Aquatic Invasions (2011) Volume 6, Supplement 1: S153–S157
doi: 10.3391/ai.2011.6.S1.034

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Aquatic Invasions Records

First record of round goby, *Neogobius melanostomus* (Pallas, 1814) in the Sava River, Croatia

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Received: 18 July 2011 / Accepted: 30 November 2011 / Published online: 2 December 2011

Abstract

In June 2011, 34 specimens of round goby (*Neogobius melanostomus*) were caught at three different locations in the Sava River in Croatia, which is a first record of this invasive species in Danube tributaries in Croatia. Size, structure and condition of populations indicate that the species is well adjusted to its new habitat and that further range expansions are highly likely.

Key words: round goby, Sava River, Croatia, invasive species

Introduction

Recently, expansion of two species of Ponto-Caspian gobies has been reported in the Croatian part of the Sava River: bighead goby *Ponticola kessleri* (Günther 1861; Neilson and Stepien 2009) and monkey goby *Neogobius fluviatilis* (Pallas, 1814) (Ćaleta 2007; Piria et al. 2011).

Round goby is a species with a broad and flexible diet (Diggins et al. 2002; Corkum et al. 2004; Copp et al. 2008; Polačik et al. 2009), aggressive behaviour, tolerance of a wide range of environmental factors, early sexual maturation (L'avrinčíkova and Kováč 2007), an ability to spawn several times a year (Kulikova and Fandeeva 1975; Moiseyeva and Rudenko 1978; Moiseyeva et al. 1983; Stammler and Corkum 2005) and male parental care that facilitates successful recruitment (Sapota 2004). Native to Azov, Black and Caspian Sea basins (Kottelat and Freyhof 2007), during the last several decades it has been rapidly spreading throughout most of the Europe (Jurajda et al. 2005; Ojaveer 2006; Czugala and Woźniczka 2010), and, probably via ballast water, even reached North America (Great Lakes) (Charlebois et al. 2001).

Compared to several other Ponto-Caspian gobies, the round goby invasion of the upper parts of Danube basin was reported relatively late (Harka and Biro 2007). In 1997, its presence was observed in Serbia around Prahovo (downstream from the Sava River) (Simonović and Nikolić 1996; Simonović et al. 1998). Several years later, its presence was reported around Vienna, Austria (Wiesner et al. 2000), while in 2001, it was found near Budapest (Guti et al. 2003). Though both latter reports are upstream from the Sava, in the light of possible discontinuous range expansion of Ponto-Caspian gobies (Jurajda et al. 2005; Harka and Biro 2007; Borcherding et al. 2011), it is unclear whether it was present in the relatively short (137 km) stretch of the Danube in the far-eastern part of Croatia, that acts as a border with Serbia, before the reported findings (Mustafić 2005; Polačik et al. 2008; Francová et al. 2011) (Appendix 1). As yet, no findings were reported in any other locality in Croatia.

