

A report of Zebra Mussel *Dreissena polymorpha* (Pallas, 1771) (Bivalvia: Dreissenidae) in the middle sector of Iskar River, Bulgaria

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Abstract. Single specimens of invasive mussel species *Dreissena polymorpha* (Pallas, 1771) were found in the middle part of the Iskar River, Bulgaria during 2016 and 2017. A cascade of 14 small HPPs was built in this river sector and a shift in the flowing river conditions with stagnant ones in SHPP dam lakes was induced. Future mass invasion of the species is possible. It is important to provide regular monitoring of occurrence of the Zebra Mussel because of the possible negative economic impact during the invasion.

Key words: Zebra Mussel, invasive species, Iskar River

Introduction

D. polymorpha is one of widespread invasive mussel in Europe and North America (Griffiths *et al.* 1991; Karatayev *et al.* 1997; Aldridge *et al.* 2004). In Bulgaria, the species is common in some Black sea lagoons and Danube River and seems to be native because of its Ponto-Caspian origin (Hubenov 2005). Recent years the Zebra Mussel invades some Bulgarian inland reservoirs (Trichkova *et al.* 2009; Kalchev *et al.* 2014; Cardeccia 2016) and brought great attention to the scientific community and the public as example ESENAS and DIAS networks (Trichkova *et al.* 2017). Abundant occurrence of the species in some reservoirs impedes normal work of facilities such pipes, floodgates, hydropower turbines, fisheries and has a high economic impact (O'Neill 1997; Leung *et al.* 2002; Pimentel *et al.* 2005; Connelly *et al.* 2007). In some cases invasion of *D. polymorpha* may cause extinction of native mussel species (Ricciardi *et al.* 1998) and serious disturbances in aquatic ecosystems (Karatayev *et al.* 1997; Strayer *et al.* 2004; Kalchev *et al.* 2014; Kenderov *et al.* 2014; Beshkova *et al.* 2017).

In the middle part of Iskar River, the waters and bottom sediments have been highly organic polluted by Sofia Region and the surrounding industrial area (Todorova *et al.* 2015, Todorova *et al.* 2016; Yotinov *et al.* 2017). The river ecosystems were reported to have "poor" or "bad" ecological quality according to WFD (Regulation N4/2012). Slight self-purification processes have been lead to improvement of the ecological situation up to "moderate" downstream river (Kenderov & Yaneva 2009; Yaneva & Kenderov 2016). In this middle sector of Iskar River until now 14 small hydropower plants (SHPP) have been constructed and exploited. The dam's microreservoirs dramatically change river habitats from flowing to standing and typical rheobionts drop out of macroinvertebrate communities. Contrary to them, some limnetic species would find good environmental conditions. Probably, these new macroinvertebrates would colonize effectively bottom microhabitats.

The aim of this report is to alarm for future potential invasion of one of this species, Zebra Mussel (*D. polymorpha*) which already occurs nearby upstream in some artificial lakes around Sofia City (Kozuharov *et al.* 2008).

Material and Methods

Annual hydrobiological and microbiological monitoring of middle sector of Iskar River (between Sofia City and Eliseyna Village) was realized from 2005 to now. Scientific and technical reports were prepared because of construction and exploitation of first 5 SHPPs from cascade “Sreden Iskar” (Yaneva & Kenderov 2016). Bottom samples were collected by hand net according to multihabitat approach (BDS EN 16150) from riparial zone of main river corridor (0-0.5m depth). The SHPP microreservoirs were monitored also. Totally 4 river monitoring sites and all first 5 SHPP’s microreservoirs were studied (Figure 1).

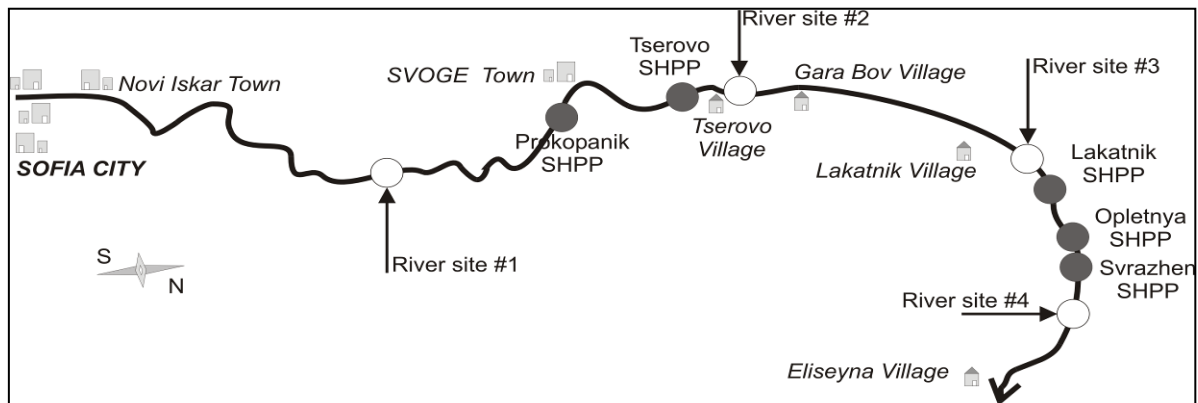


Fig. 1. Study sector of the Iskar River: white circles marked macrozoobenthos sampling sites, dark circles marked microreservoirs of SHPPs.

Results

For all years of annual hydrobiological monitoring (from 2004 until now) we have found Zebra Mussel only in the last two years. Single mature individuals were found on September 29, 2016 and October 13, 2017 attached to big river stones. Both records were done in the Iskar River near the Tserovo Village, on the border between the shallow ripal and the deep medial river zones (Figure 2). Geographical coordinates of the location are N: 43.003298°, E: 23.351215°. In this river sector, the surface water velocity is very high, about $1.4 \text{ m}\cdot\text{s}^{-1}$ in midstream. This is due to the local hydro-morphological situation and probably some influence caused by SHPP “Tserovo”. Thus, this is unusual microhabitat of *D. polymorpha*. The stagnant conditions into the dam lakes are most suitable but until now, we haven't any records of Zebra Mussels in these water bodies. Another record of Zebra Mussels in Iskar River was observed upstream, near Svoege Town during July 2017 (D. Kozuharov, pers. comm.).

Discussion

It can be assumed and suggested that:

1. It seems that the Zebra Mussel planktonic larvae have been transported from upstream pit lakes near Sofia City. This vector of spreading is possible despite the high organic pollution of Iskar River. Another vector is the direct transportation of individuals from some human activities in the river basin such fisheries, building activities during SHPP's constructions, water sports, etc.

2. The shift in the flowing river conditions with stagnant ones in the SHPP dam lakes provides a suitable environment for future colonization. The downstream vector of spreading in the whole river basin in near future is completely possible.

3. It is very important to provide monitoring programs of occurrence of the Zebra Mussel because of a future major threat to the normal operation of the SHPP facilities and the high negative economic impact during the mass invasion of the mussels.



Fig. 2. Zebra Mussels from Iskar River near Tserovo village. Left: first recorded individual, 2016 September 29. Right: location (yellow arrow) of single specimens in the border (red lines) between ripal zone (0-0.5m depth) and medial river zone (over 1.5m depth).

Photos: Ivaylo Yotinov.

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