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HOLOCENE MALACOFAUNA FROM A PEAT BOG IN ŻYDOWIEC, NEAR WIŚLICA (NIDA BASIN, SOUTHERN POLAND)

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ABSTRACT: The peat bog near the village of Żydowiec in the Nida Basin was subjected to malacological analysis. The peat bog is located in a subsidence basin in a gypsum karst area. The profile of deposits was identified based on materials obtained from shallow (maximum depth of 2.55 m) drillings. Lithologically diverse calcareous gyttjas and peats predominated, accompanied by dark muds. Numerous, but poorly preserved and often crushed molluscan shells were found in the calcareous gyttjas, as well as in some types of peat. Aquatic species were represented most frequently, especially drought-resistant forms and euryecological taxa. Land snails occurred in small numbers and constituted an admixture of low significance. Based on the composition and structure of faunistic assemblages, it was possible to characterise the features of the natural environment, peat bog evolution, and to determine the stratigraphic position of deposits.

KEY WORDS: peat bog, molluscs, environmental changes, Holocene, Nida Basin, South Poland

INTRODUCTION

The Nida Basin forms a wide depression filled with Mesozoic formations, mainly Upper Cretaceous marls. Miocene formations, most prominently gypsum rocks, are also commonly found, especially in the southern part. These formations are covered by Quaternary deposits with varied facies structure (RUTKOWSKI 1986). Rises occur throughout the basin, which correspond to the presence of rocks with greater resistance to erosional factors. A very important element of the geological structure, as well as topographical relief, are gypsum zones. Gypsum was a subject of geological research as early as the end of the 19th century. Numerous studies of these rocks have been developed since then, concerning aspects ranging from their stratigraphy, lithology and origin, to their distribution (e.g. FLIS 1954, BĄBEL 1999, 2002). Gypsum, similarly to limestone, is subject to the karstification processes. This leads to the development of naked and deep karst forms. The Nida Basin can be considered a classic area of such type of karst (FLIS 1954, CABAJ & NOWAK 1986, NOWAK 1986). The occurrence of numerous depressions in the form of sinkholes or karst poljes facilitates the formation of closed drainage areas, which are filled with peat bogs. One such peat bog is located approximately 1.5 km north of Wiślica, near the settlement of Żydowiec.

The Żydowiec peat bog is situated in a basin (174.5–175 m a.s.l.) surrounded from the north, east, and south, by gypsum hills reaching an altitude of 188–190 m a.s.l. The Żydowiec basin, lying 1 km east of the Nida river channel, is nearly circular in shape and covers an area of 1 km × 0.6 km (Fig. 1). The GPS coordinates are 50°21'34"N and 20°40'43"E. The flat surface of the peat bog is covered with sedge fens, and in the many areas of former peat harvesting sites there are reed fens.

Peat deposits do not create favourable conditions for the preservation of molluscan shells. This is due to

