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Molluscs of the outlet stretch of the Krutynia river (Masurian Lakeland)

Mięczaki ujściowego odcinka Krutyni (Pojezierze Mazurskie)

SUMMARY

Studies carried out twenty years ago on molluscs of the Krutynia river focussed mainly on bivalves of the family Unionidae and on *Dreissena polymorpha*. These studies showed the richness of Unionidae in the outlet part of the river. The same site was analysed in details in the years 2005–2008. The Krutynia at its outlet is 12–20 m wide and 1 m deep. Malacofauna was composed of common species of bivalves and snails dominated in numbers and biomasses by bivalves of the family Unionidae and the snail *Viviparus viviparus*. Five species of Unionidae: *Unio tumidus*, *U. pictorum*, *Anodonta anatina*, *A. cygnea* and *Pseudanodonta complanata* were always present during the whole study period. Most numerous was *U. tumidus*, whose density reached 60 ind. per m^2 of the bottom. The species contributed in 75–85% to the total density of all Unionidae. *V. vivparus* achieved similar densities. Malacofauna in the outlet part of the Krutynia was characterised by a high stability.

STRESZCZENIE

Badania nad mięczakami Krutyni prowadzone przed dwudziestoma laty dotyczyły głównie małży z rodziny Unionidae oraz *Dreissena polymorpha*. Wykazały one duże bogactwo Unionidae w części ujściowej rzeki. Stanowisko to objęto szczegółowymi badaniami w latach 2005–2008. Krutynia w tym miejscu ma szerokość 12–20 m i głębokość maksymalną 1 m. Malakofauna składała się z pospolitych gatunków ślimaków i małży, wśród których dominowały w liczebności i biomasie małże z rodziny *Unionidae* oraz ślimak *Viviparus viviparus*. W ciągu całego okresu badań stwierdzono obecność pięciu gatunków Unionidae: *Unio tumidus*, *U. pictorum*, *Anodonta anatina*, *A. cygnea* i *Pseudanodonta complanata*. Najliczniejszym gatunkiem był *U. tumidus*, którego za-

gęszczenie dochodziło do 60 osobników na 1 m^2 dna. Stanowił on od 75% do 85% wszystkich Unionidae. Podobne zagęszczenia osiągał *V. vivparus*. Malakofauna w ujściowym odcinku Krutyni charakteryzowała się dużą stabilnością.

K e y w o r d s: river, molluscs, Unionidae, *Viviparus viviparus*

INTRODUCTION

The Krutynia is one of the most important rivers of Masurian Lakeland. It is 100 km long and flows through several lakes forming a unique river-lake system typical of postglacial landscapes of northern Poland.

The river was an object of detailed physical, chemical and biological studies at the end of the 1980's (4). Molluscs were one of the then studied communities but the study involved only molluscs of the family Unionidae and *Dreissena polymorpha* (5). The entire malacofauna of the river was earlier studied by Hilbert (3) and Berger (1, 2). These studies demonstrated that the outlet stretch was one of the richest sites in the river. The site was analysed in details in the years 2005–2008. Species composition, density and other indices of molluscan community structure were studied. The aim of the study was also to compare present malacofauna of the Krutynia river with data from before several dozen years.

MATERIAL AND METHODS

Selected sampling site was located in Iznota, in the outlet part of the Krutynia 500 m upstream its outflow and was identical with that from earlier studies (5). The river is 12–20 m wide and 1 m deep there. The bottom is sandy and silty, scarcely overgrown by the yellow water lily (*Nuphar lutea*) and the common reed (*Phragmites australis*).

Molluscs were sampled every year at the break of July and August (2005–2008) from a depth of 0.2 to 1.0 m with a drag of a frame area of 0.25 m^2. The frame was randomly thrown on the river bottom. Collected material was washed on a sieve with a mesh size of 1 mm.

In the field molluscs of the family Unionidae were determined to species; their age and size were estimated and then live individuals were released back to water. Other molluscs were preserved in 50% alcohol. To obtain fresh biomass (with shells), preserved molluscs were washed, dried on absorbent paper and weighed. The biomass of Unionidae was estimated considering species composition and size structure based on abundant data gathered from the Krutynia in the year 1989 (5).

RESULTS

Twenty-three species of molluscs (15 species of snails and 8 species of bivalves) were found in the outlet stretch of the Krutynia (Tab. 1). Species composition practically did not change with years. Changes consisted only in the presence of live individuals of particular species or only their empty shells.

Average density of molluscs ranged from 50 to 180 ind./m^2. Dominating taxa were bivalves of the family Unionidae and the snail *Viviparus viviparus*.

