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The malacofauna of the Eopleistocene profile near Teremiec (eastern part of Lublin Upland)

During the geological mapping for the *Detailed Geological Map of Poland* in the scale 1:50 000, a new site of the Eopleistocene deposits was discovered. The profile is in the sand pit situated in the woods by the Teremiec village, near Dubienka, in south-eastern part of Lublin Upland. For the first time in Eastern Poland a rich fauna of molluscs was found, in the lowermost layers of these deposits. All suites of Eopleistocene sediments were deposited by the river flowing from south to north. These fluvial deposits occur recently on the surface of upland distinctly elevated in the area being under study.

INTRODUCTION

Numerous preglacial deposits' profiles of eastern Lublin Upland have been known for years (M. Harasimiuk, 1975*a*; A.Jahn, 1956; A. Jahn, M. Turnau-Morawska, 1952; M. Prószyński, 1952; J. Rzechowski, 1964, 1987). Preglacial deposits belonging generally to Eopleistocene are developed in a number of clastic rock lithofacies. They do not contain any Scandinavian material transported by Pleistocene ice-sheets, thus, they consist of local pre-Pleistocene bedrock clasts only. During the geological mapping for the *Detailed Geological Map of Poland* in the scale 1 :50 000, Dubienka sheet, a new site of these deposits was discovered. For the first time in eastern Poland a rich fauna of molluscs was found there. The site is in a sand pit situated in the woods by the Teremiec village, near Dubienka, in eastern Lublin Upland (Fig. 1). The geographic coordinates of the Teremiec profile are the following: 50°59'34"N and 23°50'20"E, while the altitude is 197.5 m a.s.l. The first two authors examined the geology of profiles while S.Skompski analyzed the fauna.

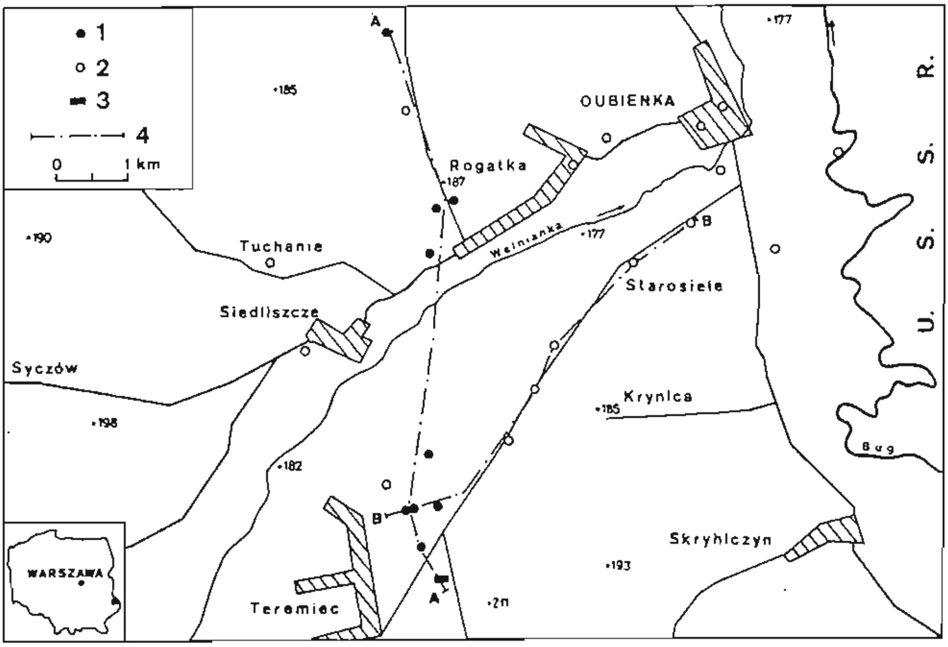


Fig. 1. Location sketch map of the examined area

1 – main profiles (boreholes, outcrops) of the preglacial deposits; 2 – borehole profiles without preglacial deposits; 3 – location of the Teremiec sand-pit; 4 – lines of geological sections