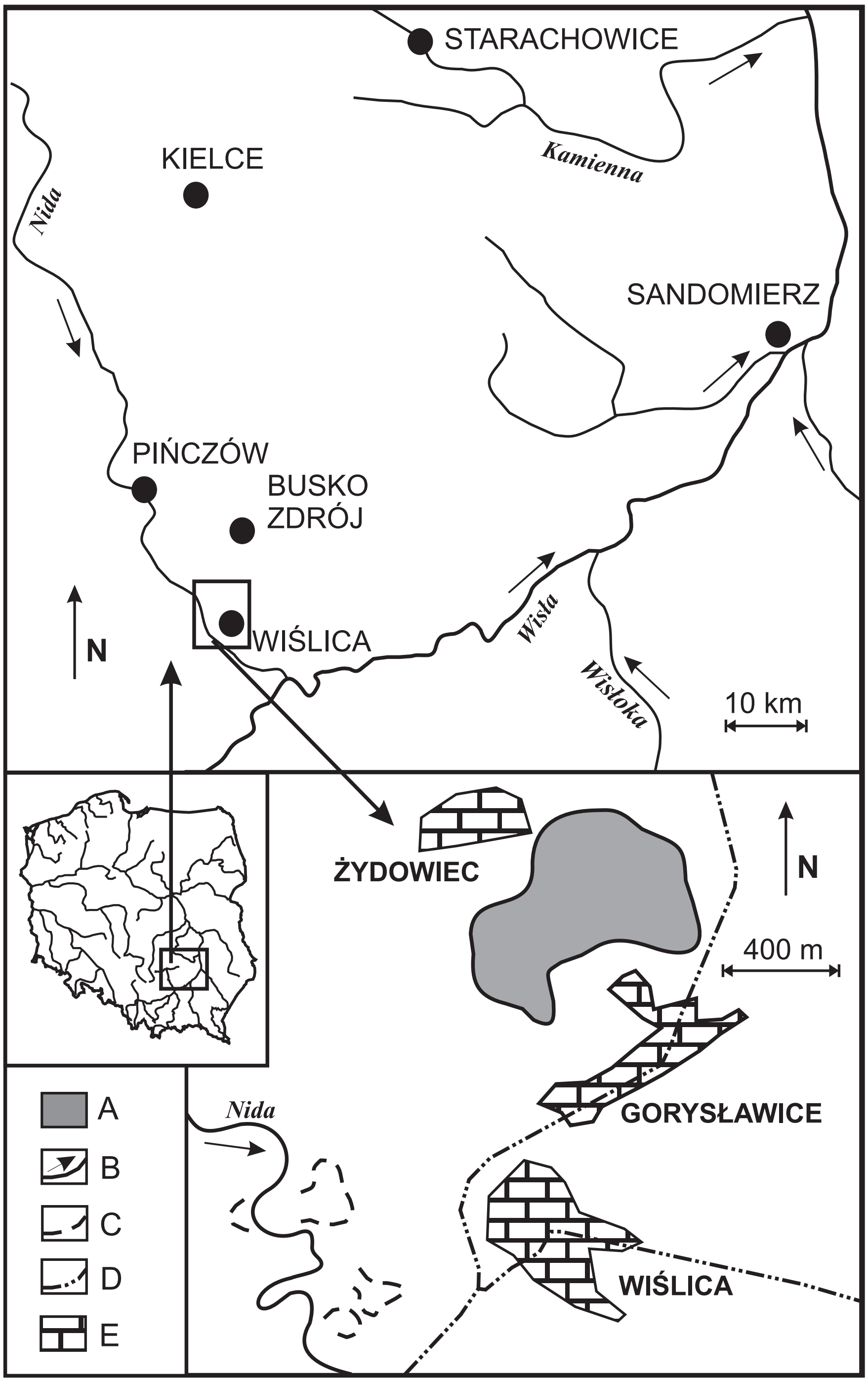

Fig. 1. Location of the Żydowiec peat bog: A – Żydowiec peat bog, B – rivers and streams, C – oxbows, D – main roads, E – towns and villages

the acidic environment of these deposits. Such properties cause molluscan carbonate shells to dissolve rapidly. In specific cases, if a peat bog has developed on rocks with a high calcium carbonate content (limestone, marl), conditions enabling the preservation of molluscan shells can be created. Several sites with such deposits containing malacofauna were found in northern and eastern Poland (ALEXANDROWICZ & ŻUREK 1996, ALEXANDROWICZ 1999b, 2007, 2013a, DOBROWOLSKI et al. 2002, 2005, 2012). Peat containing molluscan shells is also found in the Carpathian region (ALEXANDROWICZ 1987a, 1997, 2013b). However, such deposits occurring in a gypsum karst area have never been described. Several sites in the Nida Basin region have been found to contain deposits with molluscan fauna. They are mostly loess profiles representing the last glacial (ALEXANDROWICZ & URBAN 2002, ALEXANDROWICZ 2011) and single calcareous tufa locations (ALEXANDROWICZ 2004, ALEXANDROWICZ & GOŁAS-SIARZEWSKA 2011, 2013).

GEOLOGICAL SETTING

The material for the malacological study was derived from five profiles arranged in a north–south line across the eastern part of the peat bog (Fig. 2). The depth of individual profiles ranged between 1.60 and 2.55 m.

Żydowiec I drilling (Żd-I) was performed near at the north margin of the peat bog. The deposit thickness amounts to 2.55 m (Figs 2, 3):

- 0.00–0.10 m dark brown peat with numerous macroremains;
- 0.10–0.50 m calcareous gyttjas with traces of vague lamination. Black detritus gyttja intercalations occur. Calcium carbonate content in the top part is 41%, and in the bottom part increases to 64%; deposit pH is 7.4, and ash content is 71–73%;
- 0.50–0.65 m dark brown peat with calcium precipitates and numerous shells (pH – 7.4; $CaCO_3$ content – 32%);
- 0.65–0.85 m grey-yellow, in some places dark brown detritus gyttjas (pH – 7.5; $CaCO_3$ content – 52–88%);
- 0.85–1.10 m dark, gently laminated muds with plant remains (pH – 7.0; $CaCO_3$ content – 13%);
- 1.10–1.40 m black and dark brown sedge peat (pH – 6.6; $CaCO_3$ content – 30%). Radiocarbon dating performed in the material from this layer showed 3,740±70BP (Ki 11,394) (2,420–1,955 cal BC);
- 1.40–2.50 m grey, clay-calcareous and detritus gyttjas (pH – 7.7; $CaCO_3$ content – 40–80%);
- 2.50–2.55 m fine-grained sands.

Molluscan remnants were found throughout the entire sequence described.

Żydowiec II drilling (Żd-II) was performed in the central part of the peat bog approximately 50 m south of Żd-I. The deposit thickness amounts to 2.00 m (Figs 2, 4):

- 0.00–0.15 m dark brown peat with numerous macroremains;
- 0.15–0.55 m light grey calcareous gyttjas;
- 0.55–0.65 m dark brown sedge peat;
- 0.65–0.80 m light grey calcareous gyttjas;
- 0.80–1.00 m black muds with plant remains;
- 1.00–1.30 m light grey clay-calcareous gyttjas;
- 1.30–1.45 m dark brown sedge peat;
- 1.45–2.00 m light grey calcareous and clay-calcareous gyttjas.