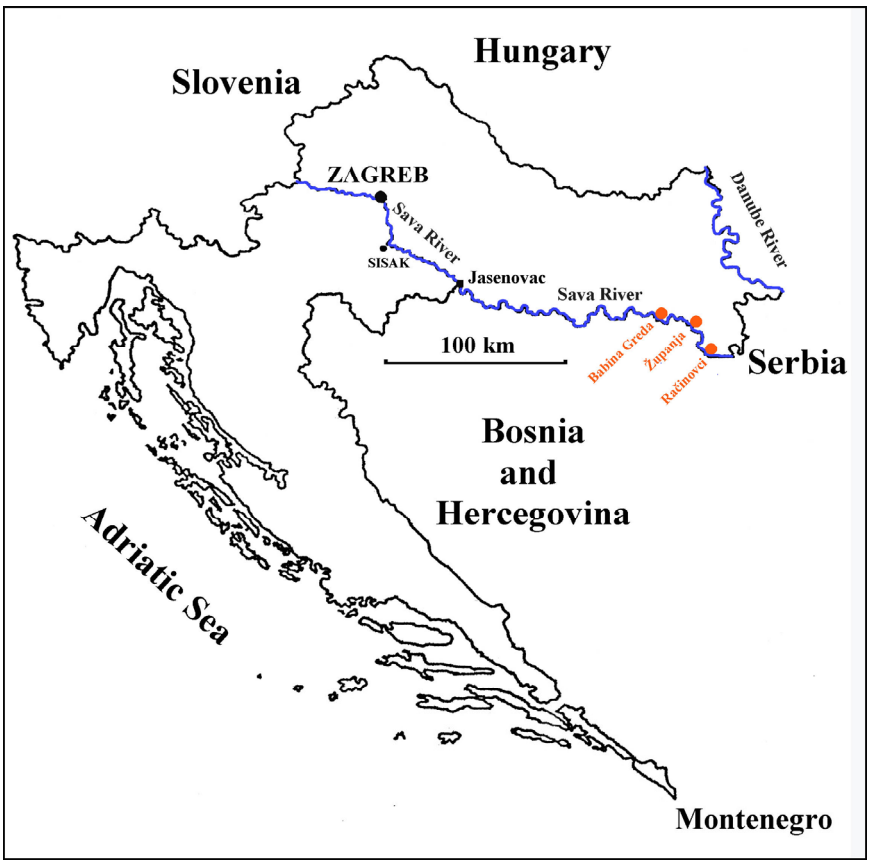

Figure 1. Location of the sampling area.

Figure 2. A typical *Neogobius melanostomus* specimen, with clearly visible black spot on dorsal fin, caught in the Sava River (30th June 2011, photo by T. Tomljanović).

Materials and methods

Round goby specimens were caught on 30th June 2011, during a regular fish survey, in the littoral part of the Sava by electric fishing (Hans Grassl EL 63 II, 220/440 V, 17.8/8.9 A) at three locations: Račinovci (N44°51′15.3″, E18°57′45.7″) - 8 specimens; Županja (N45°04′27.6″, E18°41′15.5″) - 5 specimens; Babina Greda (N45°05′36.5″, E18°32′18.5″) - 21 specimens (Figure 1). In total, 34 specimens were caught and immediately frozen at -20ºC. Round goby often shared habitat with monkey goby, but unlike the latter, which was mostly caught on sandy bottom, it was usually caught in the vicinity of boulders (ca. 1.4 m depth).

Its identification was performed based on the following morphological characteristics: a large black spot on the posterior part of first dorsal fin; nape scale coverage; pelvic-disc fraenum with small rounded lobes and length less than 1/6 of width at base; first branched ray of second dorsal

about as long as the penultimate ray (Kottelat and Freyhof 2007; Froese and Pauly 2011). A typical sample is shown in Figure 2.

Results and discussion

Total length (L_t) of the sampled specimens was in the range from 4.5 to 9.7 cm, while weight (W) was from 0.89 to 12.5 g. Condition factor (CF), calculated as $WL_t^{-3}100$, was 1.17. The length-weight relationship is expressed as $W=aL_t^b$ (Ricker 1975), where relationship parameter values were: a=0.0058 and b=3.38 (95% confidence limits 3.283-3.477). Correlation coefficient was $r^2=0.993$ ($p<0.01$). In comparison, b value of L-W relationship of round goby specimens from its native range in Turkey (where L_t was from 6.8 to 18.4 cm) varied from 2.87 to 3.27 (Tarkan et al. 2006), indicating a high positive allometry of Croatian specimens and, indirectly, their high successfulness in adapting to new habitat.

The presence of round goby in locations up to 125 km away from the confluence of Sava and Danube, the number of specimens caught, the presence of several different size-classes and L-W relationship all suggest that round goby has established a stable and well-adapted populations in this part of the Sava River. As yet, it is uncertain how far it has spread further upstream and whether it has entered other reaches of the Sava. As the morphologically, biologically and genetically closely related species monkey goby (Neilson and Stepien 2009) has already spread as far as the middle reaches of the Kupa River (Piria et al. 2011), and given the high invasiveness of round goby (Corkum et al. 2004; Jurajda et al. 2005), its further range expansion is highly probable.

Acknowledgements

Two anonymous reviewers are greatly acknowledged for valuable comments on the manuscript. Publication of this paper was supported by the EC 7th Framework Programme through the enviroGRIDS project (Grant Agreement n° 226740).

