



## Short communication

# First record of the alien invasive species rotan (*Perccottus glenii* Dybowski, 1877) in Croatia

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### Introduction

Some 35 exotic fish species from various continents have been introduced into European freshwaters (Kottelat and Freyhof, 2007). A total of 15 exotic fish species now inhabit Croatian freshwaters (Mrakovčić et al., 2006). Furthermore, in the past 10 years, upstream expansion of an invasive alien species of goby (*Neogobius* sp.) has been noted in Croatian rivers of the Danube basin.

Rotan (*Perccottus glenii*) is a species having no particular economic or sport value (Reshetnikov, 2003). It is a typical limnophilic species with high tolerance to extreme abiotic conditions (wide temperature oscillations and oxygen concentrations) that prefers still waters with well-developed aquatic vegetation and a silty substrate (Hegediš et al., 2007). Its tolerance, opportunism and aggressive behaviour make the rotan a 'perfect conqueror'. This in turn represents a grave danger for the native amphibian and fish fauna in terms of predation, competition and disease transmission (Reshetnikov and Chibilev, 2009).

The natural range of *P. glenii* comprises the far eastern part of Asia (Bogutskaya and Naseka, 2002). In the 20th century rotan was introduced on multiple occasions into various parts of Asia and eastern Europe. However, with its first appearance in the catchment of the Tisa River basin (Koščo et al., 2003; Hegediš et al., 2007), it was only a matter of time before it would spread to the Danube (Jurajda et al., 2006; Hegediš et al., 2007). At present there are no records of rotan in central and western Europe, although Andrzejewski and Mastynski (2004) speculated that *P. glenii* was likely already spreading unnoticed through western Europe. Nor did Freyhof (2003) exclude the assumption of its presence in the Odra River basin.

### Materials and methods

On 3 July 2008, a sports fisherman incidentally caught an adult *Perccottus glenii* (TL = 135 mm) specimen. The fish was captured in the afternoon in a channel that is part of a drainage system for nearby carp fishponds (Fig. 1). The channel is about 3 m wide, average water depth 0.5–1 m, and the substrate silty and overgrown with aquatic vegetation. To determine the abundance and area of occupation of the invasive species, we sampled for fish in the area where the rotan had been recorded. In addition, sampling was also conducted at two more sites upstream on the same channel, as well as on the nearby channel connecting the Sava River to fishponds. Sampling was conducted by wading, using station-

ary electro-fishing equipment (500 V, 10 ADC). The sampling area at each location was 150 m<sup>2</sup>.

### Results and discussion

The sports fisherman caught the rotan in the central course of the Sava River (Danube tributary), near the city of Slavonski Brod, at river kilometre 380 (45°09'13"N, 17°59'45"E) in a channel periodically connected to the river. This finding is the first record of rotan (*Perccottus glenii* Dybowski, 1877) (Gobioidei, Odontobutidae) in Croatia, and the most western finding in Europe. Prior to this, the nearest rotan finding was about 170 km east (Gergely and Tucakov, 2004).

During our electro-fishing survey no rotan were caught, although other fish species [*Carassius gibelio* (Bloch), *Rutilus rutilus* (L.), *Rhodeus amarus* (Bloch), *Lepomis gibbosus* (L.), *Ameiurus melas* (Rafinesque), *Leuciscus idus* (L.), *Perca fluviatilis* (L.), *Alburnus alburnus* (L.), *Cyprinus carpio* L., and *Pseudorasbora parva* (Temminck & Schlegel)] were recorded. Despite a significant capture effort over a large sampling area, we were unable to catch any rotan specimens; thus we can conclude that it is fortunately not abundant in this area. Nevertheless, due to its invasive character and the significant problems rotan causes in other areas, an immediate action plan is necessary to minimize its effects on the autochthonous ichthyofauna. Conservation measures will probably be most effective in this early stage of a rotan invasion.