Molluscan remnants were found throughout the entire sequence described.

Żydowiec III drilling (Żd-III) was performed approximately 150 m north of the southern edge of the peat bog. The deposit thickness amounts to 2.00 m (Figs 2, 5):

- 0.00–1.60 m strongly acidic black and dark brown peat;
- 1.60–2.00 m light grey calcareous and clay-calcareous gyttjas.

Molluscan remnants were found only in the bottom layer of gyttjas.

Żydowiec IV drilling (Żd-IV) was performed approximately 10 m south of Żd III. The deposit thickness amounts to 1.60 m (Figs 2, 5):

- 0.00–1.40 m strongly acidic dark brown or black reed or sedge and reed peat;
- 1.40–1.60 m dark grey detritus-clay gyttjas.

Molluscan remnants were found only in the bottom layer of gyttjas.

Żydowiec V drilling (Żd-V) was performed approximately near by the southern edge of the peat bog, approximately 50 m south of Żd-IV. The deposit thickness amounts to 1.70 m (Figs 2, 5).

- 0.00–1.60 m strongly acidic dark brown or black reed or sedge and reed peat;
- 1.60–1.70 m grey, clay calcareous gyttjas.

Molluscan remnants were found only in the bottom layer of gyttjas.

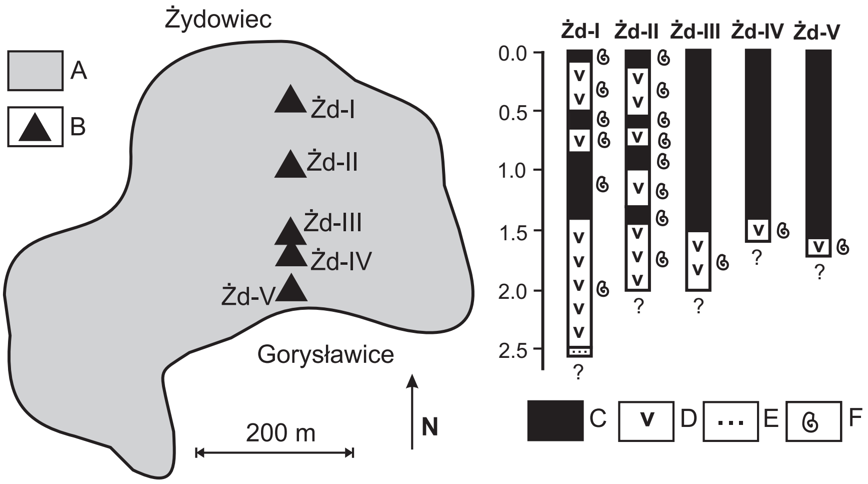

Fig. 2. Profiles and their distribution in Żydowiec peat bog: A – Żydowiec peat bog, B – profiles described in text, C – peat and mud, D – calcareous gyttja, E – sand, F – subfossil malacofauna

MATERIALS AND METHOD

The study of the Żydowiec site was conducted in 2004–2006. It involved drilling with an Instorf corer, 55 cm long and 5 cm in diameter. A total of five bore holes were drilled along a North-South line crossing the eastern part of the peat (Fig. 2). The depth of individual drillings ranged from 1.60 to 2.54 m. The material obtained was subject to standard lithological analyses. The deposit pH value and $CaCO_3$ content were also determined, the latter using Scheibler's method. The malacological analysis was performed based on core sections representing 10–20 cm thick intervals, depending on the deposit form. Two profiles represented complete deposit sequences, while single samples from the other three were analysed. A total of 26 samples were included in the malacological analysis in the studied site. The samples were subjected to flushing on a 0.5 mm mesh, and after drying all shells that were preserved whole, both adult and juvenile forms, and identifiable shell fragments were selected. The malacological analysis was performed using standard methods described by Ložek (1964), Alexandrowicz (1987b) and Alexandrowicz & Alexandrowicz (2011). Individual molluscan species were classified into defined ecological groups. The analysed material contained species of open spaces (ecological group O), mesophilous snails (ecological group M), hygrophilous forms (ecological group H), aquatic species typical of seasonal water bodies (ecological group T) and molluscs of permanent water bodies (ecological group P). The latter two clearly dominated, whereas terrestrial species occurred in small numbers. It should be noted that the shell material found in most samples was poorly preserved and highly crushed. Therefore, the shell fragments which enabled indisputable identification were recalculated into whole specimens in accordance with the formula developed by Alexandrowicz (1987b). The age of deposits was determined by radiocarbon dating. The analysis was carried out in a laboratory in Kiev.

