Vol. 20(2): 105–110
FOLIA MALACOLOGICA
ISSN 1506-7629
The Association of Polish Malacologists
& Faculty of Biology, Adam Mickiewicz University
Poznań 2012
doi: 10.2478/v10125-012-0016-0

A REMARKABLE RECORD OF A VERY RARE FRESHWATER SNAIL *BORYSTHENIA NATICINA* (MENKE, 1845) IN NORTH-EAST GERMANY COMPARED WITH THREE LITHUANIAN RECORDS

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ABSTRACT: *Borysthenia naticina* (Menke) is among the rarest and most threatened freshwater molluscs in Germany. Only in southern Germany, in the Bavarian part of the Danube River, previous studies clearly indicate a recent occurrence of this species. Some imprecise data were given for northern Germany from the Oder River; prehistoric records (Diluvium) also exist. However, all these "Oder River literature sources" are hard to locate and it was impossible to find any reliable recent records of *B. naticina* in the German parts of the Oder River. This study documents the occurrence of a recent population of this very rare Pontic-Baltic species in the lower course of the Oder River. Ecological information on the habitat and accompanying freshwater molluscs is given. The findings are compared with the data on the Lithuanian localities in the Nemunas River.

KEY WORDS: *Borysthenia*, *Lithoglyphus*, *Sphaerium solidum*, Oder River, Nemunas River, Germany, Lithuania

INTRODUCTION

Borysthenia naticina (Menke, 1845) (Fig. 1), listed as a rare and zoogeographically restricted species in Germany (JUNGBLUTH & KNORRE 2009) and endangered in some other European countries (e. g. critically endangered in Poland), is primarily confined to eastern Central Europe, Eastern Europe and Turkey. Its distribution range extends from Germany in the west to Ukraine and European Russia in the east; it inhabits large river systems of the Dnieper, Southern Bug, Dniester, Danube, Nemunas, Vistula, Warta and Oder. The distribution area reaches northwards to the Baltic States and southwards to the Black Sea basin (see NESEMANN 1994, ANISTRATENKO 1998, PIECHOCKI 2004, KANTOR & SYSOEV 2005 and YILDIRIM et al. 2006 for details of distribution).

Despite several comprehensive investigations of macrozoobenthos (including molluscs) of the German part of the Oder River and its catchment area (WALTER & SCHARF 1961, HASTRICH 1994, BRINKMANN et al. 1997, SCHMID 1998, 1999), no records of *B. naticina* were made. Some imprecise references were found only in "grey literature" (HERDAM 1996, PEPL 1998). Such sources are difficult of access, and some points are unclearly formulated. Neither accurate location nor information if the records were based on live snails or empty (eroded) shells was given. Only KUBE's (1983) unpublished report provided correct and documented information that *B. naticina* was found near the Oder as an empty shell in the channel "Hohensaaten-Friedrichtaler Wasserstraße"; the shell came from hydraulic filling at the dyke. According to HERDAM (†) (personal communication via PETRICK) some records were made along the Oder River between Kostrzyn and Schwedt in mid-1990s, but with no exact location, voucher material or differentiation between live and dead snails; the information was never published. GEYER (1909, 1927) listed *B. naticina* from large rivers east of the Oder; no mention of the species from the Oder was made in LINDHOLM (1927) or in the comprehensive monograph by EHRMANN (1933). Only JAECKEL (1962) mentioned the occurrence of *B. naticina* in the Oder River between Kostrzyn and Bielinek, albeit without any reference. It is likely that the information