Although it is difficult to ascertain how this species spread into Croatian waters, several scenarios might explain its appearance this far westwards. One possible route of expansion is the transfer of fish from Hungary or Serbia into nearby fishponds. Elovenko (1981) claimed that the rotan is prevalent in the fish-farming trade, and that the nearby fishponds are favourable habitats for reproduction and further spread of this species. The owner of the fishponds, however, claims that fish have not been transferred to these fishponds for years. Another possibility is the independent spread from the Danube during spring flooding, when water enters the rivers from stagnant water bodies (Elovenko, 1981). However, Koščo et al. (2003) stated that this form of spreading usually occurs only downstream. A third possibility is via the ballast water of ships. In the present case, this could possibly be due to an increase in river transport along the Sava River to local ports.

It is difficult to predict whether the rotan will acclimatise in Croatian rivers. However, given the experiences in eastern

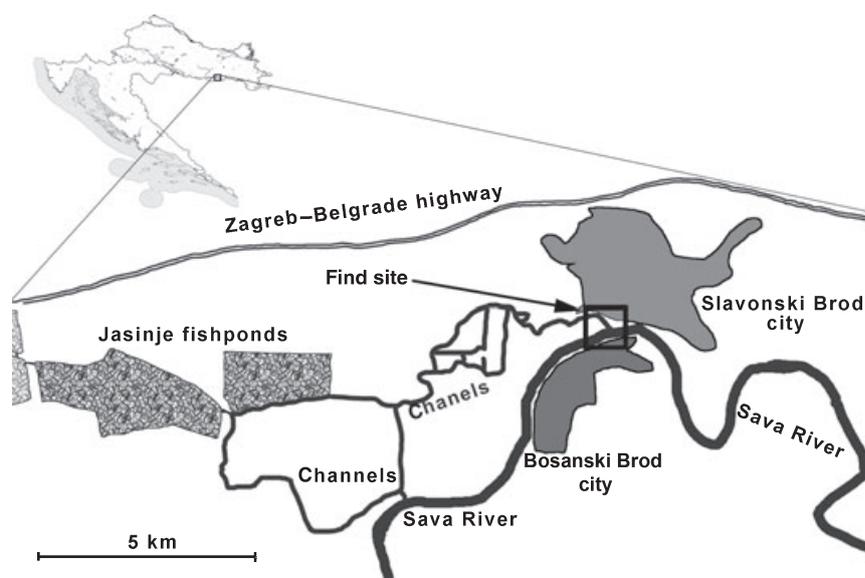


Fig. 1. Channel site of invasive *Percottus glenii* in Sava River, Croatia

Europe (Koščo et al., 2003; Nowak et al., 2008) and neighbouring countries (Harka and Farkas, 2001; Hegediš et al., 2007), the spread of this species in Croatian rivers and an increase in abundance and appearance in new watercourses can be expected in the coming years.

Despite the uncertainties as to the route of the rotan invasion, as well as the difficulties in making future predictions, we believe that in the case of such an invasive species, the worse scenario must be considered and management planning immediately proposed. A management plan should include the sensitizing of sports fisherman, fishing societies and the local populace to the problem of rotan invasion, as well as the collection of data on freshwater captures (this first action is already pending). In addition to information collected by fishermen, scientific monitoring should also be included in the management plan, which should be performed on a regular basis in the location where the rotan was recorded. Several nearby areas should also be chosen based on conditions suitable for rotan, in nearby fishponds, as well as in a few more westward areas to detect its possible spread. In this sense, ichthyologists and conservation managers in countries to the west and south of Croatia should be made aware of the spread of rotan and be prepared to act immediately should it appear in or close to their countries. According to current knowledge, the elimination of *P. glenii* in closed water systems is virtually impossible (Reshetnikov, 2003) once it has adapted. Nevertheless, since the invasion of rotan in Croatia was detected at a very early stage, the most efficient means to stop its expansion would be to conduct all possible measures to prevent its spread. This should include the official banning of the fish trade in areas where rotan has been identified.

Stopping rotan expansion and preventing it from forming stable populations in Croatia is especially important, as the limnophilic ichthyofauna of Croatia is already under exceptionally high pressure and already strongly threatened by the drying out of wetlands, melioration, river regulations and the influence of other invasive species (Mrakovčić et al., 2006).

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