Szkic sytuacyjny badanego obszaru

1 – ważniejsze profile geologiczne (wiercenia, odslonięcia) osadów preglacjalnych; 2 – profile wierceń bez osadów preglacjalnych; 3 – lokalizacja piaskowni w Teremcu; 4 – linie przekrojów geologicznych

DISTRIBUTION AND LITHOLOGY OF PREGLACIAL DEPOSITS

On the area covered by the Dubienka sheet on the 1:50 000 map, preglacial deposits have been found in numerous drillings and outcrops. They are often present on the terrain surface or under a thin cover of glacial Pleistocene deposits (Fig. 2). The area where these deposits appear is usually a flat denudation plain rising a dozen or so metres above the bottom of the Bug river valley. The differentiation of altitudes on this plain usually does not exceed 5 m. The preglacial deposits fill the oblong depression of an almost meridional course. The depression eroded in the top surface of Cretaceous rocks is commonly 1–1.5 km wide, seldom up to 2 km (Fig. 2). The thickness of preglacial deposits is generally few meters, maximum 15 m (Fig. 3). Theirs bottom in most cases lowers from the south towards the north, slightly diverting towards NNE.

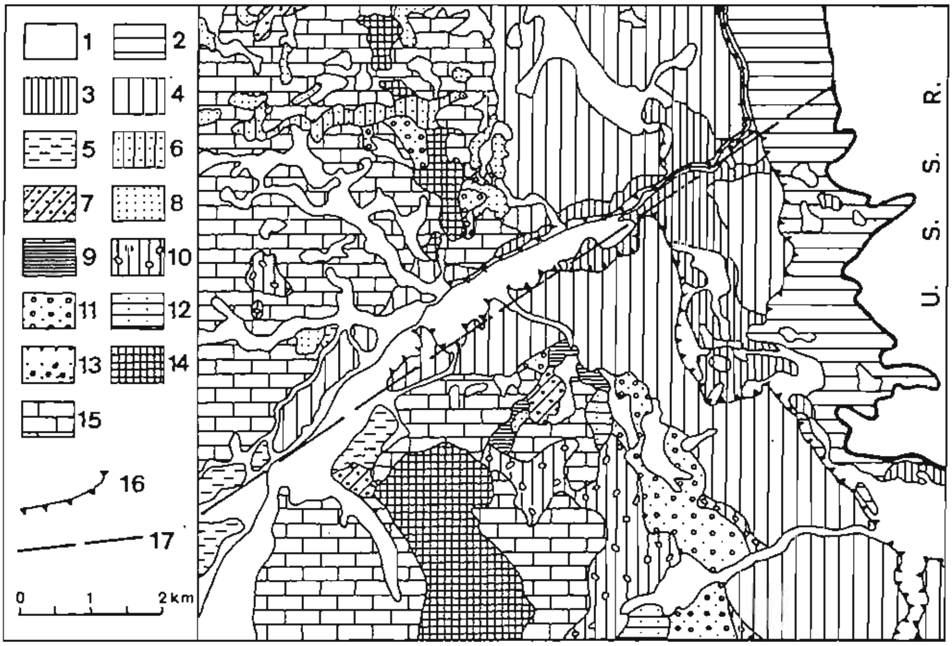


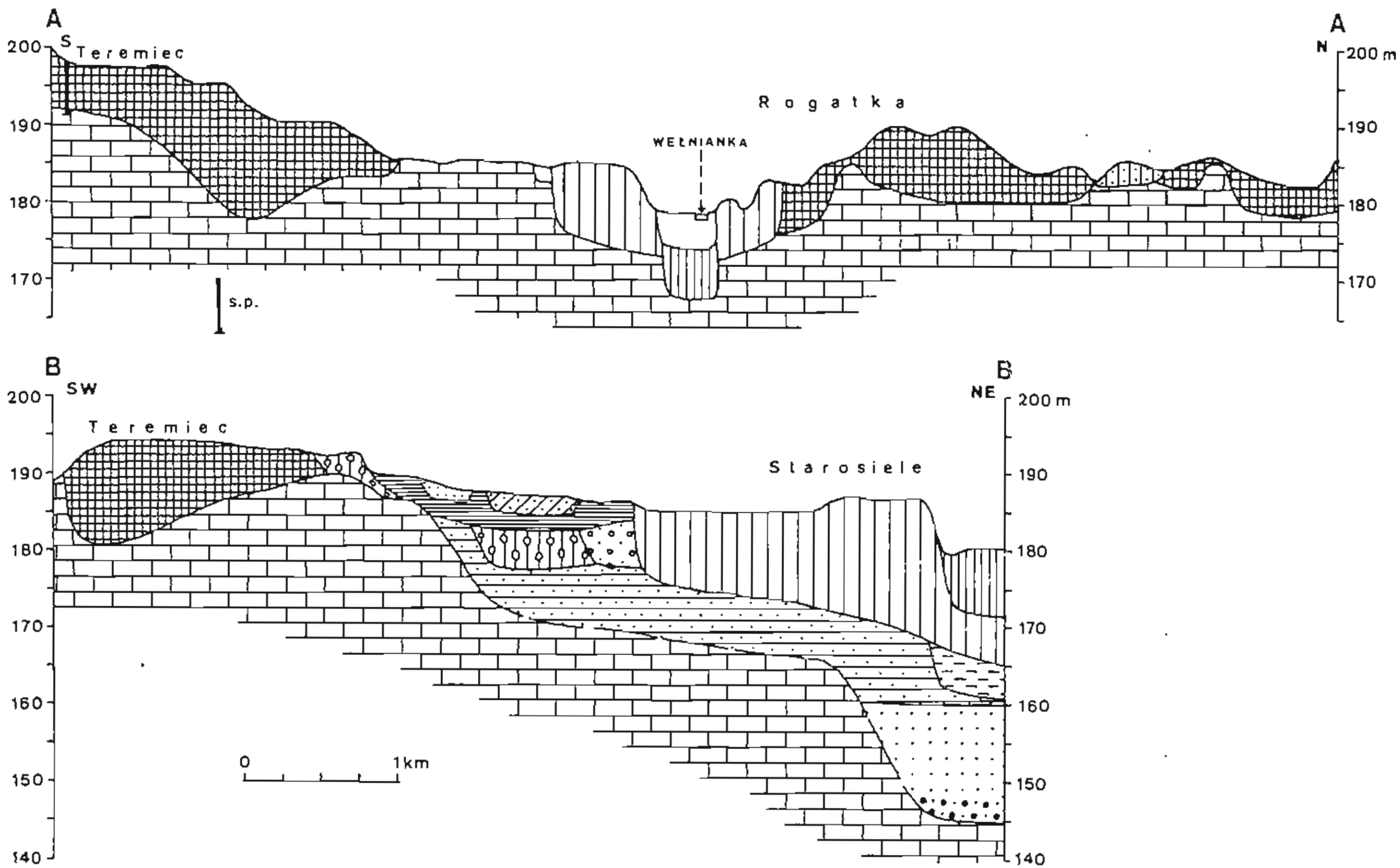
Fig. 2. Generalized geological map

Holocene: 1 – peat and peaty mud, 2 – silts of the flood plain in the Bug river valley; Vistulian Glaciation: 3 – fluvial sand and silt of the II terrace, lower; Eemian Interglacial + Warta Glaciation: 4 – fluvial silt and sand of the high, I terrace; Warta Glaciation: 5 – limnic silt; Pilica Interglacial: 6 – fluvial sand; Odra Glaciation: 7 – till, 8 – fluvioglacial sand; San Glaciation: 9 – varved clay and silt, 10 – till, 11 – fluvioglacial sand and gravel, 12 – limnic silt and clay; Podlasie Interglacial: 13 – fluvial sand and gravel; Eopleistocene: 14 – fluvial sand and gravel; Upper Cretaceous: 15 – marls and chalk, Maastrichtian; 16 – fluvial terrace edges; 17 – fault of the Wełnianka river valley

