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Molluscs (Mollusca) in selected small rivers of the Mazovian Lowland

Mięczaki (Mollusca) wybranych rzek Niziny Mazowieckiej

SUMMARY

Analyses carried out in the rivers: Długa, Miedzanka and Mała Bystrzyca showed qualitative and quantitative differentiation of molluscan fauna. Fifteen species of snails from the families: Neritidae, Viviparidae, Valvatidae, Bithyniidae, Physidae, Lymnaeidae, Planorobidae and 7 species of bivalves from the families Unionidae and Sphaeriidae were found in the rivers. Abundant species in all rivers were the snails: *Viviparus viviparus, Bithynia tentaculata, Radix auricularia, Radix labiata, Lymnaea stagnalis.* The following species were found in only one of the studied rivers: *Viviparus contectus*, *Physa fontinalis, Planorbis carinatus, Planorbarius corneus, Unio pictorum* and *Unio crassus.* The greatest number of species was recorded in the Miedzanka – 17, less in the Długa – 14 and Mała Bystrzyca – 13. Density of molluscs varied between 1 and 78 ind./m^2. Malacofauna found in the Długa, Miedzanka and Mała Bystrzyca was typical of small lowland rivers.

STRESZCZENIE

W rzekach: Długiej, Miedzance oraz Małej Bystrzy stwierdzono 15 gatunków ślimaków z rodzin: Neritidae, Viviparidae, Valvatidae, Bithyniidae, Physidae, Lymnaeidae, Planorbidae oraz 7 gatunków małży z rodziny Unionidae i Sphaeriidae. Gatunkami stwierdzanymi we wszystkich rzekach były: *Viviparus viviparus*, *Bithynia tentaculata*, *Radix auricularia*, *Radix labiata*, *Lymnaea stagnalis*. Tylko w jednej rzece występowały: *Viviparus contectus*, *Physa fontinalis*, *Planorbis carinatus, Planorbarius corneus*, *Unio pictorum*, *Unio crassus*. Największą liczbę gatunków stwierdzono w Miedzance – 17, mniejszą w Długiej – 14 i Małej Bystrzycy – 13. Zagęszczenie mięcza-

ków wynosiło od 1 do 78 osobn./m^2. Malakofauna rzeki Długiej, Miedzanki i Małej Bystrzycy była typowa dla małych, nizinnych rzek.

K e y w o r d s: molluscs, rivers, Mazovian Lowland, Poland

INTRODUCTION

Studies on molluscs of small watercourses and water basins have a long tradition in Poland, but the knowledge on that subject is still fragmentary. Aquatic molluscs are well recognised e.g. in Wielkopolska (22), in Mazurian and Suwałki Lakelands (10, 11, 4, 6) and in Silesia (Strzelec 20). Literature data provide information on malacofauna also in some large rivers, lakes or dam reservoirs (13, 5, 9, 3, 12). Relatively less known in that aspect is the Masovian Lowland, particularly tributaries of the Liwiec, Wieprz or Bug rivers. Some data on molluscs of these rivers can be found in earlier papers devoted to aquatic invertebrates (8, 7). However, there is still no profound quantitative and qualitative data on molluscs in small lowland rivers of this region.

MATERIAL AND METHODS

The studies were carried out in three rivers: the Długa, Miedzanka and Mała Bystrzyca flowing through South Podlasie Lowland, which is the macroregion of the Mazovian Lowland.

Studies were carried out in the years 2000–2002. Mean values of physical, chemical parameters of river water and results of granulometric analyses of bottom sediments are set up in Table 1.

Table 1. Habitat characteristics of the three studied rivers

Index	Unit	DŁUGA	MIEDZANKA	MAŁA BYSTRZYCA
Temperature	^{o}C	9.3–19.1 14.0	10.3–20.5 15.7	3.4–20.5 15,2
Reaction	pH	7.06–7.70 7.41	6.79–7.80 7.02	7.02–7.67 7.32
Conductivity	mS/cm	689–954 829	822–913 872	442–565 659
Total water hardness	mg $CaCO_3$/dm^3	127–204 151	113–218 147	144–298 231
Dissolved oxygen	mg O_2/dm^3	4.8–9.6 5.7	5.2–7.9 6.7	8.1–11.2 7.1
BOD_5	mg O_2 /dm^3	1.0–6.2 3.3	0.9–7.8 3.8	1.1 - 14.8 4.3
Nitrate Nitrogen	mg N-NO_3/dm^3	0.9–3.9 1.4	3.1–12.9 6.6	0.1–3.7 1.2
Dissolved phosphates	mg PO_4/dm^3	0.3–1.1 0.5	0.3–1.3 0.6	0.3–0.7 0.4
Chlorides	mg Cl/dm^3	18.5–38.0 24.1	11.5–18.1 15.2	13.0–22.0 16.7

