are migrating (Brown *et al.*, 2009). Alien fish such as largemouth black bass are introduced into water-bodies already altered by human activities; once the introduced fish establish thriving populations, it is difficult for damaged populations of salmon or trout to become re-established (Lackey, 1999). The loss of biodiversity and homogenization of freshwater ecosystems in North America is linked to the introductions of the largemouth black bass (Jackson, 2002).

The artificial flow regulation creates specific conditions and today Mala Neretva River is under a slow flow rate during winter and almost without flow during summer. The temperature range is between 7-8°C in winter and 25-28°C during summer. The salinity is always below 1 psu, despite adjacent marine waters. This creates a suitable habitat for most of the cyprinids, bream and bass species. Largemouth black bass generally inhabit waters that range from fresh to oligohaline, although some individuals have been reported from tidal freshwater and estuaries with salinities up to 24 psu (Peer *et al.*, 2006). It seems that winter temperatures are not adequate for the largemouth black bass since the minimum temperature that permits its growth is 15°C and optimal temperature for spawning and incubation is within range of 13-26°C. Survival of eggs and embryos is unlikely above 30° or below 10°C (Brown *et al.*, 2009). It seems that the lowest winter temperature could be a limiting factor in the establishment of the largemouth black bass population or increase in its abundance in the study area.

Neretva Delta is the estuary of Neretva River, the longest river that crosses the Adriatic coast; largely flowing through Bosnia and Herzegovina, as well as Croatia, where it enters into sea. Its biodiversity is of great significance and it is considered one of the most important wetlands in Europe. However, this area suffers from the uncontrolled introduction of alien species. Recently, the common bream *Abramis brama* (Dulčić & Tutman, 2015) and blue crab *Callinectes sapidus* (Dulčić *et al.*, 2011) were introduced in the Neretva River delta habitats, and now potentially represents a threat to the natural equilibrium of the delta community. Judging by these experiences, alien predators, such as largemouth black bass,

may have severe consequences for the autochthonous ecological communities in terms of significant disturbance of local communities interactions. Neretva River is one of the rivers with the largest number of endemic fish species in the Mediterranean (more than 20 endemic species, of which 18 species are endemic species of the Adriatic watershed, and three endemic species in Croatia), which could be now potentially threatened by the presence of the largemouth black bass.

In any case, prevention measures should be taken by the administration in the Republic of Croatia and in the Republic of Bosnia and Herzegovina since the Neretva River is shared between them (Mala Neretva is a 15 km river section close to the Neretva River delta) to avoid introductions of non-indigenous species and spreading of this species to other reservoirs and river basins. To achieve the desired goal, monitoring of the largemouth black bass spreading and potential effect on environment and local fishery, is strongly recommended.

Acknowledgements. – We wish to thank Mr. Marinko Curić (Opuzen, Croatia) for providing us the largemouth black bass specimen.

REFERENCES

- BOGUT I., NOVOSILIĆ D. & PAVLIČEVIĆ J., 2006. - Fish Biology. Osijek: Sveučilište J.J. Strossmayera u Osijeku, Sveučilište u Mostaru. [In Croatian]
- BROWN T.G., RUNCIMAN B., POLLARD S. & GRANT A.D.A., 2009. - Biological synopsis of largemouth bass (*Micropterus salmoides*). *Can. Manuscr. Rep. Fish. Aquat. Sci.*, 2884: 1-27.
- DULČIĆ J. & TUTMAN P., 2015. - Additional record of common bream *Abramis brama* (Cyprinidae) in the Adriatic drainage system (Norin River, Croatia). *Ann. Ser. Hist. Nat.*, 25(2): 145-148.
- DULČIĆ J., TUTMAN P., MATIĆ-SKOKO S. & GLAMUZINA B., 2011. - Six years from first record to population establishment: the case of the blue crab, *Callinectes sapidus* Rathbun, 1896 (Brachyura, Portunidae) in the Neretva River delta (southeastern Adriatic Sea, Croatia). *Crustaceana*, 84(10): 1211-1220.
- GRATWICKE B. & MARSHALL E., 2001. - The relationship between the exotic predators *Micropterus salmoides* and *Serranochromis robustus*, and native stream fishes in Zimbabwe. *J. Fish Biol.*, 58: 68-75.
- JACKSON D.A., 2002. - Ecological effects of *Micropterus* introductions: the dark side of black bass. In: Blak Bass: Ecology, Conservation and Management (Phillip D.P. & Ridgway M.S., eds), pp. 221-232. American Fisheries Society Symposium 31, Bethesda.
- LACKEY R.T., 1999. - Salmon policy: Science, society, restoration, and reality. *Renew. Res. J.*, 17: 6-16.
- MARKOVIĆ G., SIMOVIĆ S. & VASILJEVIĆ V., 1996. - Possible outcome of largemouth bass (*Micropterus salmoides* Lacepede 1802) propagation in water courses and ponds of Yugoslavia (In Serbian with English summary). *Poljopr. Sumar.*, 42:101-107.
- MRAKOVČIĆ M., BRIGIĆ A., BUJ I., ČALET M., MUSTAFIĆ P. & ZANELLA D., 2006. - Red Book of Freshwater Fishes of Croatia. Ministry of Culture, State Institute for Nature Protection, Republic of Croatia, Zagreb. [In Croatian]
- PEER A.C., DeVRIES D.R. & WRIGHT R.A., 2006. - First-year growth and recruitment of coastal largemouth bass (*Micropterus salmoides*): spatial patterns unresolved by critical periods along a salinity gradient. *Can. J. Fish. Aquat. Sci.*, 63: 1911-1924.
- SCOTT W.B. & CROSSMAN E.J., 1973. - Freshwater fishes of Canada. *Bull. Fish. Res. Bd Can.*, 184: 1-966.