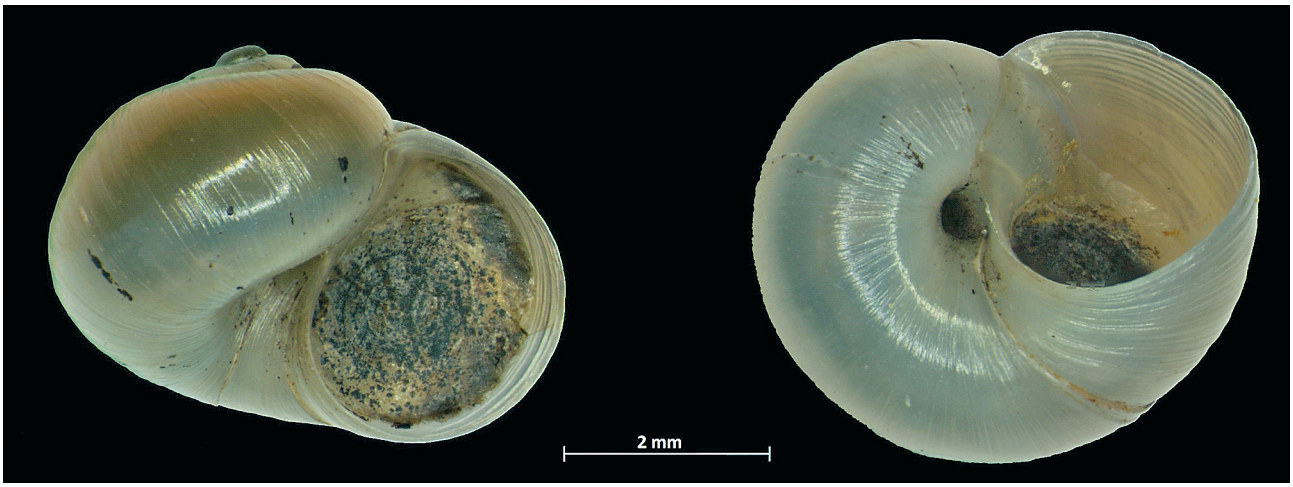

Fig. 1. *Borysthenia naticina* from the Oder River near Stützkow, sampled on the 29th October 2011 by the author (Photo: M. L. ZETTLER)

given by NESEMANN (1994) and GLÖER (2002) was based on this source. Neither the Senckenberg nor the Berlin zoological collections contain material of *B. naticina* from the Oder River (RONALD JANSSEN, CHRISTINE ZORN personal communication). Also HERDAM & ILLIG (1992) and VÖSSING (1998) indicate an occurrence in the lower Oder River, based on the unpublished reports mentioned above. It can be said that until now there was no real evidence of existence of a recent population of the species within the lower Oder River. Literature data on the existence of *B. naticina* (KOLASA 1972, NEUBAUR 1927) pertain only to the estuary of the Oder, the Stettin lagoon and its entrance.

The only relatively recent and reliable record in Germany comes from the Danube River in the south (SCHMALZ & GRÜNBERG 1989). It was the first and doubtless finding in the German part of the Danube for decades and a clear evidence of the recent occurrence of *B. naticina*.

The paper presents the first record of live *B. naticina* in the lower Oder River. The data are compared with the information on the populations from the Nemunas River (Lithuania).

MATERIAL AND METHODS

The study area is located in northeast Germany in the Federal state of Brandenburg (Fig. 2). On 29th October 2011, a sample was taken from the Lower Oder River near Stützkow (52.9824°N, 14.1919°E) at the shoreline, at the depth of 0–1 m with a pole-mounted 20 cm diameter sieve with a 1 mm mesh. The sieve was used to sweep at different places and different substrata along about 30 m of the shore. The