RESULTS

Malacological analysis of the Żydowiec site was based on 26 samples (Żydowiec I – 7, Żydowiec II – 13, Żydowiec III – 3, Żydowiec IV – 1, Żydowiec V – 2). The malacofauna contained 34 species in total (8 terrestrial snails, 21 aquatic snails, 5 bivalves) represented by 3,700 specimens.

Seven samples from the Żydowiec I profile were analysed, representing interval 0.5–2.0 m (Fig. 3 P, S). The malacofauna included 25 species (8 terrestrial taxa, 16 species of aquatic snails and 1 bivalve species) (Table 1). The numbers of species in individual samples varied from 7 to 18, while the numbers of specimens fluctuated between 103 and 530 (Fig. 3 N, Table 1). Terrestrial taxa constitute a scarcely significant component of the assemblage, and are most abundantly represented by the forms of open spaces – *Vallonia pulchella* and hygrophilous species – *Succinea putris*. The most important role in the studied association is played by water taxa. They include both the forms inhabiting seasonal, drying water bodies: *Galba truncatula* and *Planorbis planorbis*, and the species occurring in permanent but small, shallow and usually intensively overgrown water bodies (*Armiger crista*, *Stagnicola palustris*). Aquatic snails with broad habitat tolerance: *Radix balthica* and *Bithynia tentaculata* are a significant and in some samples dominant component. The former above-mentioned species is the most abundant taxon. The latter is represented both by shells and opercula. The occurrence of two characteristic species of Planorbidae is of major importance, namely: *Gyraulus albus* – specific to periods of relatively warm climate and *Gyraulus laevis* typical of cold climate (Alexandrowicz 1999b, 2007, 2013). The former is present in the upper part of the profile, while the latter is found in the lower sequence interval (Fig. 3 Mf).

The Żydowiec II profile (Żd-II) represents the most comprehensive malacological sequence. Fairly abundant malacofauna was found in the 13 samples obtained from interval 0.12–2.00 m, and it contained 5 land snail taxa, 17 aquatic snail taxa and 1 bivalve species (23 species in total) (Fig. 4 P, S, Table 2). The numbers of taxa in individual samples varied from 1 to 13, reaching a minimum in the bottom section. The numbers of individuals ranged from 47 to 431 (Fig. 4 N, Table 2). Terrestrial species are very sparse and are usually represented by single specimens. The major components among the aquatic species are two forms. The first of them is *P. planorbis*. This snail inhabits seasonal water bodies, and sometimes even highly waterlogged, frequently inundated terrestrial habitats. The second important species is the typically euryecological *R. balthica*, which is also fairly resistant to short-term drying of water bodies. The assemblage is supplemented by *B. tentaculata* (both opercula and shells), *S. palustris* and *A. crista*. The remaining 13 aquatic taxa are considerably less abundant. Particularly noteworthy, however, is the presence of the cold-loving *G. laevis* in the bottom part of the described sequence (Fig. 4 Mf).

The Żydowiec III profile was the source of two samples representing interval 1.4–1.6 m. The upper