Table 1. Molluscs in the lower part of the Krutynia river: ++ – numerous (density above 10 ind./m^2), + – scarce (density up to 10 ind./m^2), o – empty shells

No	Taxon	Frequency of occurrence
	Gastropoda	
1	*Theodoxus fluviatilis* (L.)	++
2	*Viviparus viviparus* (L.)	++
3	*Viviparus contectus* (Mill.)	+
4	*Valvata piscinalis* (Müll.)	o
5	*Bithynia tentaculata* (L.)	++
6	*Lymnaea stagnalis* (L.)	+
7	*Radix peregra* (O. F. Müll.)	+
8	*Radix auricularia* (L.)	+
9	*Stagnicola corvus* (Gmel.)	o
10	*Planorbis planorbis* (L.)	+
11	*Anisus leucostomus* (Mill.)	o
12	*Anisus vortex* (L.)	+
13	*Bathyomphalus contortus* (L.)	+
14	*Gyraulus albus* (O. F. Müll.)	o
15	*Planorbarius corneus* (L.)	++
	Bivalvia	
16	*Anodonta anatina* (L.)	++
17	*Anodonta cygnea* (L.)	+
18	*Pseudanodonta complanata* (Rossm.)	+
19	*Unio pictorum* (L.)	+
20	*Unio tumidus* (Philips.)	++
21	*Sphaerium corneum* (L.)	++
22	*Pisidium subtruncatum* (Malm.)	+
23	*Dreissena polymorpha* (Pall.)	+

During the whole study period (and in the year 1989) five species of Unionidae: *Unio tumidus*, *U. pictorum*, *Anodonta anatina*, *A. cygnea* and *Pseudanodonta complanata* were present in the outlet part of the Krutynia.

Every year some differences were, however, noted in species composition of live individuals. Only 3 species were found in 2005, in other years four species were noted. *Unio tumidus* dominated in every year constituting from 75 to 85% of all collected molluscs. Always present was also *A. anatina* ranging from 6–15%. *U. pictorum* was less frequent (maximum 9%) but its absence in the year 2005 was rather casual since the species was noted before and after this year. *Pseudanodonta complanata* was noted in the years 2005–2008 (in 4–12%) but it had not been found in earlier studies. *A. cygnea* was recorded in 1989 and in 2008.

The density of Unionidae in the outlet stretch of the river was usually of the order of several dozen individuals per m^2. The lowest densities (below 30 ind./m^2) were found in 2007; in other years they ranged from 60 to 70 ind./m^2 (Tab. 2). The highest local density (116 ind./m^2) was noted in 1989. Dominating spe-

Table 2. Changes in the density (mean and range in ind./m^2) of bivalves of the family Unionidae (data from 1989 after Lewandowski 1996a)

Taxon	Years				
	1989	2005	2006	2007	2008
Unio tumidus	56 (16-96)	54 (52-56)	52 (36-68)	21 (16-28)	36 (28-46)
Unio pictorum	4 (0-8)	0	6 (4-8)	1 (0-4)	2 (0-4)
Anodonta anatina	4 (0-8)	6 (4-8)	8 (0-16)	4 (0-12)	15 (4-24)
Anodonta cygnea	2 (0-4)	0	0	0	1 (0-2)
Pseudanodonta complanata	0	8 (4-12)	4 (0-8)	1 (0-4)	4 (0-8)
Unionidae	66 (16-116)	68 (64-72)	70 (48-92)	27 (20-32)	58 (8-66)

cies – *U. tumidus* was usually present in average densities of c. 50 ind./m^2 and only in the year 2007 – in a lower density of ca. 20 ind./m^2. Other species reached the density of several individuals per m^2 and only locally they were more dense: *A. anatina* – 16 ind./m^2 in 2006 and *P. complanata* – 12 ind./m^2 in 2005.

Large and older individuals were most numerous among collected bivalves. For example in the dominating species *U. tumidus* most (75–90%) individuals were 4–7 years old and 45–70 mm long. The oldest *U. tumidus* achieved 8–9 years and the length of 75 mm, the youngest were scarce and in some years they were absent.

The snail *Viviparus viviparus* was also present in high densities in the outlet stretch of the Krutynia. Its mean density in the years 2005–2008 varied from 30 to over 50 ind./m^2. Maximum local density was up to 100 ind./m^2. Individuals of medium and large shell size predominated. In all study years females of *V. viviparus* were more numerous (60–70% of the population) than males.

Mean fresh weights of molluscs were c. several hundred g/m^2 (from 199 g in 2007 to 1014 g in 2006). The highest local biomasses were 1680 g/m^2 in 1989 and 1330 g/m^2 in 2006. From 59 to 98% (mean ca. 80%) of the biomass of all molluscs was composed of bivalves of the family Unionidae.

DISCUSSION

According to the earliest studies by Hilbert (3) 43 species of molluscs including 31 species of snails and 12 species of bivalves lived in the Krutynia river. The same number of species but with different proportion of snails to bivalves (24 to 19 species, respectively) was found by Berger (1).

Similar numbers of species were noted in other medium-size rivers of Poland. For example, Piechocki (8) found 43 species of molluscs in the Pasłęka river (Masurian Lakeland) and 50 species in the Grabia river (7).

Noteworthy is the large number of bivalves of the genus *Pisidium* (11 species) noted in the Krutynia by Berger (1, 2). Hilbert (3) found only 3 species of the genus. In our studies we found only 1 common species – *P. subtruncatum* in the outlet part of the Krutynia. Other molluscs found there also belonged to common and widespread species in Polish waters (9).

From among native species of Unionidae, *Unio crassus* was absent in the river outlet but it occurred upstream where water velocity was much higher (5). Two most common Polish species: *Unio tumidus* and *Anodonta anatina* were present in high densities. Two other species – *A. cygnea* and *Pseudanodonta complanata* are protected in Poland.

Moderate water current which carries large amounts of fine seston creates particularly favourable conditions for filter feeders in the river outlet; hence the richness of bivalves of the family Unionidae and of snails of the family Viviparidae. The stretch can be dealt with as a river-lake ecotone. High density and biomass of macrobenthos and especially of filter feeders were frequently noted in such zones (6, 10, 11).

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