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Mollusc and ostracod fauna of selected sites of the Mazovian Interglacial in Poland*

Sites with sediments of the Mazovian Interglacial age with remains of molluscs and ostracods that have been analyzed lately, contain the key species of this interglacial. Amongst them there are freshwater snails *Lithoglyphus jahni* Urbański and *Viviparus diluvianus* (Kunth) as well as ostracods *Scottia browniana* (Jones) and *S. tumida* (Jones). Other species from these sites are used for a reconstruction of palaeoecologic conditions (rheophilous and stagnophilous species) but also palaeoclimatic (thermophilous and cool species) and palaeogeomorphologic (species of water reservoirs and their margins) conditions. Some of them are also useful for microstratigraphy (pelecypod glochidia).

INTRODUCTION

In Poland there are rare sites of deposits of the Mazovian Interglacial age in which remains of molluscs and occasionally of ostracods have been noted. In 1973 the sketch in the handbook entitled *Metodyka badań osadów czwartorzędowych* presented 11 mollusc sites and a single ostracod site of this age (S. Skompski, 1973).

Examinations of these sites were limited to a mention of molluscs, determinations of single species or analysis of single samples. No systematic examinations of the whole sections were done as it is common e.g. during palynologic investigations.

At present more sites with a fauna of the Mazovian Interglacial are known and some of them have a more complete desription.

MORE IMPORTANT FAUNISTIC SITES

At first the Boczów site of western Poland should be mentioned (Fig. 1).

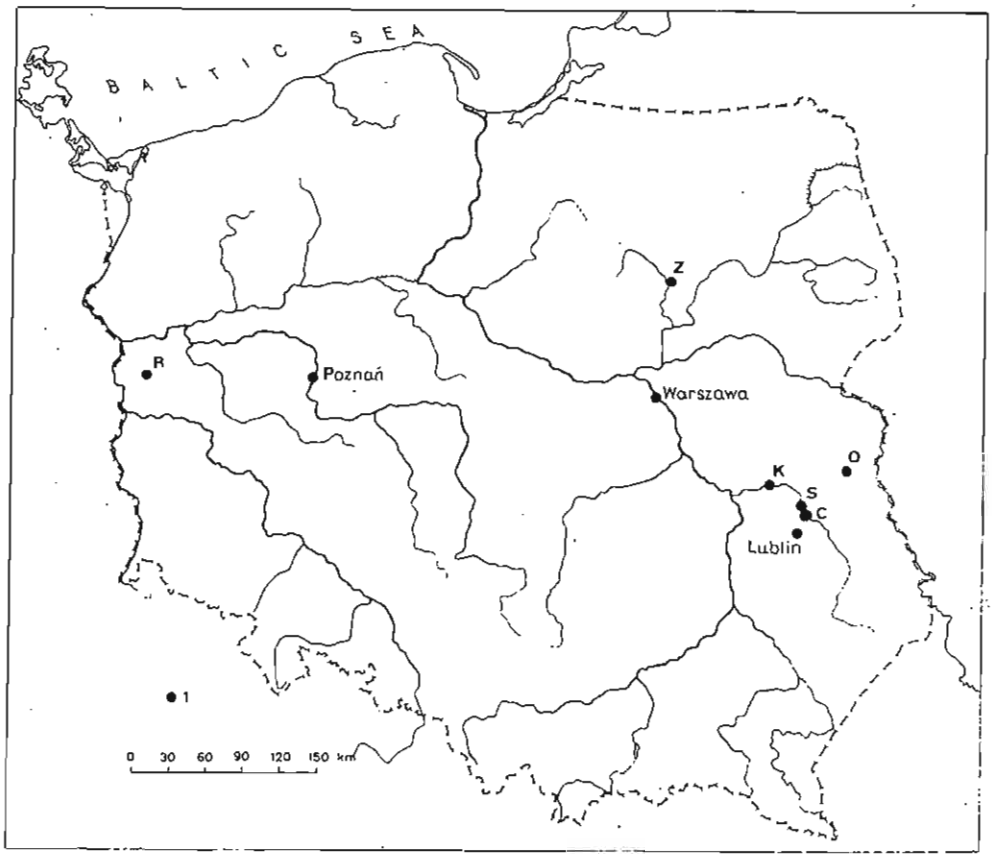

Fig. 1. Location of mollusc and ostracod sites of the Mazovian Interglacial age in Poland

Lokalizacja stanowisk mięczaków i małżoraczków z interglacjału mazowieckiego w Polsce

Faunistic sites: B — Boczów, C — Czerniejów, K — Krępa, O — Opole, S — Syrniki, Z — Zwierzyniec

Stanowiska fauny: B — Boczów, C — Czerniejów, K — Krępa, O — Opole, S — Syrniki, Z — Zwierzyniec

BOCZÓW

A palynologic analysis of 35 samples (but only 16 used for a diagram as the others, due to a content of Tertiary sporomorphs over 5%, were disregarded in the interpretation) and a malacologic analysis were prepared for this site. Their results were published in *Kwartalnik Geologiczny* (Z. Janczyk-Kopikowa, S. Skompski, 1977).

A geologic setting of deposits of the Mazovian Interglacial at Boczów was in general presented in the geologic section, annexed to the *Geologic Map of Poland* in a scale of 1 : 200 000, sheet Słubice, ed. A (S. Skompski, 1976). It proves undoubtedly that interglacial deposits are overlain by two tills, the upper one of which was ascribed to the North-Polish Gla-

ciation and the lower one to the Middle-Polish Glaciation. Such classification of these tills is supported by a confrontation of more significant geologic sections from this area. Both tills are separated by deposits of the Eemian Interglacial from the Laski site (S. Skompski, 1980), a palynologic analysis of which has been done (Fig. 2).

A detailed geologic section from Boczów is presented in Fig. 3, and its analyzed reaches are marked. Amongst 18 distinguished layers only 6 contained a mollusc fauna. The layers with fauna correspond with phytologic phases I—III (the last of them constitutes a climatic optimum). And so, a question arises why this fauna disappears during the phase IV i.e. the post-optimum one. The answer is given by the evolution of vegetation presented in the palynologic diagram (Z. Janczyk-Kopikowa, S. Skompski, 1977). It can be noted in this diagram that the layer 11 (87.3—87.6 m) is preceded by deposits with abundant pollen of plants that favour a formation of humic acids *(Alnus, Graminae, Polypodiaceae).* They probably poisoned the water and resulted in dying out of the molluscs. In general 10 snail species and 11 pelecypod species were determined (Tab. 1). The malacologic analysis allowed to draw the conclusions on various aspects. They can be grouped in the following way:

P a l a e o e c o l o g i c c o n c l u s i o n s. Most determined mollusc species live mainly in stagnant waters. Amidst them there are firstly *Armiger crista nautileus* (Linnaeus), *Planorbis planorbis* (Linnaeus), but also (although noted in runnig waters too), *Bithynia tentaculata* (Linnaeus), *Valvata piscinalis* (Müller), *V. pulchella* (Studer), *Pisidium moitessierianum* Paladilhe, *P. casertanum* f. *ponderosum* Stelfax, *P. subtruncatum* Malm. A running water is preferred by *Pisidium henslowanum* (Sheppard), *P. nitidum* Jenyns and *P. supinum* Schmidt. It can be therefore accepted that this faunistic assemblage lived in a reservoir with a stagnant water with a possible occasional overflow, with a rich vegetation (as proved by the species *Armiger crista nautileus* (Linnaeus), *Planorbis planorbis* (Linnaeus), *Valvata pulchella* (Studer), varying chemical composition of these waters and increasing acidity of these waters as indicated by a quantitative change of the species *Bithynia tentaculata* (Linnaeus). This species is abundant in the layer 8, gradually decreases in layers 9 and 10, and disappears in layer 11. Above, neither mollusc remains nor their opercula were found and the sediments did not contain $CaCO_3$. A principal role in the explanation of the reason for a change of the water chemical composition is played here by the layer 11 that contains a shell conglomeration, composed mainly of shells of the snail *Viviparus diluvianus* (Kunth). This conglomeration means that a rapid extinction of molluscs occurred, although the living conditions got worse starting from the layer 9 in which e.g. at a depth of 87.85—87.90 m, 10 species were found and already 30 cm above (at a depth 87.55—87.60 m) two species only.

An increased influx of humic acids could be a reason for extinction of fauna; it resulted from a wetter climate and development of vegetation as mentioned before. A supply with chemical compounds that usually accompany the brown coal deposits, could be another reason what is descibed below, together with a problem of absence of ostracods.

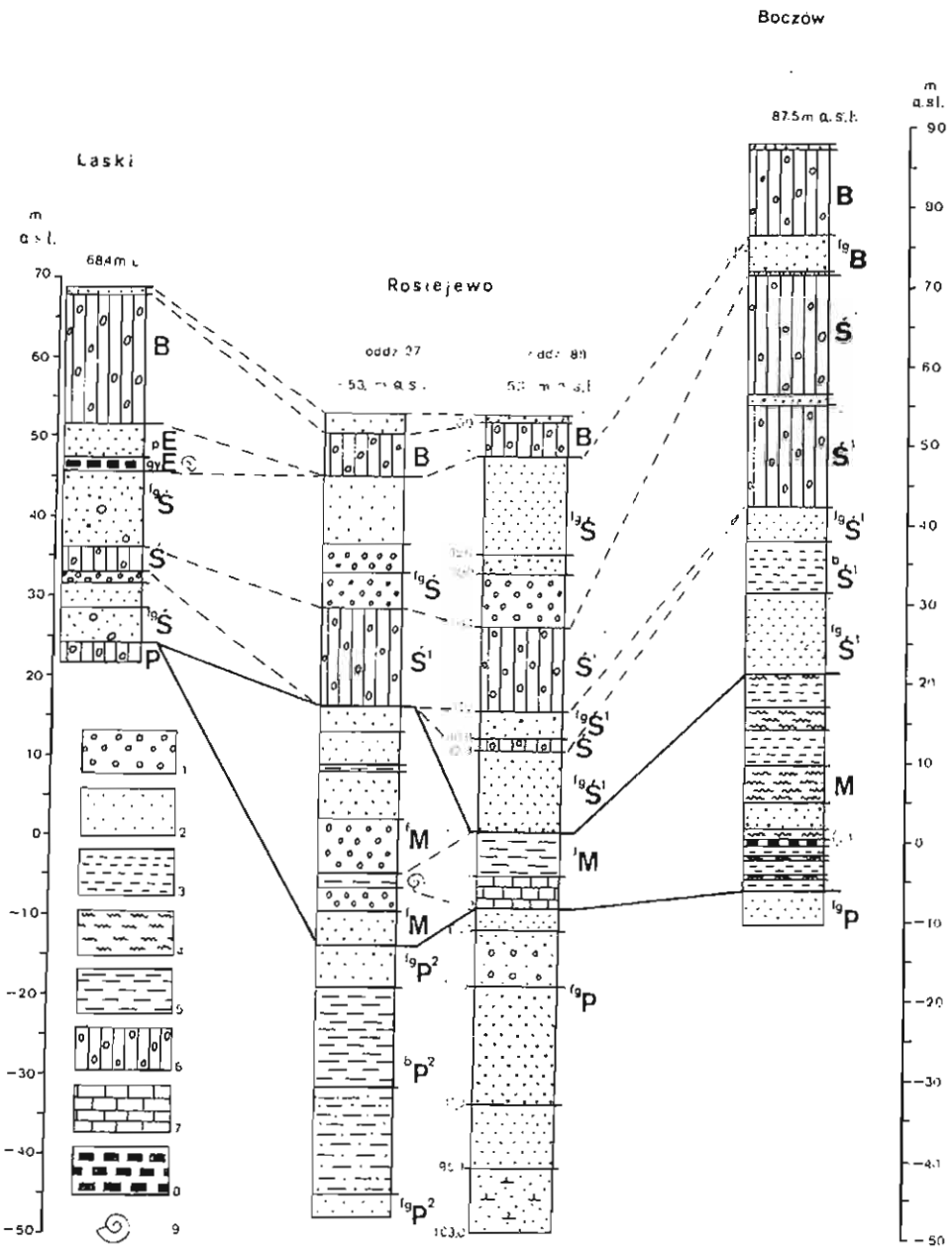

Fig. 2. Geologic sections of interglacial deposits in the Ziemia Lubuska (western Poland)