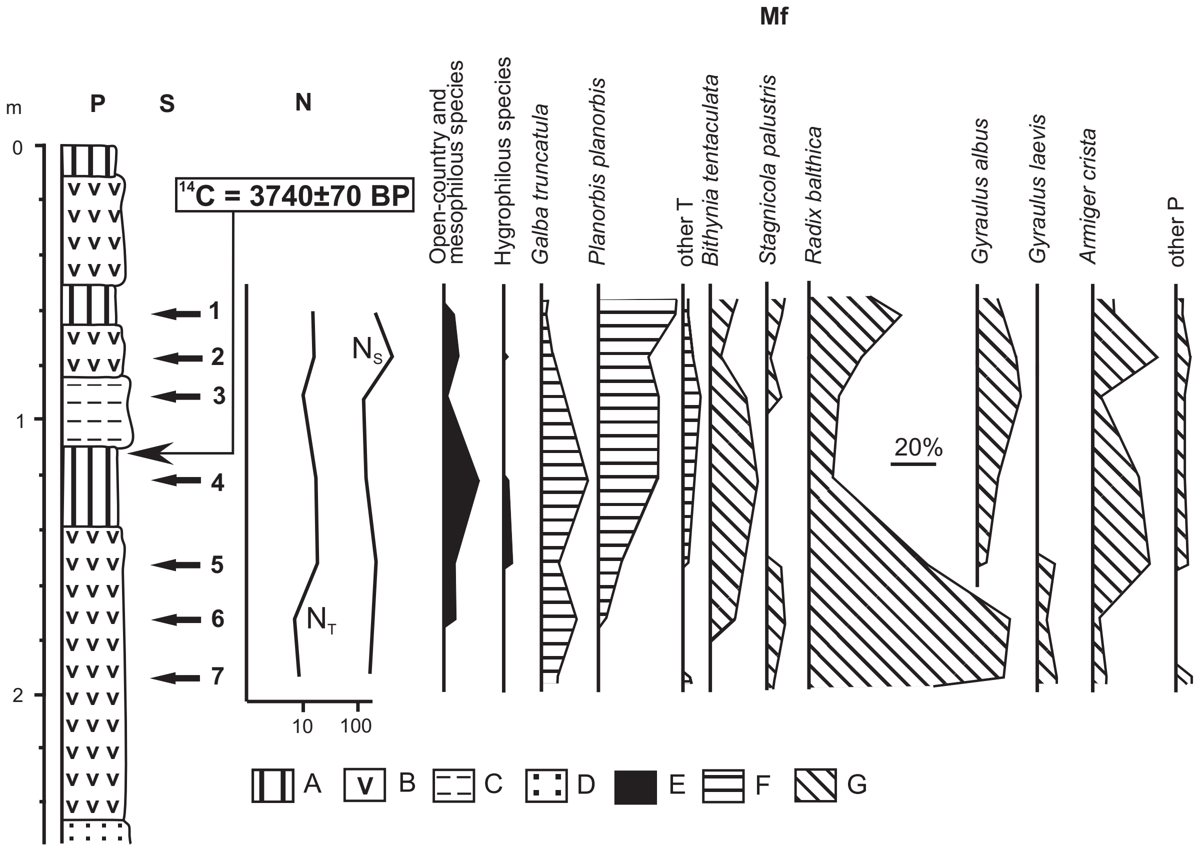

Fig. 3. Lithology and malacofauna of profile Żydowiec I (Żd-I): P – profile, S – samples, N – number of taxa (N_t) and specimens (N_s), Mf – malacofauna; A – peat, B – calcareous gyttja, C – mud, D – sand, E – terrestrial snails (open-country, mesophilous and hygrophilous), F – aquatic species typical of seasonal water bodies, G – molluscs of permanent water bodies

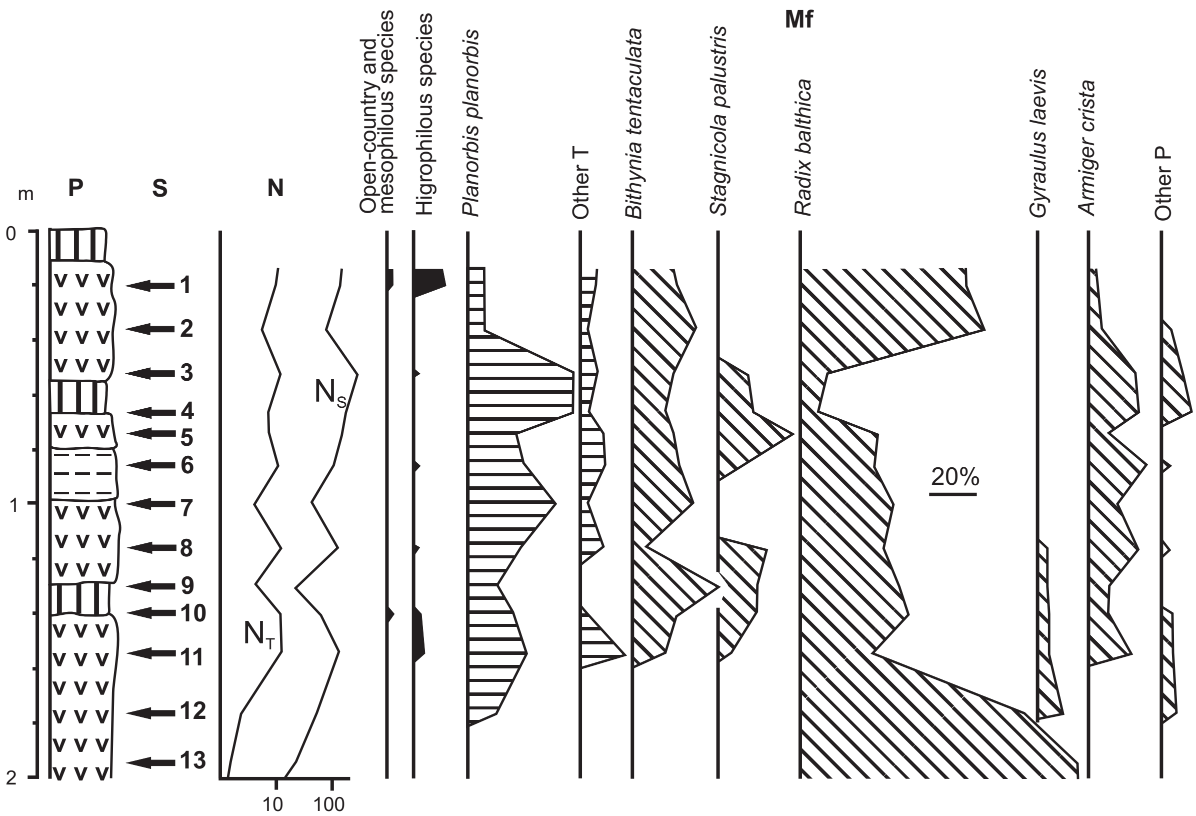

Fig. 4. Lithology and malacofauna of profile Żydowiec II (Żd-II). For explanations see Fig. 3