Zgeneralizowana mapa geologiczna

Holocen: 1 – torfy i namuły, 2 – mady równi zalewowej doliny Bugu; zlodowacenie wisły: 3 – piaski i mułki rzeczne II tarasu, niższego; interglacjał eemski + zlodowacenie warty: 4 – mułki i piaski rzeczne tarasu I, wysokiego; zlodowacenie warty: 5 – mułki jeziorne; interglacjał pilicy: 6 – piaski rzeczne; zlodowacenie odry: 7 – gliny zwałowe, 8 – piaski fluwioglacjalne; zlodowacenie sanu: 9 – iły i mułki zastoiskowe, 10 – gliny zwałowe, 11 – piaski i żwiry fluwioglaejalne, 12 – mułki i iły jeziorne; interglacjał podlaski: 13 – piaski i żwiry rzeczne; preglacjał: 14 – piaski i żwiry rzeczne; kreda górna: 15 – margle i kreda pisząca, mastrycht; 16 – krawędzie tarasów rzecznych; 17 – uskok doliny Wełnianki

The lithofacial character of the deposits seems rather uniform throughout the area. In the preglacial profile three lithofacial sets can be distinguished. Two upper sets are composed of sand and sand with gravel while the bottom set consist of marly clay with subordinate sand interbedding and single gravels (Fig. 3). Both of the upper lithofacies sets are common while clay lithofacies seldom can be found, mostly only south of the valley of the Wełnianka river (Fig. 1).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The upper lithofacial set comprises mostly coarse and medium quartz sand with sometimes a large amount of gravel. Among the sands a few depositional units could be differentiated. Cross bedding and small-scale ripplemarks can often be observed in the units, while flat, horizontal or graded bedding does not appear as often. The sands often contain a lot of silt or clay, or minute, irregular clay inserts (pockets, lenses). The deposits of the upper set are limeless or they contain a trace of carbonates. In the heavy minerals assemblage there are only minerals resistant to mechanical and chemical weathering. Such minerals as zircon and rutile dominate and they are accompanied by disthene and tourmaline while epidote, staurolite and titanite appear rather in lower frequency. Gravel fractions contain almost only very hard and resistant rocks: flint, hornstones, lydites and quartz. Apart from them fragments and gravel of carbonate rocks of the local bedrock can be found. In the upper lithofacies group opokas and marly opokas, and gaize of the Upper Cretaceous prevail. Therefore, the petrographic compound of gravels and the heavy minerals assemblage (zircon and rutile predominate) indicate that rocks of Upper Cretaceous constituted the basic source of parent material during sedimentation of this facies group.

The middle lithofacies set is also composed of mainly medium and coarse sands with gravel. Interbeddings or irregular clay inserts can be found more often than in the upper set, the admixture of silt and clay fractions in the sand itself is visibly larger. The deposits of the middle set are clearly calcareous. Usually there are only a few percent of carbonates, but sometimes it reaches even 20% (in clay interbeddings). The bedding of these deposits is usually horizontal, flat, and rather seldom cross. Among the heavy minerals disthene together with staurolite and tourmaline are the most frequent, while rutile and zircon being less numerous. It would point to the fact that parent material originated mostly from Tertiary rocks (Miocene). Such a notion can be supported by the inventory of rocks present among gravels. Apart from hard rocks identical with the upper group the content of local carbonate rocks is different. Miocene reef limestones prevail among them with their present outcrops located south of the examined area. Similarly to the upper set, several sedimentation rhytms could be distinguished in the middle set.

The lower lithofacies set consists mainly of marly clay and subordinate coarse sands accompanied by single, small gravels. This lithofacies often shows convolute bedding as well as load cast and flute cast deformations. The clay material originated from weathered covers of local Upper Cretaceous and Miocene rocks. The spectrum of heavy minerals with the predominance of minerals from Miocene rocks over those

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Fig. 3. Generalized geological sections

A–A – along the preglacial river valley; B–B – across the preglacial valley; s.p. – location of the Teremiec sand-pit; lithological explanations as given in Fig. 2

Zgeneralizowane przekroje geologiczne

A–A – wzdłuż doliny preglacjalnej; B–B – w poprzek doliny preglacjalnej; s.p. – lokalizacja piaskowni w Teremcu; objaśnienia litologiczne jak na fig. 2

from Cretaceous ones and the larger amount of Miocene limestones fragments over Cretaceous ones among gravels supports the claim.