Profile geologiczne osadów interglacjalnych Ziemi Lubuskiej

1 — gravels; 2 — sands; 3 — aleurites; 4 — silts; 5 — clays; 6 — tills; 7 — lake marl; 8 — gyttja; 9 — fauna; B — North-Polish Glaciation; E — Eemian Interglacial; M — Mazovian Interglacial; S — Middle-Polish Glaciation; S¹ — maximum stadial; P — South-Polish Glaciation; P² — younger stadial; b — ice-dammed lake; j — lake, f — fluvial; fg — glacifluvial

1 — żwiry; 2 — piaski; 3 — pyły; 4 — mułki; 5 — iły; 6 — gliny zwałowe; 7 — kreda jeziorna; 8 — gytia; 9 — fauna; B — zlodowacenie północnopolskie; E — interglacjał eemski; M — interglacjał mazowiecki; S — zlodowacenie środkowopolskie; S¹ — stadiał maksymalny; P — zlodowacenie południowopolskie; P² — stadial górny; osady: b — zastoiskowe; j — jeziorne; f — rzeczne; fg — wodnolodowcowe

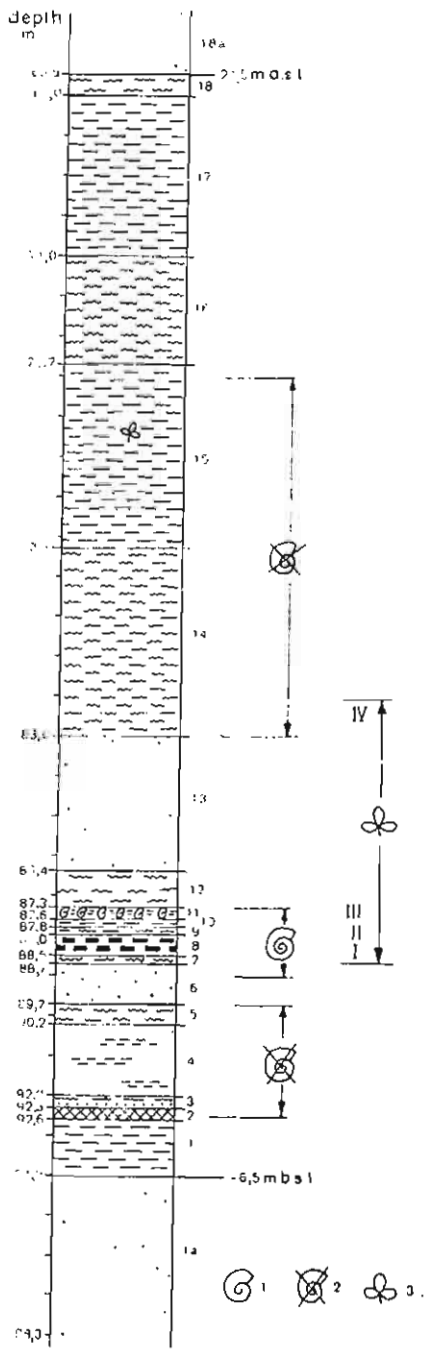

Fig. 3. Geologic section of interglacial deposits from Boczów
Profil geologiczny osadów interglacjalnych z Boczowa

1 — analysis of a mollusc fauna, results of which are presented in Tab. 1; 2 — section fragment analyzed for its faunistic content with negative results; 3 — palynologic analysis, results of which are presented in a pollen diagram (Z. Janczyk-Kopikowa, S. Skompski, 1977); I—IV — phytophases; South-Polish Glaciation: 1a — medium- and fine-grained glacifluvial sand; Mazovian Interglacial: 1 — white aleurite, 2 — detritus of gyttja and silt, 3 — gray silt, 4 — silty sand and silt, 5 — gray silt, 6 — medium-grained sand (sample from a pan), 7 — darkgray silt, 8 — calcareous-detritic gyttja, 9 — silty aleurite, 10 — white aleurite, 11 — silty aleurite with a shell limestone composed of shells of *Viviparus diluvianus* (Kunth), 12 — gray silt, 13 — vari-grained sand (sample from a pan), 14 — gray silt, 15 — aleurite, 16 — lightgray silt, 17 — gray aleurite with mica, 18 — gray silt; Middle-Polish Glaciation; 18a — sands and silts

1 — analiza fauny mięczaków, której wyniki przedstawiono w tab. 1; 2 — odcinki profilu, które przeanalizowano pod względem zawartości fauny z wynikiem negatywnym; 3 — analiza palinologiczna, której wyniki przedstawiono na diagramie pyłkowym (Z. Janczyk-Kopikowa, S. Skompski, 1977) I—IV — fitofazy; zlodowacenie południowopolskie: 1a — piasek średnio- i drobnoziarnisty wodnolodowcowy; interglacjał mazowiecki: 1 — pył biały, 2 — detrytus gytii i mułku, 3 — mułek szary, 4 — piasek pylasty i pył, 5 — mułek szary, 6 —piasek średnioziarnisty (próbka z koryta), 7 — muł ciemnoszary, 8 — gytia wapienno-detrytyczna, 9 — pył mułkowaty, 10 — pył biały, 11 — pył mułkowaty z muszlowcem ze skorupek *Viviparus diluvianus* (Kunth), 12 — mułek szary, 13 —piasek różnoziarnisty (próbka z koryta), 14 — mułek szary, 15 — pył, 16 — mułek jasnoszary, 17 — pył z miką siwy, 18 — mułek siwy; zlodowacenie środkowopolskie: 18a — piaski i mułki

Table 1

Molluscs from the Mazovian Interglacial in Boczów

Gastropoda	Bivalvia
Armiger crista nautileus (Linnaeus)	*Pisidium casertanum ponderosum* Stelfox
Bithynia tentaculata (Linnaeus)	*Pisidium henslowanum* (Sheppard)
Gyraulus sp.	*Pisidium moitessierianum* Paladilhe
Lithoglyphus sp.	*Pisidium nitidum* Jenyns
Lymnaea (Radix) sp.	*Pisidium subtruncatum* Malm
Planorbis planorbis (Linnaeus)	*Pisidium sulcatum* (Wood)
Succinea sp.	*Pisidium supinum* Schmidt
Valvata piscinalis alpestris (Küster)	*Pisidium* sp.
Valvata piscinalis (Müller)	*Sphaerium corneum?* (Linnaeus)
Valvata pulchella (Studer)	*Sphaerium rivicola-solidum*
Viviparus diluvianus (Kunth)	*Unio* sp. *(Anodonta?)*

The ostracods were only occasionally noted. At a depth of 87.0 m shell remains were found and at 89.0 m *Herpetocypris* sp., that does not provide anything important, neither in ecology nor in stratigraphy. Why is it so? The environment seems to have been unsuitable for ostracods what can be concluded from observations of sediments. The latter contained pieces of brown coal and therefore, chemical compounds that accompany a brown coal (sulphides, sulphates) and poisoned the environment. These compounds could come from Miocene deposits, several kilometres northeastwards from the described site, as pushed folds and scales.

Numerous ostracod species were however noted in sediments of this interglacial to the west of the Odra, in German Democratic Republic, in a borehole to the northeast of Fürstenberg. E. Triebel (1941) described there 15 ostracod species, among others the new species *Cyclocypris huckei* Triebel (according to the recent terminology *Scottia tumida* (Jones), found later not only in German Democratic Republic but also in the Soviet Union (S. F. Zubowicz, 1978) and Poland (Syrniki); always it does not occur in sediments younger than of the Mazovian Interglacial age.

Palaeogeomorphologic conclusions. Palaeoecologic conditions, reconstructed on the basis of the whole mollusc assemblage noted in sediments, allow to reconstitute the landscape in which water reservoirs existed, with molluscs living in them. Such lakes formed probably a row, connected by a river and located in glacial channel formed during the Middle-Polish Glaciation. Basing on results of faunistic and geologic analyses, 6 phases of development and disappearance of these interglacial lakes were distinquished (S. Skompski, 1980).

Palaeoclimatic conclusions. A presence of the snail *Viviparus diluvianus* (Kunth) in the faunistic assemblage proves a temperate climate in that time (this snail does not occur at higher northern altitudes than 60°). It is concordant with results of a palynologic analysis that indicates a presence of thermophilous deciduous trees as *Quercus Ulmus, Tilia, Corylus, Carpinus* (Z. Janczyk-Kopikowa, S. Skompski, 1977).

Stratigraphic conclusions. A presence of the snail *Viviparus diluvianus* (Kunth) in the examined sediments proves them not to be younger than the Mazovian Interglacial as this snail became extinct at the end of this interglacial.

ZWIERZYNIEC

The site Zwierzyniec near Przasnysz, found by A. Bałuk (1983), is the second one in which a fauna was examined in a section instead of single samples.

Interglacial sediments are overlain only by a single till (Fig. 4) and because the site is located within the extent of the Wkra Stadial, then three tills of three stadials (Wkra, Warta and Odra) should be found. A lack of the expected tills induced to look for the arguments that this interglacial deposit, covered by a single till only, belongs to the Mazovian Interglacial. Such argument have been provided just by the mollusc and ostracod fauna.

8 samples were examined from a depth 19.0—20.6 m (S. Skompski, 1983b). On the whole 7 snail species and 12 mollusc species were determined (Tab. 2). Two species: *Lithoglyphus jahni* Urbański and *Viviparus diluvianus* (Kunth), are the most valuable for stratigraphic purposes as they did not survived the Mazovian Interglacial. Therefore, they indicate that the sediments in which they were found, could not be younger than the Mazovian Interglacial.

Shells of the species *Lithoglyphus jahni* Urbański, *Valvata piscinalis antiqua* Sowerby, *Pisidium amnicum* (Müller), *P. sulcatum* (S. V. Wood) and *Sphaerium solidum* (Normand) are best preserved. These species are described in detail.