Index	Unit	DŁUGA	MIEDZANKA	MAŁA BYSTRZYCA
Depth in sampling	cm	50–65 58	60–70 65	65–80 72
Sediment grain diameter	mm	0.18–0.39 0.27	0.15–0.23 0.19	0.87–2.10 1.38
Minimum water velocity	cm/s	1.0–1.9 1.3	1.4–2.0 1.7	1.9–2.0 1.9
Character of the bottom		sandy-muddy	sandy-muddy	sandy-gravel
Character of the shore		natural, gentle	natural, gentle	steep, stony
Dominating macrophytes		*Potamogeton perfoliatus* (L.)	*Alisma plantago – aquatica* (L.), *Lemnna minor* (L.), *Nuphar lutea* (L.), *Hydrocharis morsus - ranae (L.), Typha latifolia (L.), Ceratophyllum demersum* (L.),	*Potamogeton pectinatus* (L.), *Potamogeton perfoliatus* (L.)

Benthic samples were obtained by semi-quantitative method using a 20 x 20 cm grab sampler mounted on a 4 m-pole which was dragged parallel to the river bank over approximately 1 m in triplicate. Density of snails was calculated per 1 m^2.

The material was rinsed on a sieve with a net mesh size of 0.5 mm. Dominance pattern was analysed using the dominance index $D = n_i/N$, where n_i is the number of individuals of an i^{th} species and N is the number of individuals of all species recorded in the river.

Species diversity of the studied communities was expressed with the Shannon-Wiener index $H' = -\sum p_i \ln p_i$, where p_i is the share of an i^{th} species in the total number of individuals in the community.

RESULTS

Altogether 3330 individuals representing 22 species of molluscs including 7 species of bivalves were found in the studied rivers (Tab. 2). The greatest number of species (17) was recorded in the Miedzanka, less in the Długa – 14 and in the Mała Bystrzyca – 13.

In the Długa the dominant species was *Valvata piscinalis,* which constituted over 11% of all molluscs (Tab. 2). Lymnaeidae were represented by 5 species – *Radix auricularia*, *R. labiata*, *Stagnicola corvus*, *Lymnaea stagnalis*, *Galba truncatula.*

Lymnaeidae (*R. auricularia, S. corvus, L. stagnalis*) contributed in 22% (the largest share) and Viviparidae – in over 18% to malacofauna in the Miedzanka river.

Table 2. Density of molluscs in the rivers Długa, Miedzanka, Mała Bystrzyca; N– number of individuals, D – dominance index

SPECIES	DŁUGA			MIEDZANKA			MAŁA BYSTRZYCA		
	Minimum and maximum density	N	D (%)	Minimum and maximum density	N	D (%)	Minimum and maximum density	N	D (%)
1. *Theodoxus fluviatilis* (L.)	10–34	69	6.2	1–47	105	7.1			
2. *Viviparus viviparus* (L.)	16–56	86	7.8	18–78	126	8.5	10–26	43	5.8
3. *Viviparus contectus (*Millet)				15–58	143	9.6			
4. *Valvata piscinalis* (O.F. Müller.)	3–67	132	11.9	17–70	115	7.8			
5. *Bithynia tentaculata* (L.)	3–37	65	5.9	6–40	97	6.5	1–27	45	6.1
6. *Physa fontinalis* (L.)				5–25	60	4.0			
7. *Radix auricularia* (L.)	5–42	84	7.6	1–47	106	7.1	4–23	73	9.9
8. *Stagnicola corvus* (Gmelin)	12–50	87	7.9	2–67	145	9.8			
9. *Radix labiata* (Rossmässler)	10–48	89	8.1	4–31	74	5.0	1–18	54	7.3
10. *Lymnaea stagnalis* (L.)	1–38	90	8.1	8–35	75	5.1	2–40	95	12.8
11. *Galba truncatula* (O. F. Müller)	3–28	72	6.5	5–28	58	3.9			
12. *Planorbis carinatus* (O. F. Müller)							6–18	44	5.9
13. *Planorbis planorbis* (L.)	10–40	86	7.8	1–17	43	2.9			
14. *Anisus contortus* (L.)				7–18	36	2.4	2–10	17	2.3
15. *Planorbarius corneus* (L.)				1–30	55	3.7			
16. *Unio pictorum* (L.)							2–20	51	6.9
17. *Unio crassus* Philipsson							4–20	46	6.2
18. *Unio tumidus* Philipsson	1–47	88	8.0	3–47	83	5.6			
19. *Sphaerium corneum (*L.)	1–23	45	4.1	1–30	72	4.9	1–35	77	10.4
20. *Sphaerium rivicola* (Lamarck)	2–30	62	5.6				5–20	47	6.3
21. *Pisidium amnicum* (O. F. Müller)				2–48	91	6.1	2–40	73	9.8
22. *Pisidium nitidum* (Jenyns)	2–23	50	4.5				3–40	76	10.3
TOTAL		**1105**			**1484**			**741**	

