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THE THICK-SHELLED RIVER MUSSEL *UNIO CRASSUS* IN ROMINCKA FOREST'S RIVERS

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ABSTRACT: The thick-shelled mussel *Unio crassus* Philipsson is a legally protected, endangered species. This paper reports on its previously unknown localities in Romincka Forest (NE. Poland). Out of the four largest rivers of the Forest, live individuals were found in the Bludzia and Błędzianka; only empty shells were found in the Jarka River, and neither live mussels nor shells were found in the Żytkiejmska Struga. *U. crassus* avoids canalised river sections, while water quality does not seem to affect its distribution in the examined rivers.

KEY WORDS: endangered species, *Unio crassus*, Romincka Forest, Poland

INTRODUCTION

The thick-shelled mussel *Unio crassus* Philipsson, 1788 is a Eurasian species inhabiting fast-flowing rivers with sandy or sandy-gravelly bottom (PIECHOCKI & DYDUCH-FALNIOWSKA 1993, ZAJĄC 2004). Formerly, it was common in rivers of entire Europe. At present it is a receding species in most sites and is threatened with extinction (ZAJĄC 2004). In the Polish Red List and Red Book (GŁOWACIŃSKI 2002, GŁOWACIŃSKI & NOWACKI 2004) it has EN category – endangered; in the IUCN Red List of Threatened Species it has an NT status – near threatened (IUCN 2009). The thick-shelled mussel is included in Annexes II (species requiring designation of special protection areas) and IV (species requiring strict protection) of the EU Habitats Directive. Besides, in Poland it is under strict legal protection and requires active protection measures. In north-eastern Poland it was previously recorded from the Wigry National Park and the Suwałki Landscape Park (ZAJĄC 2004), but not from Romincka Forest.

STUDY AREA

Romincka Forest is situated in north-eastern Poland. The forest complex, 36 thousand ha in area, is divided by the state boundary; about one third is located on the Polish side, the remaining part is in the Russian Federation (Kaliningrad District). The Polish part of the forest is protected within Natura 2000 (Special Area of Conservation PLH 280005) and as the Romincka Forest Landscape Park.

According to the geographical regionalisation of Poland, Romincka Forest is a mesoregion within the macroregion of Lithuanian Lakeland (KONDRACKI 2000). The climate is rather severe and continental, with the mean January temperature of about –5°C, and the July mean of 16–17°C. Snow cover persists for ca. 100 days, the vegetation period is 190 days, the rainfall is up to 700 mm.

The forest is located in the Pregoła River system, in the Vistula Bay catchment area. Most of the river system and the Pregoła mouth are on the northern side of the border, in Russia. Four largest rivers of Romincka Forest were searched for the thick-shelled mussel.

The upper section of the Błędzianka River (its Russian part is called Krasnaya) has a mountain stream character (numerous rapids, stony or gravelly bottom, deep valley). In the forest it changes into a typical,

slow, lowland river and this section is canalised, with predominantly sandy and muddy bottom.

The Bludzia – a left-bank tributary of the Błędzianka – of a varied character, has fragments typical of a slowly meandering wetland river while other sections are fast-flowing, with stony and gravelly bottom. The river has retained its natural character, only few fragments bear traces of former regulation. The beaver have a great effect on the river on which they have built numerous dams.

The Żytkiejmska Struga is a right-bank tributary of the Błędzianka, with its mouth located in the Kaliningrad District. The dam in the village of Żytkiejmy causes an uneven water flow which is greater when the power station is working. Within the forest the Żytkiejmska Struga flows along a flat, marshy valley. Its large part has been canalised and the marshy meadows – drained. The river bed there is narrow and fairly deep, the bottom sandy or muddy.

The Jarka (in its lower reaches called Gołdapa) is a right-bank tributary of the Węgorapa, which joins the Pissa River on the Russian side. It has a varied character, and within the forest it is natural. It is fast-flowing, with mainly sandy and, in places, gravelly bottom. It becomes marshy only above Lake Gołdap.

Within the programme of monitoring water quality in Poland, in 2007 the Voivodeship Inspectorate of Environment Protection in Olsztyn assessed rivers of Romincka Forest: Żytkiejmska Struga (below Żytkiejmy, before entering the forest), Błędzianka (below Bludzia mouth, in the forest) and Gołdapa (below Gołdap, after leaving the forest). On the five-grade scale of water quality, all these rivers were classified as unsatisfactory quality i.e. class IV because of their colour, chemical oxygen demand, faecal coliform bacteria count and overall coliform bacteria count.

METHODS

The main rivers of Romincka Forest were searched for unionids from the 4th till the 19th of June 2007. Selected sites were visually searched for the presence of large mussels on a section ca. 100 m long. Fragments of the bottom were dredged with a net of 5 mm mesh. The sampling was qualitative. Live mussels, after measuring shell length, were released; empty shells were taken. The sites were numbered according to their position along the river course.

RESULTS

The thick-shelled mussel was found in three rivers of Romincka Forest: live individuals in the Bludzia and Błędzianka; only shells in the Jarka. No shells or live mussels were found in the Żytkiejmska Struga. The occurrence of *U. crassus* is presented in Table 1. No other unionids were found in the studied sites.