MORE SIGNIFICANT SPECIES OF MOLLUSCS AND OSTRACODS

Lithoglyphus jahni Urbański, 1975
(Tabl. I, Fig. 1a, b, 2)

1923 *Lithoglyphus pyramidatus* Moellendorff; T. Schmierer, p. 207—236, Tabl. III, Figs 18, 19.

1956 *Lithoglyphus pyramidatus* Moellendorff; J. Urbański in: A. Jahn, p. 24.

1975 *Lithoglyphus jahni* Urbański; J. Urbański, p. 109—110, Tabl. I, Figs 1—6.

Material. Single specimens of this species were found in the samples 2, 3, 4, 6, 7, 8 (7 specimens in the sample 3). They are quite well preserved; destruction was usually noted near aperture.

Description. Shells usually small; 5.5—6.6 mm high, maximum to 7.9 mm (sample 7). Width 4.5—5.6 mm (for a comparison the holotype from Czerniejów is 7.2 mm high and 5.5 mm wide; J. Urbański, 1975). Opposite to the species *Lithoglyphus naticoides*, noted in Poland, the determined specimens have a slightly slimer spire with more weakly vaulted whorls and worse expressed (less thick) aperture wall close to a columella.

Remarks. Due to revision of holotype (described by Moellendorff), done by P. Radoman (1966), the specimen was accepted as the same if

Table 2

Pleistocene molluscs from Zwierzyniec near Przasnysz

Number of sample	Depth in metres	Gastropoda							Bivalvia										
		Acroloxus lacustris (Linnaeus)	*Bithynia tentaculata* (Linnaeus)	*Lithoglyphus jahni* (Urbański)	*Limnaea stagnalis* (Linnaeus)	*Succinea putris* (Linnaeus)	*Valvata piscinalis antiqua* Sowerby	*Viviparus diluvianus* (Kunth)	*Pisidium amnicum* (Müller)	*Pisidium casertanum* (Poli)	*Pisidium henslowanum* (Sheppard)	*Pisidium moitessierianum* Paladilhe	*Pisidium personatum* Malm	*Pisidium subtruncatum* Malm	*Pisidium sulcatum* (S. V Wood)	*Pisidium supinum* Schmidt	*Sphaerium corneum* (Linnaeus)	*Sphaerium rivicola* (Lamarck)	*Sphaerium solidum* (Normand)	*Unio* sp.
1	19,0 —19,1	1					163	4				1							2	
2	19,1 —19,2		(6)	1	k		85	d	1						k			d	2	d
3	19,3 —19,4		1 (6)	7	k		163	3+d	4?	2				1	2			1+d	2+k	k
4	19,45—19,55		1 (6)	1			144	1	1+k	2	2			1		1?		k	3	
5	19,65—19,75						24	k	1	1			1		1	1		1?		
6	19,90—20,00		(16)	1	2?		116	k	1	1				1	1			2+k	3+k	
7	20,1 —20,2		(3)	3			39	d	5					1?	2	2?	1?	1	4	
8	20,55—20,60			1			5	k												

Explanations: d — shell detritus (numerous bits), k — a few bits, 1 (6) — number of shells or number of valves for bivalve molluscs, in brackets — number of opercles (see *Bithynia tentaculata*), 1? — uncertain estimate

compared with the previously formed species *Lithoglyphus fuscus* (C. Pfeiffer, 1928), noted in Croatia and Bosnia. Instead, a spire of *Lithoglyphus jahni* (J. Urbański, 1975) resembles small specimens of *Lithoglyphus fuscus* (C. Pfeiffer, *l.c.*) whereas a shape of aperture and better developed callus are close to the species *Lithoglyphus naticoides* (C. Pfeiffer, *l.c.*).

Ecology. According to J. Urbański (1975) this species lived in river waters (as e.g. in the Berlin area) and lake waters (as e.g. at Czerniejów and Syrniki).

Occurrence. Czerniejów and Syrniki on the Wieprz River, the Berlin Paludina Bed (T. Schmierer, 1923) — the Mazovian Interglacial.

Valvata piscinalis antiqua Sowerby
(Tabl. I, Fig. 3, 4a, b; Tabl. II, Fig. 1)

1838 *Valvata antiqua* Sowerby; G. Sowerby, p. 574.

1971 *Valvata piscinalis antiqua* Sowerby; A. Makowska, p. 96, Tabl. I, Fig. 2a, b.

Material. Numerous shells were found in all the samples (Tab. 2). In four samples over 100 specimens were noted. Most shells are destructed near aperture.

Description. Cone-like shell. Oval aperture, partly pointed in the upper part. Massive shell, locally to 0.3 mm thick (near the axial depression). Deep raphe, last whorl frequently well vaulted, step-like. The largest specimen was noted in the sample 8: 7.2 mm high, 5.8 mm wide.

Ecology. It lives in lakes in a sublittoral and profundal zone (even to a depth of 80.0 m (A. Piechocki, 1979). According to W. I. Zhadin (1952) it is also noted in streams.

Present occurrence. Alpine lakes, northern central as well as northern Europe; Poland: almost all the larger lakes, especially in northern Poland (Mazury Lakeland e.g. Mamry Lake — L. Berger, 1960), the Pomorze Lakeland, the Wielkopolska-Kujawy Lowland, Upper and Lower Silesia (A. Piechocki, 1979) and the Vistula Firth (H. Janiszewska-Pactwa, 1976).

Occurence in deposits. Europe: the bottom of Quaternary sediments at Dürnten near Zürich, Tempelhof near Berlin, Mosbach near Wiesbaden (F. Sandberger, 1875), the Artern Interglacial (H. Zeissler, 1965), Lower Quaternary sediments of England (Mammaliferous Crag — S. V. Wood, 1848), the Mindel-Riss and Riss-Würm interglacials of the Soviet Union (I. V. Danilovsky, 1955; W. M. Motuz, 1962, 1969); Poland: several sites of the Middle-Polish Glaciation (L. Dolecki, S. Skompski 1986), Eemian Interglacial, North-Polish Glaciation and Holocene (S. Skompski, 1977, 1983*a*).

Pisidium amnicum (Müller)
(Tabl. II, Fig. 4, 5)

1774 *Tellina amnica* Müller; O. F. Müller, II, p. 205.

1805 *Cyclas palustris* Draparnaud; J. P. R. Draparnaud, p. 131, Tabl. X, Figs 17—18.

1845 *Pisidium amnicum* (Müller); L. Jenyns, p. 11, Pl. XIX, Fig. 2.

Material. Single specimens were found in 6 samples (in total 9 specimens, 5 of which are well preserved, some even with traces of periostracum).

Description. Massive, non-symmetric shell with an apex shifted to the back and distinctly ribbed surface. A largest specimen was found in the sample 4; length 7.0 mm, height 5.9 mm.

Ecology. It lives in rivers and littoral zones of lakes but occasionally is noted in a profundal, even at a depth of 30 m (P. Ehrmann, 1956). Observations of A. Piechocki prove that in rivers it prefers the zones with a moderate current (A. Piechocki, 1969, 1972).

Present occurrence. From northern Africa to central Scotland and 69° of northern latitude in Sweden in the Alpine valleys — 1100 m a.s.l. (P. Ehrmann, 1956); Europe: the Lower Quaternary of England (S. V. Wood, 1851), West Germany (F. Sandberger, 1875), Yugoslavia (E. Krolopp, 1975); the Cromer Interglacial of German Democratic Republic (H. Zeissler, 1965) and the Soviet Union (A. L. Chepalyga, 1971); the Holstein Interglacial in the west Europe (T. Schmierer, 1923; E. K. Kempf, 1966, 1968); the Likhvin Interglacial in the east Europe (W. M. Motuz, 1971, 1975; M. N. Grishchenko, 1976); numerous younger sites in many European countries — Middle-Polish Glaciation — Holocene. Poland: 26 sites of age: from the Middle-Polish Glaciation to the Holocene, but in the Mazovian Interglacial it was found for the first time just here, at Zwierzyniec.

Pisidium sulcatum (S. V. Wood, 1851)[1]
(Tabl. II, Fig. 2; Tabl. IV, Figs 6a, b, 7)

1851 *Pisidium amnicum* var. *sulcatum* S. V. Wood; S. V. Wood, p. 109—110, Tabl. XI, Fig. 1b.

1864 *Pisidium antiquum* Martens; E. Martens, p. 349.

1956 *Pisidium clessini* Neumayr (= *Pisidium astartoides* Sandberger); P. Ehrmann, p. 248.

1968 *Pisidium sulcatum* (S. V. Wood, 1951) K. Kennard; E. K. Kempf, p. 8, Tabl. 4, Figs 66—67.

1969 *Pisidium astartoides* Sandberger; A. Makowska, p. 76.

1980 *Pisidium astartoides* Sandberger; S. Skompski, p. 18, Tabl. III, Fig. 2.

Material. Rare specimens (7) of shells of this species were found in 5 samples. All of them are considerably destructed. The largest specimen (after reconstruction) is 7.0 mm long and 5.0 mm high.

Remarks. Opposite to the described species *P. amnicum*, the shell is slightly shorter and concentric ribs at a shell surface are sharp-edged and more rarely distributed, particularly near the apex.

Ecology. It is an extinct species but its common occurrence with *P. amnicum* allows to conclude that *P. sulcatum* lived in the past in rivers and lakes but with circulating waters (littoral zone of lakes, lakes

[1] S. V. Wood considered this species for the variant of the species *Pisidium amnicum* only: "...this has been called *P. sulcatum*... but it is, I believe, no more than a variety..." (l.c., p. 110).

with a flow). Mollusc assemblages in which *P. sulcatum* occurred, are treated in some sites for the river ones (T. Schmierer, 1923; K. Hucke, 1941; E. K. Kempf, 1968).

Occurrence. Europe: since the Pliocene, Early Pleistocene sands on the Rhine, Neckar and Saale, complex of the Tiraspol fauna correlated with the Voigtstedt Interglacial (V. I. Gromov, 1970), the Holstein Interglacial in the Berlin region and, Krefeld region on the Lower Rhine (T. Schmierer, 1923; E. K. Kempf, 1968), Smolary Rogowe (about 10 km to northeast from Zbereże on the Bug River — M. Prószyński, 1952), the Eemian Interglacial in the Soviet Union; Poland: Mazovian Interglacial at Boczów (S. Skompski, 1980), Brörup Interstadial at Podgłębokie in the Lublin Polesie (A. Makowska, 1969).

Sphaerium solidum (Normand)
(Tabl. II, Fig. 6a, b; Tabl. III, Fig. 1a, b)

1844 *Cyclas solida* Normand; N. A. J. Normand, p. 6, Figs 3, 4.
1875 *Sphaerium solidum* Normand; F. Sandberger, p. 766—767.
1923 *Sphaerium solidum* Normand; T. Schmierer, p. 223.
1952 *Sphaerium solidum* (Normand); V. I. Zhadin, p. 320, Fig. 286.

Material. Amongst 16 specimens found in 6 samples, there were only 6 complete ones, slightly destructed.

Description. Massive, oval shell with strongly emerging wide apex in the centre of the upper shell edge. Shell surface covered with distinct, quite regular but dull and concentric ribs. A hinge ledge is wide. A copula niche is covered from the top. The largest shell is 9.0 mm long and 7.4 mm high.