Table 1. Composition of malacofauna in profile Żydowiec I (Żd-I). E – Ecological groups of molluscs (according to: LOŽEK 1964, ALEXANDROWICZ 1987b and ALEXANDROWICZ & ALEXANDROWICZ 2011): O – species of open spaces, M – mesophilous species, H – hygrophilous species, T – aquatic species typical of seasonal water bodies, P – molluscs of permanent water bodies

E	Taxon	Żydowiec Żd-I						
		0.50–0.71	0.71–0.84	0.84–1.00	1.00–1.40	1.40–1.60	1.60–1.80	1.80–2.00
O	*Pupilla muscorum* (L.)		2	1				
O	*Vallonia pulchella* (Müll.)	1	2	2	6	2	1	
M	Limacidae		2		1	1		
M	*Succinea oblonga* Drap.			1	4			
M	*Euconulus fulvus* (Müll.)	1		1				
H	*Carychium minimum* Müll.		1					
H	*Succinea putris* (L.)		2			4		
H	*Vertigo antivertigo* (Drap.)				1			
T	*Valvata cristata* (Müll.)	2	15	10				
T	*Valvata macrostoma* Steen.							2
T	*Aplexa hypnorum* (L.)		1					
T	*Galba truncatula* (Müll.)	3	29	26	18	12	20	8
T	*Planorbis planorbis* (L.)	55	92	57	22	14	2	
T	*Anisus leucostomus* (Mill.)		5	3	1	1		
T	*Segmentina nitida* (Müll.)			1	1			
P	*Bithynia tentaculata* (L.) (+operculum)	5 (12)	12 (12)	15 (8)	8 (9)	9 (8)	5 (5)	
P	*Physa fontinalis* (L.)		1					
P	*Stagnicola palustris* (Müll.)	12	14	5		10	12	3
P	*Radix balthica* (L.)	64	114	35	8	75	135	86
P	*Anisus contortus* (L.)		20	12	1	1		
P	*Gyraulus riparius* (West.)					4		7
P	*Gyraulus albus* (Müll.)	17	76	44	5	5		
P	*Gyraulus laevis* (Ald.)					10	2	6
P	*Armiger crista* (L.)	11	12	1	18	39	2	5
P	*Pisidium casertanum* (Poli)	1	1	1				
Species (N_T)		11	18	16	13	14	8	7
Specimens (N_S)		184	530	223	103	195	184	117

one did not contain much malacofauna and only several *R. balthica* shells were found. The lower sample contained rich and diversified malacofauna (17 species and 216 specimens) dominated by aquatic forms. The major components were euryecological species: *R. balthica*, *B. tentaculata*, *Pisidium casertanum* and the taxa of overgrown water bodies: *A. crista*, *G. laevis*. The aquatic forms resistant to periods of dry conditions – *P. planorbis* were of less significance (Fig. 5, Table 3).

The Żydowiec IV profile is represented merely by a single sample acquired from interval 1.40–1.50 m. The scarce malacofauna (7 species and 61 specimens) is marked by the lack of terrestrial species. The most numerous forms of fauna are *R. balthica* and *G. albus* (Fig. 5, Table 3).

The fauna of poor species composition was found in the three samples obtained from interval 1.62–2.12 m of the Żydowiec V profile (6 species and nearly 200 specimens). The dominant taxon in all the samples is *R. balthica*. The second distinctive component of the fauna is *G. laevis* (Fig. 5, Table 3).

Table 2. Composition of malacofauna in profile Żydowiec II (Żd-II). For explanations see Table 1

E	Taxon	Żydowiec Żd-II												
		0.12 – 0.30	0.30 – 0.45	0.45 – 0.60	0.60 – 0.70	0.70 – 0.80	0.80 – 0.90	0.90 – 1.10	1.10 – 1.25	1.25 – 1.35	1.35 – 1.45	1.45 – 1.65	1.65 – 1.85	1.85 – 2.00
O	*Pupilla muscorum* (L.)			1										
M	*Succinea oblonga* Drap.	1												
M	Limacidae										1			
H	*Carychium minimum* Müll.	1												
H	*Succinea putris* (L.)	19		5			2		1		1	6		
T	*Valvata cristata* (Müll.)	2	1	27	8	6	6		2			2		
T	*Valvata macrostoma* Steen.											1		
T	*Aplexa hypnorum* (L.)										1			
T	*Galba truncatula* (Müll.)	6	2			10	3		7			29		
T	*Planorbis planorbis* (L.)	9	4	163	93	39	24	18	19	4	12	44	7	
T	*Anisus leucostomus* (Mill.)						1	1			1			
T	*Segmentina nitida* (Müll.)			1								1		
T	*Pisidium obtusale* (Lam.)				1									
P	*Bithynia tentaculata* (L.) (+operculum)	20 (4)	11 (10)	34 (23)	15 (13)	16 (15)	6 (13)	3 (8)	2 (1)	3 (9)	0 (11)	12 (13)		
P	*Physa fontinalis* (L.)	1	1									1		
P	*Stagnicola palustris* (Müll.)			42	29	61	10		19	6	10	12		
P	*Radix auricularia* (L.)								3					
P	*Radix balthica* (L.)	99	64	28	19	52	29	18	32	14	28	56	63	47
P	*Anisus contortus* (L.)			32	26	1	2		1		2			
P	*Anisus vorticulus* (Trosch.)			1										
P	*Gyraulus laevis* (Ald.)								1	1	1	5	5	
P	*Armiger crista* (L.)	3	3	74	44	17	27	7	19	3	5	33		
P	*Hippeutis complanatus* (L.)											8	3	
Species (N_T)		10	7	11	8	8	10	5	11	6	11	13	4	1
Specimens (N_S)		165	96	431	248	217	123	55	107	40	73	223	78	47