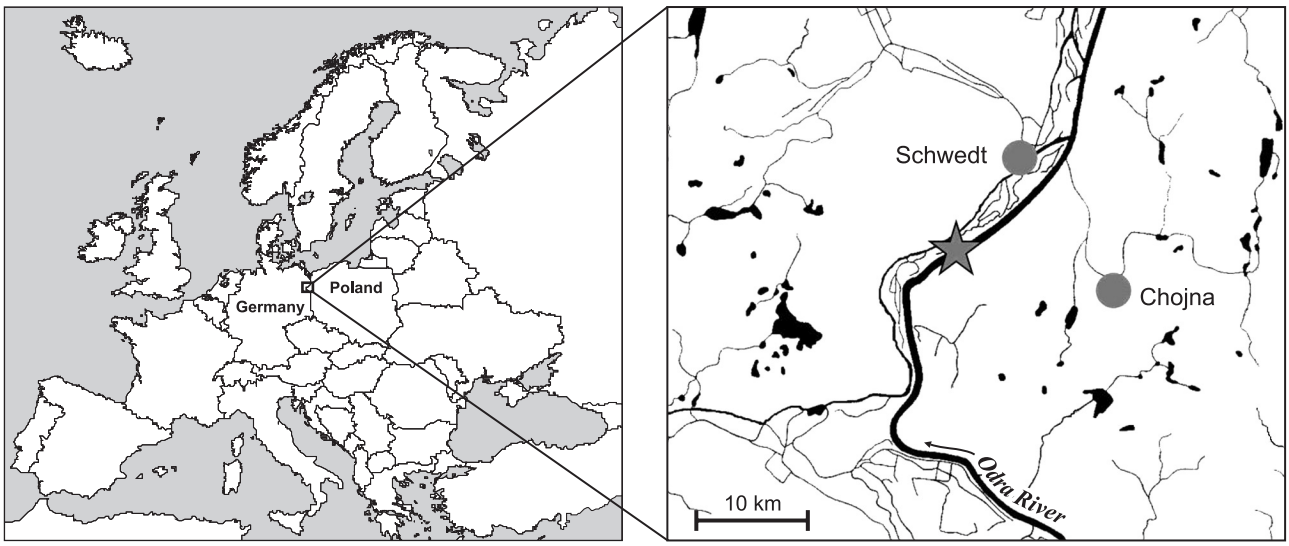

Fig. 2. Investigation area of northern Germany. The sampling station in the Oder River near Stützkow is indcated by a star

Table 1. Mollusc species at four localities with *Borysthenia naticina* (A – ≥101 individuals; C – 51–100; F – 16–50; O – 6–15; R – 1–5; ES – empty shells; x – present but not counted). Oder – Oder near Stützkow, 29th Oct. 2011, 52.9824°N; 14.1919°E (Germany); Nemunas 1 – Nemunas near Rusne, 11th Sept. 2004, 55.298°N; 21.388°E (Lithuania); Nemunas 2 – Nemunas 10 km south of Rusne, 11th Sept. 2004, 55.233°N; 21.445°E (Lithuania); Nemunas 3 – Nemunas east of Skirsnemune, 18th Sept. 2004, 55.096°N; 22.972°E (Lithuania)