Ecology. It lives on sandy and sandy-silty bottoms of larger rivers, occasionally in oxbows. Noted also in the Vistula Firth near Frombork where a water salinity equals 2.94% (H. Janiszewska-Pactwa, 1976, p. 170—171).

Present occurrence. Central and eastern Europe: from France as far as the Ural River and from the Lower Dniepr to the Ladoga Lake and also Dvina drainage basin.

Occurrence in deposits. It is rare in the Quaternary deposits of Europe: the Cromer Interglacial in England, Borntal Interglacial in German Democratic Republic (D. Mania, 1973), Tiraspol faunistic assemblage, Holstein Interglacial (T. Schmierer, 1923), the Soviet Union and German Democratic Republic — Middle-Polish Glaciation, Eemian Interglacial. Poland: the Holocene sediments near Dobrzyń on the Vistula and at the Vistula mouth.

STRATIGRAPHIC AND PALAEOECOLOGIC REMARKS

Amongst 5 ostracod species, *Scottia browniana* (Jones) is especially important as it belongs to the species that became extinct at the end of the Mazovian Interglacial, similarly as both above mentioned snail species *Lithoglyphus jahni* Urbański and *Viviparus diluvianus* (Kunth). Thus, it supports the conclusion drawn from the snail fauna. Those two species of snails and ostracod *Scottia browniana* (Jones) can be considered

as guide-fossils for Mazovian Interglacial (and probably also for the older interglacials), while the mollusc *Pisidium sulcatum* (S. V. Wood) — for Interstadial Brörup, Eemian Interglacial and older.

From the point of view of the environment the Zwierzyniec site resembles the Boczów one so, sediments were formed in this case also in a stagnant water reservoir, with a possible flow in a temperate climate. This flow seems to be indicated by the species: *Pisidium amnicum* (Müller), *P. henslowanum* (Sheppard), *Sphaerium rivicola* (Lamarck), *S. solidum* (Normand), known also from the Berlin Paludina Beds (S. Skompski, 1982).

OPOLE

The site Opole is located within the extent of the maximum stadial of the Middle-Polish Glaciation. A more complete description of a geologic setting, a palynologic analysis inclusive, are to be presented after a preparation of the *Detailed Geologic Map of Poland* in a scale of 1 : 50 000, sheet Wisznice, by the discoverer of this site, L. Dolecki from the M. Curie-Skłodowska University of Lublin. I owe to him for the samples of the borehole Opole 5. A geologic section of this borehole is quite monotonous, mainly sandy-silty one (Fig. 5). It should be underlined that sediments with fauna are not covered with till as should be expected in this area.

8 samples were examined, coming from a depth of 22.0—23.2 m from silts and calcareous gyttja. 7 snail species and 10 pelecypod species were determined (Tab. 3). And so, similarly as in the previous section, the age is set by the species *Lithoglyphus jahni* Urbański and amidst ostracods by *Scottia browniana* Jones. In total 15 ostracod species were found (S. Skompski, 1985). This ostracod calls for a wider description due to two aspects: as the key species for the Mazovian Interglacial and as the species that has been seldom noted in Poland.

Scottia browniana (Jones)
(Tabl. III, Fig. 2a, b, 3a, b)

1850 *Cypris browniana* n. sp.; T. R. Jones, p. 25—26, Tabl. 3, Figs 1a—d.
1889 *Scottia browniana* (Jones); G. S. Brady, A. M. Norman, p. 72.
1967 *Cyclocypris triebeli* n. sp.; E. K. Kempf, p. 123—127, Abb. 2—3, Tabl. 1, Figs 11—12.
1982 *Scottia browniana* (Jones); P. Jesionkiewicz, p. 425—428, Tabl. I, Figs a — f.

Material. Numerous shells of this species were found in 8 samples (from 3 to 85 specimens). Most shells were well preserved (50—80%). In the sample 1 all were in a good state whereas in the sample 2 all were destructed. Shells were white and only sporadicaly brown (sample 1) and represented all the development stages (samples 3—6).

Description. A shells is trapezoid-like in a lateral view with a characteristic straight dorsal edge. A left shell (from the sample 1 at a depth 22.0—22.12 m) is smooth and brilliant. Length 0.69 mm, height 0.46 mm. A straight dorsal edge is parallel to a ventral ones but twice shorter. Frontal and back edges are widely rounded, more convex in the lower part than in the upper one. A ventral edge is straight. A maximum width of the calcified fragment of an inner lamella in the frontal-ventral

Table 3

Pleistocene molluscs and ostracods from Opole in Lublin Polesie

Number of sample	Depth in metres	Gastropoda							Bivalvia									Ostracoda																
		Armiger crista (Linnaeus)	*Cochlicopa* sp.	*Gyraulus albus* (Müller)	*Lithoglyphus jahni* Urbański	*Lymnaea stagnalis*? (Linnaeus)	*Succinea oblonga* Draparnaud	*Valvata piscinalis* (Müller)	*Anodonta anatina* (Linnaeus)	*Pseudanodonta complanata* Rossmässler	*Pisidium henslowanum* (Sheppard)	*Pisidium moitessierianum* Paladilhe	*Pisidium* sp.	*Pisidium subtruncatum* Malm	*Pisidium sulcatum* (Wood)	*Sphaerium lacustre* (Müller)	*Sphaerium rivicola* (Lamarck)	*Unio* sp.	*Candona levanderi*? Hirschmann	*Candona neglecta* Sars	*Candona protzi* Hartwig	*Candona rostrata* Brady et Norman	*Candona* sp.	*Candoniella* sp.	*Candoniella subelipsoida* Sharapova	*Cyclocypris ovum* (Jurine)	*Cyclocypris triangula*? Negadaev	*Cytherissa lacustris* (Sars)	*Darwinula stevensoni* (Brady et Robertson)	*Herpetocypris* sp.	*Ilyocypris gibba* (Ramdohr)	*Limnocythere* sp.	*Scottia browniana* (Jones)	Volume of sample in cm³	Lake-stages
1	22,00—22,12				25					58	2	28		1	1		d				1	1			2			1	4			1	3	130	c
2	22,12—22,25				35					191	3	39					d				2				9	4		3			2	13	250	
3	22,25—22,35				9					11		19					d	k							24			14			2	20	180	
4	22,35—22,45				20					155		16					d								38			33	2		5	74	225	b
5	22,45—22,60	1	1		31				1	45		12		2			d						1		16	2	1	13	5	2	10	84	390	
6	22,60—22,70				3			1	3	2	2	22					d							1 ?	41	3		33			19	85	100	
7	22,70—22,85			k		k	1	19			4	8	1	1		1	d		1	2					1	1		1		k	18	68	130	a
8	22,85—23,20		1	k		d	3	56			4	2	1										1					1		k	3	32	200	
9	25,00—26,50				k												d	k																

Explanations: d — shell detritus (numerous bits — not less than 10 valves), k — a few bits, 25 — number of shells (number of valves for bivalve molluscs, for glochidia of *Pseudanodonta complanata* and for ostracods)

area is equal 0.12 mm. A right brown shell (from the same sample) is 0.74 mm long and 0.49 mm high. There are distinct imprints of muscles on a smooth brilliant surface. A ventral edge sligthly concave. Dorsal and ventral edges of young stages are not parallel (Tabl. III, Fig. 3b).

Ecology. *Scottia browniana* (Jones) is an extinct species. It does not occur in younger sediments than of the Mazovian Interglacial age. Therefore, conclusions on its environment can be drawn indirectly, on the basis of a sediment type in which it was found and the accompanying organisms. In Europe this species have been noted in sediments of stagnant water reservoirs (gyttjas, lake marls, limy sands, silts), together with molluscs that live now in stagnant waters with an occasional flow or in a wave zone as proved by rheophilous species. Thus, it can be a lake or fluvial (oxbows, floods, etc.) environment.

As indicated by considerations on a depth of the buried lake at Opole, *Scottia browniana* (Jones) lived at various depths of this lake, in a profundal one as well what is proved by a coexistence of the species *Cytherissa lacustris* (Sars).

Palaeoclimatic conditions that corresponded with the described ostracod can be concluded on the basis of the accompanying thermophilous molluscs and ostracods as well as plants e.g. *Azolla filiculoides* Lamarck, *Vitis silvestris* Gmelin, *Brasenia purpurea* (Micheaux) Caspary and others (E. K. Kempf, 1971). A similar conclusion results also from a geographic distribution of fossil sites of this species (E. K. Kempf, 1971). They are located between the parallels 37 to 54° of northern latitude. At the assumption that a pattern of climatic zones during the Mazovian Interglacial and older ones was similar as during the Holocene, the climate is to be accepted for a temperate and warm one.

Occurrence. Europe: mainly the Middle and Lower Pleistocene and probably the Upper Pliocene of England. Poland: Krępa near Kock (P. Jesionkiewicz, 1982), Opole in the Lublin Polesie (L. Dolecki, Z. Gardziel, 1982) and Zwierzyniec near Przasnysz (A. Bałuk, 1983) — Mazovian Interglacial.

Its geographic occurrence was limited in the past to the area from England to Greece and the southwestern Soviet Union (Tiraspol and Kuyalnik near Odessa). Röpersdorf and Pritzwalk in German Democratic Republic are the northernmost sites (53°18' and 53°12' northern latitude respectively) and in Poland Zwierzyniec (53°06'). In other 20 sites cited by E. K. Kempf (1971) it does not occur to the north of the parallel 53°.

Examinations of molluscs and ostracods from the section of the borehole Opole 5 proved that the sediments had been formed in a stagnant water reservoir (lake) during the Mazovian, eventually older but not younger interglacial.

PALAEOECOLOGIC AND MICROSTRATIGRAPHIC REMARKS

A quantitative and qualitative change of mollusc and ostracod species in a geologic section of the Opole site proves that conditions in the lake have been changeable. Three stages of the lake development can be distinguished: a — of a shallow lake, b — of a deeper lake and c — of a shallower lake.