DISCUSSION

Based on the lithological features of the above-described profiles, it is possible to divide them into two groups. The Żd-I and Żd-II profiles, which represent the northern part of the peat bog, should comprise the first group. Their characteristic feature is the predominance of calcareous gyttjas and peat that are only slightly acidic. These profiles involve uninterrupted malacological sequences enabling the reconstruction of environmental conditions for longer periods. The profiles Żd-III, IV and V are located in the southern part of the peat bog and their malacological documentation is considerably sparser. This is mainly due to the lithological features of the deposits. The gyttjas where highly damaged and corroded molluscan shells have been preserved, occur only in the bottom parts of the mentioned sequences. Such a poor malacological record makes it impossible to describe the sequences. It is only feasible to characterise the particular samples. The peat located above the gyttja series in Żydowiec III, IV and V profiles is strongly acidic, and molluscan shells have been dissolved. The acidification is probably related to the more limited infiltration of waters rich in calcium ions in the southern part of the peat bog.

The malacofauna is marked by a fairly stable composition and structure. The dominant element in each case are aquatic species, while terrestrial forms are collateral components. Dominant among the aquatic species is the euryecological snail *R. balthica*, which occurs in nearly all samples and sometimes reaches large numbers. The second significant component of the assemblage is *B. tentaculata*. Both shells and opercula of this species appeared in the studied material. In the majority of samples, the number of

Table 3. Composition of malacofauna in profiles Żydowiec III, IV and V (Żd-III, Żd-IV, Żd-V). For explanations see Table 1

E	Taxon	Żydowiec					
		Żd-III	Żd-IV	Żd-V			
		1.60–1.70	1.70–1.80	1.40–1.58	1.62–1.75	1.75–1.95	1.95–2.12
O	*Vallonia pulchella* (Müll.)		1				
T	*Valvata cristata* (Müll.)		5				1
T	*Valvata macrostoma* Steen.		5	7			
T	*Planorbis planorbis* (L.)		18				
T	*Segmentina nitida* (Müll.)		8	1			
P	*Bithynia tentaculata* (L.) (+operculum)		11 (19)	0 (3)	1 (0)		
P	*Valvata piscinalis* (Müll.)		3	4			1
P	*Acroloxus lacustris* (L.)		2				
P	*Stagnicola palustris* (Müll.)		7				
P	*Radix balthica* (L.)	3	52	28	53	84	43
P	*Anisus contortus* (L.)		3				
P	*Gyraulus albus* (Müll.)		6	14			
P	*Gyraulus laevis* (Ald.)		29		3	2	7
P	*Armiger crista* (L.)		34	4	2		2
P	*Anodonta cygnea* (L.)		1				
P	*Sphaerium corneum* (L.)		2				
P	*Pisidium casertanum* (Poli)		10				
Species (N_T)		1	17	7	4	4	5
Speciemens (N_S)		3	216	61	59	86	54

opercula was similar or larger than the number of shells, which indicates a shallow and overgrown water body (ALEXANDROWICZ 1999a, b, 2007, 2013a). The frequent occurrence of *A. crista* and the species capable of surviving the phases when a water body dries up, particularly *P. planorbis*, also suggest this type of habitat. The discussed faunistic assemblage signifies that a small, shallow and intensively overgrown water body was present throughout the deposition period. A considerable proportion of forms typical of seasonal water bodies, found at some places, demonstrates a periodic drop in the water table or even a short-term drought. The low diversity of species composition and the similar assemblage structures observed in all analysed profiles, and within each profile, indicate stable and fairly unchangeable environmental conditions during the sedimentation process.