PROFILE IN THE TEREMIEC SAND PIT

In the Teremiec sand pit two profiles have been examined: on the eastern wall (profile A) and on the southern wall (profile B). The distance between the two profiles is about 30 m (Fig. 4). On the irregular top surface of the Cretaceous rocks — delevelling within the sand pit area exceeds 2 m — all of the described above lithofacies sets exist in superposition.

The lithological description of both of the examined profiles is as follows:

PROFILE A

Depth in m	Lithological profile
a) 0.0–0.3	Humus soil, dark-gray, sandy with single gravels of Scandinavian rocks.
b) 0.3–0.8	Silty sand, light-yellow-gray.
c) 0.8–1.0(1.3)	Loamy sand with blocks and debris of Cretaceous rocks, almost leached; single gravels of quartz and Scandinavian rocks; the whole layer cut through by a frost wedge.
d) 1.0(1.3)–1.25(1.55)	Fine sand, light-gray; small-scale ripplemarks (northbound direction of transport); lamina of small quartz gravel at the bottom.
e) 1.25–1.85	Fine, quartz sand, light-gray, intercalated by coarse and medium sand and with single gravels of flint, quartz and decalcified Cretaceous limestones; flat, diagonal bedding; erosional top and bottom surfaces.
f) 1.85–2.35	Coarse and medium sand; gray-olive with brown laminae; two sets of inclined bedding, on the boundary of lamina flint, lydites and quartz gravels of ϕ to 4 cm appear.
g) 2.35–3.55	Medium sand, gray-olive with brown stripes; horizontal bedding.
h) 3.55–5.0	Mostly coarse sand, rusty-yellow, with clay pebbles; flat, diagonal bedding.
i) 5.0–6.0	Coarse sand, light-gray, structureless.

PROFILE B

Depth in m	Lithological profile
a) 0.0–0.2	Humus soil, sandy, dark-gray.
b) 0.2–1.3	Fine and medium sand, light-yellow-gray, with intercalations of loamy, various grained sand and with fine gravels (quartz, leached Cretaceous marls).
c) 1.3–1.7	Medium and fine sand, lightly loamy, rusty or yellow-olive.
d) 1.7–2.8	Fine and medium sand, light-gray or yellow-gray; the diameter of graining becomes larger to the bottom; horizontal bedding; in the bottom part — coarse sand with fine gravels; erosional bottom surface.
e) 2.8–3.4	Medium sand, rusty-yellow; interbedding of coarse sand with loam-balls; horizontal bedding.

f) 3.4–3.6(3.5)	Coarse sand, quartz; with irregular inserts of loam containing of malacofauna and fine limestone gravels; convolutions and flow structures.
g) 3.6–3.8(3.7)	Medium and coarse sand, quartz; olive-yellow.
h) 3.8–4.05	Marly clay with fine pockets of coarse, quartz sand; numerous malacofauna; single gravels (quartz, flint, Cretaceous marl); deformation structures such as load and flute casts.
i) 4.05–4.2	Weathering loam of Cretaceous rocks.