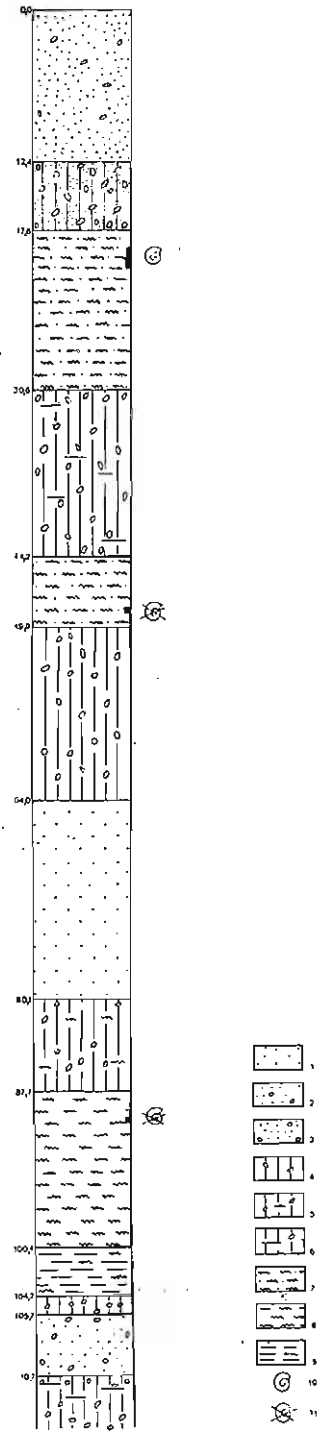

Fig. 4

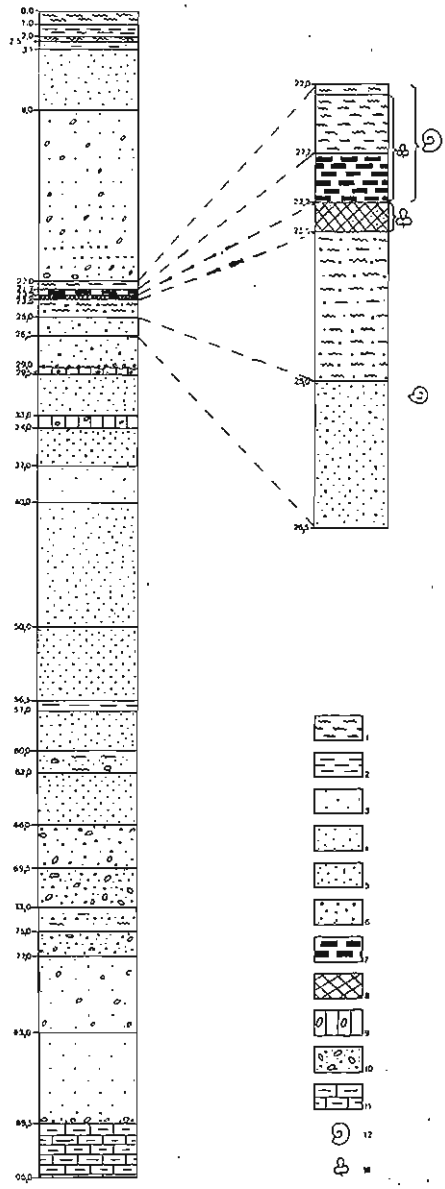

Fig. 5

The conclusions based on the analysis of found mollusc and ostracod species in individual sites and connected with stratigraphy of the Quaternary, palaeoecology, palaeogeomorphology and palaeoclimatology were drawn on the basis of shells of mature, eventually young specimens. Founds of pelecypod larvae, named the glochidia, of *Pseudanodonta complanata* in a millimetre thick layer of the section Opole 5, is the new element to evaluate the value of some species, valuable for a microstratigraphic analysis. A presence of these glochidia proves that layers with them were formed in a warm period as glochidia are expelled by females into water during a spring-summer season (May — June) — I. Brodniewicz (1968).

REFERENCE TO OTHER SITES OF THE MAZOVIAN INTERGLACIAL

Besides the mentioned sites of the Mazovian Interglacial, in which a fauna was examined in a systematic way in the sections, one should also mention the sites in which single samples were examined but their faunistic contents were found diagnostic for stratigraphic purposes. Amidst them there are: Krępa (P. Jesionkiewicz, 1982) where a key ostracod for the Mazovian Interglacial — *Scottia browniana* (Jones) was described for the first time in Poland; Syrniki (M. Prószyński, W. Karaszewski, 1952; W. Karaszewski, 1954; K. Diebel, 1961; Z. Janczyk-Kopikowa et al., 1980) in which shells of snails *Viviparus diluvianus* (Kunth) and *Lithoglyphus jahni* Urbański and the ostracod *Scottia tumida* (Jones) — of a similar stratigraphic value as *S. browniana* — were found; Czerniejów (A. Jahn, 1956) from which a snail holotype of the species *Lithoglyphus jahni* Urbański was described (J. Urbański, 1975), also significant for the Mazovian Interglacial.

RECAPITULATION

Summing up this review of the sites of the Mazovian Interglacial age, one should underline that there are in them 4 species useful for the Quaternary stratigraphy i.e. the snails *Lithoglyphus jahni* Urbański

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Fig. 4. Geologic section of interglacial deposits from Zwierzyniec (after A. Bałuk, 1975: a chart of the borehole Zwierzyniec 10 — IG 121 405)
Profil geologiczny osadów interglacjalnych ze Zwierzyńca (wg A. Bałuk, 1975 — karta otworu wiertniczego Zwierzyniec nr 10 — IG 121 405)

1 — fine-grained sand; 2 — fine- and vari-grained sand with fine gravel, 3 — vari-grained sand with gravel; 4 — till; 5 — till slightly silty; 6 — till with interbeddings of clays; 7 — sandy silt; 8 — silt; 9 — clays and silts; 10 — malacologic analysis and sampling site; 11 — malacologic analysis with negative results
1 — piasek drobnoziarnisty; 2 — piasek drobnoziarnisty i różnoziarnisty z drobnym żwirem; 3 — piasek różnoziarnisty ze żwirem; 4 — glina zwałowa; 5 — glina zwałowa nieco mułkowata; 6 — glina zwałowa z przewarstwieniami iłów; 7 — mułek piaszczysty; 8 — mułek; 9 — iły i mułki; 10 — analiza malakologiczna i miejsce pobrania próbek; 11 — analiza malakologiczna z wynikiem negatywnym

Fig. 5. Geologic section of interglacial deposits from Opole (after L. Dolecki and Z. Gardziel, 1982: a chart of the borehole Opole 5 — IG 128. 666)
Profil geologiczny osadów interglacjalnych z Opola (wg L. Doleckiego i Z. Gardzieła, 1982 — karta otworu wiertniczego Opole 5 — IG 128, 666)

1 — silt; 2 — clay; 3 — fine-grained sand; 4 — medium-grained sand; 5 — coarse-grained sand; 6 — grit; 7 — gyttja; 8 — sandy peat; 9 — till; 10 — gravel with boulders; 11 — Cretaceous marls; 12 — malacologic analyses; 13 — palynologic analyses
1 — mułek; 2 — il; 3 — piasek drobnoziarnisty; 4 — piasek średnioziarnisty; 5 — piasek gruboziarnisty; 6 — żwirek; 7 — gytia; 8 — torf piaszczysty; 9 — glina zwałowa; 10 — żwir z głazami; 11 — margle kredowe; 12 — analizy malakologiczne; 13 — analizy palinologiczne

Table 4

Key-species of molluscs and ostracods as stratigraphic indicators of Mazovian Interglacial

Localities	*Lithoglyphus jahni* Urbański	*Viviparus diluvianus* (Kunth)	*Scottia browniana* (Jones)	*Scottia tumida* (Jones)
Boczów		+		
Zwierzyniec	+	+	+	
Opole	+		+	
Krępa			+	
Syrniki	+	+		+
Czerniejów	+			

and *Viviparus diluvianus* (Kunth) as well as the ostracods *Scottia browniana* (Jones) and *S. tumida* (Jones). An occurrence of these species in individual sites is presented by the Tab. 4.

Palaeoclimatic conclusions result from an occurrence of the species noted in interglacial sediments e.g. *Lithoglyphus jahni* Urbański, *Viviparus diluvianus* (Kunth), *Acroloxus lacustris* (Linnaeus) — that to the north, in Sweden, does not occur beyond 61° of northern latitude — *Pisidium sulcatum* (S. V. Wood) as well as *Scottia browniana* (Jones) and *S. tumida* (Jones) — that to the north did not pass over the Mazovian Interglacial 60° of northern latitude. Thus, a temperate climate must have prevailed.

This conclusion is of general value and cannot be referred to the whole examined geologic sections as e.g. a cool climate could prevail during a formation of the lower part of sediments of the section Opole („phase a") what seems to be indicated by the absence of the species *Lithoglyphus jahni* Urbański and presence of the cool ostracod *Candona neglecta* (Sars). This index can be however considered for the uncertain as only a single specimen of *C. neglecta* (Sars) was found and also, numerous shells of *Scottia browniana* (Jones) were noted.

In general the palaeoecologic conditions can be presented by the occurrence of mollusc and ostracod assemblages, determined in the mentioned sections, that lived in stagnant waters with an occasional flow. The latter is suggested by rheophilous species: *Sphaerium rivicola* (Lamarck), *Pisidium amnicum* (Müller), *P. henslowanum* (Sheppard), *P. su-*

pinum A. Schmidt, *P. casertanum ponderosum* Stelfox. More details can be presented for some fragments of examined sections e.g. about a change of a water chemism (Boczów) or depth changes in a lake (Opole).

Palaeogeomorphologic conclusions can be drawn from palaeoecolologic ones what is more widely described in the Boczów site presentation.

In a final recapitulation one should find that all described faunistic sites of the Mazovian Interglacial age can be referred to lake sediments or mixed (lake-fluvial) ones. No fluvial sites [2] with a section examination are known. The same remark is also due to inland and marine sites.

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REFERENCES

BAŁUK A. (1975) — Karta otworu wiertniczego Zwierzyniec nr 10. Arch. Inst. Geol. Warszawa.

BAŁUK A. (1983) — Nowe profile czwartorzędu z okolic Przasnysza. Kwart. Geol., 27, p. 414, nr 2.

BERGER L. (1960) — Badania nad mięczakami (Mollusca) Pojezierza Mazurskiego. Badania Fizjogr. nad Polską Zach., 6, p. 7—49.

BRODNIEWICZ I. (1968) — On glochidia of the genera Unio and Anodonta from the Quaternary freshwater sediments of Poland. Acta Palaeont. Pol., 13, p. 619—631, nr 4.

DIEBEL K. (1961) — Ostracoden des Paludinenbank-Interglazials von Syrniki am Wieprz (Polen). Geologie, 10, p. 533—545, nr 4/5.

DOLECKI L., GARDZIEL Z. (1982) — Karta otworu wiertniczego Opole 5. Arch. Inst. Geol. Warszawa.

DOLECKI L., SKOMPSKI S. (1986) — Mięczaki plejstoceńskie z Horodła nad Bugiem. Kwart. Geol., 30, p. 309—334, nr 2.

EHRMANN P. (1956) — Mollusken (Weichtiere). In: Die Tierwelt Mitteleuropas (ed. P. Brohmer, P. Ehrmann, G. Ulmer), II, p. 1—277. Leipzig.

GROMOV V. I. (1970) — The Tiraspol faunal complex. Palaeogeogr. Palaeoclim. Palaeoecol., 8, p. 187—195, nr 2/3.

HUCKE. K. (1941) — Weitere Vorkommen der Paludinenbank im Osten von Berlin. Z. Geschiebeforsch., 17, p. 49—61, nr 2.

JAHN A. (1956) — Wyżyna Lubelska. Rzeźba i czwartorzęd. Pr. Geogr. Inst. Geogr. PAN, 7.

JANCZYK-KOPIKOWA Z., MOJSKI J. E., RZECHOWSKI J. (1980) — Stratygrafia i zasięgi osadów glacjalnych dolnego i środkowego plejstocenu między Wisłą a Bugiem. Mat. Konf. nt. Stratygrafia i chronologia lessów oraz utworów glacjalnych dolnego i środkowego plejstocenu w Polsce SE, p. 35—36. Lublin.