Species	Oder	Nemunas 1	Nemunas 2	Nemunas 3
Theodoxus fluviatilis (Linnaeus, 1758)	ES	ES	ES	
Viviparus viviparus (Linnaeus, 1758)	A	A	A	A
Bithynia (Bithynia) tentaculata (Linnaeus, 1758)	R	x	x	x
Bithynia (Codiella) leachii (Sheppard, 1823)	R			
Bithynia (Codiella) troschelii (Paasch, 1842)	ES			
Potamopyrgus antipodarum (J. E. Gray, 1843)	A			
Lithoglyphus naticoides (C. Pfeiffer, 1828)	A	A	A	A
Valvata (Cincinna) piscinalis piscinalis (O. F. Müller, 1774)	R	A	x	x
***Borysthenia naticina* (Menke, 1845)**	**F**	**O**	**O**	**O**
Acroloxus lacustris (Linnaeus, 1758)				x
Galba truncatula (O. F. Müller, 1774)				x
Stagnicola palustris (O. F. Müller, 1774)				x
Radix auricularia (Linnaeus, 1758)	ES			x
Radix balthica (Linnaeus, 1758)			x	x
Lymnaea stagnalis (Linnaeus, 1758)		x	x	x
Physa fontinalis (Linnaeus, 1758)				x
Physella (Costatella) acuta (Draparnaud, 1805)	R			
Planorbarius corneus (Linnaeus, 1758)	ES	x	x	x
Planorbis planorbis (Linnaeus, 1758)	ES			
Planorbis carinatus O. F. Müller, 1774				x
Gyraulus (Gyraulus) albus (O. F. Müller, 1774)		x		
Gyraulus (Torquis) laevis (Alder, 1838)				ES
Ferrissia (Pettancylus) wautieri (Mirolli, 1960)	R			
Ancylus fluviatilus O. F. Müller, 1774	R	ES		ES
Unio (Unio) pictorum (Linnaeus, 1758)	F	x	x	x
Unio (Unio) tumidus Philipsson, 1788	C	x	C	x
Unio (Crassiana) crassus Philipsson, 1788		ES		ES
Anodonta anatina (Linnaeus, 1758)	F	x	x	x
Anodonta cygnea (Linnaeus, 1758)		x		
Pseudanodonta complanata (Rossmässler, 1835)		x		ES
Corbicula fluminea (O. F. Müller, 1774)	R			
Sphaerium (Sphaerium) corneum (Linnaeus, 1758)	R	ES		x
Sphaerium (Amesoda) rivicola (Lamarck, 1818)	F	ES		ES
Sphaerium (Cyrenastrum) solidum (Normand, 1844)	O	ES		ES
Pisidium (Pisidium) amnicum (O. F. Müller, 1774)	ES	ES		ES
Pisidium (Euglesa) ponderosum Stelfox, 1918	F		ES	x
Pisidium (Henslowiana) henslowanum (Sheppard, 1823)				x
Pisidium (Henslowiana) supinum A. Schmidt, 1851	F	x		x
Pisidium (Cingulipisidium) crassum Stelfox, 1918	O			
Pisidium (Pseudeupera) subtruncatum Malm, 1855	R			x
Pisidium (Odhneripisidium) moitessierianum Paladilhe, 1866	R			x
Dreissena polymorpha (Pallas, 1771)	F	x	x	x
Number of species	29	22	14	31

sample was collected in a plastic box and fixed with 70% ethanol. In the laboratory it was further processed using two sieves: 5 mm and 1 mm mesh. The fine fraction was sorted under stereomicroscope with 10-40× magnification. The same procedure was used in sampling and analysis at the Nemunas River in 2004 (see also ZETTLER et al. 2005).

Mollusc species were identified using GLÖER (2002), GLÖER & MEIER-BROOK (2003) and ZETTLER & GLÖER (2006). The identification of *B. naticina* was checked both morphologically and anatomically (see: FALNIOWSKI 1989). Nomenclature follows GLÖER & ZETTLER (2005). The analysis included live and dead specimens (Table 1).

RESULTS

The sample from the Oder River near Stützkow yielded 29 freshwater mollusc species (Table 1). Some of them were among the rarest molluscs in Germany. Besides *B. naticina* the rare and endangered snails included *Lithoglyphus naticoides* – in the site it co-dominated with *Viviparus viviparus*. Among the bivalves, *Sphaerium rivicola* and *S. solidum* occurred abundantly. Some species (*Theodoxus fluviatilis*, *Pisidium amnicum*) were represented only by sub-recent empty shells and were probably recently extinct in the area. Comparison with the Lithuanian records from the Nemunas River revealed a similarity both in species composition and abundance (Table 1). Altogether 42 mollusc species were recorded at the four sites with *B. naticina*. The following species were found in all the sites: *Viviparus viviparus, Bithynia tentaculata, Lithoglyphus naticoides, Valvata piscinalis, Borysthenia naticina, Planorbarius corneus, Unio pictorum, Unio tumidus, Anodonta anatina* and *Dreissena polymorpha*. In all the sites *L. naticoides* and *V. viviparus* were the most abundant species. Like in the Oder River, in the Nemunas *T. fluviatilis* and *P. amnicum* showed signs of becoming extinct. Unionid bivalves (except *Unio crassus* and *Pseudanodonta complanata*) were very abundant.

The main difference between the Oder River in Germany and the three Nemunas River sites in Lithuania was the presence of some alien species (*Potamopyrgus antipodarum*, *Physella acuta*, *Ferrissia wautieri*, *Corbicula fluminea*) in the Oder River.