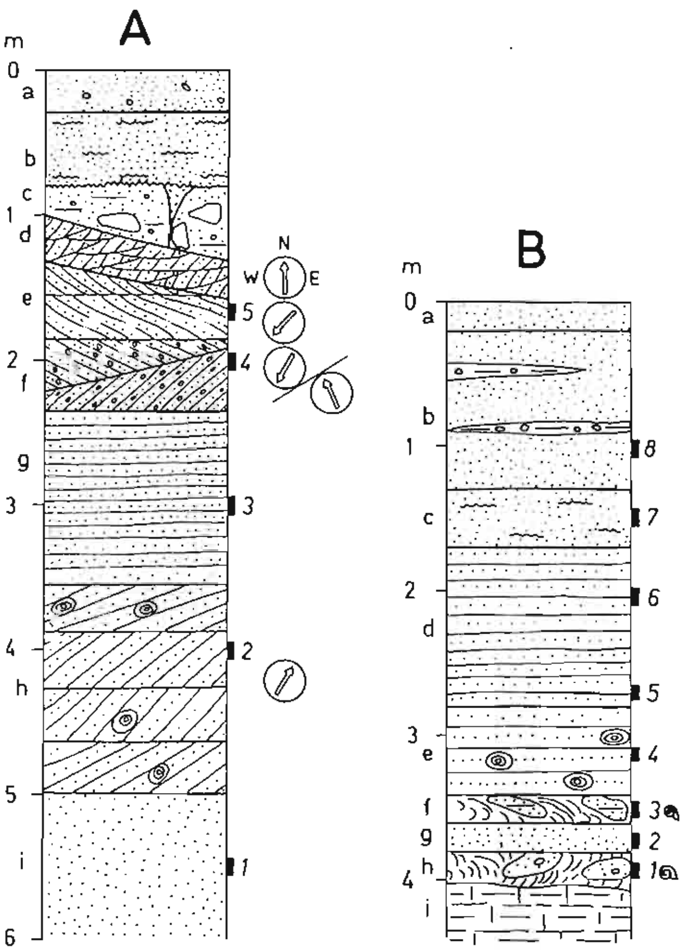

Fig. 4. Profiles in Teremiec sand-pit

For geological description see text; arrows – transport direction; numerated bricks – sampling points

Profile w piaskowni w Teremcu

Opis geologiczny profilów w tekście; strzałki – kierunek transportu osadów; kostki z numerem – miejsca pobrania próbek do badań

The a, b and c strata of profile A and layers a and b of profile B represent a residual cover of Pleistocene deposits containing Scandinavian, glacial material. Layers d, e and f of profile A and the layer c of profile B belong to the upper lithofacies set of preglacial deposits. The layers g, h and i of profile A as well as the layers d and e of profile B represent the middle lithofacies set. Layers f, g and h of profile B should be considered a part of the lower lithofacies set.

The measurements of the strike and the dip of bedding indicate that the direction of transport was from south to north with a slight diversion towards NNW and NNE. In some layers direction variations connected with side migration of the river channel can be observed. Sedimentation structures and grain-size of deposits prove that in the upper lithofacies set, the clastic material was mostly transported by the channel bottom i.e. the drag transport prevailed. The middle set of lithofacies was deposited partly from the dragged material and partly from graded suspension. The lower set was accumulated by waters overloaded with clastic material i.e. by high density and high viscosity waters. Such condition appear in the turbidity currents or even in the mud flow.

The assemblage of heavy minerals indicates that parent material of local Miocene rocks dominated in the lower facies set being accompanied by the parent material of the Upper Cretaceous provenance. In the middle lithofacies set, the alimentation from Miocene local bedrock is still noticeable. The closer the top the larger the mixed parent material of Miocene-Cretaceous provenance is visible, with a clear presence of minerals originating from the crystalline Ukrainian Platform. The deposits of the upper lithofacies set originate mainly from local Upper Cretaceous bedrock.

QUATERNARY FAUNA FROM THE TEREMIEC PROFILE

Two samples from the Teremiec profile B were examined paleontologically. Sample no. 1 (layer h) taken at 3.8–4.0 m had a volume of 1900 cm^3. Sample no. 3 (layer f) at 3.4–3.6 m had a volume of 600 cm^3.

Mollusca in the lower sample are clearly more frequent than in upper one. Many of the shells were broken, and their identification thus rendered difficult. Therefore, some species or genera are recorded with doubt in Table 2. Certain other identifications are tentative because they concern species difficult to separate in the very juvenile state of the shells commonly found in Pleistocene deposits.