[2] Fluvial sediments were analyzed in single samples e.g. in the Bug valley (M. Prószyński, 1952).

JANCZYK-KOPIKOWA Z., SKOMPSKI S. (1977) — Osady interglacjalne w Boczowie koło Rzepina (Polska zachodnia). Kwart. Geol., 21, p. 789—801, nr 4.

JANISZEWSKA-PACTWA H. (1976) — Dzisiejsze zróżnicowanie fauny dennej w Zalewie Wiślanym i jeziorze Drużno w zależności od zasolenia wód. Biul. Inst. Geol., 285, p. 165—178.

JESIONKIEWICZ P. (1982) — Nowe stanowisko interglacjału mazowieckiego w Krępie koło Kocka. Kwart. Geol., 26, p. 423—428, nr 2.

KARASZEWSKI W. (1954) — O obecności dwóch starszych interglacjałów w profilu Syrnik nad Wieprzem. Biul. Inst. Geol., 69, p. 167—176.

KEMPF E. K. (1966) — Das Holstein-Interglazial von Tönisberg im Rahmen des niederrheinischen Pleistozäns. Eiszeitalter u. Gegenwart., 17, p. 5—60.

KEMPF E. K. (1967) — Ostrakoden aus dem Holstein-Interglazial von Tönisberg (Niederrheingebiet). Monatsber. Deutsch. Akad. Wiss. Berl., 9, p. 119—139.

KEMPF E. K. (1968) — Mollusken aus dem Holstein-Interglazial des Niederrheingebietes. Arch. Molluskenkunde, 98, p. 1—21, nr 1/2.

KEMPF E. K. (1971) — Ökologie, Taxonomie und Verbreitung der nichtmarinen Ostrakoden-Gattung Scottia im Quartär von Europa. Eiszeitalter u. Gegenwart., 22, p. 43—63.

KROLOPP E. (1975) — Revision of fossil Molluscs coming from the material of deep boreholes driven by Zsigmondy in the Great Hungarian Plain and studied by Halaváts. Évi Jelentése, Az 1974, p. 133—156.

LOŽEK V. (1964) — Quartärmollusken der Tschechoslowakei. Rozpr. Ústř. Úst. Geol., 31, p. 9—406.

MAKOWSKA A. (1969) — Mięczaki z plejstoceńskich osadów w Podgłębokiem na Lubelszczyźnie. Biul. Inst. Geol., 220, p. 73—79.

MAKOWSKA A. (1971) — Fauna mięczaków w osadach interglacjalnych Leśnej Niwy i Zabrzezia. Biul. Inst. Geol., 254, p. 89—108.

MANIA D. (1973) — Paläoökologie, Faunenentwicklung und Stratigraphie des Eiszeitalters im mittleren Elbe-Saalegebiet auf Grund von Molluskengesellschaften. Geologie, 21, p. 5—175. Beih. 78/79.

MOTUZ W. M. (1969) — Über die Süsswasser- und Landmolluskenfauna aus Ablagerungen des letzten Interglazials in der Belorussischen SSR. Ber. Deutsch. Gesell. Geol. Wiss., A, 14, p. 481—489, nr 4.

PFEIFFER C. (1828) — Naturgeschichte Deutschen Land- und Süsswasser-Mollusken, 3, p. 1—84. Weiner u. Cassel.

PIECHOCKI A. (1969) — Mięczaki (Mollusca) rzeki Grabi i jej terenu zalewowego. Fragmenta Faunistica, 15, p. 112—197, nr 10.

PIECHOCKI A. (1972) — Materiały do poznania mięczaków (Mollusca) rzeki Pasłęki. Fragmenta Faunistica, 18, p. 121—139, nr 7.

PIECHOCKI A. (1979) — Mięczaki (Mollusca). Ślimaki (Gastropoda). Fauna słodkowodna Polski, 7, p. 7—173. PWN. Poznań.

PRÓSZYŃSKI M. (1952) — Spostrzeżenia geologiczne z dorzecza Bugu. Biul. Państw. Inst. Geol., 65, p. 313—364.

PRÓSZYŃSKI M., KARASZEWSKI W. (1952) — Notatka o profilu interglacjalnym w Syrnikach nad Wieprzem w powiecie Lubartowskim (wiadomość tymczasowa). Biul. Inst. Geol., 66, p. 583—588.

RADOMAN P. (1966) — The zoogeographical and phylogenetic interrelations of the genera *Lithoglyphus* and *Emmericia*. Bull. Mus. Hist. Nat. Belgrade, ser. B, 21, p. 43—49.

SANDBERGER F. (1875) — Die Land- und Süsswasser-Conchylien der Vorwelt. Wiesbaden.

SCHMIERER T. (1923) — Beitrag zur Kenntnis des faunistischen und floristischen Inhalts der Berliner Paludinenbank. Z. Deutsch. Geol. Ges., 74, p. 207—236.

SKOMPSKI S. (1973) — Badanie mięczaków. In: Metodyka badań osadów czwartorzędowych, p. 231—255. Pr. zbior. pod red. E. Rühlego. Wyd. Geol. Warszawa.

SKOMPSKI S. (1976) — Mapa geologiczna Polski 1 : 200 000, ark. Słubice, wyd. A. Inst. Geol. Warszawa.

SKOMPSKI S. (1977) — Mollusca. In: Budowa geologiczna Polski, 2 — Katalog skamieniałości, cz. 3b. — Kenozoik, czwartorzęd, p. 12—21. Inst. Geol. Warszawa.

SKOMPSKI S. (1980) — Nowe stanowiska mięczaków z osadów interglacjalnych w zachodniej Polsce. Biul. Inst. Geol., 322, p. 5—30.

SKOMPSKI S. (1982) — Correlation of the Mazovian Interglacial of the Western Poland with the Holstein Interglacial of the Eastern Part of the German Democratic Republic. Biul. Inst. Geol., 343, p. 51—58.

SKOMPSKI S. (1983a) — Mięczaki z interglacjału eemskiego w Żmigrodzie nad Baryczą. Kwart. Geol., 27, p. 151—180, nr 1.

SKOMPSKI S. (1983b) — Wstępne wyniki badań fauny mięczaków plejstoceńskich ze Zwierzyńca kolo Przasnysza. Arch. Inst. Geol. Warszawa.

SKOMPSKI S. (1985) — Mięczaki i małżoraczki plejstoceńskie z Opola na Polesiu Lubelskim. Arch. Inst. Geol. Warszawa.

TRIEBEL E. (1941) — Die ersten Ostracoden aus der Paludinenbank. Z. Geschiebeforsch. u. Flachlandsgeologie, 17, p. 61—75, nr 2.

URBAŃSKI J. (1975) — *Lithoglyphus jahni* n. sp. aus den Mitteleuropäischen Ablagerungen des Mindel/Riss Interglazials, nebst Bemerkungen über den nordbalkanischen *Lithoglyphus fuscus* (C. Pfeiffer, 1828) (= *L. pyramidatus* Moellendorff 1873); — (Gastropoda. Prosobranchia. Hydrobiidae). Bull. Soc. Amis Sc. et Lettres Poznań. Ser. D-15, p. 107—115.

WOOD S. V. (1848) — A monograph of the Crag Mollusca. Part I — Univalves. London.

WOOD S. V. (1851) — A monograph of the Crag Mollusca. Part II — Bivalves. London.

ZEISSLER H. (1965) — Konchylien aus dem Pleistozän von Voigtstedt (Thür.). Paläont. Abh., A., 2, p. 273—290, nr 2/3.

ГРИЩЕНКО М. Н. (1976) — Плейстоцен и голоцен бассейна верхнего Дона. Ком по изуч. четвертич. периода. АН СССР, стр. 3—227. Изд. Наука. Москва.

ДАНИЛОВСКИЙ И. В. (1955) — Опорный литолого-стратиграфический разрез отложений Скандинавского оледенения Русской Равнины и руководящие четвертичные моллюски. Тр. Всес. Научно-Ислед. Геол. Инст., 9, стр. 3—196. Москва.

ЗУБОВИЧ С. Ф. (1978) — Остракоды среднеплейстоценовых отложений Белоруссии и юга Литвы. Инст. Геох. Геоф. АН БССР, стр. 3—167. Изд. Наука и Техника. Миск.

ЖАДИН В. И. (1952) — Моллюски пресных и солоноватых вод СССР. В: Определители по фауне СССР, 46, стр. 3—376. АН СССР.

МОТУЗ В. М. (1962) — Малакафауна антрапагенавых адкладаннау Беларусіі. Весці АН БССР, 2, сер. фіз-тех., стр. 91—98.

МОТУЗ В. М. (1971) — Пресноводные моллюски из лихвинских меж-

ледниковых отложений Белорусского Полесья. Докл. АН БССР, 15, стр. 830—832, № 9.
МОТУЗ В. М. (1975) — Четвертичные моллюски долины Днепра в пределах БССР. Бюл. Ком. по изуч. четвертич. периода, 43, стр. 54—62.
ЧЕПАЛЫГА А. Л. (1971) — Моллюски. Плейстоцен Тирасполя. Геол. Инст. АН СССР, Отдел Палеонт. и Страт. АН Молдавской ССР. Изд. Штиинца. Кишинев.

Sylwester SKOMPSKI

MIĘCZAKI I MAŁŻORACZKI WYBRANYCH STANOWISK INTERGLACJAŁU MAZOWIECKIEGO W POLSCE

Streszczenie

Do nielicznych stanowisk interglaciału mazowieckiego w Polsce, opracowanych systematycznie (profilowo), należą: Boczów w zachodniej Polsce, Zwierzyniec k. Przasnysza i Opole na Polesiu Lubelskim.

Z osadów z Boczowa wykonano analizę palinologiczną na 35 próbkach, ale ze względu na domieszkę sporomorf trzeciorzędowych (ponad 5%) do konstrukcji diagramu wykorzystano tylko 16 próbek (Z. Janczyk-Kopikowa, S. Skompski, 1977). Wykonano również analizę malakologiczną (22 próbki — 10 gatunków ślimaków i 11 gatunków małżów), co pozwoliło skorelować to stanowisko ze stanowiskami interglacjału holsztyńskiego w NRD. Bardzo interesującym zjawiskiem w profilu Boczowa było gwałtowne wymarcie mięczaków i powstanie muszlowca z muszli ślimaka *Viviparus diluvianus* (Kunth), związane ze zwilgoceniem klimatu i tworzeniem się kwasów humusowych prowadzących do zatrucia zbiornika interglacjalnego i do tanatocenozy (S. Skompski, 1980, 1982). Na podstawie opracowania tego stanowiska wyciągnięto wnioski paleoekologiczne, paleogeomorfologiczne, paleoklimatyczne i stratygraficzne. Określenie górnej granicy stratygraficznej ułatwiła obecność ślimaka *Viviparus diluvianus* (Kunth).