SITES WITH *U. CRASSUS*

Bludzia site 2. Fast current, shallow, sandy and sandy-gravelly bottom, muddy in meanders. Six live adults were found, with shell length ranging from 27 to 34 mm, four juveniles with shell length below 10 mm, and 25 shells ranging from 38 to 57 mm.

Bludzia site 3. Fast current, varied depth, with some shallows and deeps, sandy bottom with gravelly fragments, muddy in meanders. One live mussel of shell length 28 mm was found, and nine shells ranging from 35 to 54 mm

Błędzianka site 1. Very fast current, river bed shallow and wide, stony-gravelly bottom, above the site a slower section with sandy bottom. Two live mussels with shell length of 53 and 29 mm, and 23 shells ranging from 38 to 70 mm.

Jarka site 1. Fast flow, river bed very shallow and wide, stony bottom, above the site a slower section of sandy bottom. One empty shell 59 mm long.

SITES WITHOUT *U. CRASSUS*

Bludzia site 1. Slow current (slowed by a beaver dam), river bed shallow and divided into several smaller branches; sandy and muddy bottom.

Błędzianka sites 2 and 3. Fairly fast current, canalised, moderately deep, sandy and sandy-muddy bottom.

Jarka site 2. Fairly fast current, river bed shallow with deep meanders, sandy bottom.

Żytkiejmska Struga sites 1 and 2. Slow-flowing, canalised, shallow, sandy bottom with muddy fragments.

Table 1. Thick-shelled river mussel in Romincka Forest

Sites				Mussel's presence	
River	No	Geographical coordinates	UTM	Live mussels	Empty shells
Bludzia	1	54°19,16' N	FF 01		
		22°34,49' E			
Bludzia	2	54°20,04' N	FF 02	X	X
		22°34,49' E			
Bludzia	3	54°20,48' N	FF 02	X	X
		22°34,18' E			
Bledzianka	1	54°18,19' N	FF 01	X	X
		22°39,52' E			
Bledzianka	2	54°19,74' N	FF 02		
		22°36,05' E			
Bledzianka	3	54°20,43' N	FF 02		
		22°35,06' E			
Jarka	1	54°17,97' N	EF 91		X
		22°23,98' E			
Jarka	2	54°18,43' N	EF 81		
		22°21,62' E			
Zytkiejmska Struga	1	54°20,95' N	FF 02		
		22°39,28' E			
Zytkiejmska Struga	2	54°21,25' N	FF 02		
		22°36,66' E			

DISCUSSION

The studied rivers of Romincka Forest have a varied character, with sections potentially meeting the habitat requirements of *U. crassus*. Besides, all the rivers hold fish species which are potential hosts to glochidia (BIAŁOKOZ et al. 2009). Despite this, the mussel was not found in all the rivers.

The water chemistry was not studied while this factor has a considerable effect on the thick-shelled mussel (PIECHOCKI & DYDUCH-FALNIOWSKA 1993). The results of the analysis by the Voivodeship Inspectorate of Environment Protection show that the water of all the rivers is similarly polluted, of class IV (=unsatisfactory quality). The main sources of pollution are the villages on the edge of the forest which discharge their communal sewage into the rivers. Despite the pollution, *U. crassus* lives and reproduces in the rivers. It seems that the water quality is not the decisive factor determining its occurrence in the studied sites. Analysis of water quality in each of the sites could confirm this conjecture.

Live individuals of the thick-shelled mussel occurred in the Błędzianka and Bludzia in sections with varied bottom, with sandy places adjoining gravelly and muddy areas. The mussel seems to avoid canalised sections of rivers; it was found neither in the Żytkiejmska Struga (where only canalised sections were searched) nor in regulated sections of the Błędzianka. Its absence in site 1 in the Bludzia may also be associated with the changes in the river's character resulting from the beaver activity. The relatively new beaver dam has slowed down the river current and changed the character of the river below; the river is very shallow there and the bottom - sandy. The dam could also retain empty shells brought from the upper sections of the river.

The presence of *U. crassus* in the Jarka River requires confirmation. The species was not found even in natural sites. The single empty shell may indicate a recent presence of the thick-shelled mussel in the river. The Jarka has no direct connection with the Błędzianka and its tributaries where *U. crassus* occurs, which may prevent recolonisation even if the habitats in the Jarka meet the species' requirements.

According to the Habitats Directive, protection of the thick-shelled mussel requires designation of special protection areas. The Bludzia is a natural refuge of the species and deserves a special protection, especially because of its natural character and rich fauna,

mainly fish fauna (BIAŁOKOZ et al. 2009). Protection of the Bludzia should be included in the protection plan of the area Natura 2000 of Romincka Forest. Besides, the plan should consider the possibility of renaturisation of the remaining rivers or their parts. Stopping pollution of these rivers should be an equally important measure of the mussel's protection. Since the pollution sources are located outside the protected area, this requires cooperation with institutions which are responsible for protected areas, as well as with local government and non-government organisations.

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