The fauna remains found in the Teremiec sand-pit can be divided into two groups: the Miocene (Table 1) and the Quaternary (Table 2) different in their thickness and the degree of fossilization. The remains of the Miocene fauna, massive and with a high degree of fossilization is presented mostly in the form of small fragments, few milimeters in size. Animal remains of various systematic groups have been identified: *Foraminifera* (at least 8 different species), *Mollusca* (genera: *Chlamys, Pecten, Bittium*), the *Annelida*: *Serpula lacera* (Reuss), *S. serpuliformis* (Eichwald), *S. reussi?*

Table 1

Miocene fauna from Teremiec sand-spit

Faunistic groups	Layer h (sample 1)	Layer f (sample 3)
Foraminifera	more than 8 sp.	3 sp.
Annelida	more than 3 sp.	3 sp.
Bryozoa	+	+
Brachiopoda	+	–
Mollusca	more than 3 sp.	3 sp.
Arthropoda	.	1 sp.
Echinodermata:		
Echinodea	spines, fragments of test	spines, fr. of test
Crinoidea	+	+
Vertebrata:*		
Rodentia	teeth, bony remains	?
Pisces	teeth	teeth, vertebra, a. o

*Miocene and Quaternary *Vertebrata*

Rovereto, *Ditrupa cornea* Linnaeus, the *Arthropoda* (ostracods), the *Bryozoa*, the *Echinodermata* and probably also the *Vertebrates* (Table 1). The foraminifers, the *Annelida* and the *Bryozoa* were the best preserved. Similar species of annelids have already been found in SE Poland, on Southern Roztocze (G.Jakubowski, T.Musiał, 1977) in Miocene rocks.

Molluscs shells, more fragile, white, but also often preserved in the detrital form or heavily damaged have been included in the second group of the Quaternary fauna (Table 2). In this group *Bithynia* opercula, vestigial shells of naked snails (*Deroceras* sp.) and partly small pelecypods shells such as *Pisidium* were best preserved.

Ecologically, both of the distinguished groups are diametrically opposed to each other. The Miocene group is connected with a marine environment while the Quaternary group of molluscs represents land and fresh-water environments.

The genetic interpretation of the deposits containing such ecologically differentiated groups of fauna seems the most probable when we assume it to be fluvial. Such interpretation can be proved as correct by the presence of the *Valvata naticina* Menke (V.Ložek, 1964; S.Skompski, A.Makowska, 1989) and the rheofil *Pisidium amnicum* Müller. The presence of a considerably numerous marine fauna can also be explained by the activity of river waters washing out Miocene, marine deposits and redepositing the marine fauna among Quaternary ones. The rounding of numerous Miocene remains well confirms this assumption. The presence of land and stagnant water (ox-how) species is a natural phenomenon. It is connected with the cyclic seasonal floods causing the mixing of river species with land species occupying the dried flood terraces in the river valley, and with the species from the stagnant waters of the ox-bows.

Table 2

Distribution of Quaternary Mollusca at Teremiec

Genera and species	Layer h (sample 1)	Layer f (sample 3)	Ecological and climatic groups	Stratigraphical extent
Snails				
Anisus contortus? (Linnaeus)	2		fs	Miocene – recent
Aplexa hypnorum? (Linnaeus)	1		fs	
Bithynia leachi? (Sheppard)	(14)		fs	Miocene – recent
Carychium sp.	3	1	l	
Clausiliidae	7		l	
Cochlicopa sp.	1	?	l-t	
?*Daudebardia* sp.	4		l-t	
Deroceras sp.	4	2	l	
Discus ruderatus (Férussac)	3		l-c	Eopleistocene – recent
Helicidae	12+	+	l-t	
Lymnaea sp.	+		fs	
Lymnaea stagnalis? (Linnaeus)	1		fs	Miocene – recent
Lymnaea truncatula? (Müller)	5	?	fs	Miocene – recent
?*Monacha* sp.	3		l	
Oxychilus sp.	4		l-t	Oligocene – recent
Succinea cf. *oblonga* Draparnaud	2	1	l	Sarmatian – recent
Succinea sp.	6		l	
Trichia unidentata?(Draparnaud)	32	+	l-t	
Valvata cf. *naticina* Menke	6		fr-w	Pliocene – recent
Valvata piscinalis (Müller)*	8		fs-c	Sarmatian – recent
Bivalves				
Pisidium amnicum (Müller)	2	1	fr	Miocene – recent
P. obtusale lapponicum Clessin	5		fs-c	
Pisidium sp.	+	1	fs	