Z osadów ze Zwierzyńca zbadano 8 próbek, oznaczając 7 gatunków ślimaków, 12 gatunków małżów, m.in. przewodnie: *Lithoglyphus jahni* Urbański i *Viviparus diluvianus* (Kunth), oraz 5 gatunków małżoraczków, w tym *Scottia browniana* (Jones). Oprócz wniosków stratygraficznych wyciągnięto tu również wnioski paleoekologiczne i paleoklimatyczne, tzn., że osad powstawał w klimacie umiarkowanym — ciepłym, w zbiorniku wody stojącej z ewentualnym przepływem.

Z osadów w Opolu poddano analizie 8 próbek, wykrywając 7 gatunków ślimaków i 10 gatunków małżów (także ich glochidiów) oraz 15 gatunków małżoraczków, przy czym dwa: ślimak *Lithoglyphus jahni* Urbański i małżoraczek *Scottia browniana* (Jones) są przewodnie dla interglacjału mazowieckiego i starszych. Badania mięczaków i małżoraczków wykazały, że osady z fauną w Opolu tworzyły się w interglacjale mazowieckim lub starszym, w zbiorniku wody stojącej, którego rozwój odbywał się w trzech etapach: a — jeziora płytkiego, b — jeziora głębszego, c — jeziora spłyconego.

W podsumowaniu wyników badań przedstawionych stanowisk i w nawiązaniu do innych stanowisk interglacjału mazowieckiego w Polsce należy stwierdzić, że wyraźnie dominują stanowiska fauny związane z osadami jeziornymi, natomiast notuje się niedostatek stanowisk fauny związanych z osadami typowo rzecznymi, lądowymi i morskimi.

Сильвестер СКОМПСКИ

ФАУНА МОЛЛЮСКОВ И ОСТРАКОДОВ ИЗБРАННЫХ МЕСТОНАХОЖДЕНИЙ МАЗОВЕЦКОГО МЕЖЛЕДНИКОВЬЯ В ПОЛЬШЕ

Резюме

К небольшой группе местонахождений мазовецкого межледниковья в Польше, систематически разработанных, принадлежат: Бочув в западной Польше, Звежинец около Пшасныша и Ополе в Люблинском Полесье.

В Бочове был проведен палинологический анализ 35 образцов, но из-за примеси третичных спороморф (свыше 5%), для конструкции диаграммы использовано только 16 образцов (З. Янчик-Копикова, С. Скомпски, 1977). Был сделан также малакологический анализ ((22 образца — 10 видов гастроподов и 11 видов двухстворчатых моллюсков), что сделано возможной корреляцию этого местонахождения с местонахождениями хольштинского межледниковья в ГДР. В разрезе Бочова весьма интересным явлением было стремительное вымирание моллюсков и образование ракушечника из раковин гастропода *Viviparus diluvianus* (Kunth), что было связано с увлажнением климата и образованием гумусовых кислот, которые привели к отравлении межледникового бассейна и к танатоценозу (С. Скомпски, 1980, 1982).

На основании результатов разработки этого местонахождения были сделаны выводы: палеоэкологические, палеогеоморфологические, палеоклиматические и стратиграфические. Определение верхней стратиграфической границы облегчено присутствием гастропода *Viviparus diluvianus* (Kunth).

В Звежинце исследованиям подвергнуто 8 образцов, обозначая 7 видов гастроподов и 5 видов остракодов, в частности руководящие: *Lithoglyphus jahni* Urbański, *Viviparus diluvianus* (Kunth), а также остракод *Scottia browniana* (Jones). Кроме стратиграфических были сделаны также палеоэкологические и палеоклиматические выводы, т. е. что осадок овразовался в умеренном климате в бассейне стоящей воды с возможным теченнем.

В Ополе подвергнуто анализу 8 образцов, находя 7 видов гастроподов и 10 видов двухстворчатых моллюсков (также их глохидиев), а также 15 видов остракодов. Два вида: гастропод *Lithoglyphus jahni* Urbański и остракод *Scottia browniana* (Jones) являются рукободящими для межледниковья мазовецкого и старших.

Исследования моллюсков и остракодов выказали, что в Ополе осадки с фауной образовались в теченин мазовецкого или старшего межледниковья, в бассейне стоящей воды, которого развитие происходило в 3 этапах: а — мелкого озера, б — более глубокого озера, в — обмеленного озера.

На основании результатов исследований представленных местонахождений и других местонахожденнй мазовецкого межледниковья в Польше можно сконстатировать, что преобладают здесь озерные осадки, зато наблюдается недостаток местонахождений фауны, связанных с типичными речными, континентальными и морскими осадками.

TABLICA I

Fi. 1. *Lithoglyphus jahni* Urbański MUZ IG 1565.II.1
a — apertural view, b — view of the back side; height of shell 6.6 mm, width 5.5 mm; borehole Zwierzyniec, depth 19.9—20.0 m
a — widok od strony ujścia, b — z przeciwnej strony; wys. muszli 6,6 mm, szer. 5,5 mm; otwór Zwierzyniec, głęb. 19,9—20,0 m

Fig. 2. *Lithoglyphus jahni* Urbański MUZ IG 1566.II.1
Height of shell 5.8 mm, width 4.4 mm; traces of two egg-capsules are visible on the surface of shell; borehole Opole 5, depth 22.35—22.45 m
Wys. 5,8 mm, szer. 4,4 mm; na powierzchni muszli widoczne ślady po dwóch kapsułkach jajowych o średnicy 1 mm; otwór Opole 5, głęb. 22,35—22,45 m
Fig. 3. *Valvata piscinalis antiqua* Sowerby MUZ IG 1565.II.2
Height of shell 6.0 mm, width 5.2 mm; borehole Zwierzyniec, depth 19.3—19.4 m
Wys. 6,0 mm, szer. 5,2 mm; otwór Zwierzyniec, głęb. 19,3—19,4 m
Fig. 4. *Valvata piscinalis antiqua* Sowerby MUZ IG 1565.II.3
a — apertural view, b — view of the back side; height of shell 6.9 mm, width 5.2 mm; borehole Zwierzyniec, depth 19.45—19.55 m
a — widok od strony ujśoia, b — z przeciwnej strony; wys. 6,9 mm, szer. 5,2 mm; otwór Zwierzyniec, głęb. 19,45—19,55 m
Photo J. Modrzejewska

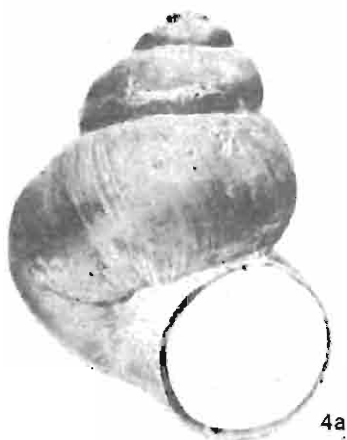
TABLICA I

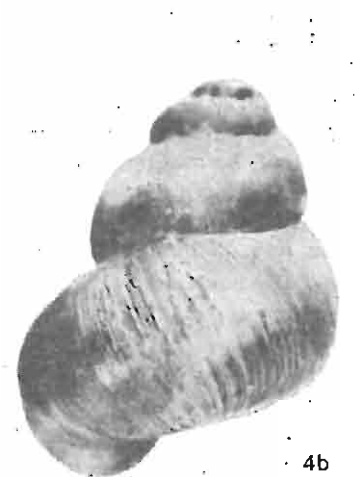

1a


1b


2


3


4a


4b

Sylwester SKOMPSKI — Mollusc and ostracod fauna of selected sites of the Mazovian Interglacial in Poland

TABLICA II

Fig. 1. *Valvata piscinalis antiqua* Sowerby MUZ IG 1565.II.4
Height of shell 7.2 mm, width 5.5 mm; borehole Zwierzyniec, depth 20.55—20.60 m
Wys. 7,2 mm, szer. 5,5 mm; otwór Zwierzyniec, głęb. 20,55—20,60 m

Fig. 2. *Pisidium sulcatum* (S. V. Wood) MUZ IG 1566.II.2
Upper part of the right shell — outer side; length of shell 3.7 mm, height 2.6 mm; borehole Opole 5, depth 22.0—22.12 m
Górny fragment skorupki prawej od strony zewnętrznej; dług. 3,7 mm, wys. 2,6 mm; otwór Opole 5, głęb. 22,0—22,12 m

Fig. 3. *Acroloxus lacustris* (Linnaeus) MUZ IG 1565.II.9
Side view; length of shell 3.7 mm, width 2.3 mm, height 1.1 mm; borehole Zwierzyniec, depth 19.0—19.1 m
Widok z boku; dług. 3,7 mm, szer. 2,3 mm, wys. 1,1 mm; otwór Zwierzyniec, głęb. 19,0—19,1 m

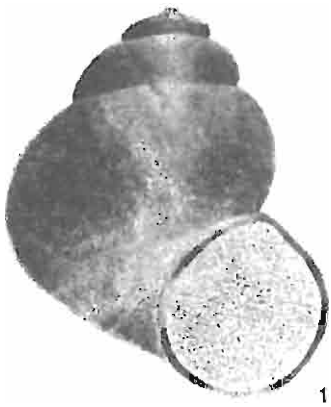
Fig. 4. *Pisidium amnicum* (Müller) MUZ IG 1565.II.5
Left shell — outer side; length of shell 6.6 mm, height 5.4 mm; borehole Zwierzyniec, depth 19.3—19.4 m
Skorupka lewa od strony zewnętrznej; dług. 6,6 mm, wys. 5,4 mm; otwór Zwierzyniec, głęb. 19,3—19,4 m

Fig. 5. *Pisidium amnicum* (Müller) MUZ IG 1565.II.6
Right shell — inner side; length of shell 6.7 mm, height 5.2 mm; borehole Zwierzyniec, depth 20.1—20.2 m
Skorupka prawa od strony wewnętrznej; dług. 6,7 mm, wys. 5,2 mm; otwór Zwierzyniec, głęb. 20,1—20,2 m

Fig. 6. *Sphaerium solidum* (Normand) MUZ IG 1565.II.8
Right shell: a — outer side, b — inner side; length of shell 9.1 m, height 7.5 mm; borehole Zwierzyniec, depth 1.9—20.0 m
Skorupka prawa: a — od strony zewnętrznej, b — od strony wewnętrznej; dług. 9,1 mm, wys. 7,5 mm; otwór Zwierzyniec, głęb. 19,9—20,0 m

Photo J. Modrzejewska (Fig. 1, 2, 6a, b), S. Skompski (Fig. 3, 4, 5)

TABLICA II



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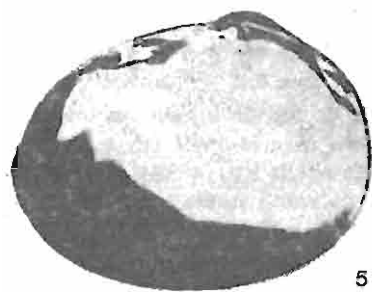

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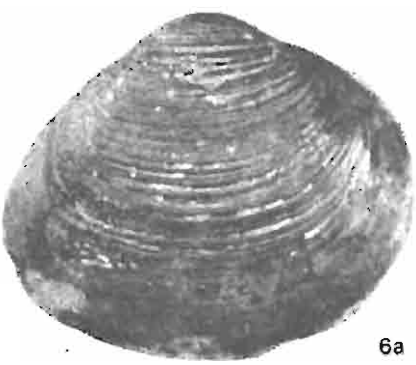