In the Mała Bystrzyca the dominants were *L. stagnalis*, *Sphaerium corneum* and *Pisidium nitidum.*

The density of molluscs varied from 1 to 78 individuals/m^2 (Tab. 2). *Valvata piscinalis* (67 ind./m^2) and *Viviparus viviparus* (56 ind./m^2) showed the highest densities in the Długa river. The highest densities in the Miedzanka were achieved by the former species (70 ind./m^2) and by *V. viviparus* (78 ind./m^2). *L. stagnalis, Pisidium amnicum* and *P. nitidum* showed the highest densities in the Mała Bystrzyca river (40 ind./m^2 each). In that river the density of snails was lower (Tukey test $p<0.005$) and the density of bivalves was similar (Tukey test $p<0.001$) to that in the Długa and Miedzanka Indices of species diversity calculated for consecutive years were similar for the Długa and Mała Bystrzyca ($p = 0.67$) but different for the Długa and Miedzanka ($p<0.001$) and for the Miedzanka and Mała Bystrzyca ($p<0.001$).

DISCUSSION

Comparison of species composition and densities of molluscs in small lowland rivers in Poland showed mean densities of mollusc in the three studied rivers. The number of species in the studied rivers was distinctly lower than that in the Grabia, Pasłęka, Krutynia, Raba and in the rivers of the Świętokrzyskie Mts. and Roztocze, where about 40 mollusc species were recorded in each of the listed rivers (1, 13, 14, 16, 17, 18).

Different contribution of various mollusc species observed in three studied rivers resulted from different vegetation and substrata preferred by particular species and from physical and chemical water characteristics.

Specific vascular flora may decide on the presence of some snail species. For example, a β-mesosaprobic species *Physa fontinalis* prefers *Elodea canadensis*, *Nuphar lutea* and *Sagittaria sagittifolia* (15). In the Miedzanka this snail was associated with *N. lutea* ($r^2 = 0.87$) which was one of most common macrophytes. The occurrence of *Planorbarius corneus* in the Miedzanka was an effect of the presence of *Hydrocharis morsus-ranae* ($r^2 = 0.89$), *Typha latifolia* ($r^2 = 0.79$), *Ceratophyllum demersum* ($r^2 = 0.75$) and *Lemnna minor* ($r^2 = 0.71$). *Planorbis carinatus* numerous in the Mała Bystrzyca preferred sites with sandy bottom and the presence of *Potamogeton perfoliatus* ($r^2 = 0.85$).

Sediment structure, grain size and hardness are also important for the occurrence of snails. An analysis of the grain size structure revealed differences of riverine sediments in that aspect. Fine sediments offering more favourable habitat for detrivores and small filter feeders were found in the Długa and Miedzanka rivers. A large contribution of *Valvata piscinalis* and snails from the family Lym-

naeidae feeding in bottom sediments were found there. The bottom covered by thick detritus layer and mud increased also the number of *Bithynia tentaculata* and Viviparidae

The type of substratum affected the occurrence of bivalves. Coarse-grained sediments favourable for Unionidae and bivalves from the genera Pisidium and Sphaerium prevailed in the Mała Bystrzyca river.

Waters of the three studied rivers were of the beta-mesosaprobic character. They are slightly polluted, not affected by human impact and typical of many lowland rivers in Poland (21). Water pH being slightly alkaline, i.e. most favourable for molluscs (e.g. 15, 19), markedly affected their occurrence. Abundance of snails is not always associated with the presence of calcium carbonate, particularly in species which take it up in food and not directly from the substratum (2). This was true for pond snails, which clearly dominated in the Długa and Miedzanka.

Malacofauna of the studied rivers in the Mazowian Lowland is similar in both qualitative and quantitative aspects to that in many small lowland rivers in Poland. It is moderately rich in species. Noteworthy is the presence of bivalves of the family Unionidae represented by *Unio tumidus* in the Długa and Miedzanka and by *U. pictorum* and *U. crassus* in the Mała Bystrzyca. *U. crassus* is the only species of the family placed in a list of species that require conservation acc. to the EU Directive on the protection of natural habitats and wild flora and fauna.

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