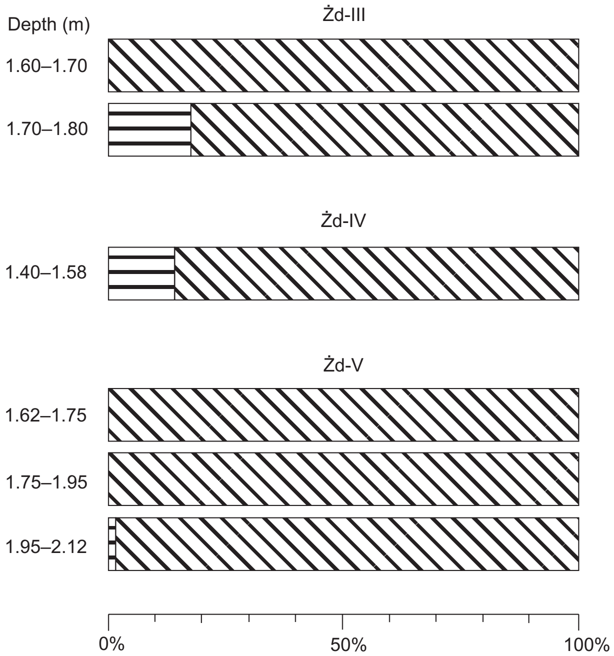

Fig. 5. Malacofauna of profiles Żydowiec – III, IV and V (Żd-III, Żd-IV, Żd-V). For explanations see Fig. 3

It is difficult to determine the age of deposits on the basis of malacofauna. Nevertheless, species that can serve as stratigraphic indicators can been found here. The most important one is *G. laevis*. This form occurs in several profiles, always in the bottom section. *G. laevis* is an aquatic species typical of cold climates. It is commonly found in lacustrine deposits related to the Late Glacial and Lower Holocene as well as in the initial phases of older Interglacial periods, while it is exceedingly rare or absent in Middle and Upper Holocene deposits, where it is usually replaced by *G. albus*, which require higher temperatures (ALEXANDROWICZ 1989, 1999a, 2007, 2013a, GITTENBERGER et al. 1998). A similar sequence is observed in the studied profiles (Figs 3, 4, Tables 1, 2). Another stratigraphic indicator is the occurrence of *B. tentaculata*. This species is nearly always associated with deposits from the Holocene, and its presence in late Glacial formations is exceptional (ALEXANDROWICZ 1989, 1999a, b, 2007, 2013a). In Żydowiec, this form does not occur in the lowest sections of profiles (Figs 3, 4, Tables 1, 2). Considering the above stated facts, it can be suggested that the bottom sections of the profiles analysed, containing *G. laevis* are associated with the Lower Holocene. The intervals marked with the presence of *G. albus* correspond to the Middle and perhaps Late Holocene.

The age of a peat sample representing the middle part of Żd-I profile (Fig. 3) was determined by radiocarbon dating as 3,740±70BP (Ki 11,394) (2,420–1,955 cal BC). Hence its age corresponds to the Subboreal Phase of the Holocene. The reliability of this date is questionable. Firstly, the malacofauna found in this interval suggests rather the Atlantic Phase. This statement is supported by the large proportion of *B. tentaculata* and *G. albus*, the latter of which is typical of this period, as well as the disappearance of *G. laevis* – an indicator species of the Early Holocene (ALEXANDROWICZ 1989, 1999a, b, 2007, 2013a). The last mentioned may also occur within an Interglacial period, during the initial phase of a new lake and in that case its pioneer character overcomes its colder significance (GITTENBERGER et al. 1998). Secondly, the same laboratory has simultaneously carried out the radiocarbon dating of peat from the nearby Krzywopłoty peat bog. The result was 4,450±70BP (Ki 11,393) (3,350–2,930 cal BC). The palynological analysis of the same depth interval has shown the presence of a pollen combination with a composition typical of the Late Glacial, hence much older than the date obtained (WOŹNIAK & ŻUREK 2005, ŻUREK et al. 2011). The problem of deriving a seemingly younger age from the radiocarbon dating of peat bogs, especially ones fed by waters with a high calcium ion content, is a frequently reported phenomenon (e.g. PAZDUR et al. 1988a, b).

Considering the above observations, the karst depression in Żydowiec was filled in the Early and Middle Holocene. The strongly acidic peat covering the deposits which contain molluscan shells is most likely related to the Late Holocene. These conclusions concur with the results of studies performed in other, similar sites within the southern part of the Nida Basin (SZCZEPANEK & STACHOWICZ-RYBKA 2004, WOŹNIAK & ŻUREK 2005, NITA & SZYMCZYK 2010, ŻUREK et al. 2011). The alteration of peat character and chemistry in the Late Holocene has been reported in the case of many marsh and lacustrine deposit profiles throughout Poland (e.g. RALSKA-JASIEWICZOWA & STARKEL 1988, RALSKA-JASIEWICZOWA 1989, DOBROWOLSKI et al. 2002), including the malacologically explored profiles (ALEXANDROWICZ 1989, 1999a, b, 2007, 2013a, DOBROWOLSKI et al. 2005, 2012).

The Żydowiec site represents an illustration of a peat bog development process occurring inside a karst depression. Its uniqueness lies in the fact that the depression is formed on gypsum, unlike the great majority of such forms which occur on limestone.

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