6a

6b

Sylwester SKOMPSKI — Mollusc and ostracod fauna of selected sites of the Mazovian Interglacial in Poland

TABLICA III

Fig. 1. *Sphaerium solidum* (Normand) MUZ IG 1565.II.7
Right shell: a — outer side, b — inner side; length of shell 6.8 mm, height 5.4 mm; borehole Zwierzyniec, depth 20.1—20.2 m
Skorupka prawa: a — od strony zewnętrznej, b — od strony wewnętrznej; dług. 6,8 mm, wys. 5,4 mm; otwór Zwierzyniec, głęb. 20,1—20,2 m

Fig. 2. *Scottia browniana* (Jones) MUZ IG 1566.II.3
Left shell: a — outer side, b — inner side; length of shell 0.71 mm, height 0.47 mm; borehole Opole 5, depth 22.0—22.12 m
Skorupka lewa: a — od strony zewnętrznej, b — od strony wewnętrznej; dług. 0,71 mm, wys. 0,47 mm; otwór Opole 5, głęb. 22,0—22,12 m

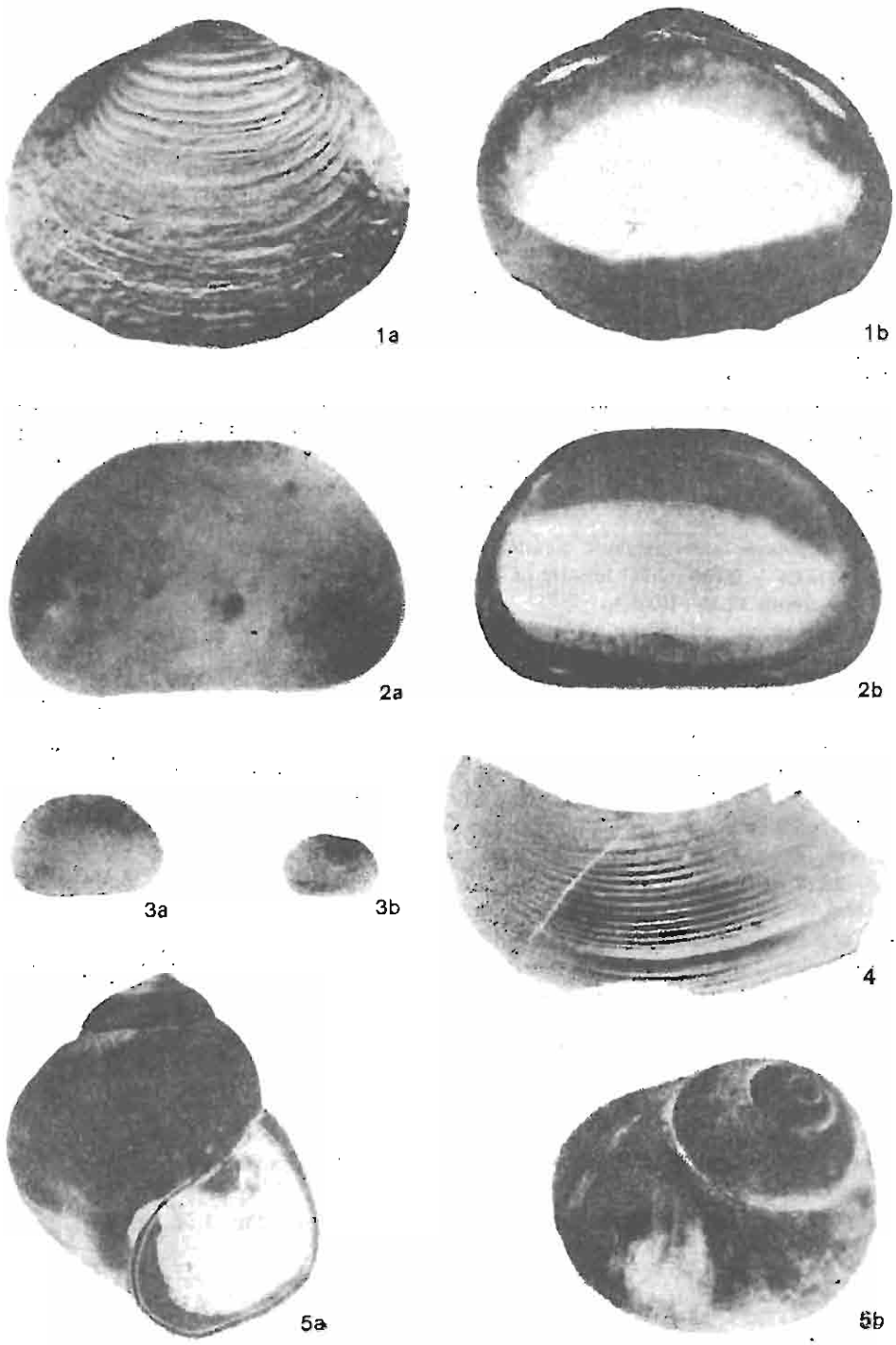
Fig. 3. *Scottia browniana* (Jones) MUZ IG 1593.II.16
Two diverse molt stages: a — right shell: length 0.66 mm, height 0.44 mm; b — left shell: length 0.41 mm, height 0.28 mm; borehole Opole 5, depth 22.45—22.60 m
Dwa różne stadia larwalne: a — skorupka prawa: dług. 0,66 mm, wys. 0,44 mm; b — skorupka lewa: dług. 0,41 mm, wys. 0,28 mm; otwór Opole 5, głęb. 22,45—22,60 m

Fig. 4. *Sphaerium rivicola* (Lamarck) MUZ IG 1565.II.11
A part of shell — length 15.6 mm; borehole Zwierzyniec, depth 19.9—20.0 m
Fragment skorupki długości 15,6 mm; otwór Zwierzyniec, głęb. 19,9—20,0 m

Fig. 5. *Viviparus diluvianus* (Kunth) MUZ IG 1565.II.10
a — apertural view, b — oblique view from above; height of shell 17.5 mm, width 14.5 mm; borehole Zwierzyniec, depth 19.0—19.1 m
a — widok od strony ujścia, b — widok ukośny z góry; wys. 17,5 mm, szer. 14,5 mm; otwór Zwierzyniec, głęb. 19,0—19,1 m

Photo J. Modrzejewska (Fig. 1a, b, 2a, b, 3a, b), S. Skompski (Fig. 4, 5a, b)

TABLICA III



Sylwester SKOMPSKI — Mollusc and ostracod fauna of selected sites of the Mazovian Interglacial in Poland

TABLICA IV

Fig. 1. *Pisidium henslowanum* (Sheppard) MUZ IG 1566.II.4
Right shell: a — outer side, b — inner side; length of shell 2.2 mm, height 1.8 mm; borehole Opole 5, depth 22.0—22.12 m
Skorupka prawa: a — od strony zewnętrznej, b — od strony wewnętrznej; dług. 2,2 mm, wys. 1,8 mm; otwór Opole 5, głęb. 22,0—22,12 m

Fig. 2. *Pisidium moitessierianum* Paladilhe MUZ IG 1566.II.5
Right shell: a — outer side, b — inner side; length of shell 1.6 mm, height 1.4 mm; borehole Opole 5, depth 22.12—22.25 m
Skorupka prawa: a — od strony zewnętrznej, b — od strony wewnętrznej; dług. 1,6 mm, wys. 1,4 mm; otwór Opole 5, głęb. 22,12—22,25 m

Fig. 3. *Pisidium casertanum* f. *ponderosum* Stelfox MUZ IG 1565.II.13
Right shell — inner side; length of shell 3.4 mm, height 3.0 mm; borehole Zwierzyniec, depth 19.45—19.55 m
Skorupka prawa od strony wewnętrznej; dług. 3,4 mm, wys. 3,0 mm; otwór Zwierzyniec, głęb. 19,45—19,55 m

Fig. 4. *Pisidium moitessierianum* Paladilhe MUZ IG 1565.II.12
Left shell with expressive umbo-fold — outer side; length of shell 1.15 mm, height 1.06 mm; borehole Zwierzyniec, depth 19.0—19.1 m
Skorupka lewa od strony zewnętrznej z wyraźną fałdką podszczytową; dług. 1,15 mm, wys. 1,06 mm; otwór Zwierzyniec, głęb. 19,0—19,1 m

Fig. 5. *Pseudanodonta complanata* (Rossmässler) MUZ IG 1566.II.6
Length of shell 0.33 mm, height 0.28 mm (glochidium); borehole Opole 5, depth 22.0—22.12 m
Dług. 0,33 mm, wys. 0,28 mm (glochidium); otwór Opole 5, głęb. 22,0—22,12 m

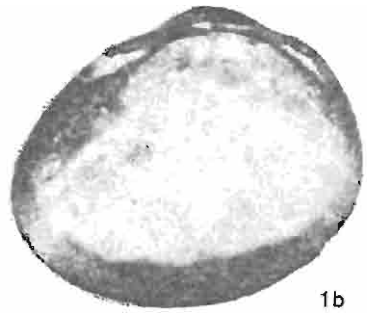
Fig. 6. *Pisidium sulcatum* (S. V. Wood) MUZ IG 1565.II.14
Right shell: a — outer side, b — inner side; length of shell 5.5 mm, height 4.3 mm (shell damaged); borehole Zwierzyniec, depth 20.1—20.2 m
Skorupka prawa: a — od strony zewnętrznej, b — od strony wewnętrznej; dług. 5,5 mm, wys. 4,3 mm (skorupka uszkodzona); otwór Zwierzyniec, głęb. 20,1—20,2 m

Fig. 7. *Pisidium sulcatum* (S. V. Wood) MUZ IG 1565.II.15
Left shell — outer side; length of shell 5.0 mm, height 3.7 mm (shell strongly damaged); borehole Zwierzyniec, depth 19.65—19.75 m
Skorupka lewa od strony zewnętrznej; dług. 5,0 mm, wys. 3,7 mm (skorupka mocno uszkodzona); otwór Zwierzyniec, głęb. 19,65—19,75 m

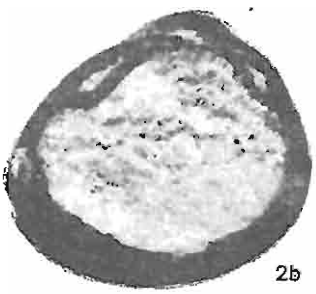
Photo J. Modrzejewska (Fig. 1a, b, 2a, b, 5), S. Skompski (Fig. 3, 4, 6a, b, 7)

TABLICA IV


1a


1b


2a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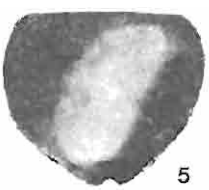
3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6a


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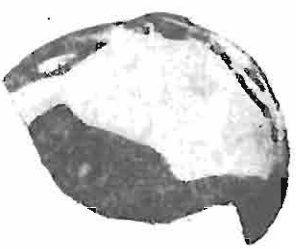
6b

Sylwester SKOMPSKI — Mollusc and ostracod fauna of selected sites of the Mazovian Interglacial in Poland