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Appendix 1. Records of round goby in the Danube River basin.

Record No.	Country	Location			Records coordinates		Record date	No. specimens	Reference
		River	Point	rkm	Latitude, N	Longitude, E			
1	Serbia	Danube	Prahovo	861	44°18′38″	22°33′05″	1997	13	Simonović et al. 1998
2	Austria	Danube	Wienna	1917	48°10′06″	16°29′26″	2000	-	Wiesner et al. 2000
3	Serbia	Danube	Tekija-Banatska Palanka	956-1076	44°41′-44°49′	22°24′-21°20′	2001	-	Višnjić-Jeftić and Hegediš 2004
4	Hungary	Danube	Göd	1670	47°41′	19°07′	2001	4	Guti et al. 2003
5	Austria	Danube	Wolfsthal – Krems Hafen	1873-1999	48°08′34″-48°24′12″	17°01′16″-15°38′14″	2002	26	Wiesner 2005
6	Slovakia	Hron	-	0.82	47°49′	18°43′	2003	1	Stráňai and Andreji 2004
7	Slovakia	Danube	Štúrovo	1720	47°47′	18°43′	2003	3	Stráňai and Andreji 2004
8	Hungary	Danube	Budapest	-	47°49′	19°00′	2003	-	Harka and Biro 2007
9	Hungary	Danube	Göd- Dömös	1668-1708	47°41′-47°46′	19°07′-18°54′	2003	61	Guti et al. 2003
10	Slovakia	Danube	Gabčíkovo	1821	47°52′	17°32′	2003	7	Ondračková et al. 2005

Appendix 1 (continued).

Record No.	Country	Location		Records coordinates			Record date	No. specimens	Reference
		River	Point	rkm	Latitude, N	Longitude, E			
11	Slovakia	Hron	-	0.50	47°49′	18°43′	2003	5	Adamek et al. 2007
12	Slovakia	Danube	Štúrovo	1720	47°47′	18°43′	2003		Adamek et al. 2007
13	Slovakia	Danube	Čunovo- Karloveské side arm	1851-1873	47°59′-48°08′	17°22′ - 17°03′	2003-2004	184	L'avrinčíkova et al. 2005
14	Croatia	Danube	Dalj	1355	45°28′58″	18 °59′20″	2004	1	Mustafić 2005
15	Slovakia	Danube	Chl'aba - Bratislava	1706 - 1873-	47°49′-48°08′	18°49′-17°06′	2004		Jurajda et al. 2005
16	Slovakia	Vah	Komárno - Kava	3 - 8	47°46′-47°48′	18°08′-18°03′	2004	575	Jurajda et al. 2005
17	Slovakia	Hron	Kamenice nad Hronom	6	47°49′	18°42′	2004		Jurajda et al. 2005
18	Slovakia	Ipel'	Chl'aba	3	47°49′	18°49′	2004		Jurajda et al. 2005
19	Hungary	Danube	-	-	46°10′-47°44′	18°55′-17°49′	2004	916	Erős et al. 2005
20	Slovakia	Danube	Čunovo	1845-1851	48°01′-47°59′	17°13′-17°22′	2004	33	Copp et al. 2008
21	Slovakia	Danube	Čunovo- Karloveské side arm	1851-1873	47°59′-48°08′	17°22′-17°03′	2004-2005	109	L'avrinčíkova and Kováč 2007
22	Croatia	Danube	Batina	1423	45°51′11″	18 °51′14″	2005	4	Polačik et al. 2008
23	Croatia	Danube	-	1327–1423	43°33′	18°55′	2005-2006	3	Francova et al. 2011
24	Austria	Danube	Wienna	1900 - 1902	48°21′	16°14′	2005-2006	40	Polačik et al. 2009
25	Czech Republic	Confluence Morava and Dyje	-	-	48°37′	16°56′	2008	-	Lusk et al. 2010
26	Croatia	Sava	Račinovci	207	44°51′15.3″	18°57′45.7″	2011	8	Present study
27	Croatia	Sava	Županja	261	45°04′27.6″	18°41′15.5″	2011	5	Present study
28	Croatia	Sava	Babina Greda	302	45°05′36.5″	18°32′18.5″	2011	21	Present study