The main habitat for *B. naticina* in the two rivers was the shallow (0.5 to 1 m depth) water with sandy and muddy-sandy bottom between spur dykes (breakwaters). The species was absent on hard substrata (stones, wood, etc.) or macrophytes. It avoided shallower, amphibious areas, as well as deeper places with stronger current and gravel bottom.

DISCUSSION

The present study documents the first recent and reliable record of the very rare freshwater snail *B. naticina* in northern Germany in the Oder River. Although information on the alleged occurrence of the species in the Oder is found in the literature (e. g. HERDAM & ILLIG 1992, HASTRICH 1994, GLÖER 2002) no details are given for a recent population. Even checking of all literature cited in the bibliography of molluscs of Brandenburg (HALDEMANN 1998) provided no evidence for a recent occurrence of this species in the area. Likewise, comprehensive recent investigations of macrozoobenthos of the lower Oder River (HASTRICH 1994, SCHMID 1998, 1999) yielded no records of the species. HASTRICH (1994) emphasised the absence of this species in her study.

It is likely that *B. naticina* is native to the lower Oder River and exists locally at different places with varying abundance. Also my own investigations at the lower Oder River during the last decade revealed no signs of occurrence of this species. Sixteen live individuals and 40 empty shells were found near Stützkow. The different condition of empty shells (some very old sub-recent, eroded, opaque, others fresh and glossy) indicates that the species is not a new arrival. In general, its successful detection depends on the following points: a) sampling of shallow near shore areas by wading (impossible from boats usually used for macrozoobenthos sampling); b) transition between lotic and lentic zones with sandy and sandy-muddy substrata is preferred by the species: c) during high water conditions (mainly in spring) sampling of these habitat patches is hardly possible.

In the Oder River *B. naticina* lives at the boundary of its distribution range; this is probably its westernmost occurrence. Although there is a single record (HEINEMANN, pers. comm.) of the species from the Havel River near Gülpe (ca. 25 km from the outlet into the Elbe River and ca. 250 km watercourse length west of the Oder River) made in 1995, the population in the Oder River is due to its closeness to the Polish localities (e.g. Vistula and Warta River) and appears to be the westernmost established one.

Contrary to the IUCN European Red List of Non-marine Molluscs (CUTTELOD et al. 2011) where *B. naticina* is categorised as LC (least concern), the species is at least endangered in some parts of its distribution area. Typical habitats of *B. naticina* are large and medium-sized lowland rivers. Because of the past

degradation of such habitats in many European countries (hydraulic engineering, eutrophication, pollution, shipping traffic) and, recently, invasion of alien species (e.g. *Dikerogammarus* spp., see KRISP & MAIER 2005) the occurrence of this and other characteristic species (e.g. *Theodoxus fluviatilis*) is in my opinion highly vulnerable. For example, gradual disappearance of the freshwater nerite has been observed in many of these large rivers in the last decade (see also ZETTLER 2008). A shift from high-diversity mollusc assemblages with distinct key species (e. g. *Sphaerium solidum*, *Pisidium amnicum*, *Lithoglyphus naticoides*) to low-diversity communities with ubiquitous species and a high proportion of invasive taxa is an equally common phenomenon. Anthropogenic disturbance paves the way for new invasions and the invasive species are both the drivers and passengers of change in degraded ecosystems (e.g. MACDOUGALL & TURKINGTON 2005).

ACKNOWLEDGEMENTS

I am grateful to KAI HEINEMANN for providing me with information of the record of *Borysthenia naticina* in the Havel River. I thank SIEGFRIED PETRICK for the information on the records of VOLKER HERDAM (†), and JAN KUBE for his own findings. The curators of the malacological collections of the Museums of Senckenberg and Berlin (RONALD JANSSEN and CHRISTINE ZORN) provided me with information on the stored material of *Borysthenia naticina*. I thank two anonymous referees, who reviewed the previous draft of this manuscript. Their comments greatly improved the quality of the paper.

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Received: January 4th, 2012
Revised: March 23rd, 2012
Accepted: April 4th, 2012