Explanations: (14) – number of opercula; + – few fragments of shells; l – land snails; fs – fresh-water molluscs (chiefly stagnant water); fr – running water species; c – cold-loving species; w – warm-loving species; t – moderately warm climate species
*a part of numbers includes *V. piscinalis f. antiqua* Sowerby

When the Quaternary molluscs are considered of theirs climatic distribution, there is seen to be a clear differentiation. Particularly it is well observed in the lower sample no. 1 (Table 2). The warm species such as *Valvata naticina* Menke, *Trichia unidentata* (Draparnaud) occur together with could species such as *Pisidium obtusale lapponicum* Clessin, *Discus ruderatus* (Férussac), *Valvata piscinalis antiqua* Sowerby. At present we have a very imperfect understanding of the curious mixtures of warm and could species in some deposits. The number of individuals within the warm species is far more frequent than those of could species. It may be due to the incorporation of derived shells or to the survival of could species in favoured niches. This supposition can be confirmed by the fact that the could species are wholely absent in the upper sample no. 3, while the warm molluscs are still noticed.

The fauna assemblage proves the Eopleistocene age of the preglacial deposits from Teremiec. The uppermost Pliocene age may be instead considered as not enough plausible.

AGE OF PREGLACIAL DEPOSITS

The preglacial deposits were accumulated by the river running from south to north, in the environment of semi-dry or even dry and warm climate (J.Rzechowski, 1987). These deposits always occur below the oldest sediments of the glacial Pleistocene. In northern part of Lublin Upland, the oldest glacial deposits were correlated with the Narew Glaciation (Narevian), i.e. their age was determined close to 800 ka BP (Z. Janczyk-Kopikowa et al., 1980). In the examined area, the oldest glacial (morainic) deposits are correlated with the San Glaciation (Sanian), because the Narew ice-sheet did not reach this territory (Fig. 2, 3). The fauna assemblage found at Teremiec profile indicates an Eopleistocene age, while the Pliocene age is rather open to doubt. In the area of eastern part of Lublin Upland the Pliocene deposits occur however in a quite different geomorphological situation as well in a quite other geological sequence than those from the Teremiec area (M. Harasimiuk, 1975*a*, *b*). The TL datings of the preglacial deposits made in the Laboratory of the Institute of Earth Science in the University M. Curie-Skłodowska in Lublin by dr J.Butrym, were as follows. The sands of the upper and middle lithofacies set are more than 800 ka BP old (Lub 1406 and Lub 1753 — M.Harasimiuk et al., 1991).

The results of the researches we have obtained hitherto prove the age of Eopleistocene fluvial deposits from the Teremiec area. The lowermost layers may be eventually of the age from the Pliocene-Pleistocene transition.

CONCLUSIONS

The preglacial sediments in the Teremiec area were deposited by the river running from south to north, in the environment of most probably semi-dry and warm climate.

Recent distribution of the preglacial deposits, on the inter-valley plateau is an example of geomorphological inversion. The inversion is a result of the young tectonical uplift acting still during the Quaternary and also the result of postsedimentational degradation.

The parent rocks of the preglacial deposits were as the Miocene as well Upper Cretaceous local bedrock, and in minor part the crystalline rocks from the Ukrainian Platform.

In the malacofauna assemblage predominate warm species, but the could species are also present. Ecologically, the Quaternary molluscs contain the land- and fresh-water species as well the running water ones. The Eopleistocene age of the preglacial deposits is established.

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MALAKOFAUNA W PROFILU OSADÓW EOPLEJSTOCEŃSKICH KOŁO TEREMCA (WSCHODNIA CZĘŚĆ WYŻYNY LUBELSKIEJ)

S t r e s z c z e n i e

Podczas kartowania geologicznego dla *Szczegółowej mapy geologicznej Polski* w skali 1:50 000, ark. Dubienka odkryto nowe stanowisko osadów eoplejstoceńskich. Profil znajduje się w piaskowni położonej w lasach koło wsi Teremiec k/Dubienki, w południowo-wschodniej części Wyżyny Lubelskiej. W najniższej części tych osadów znaleziono bogatą faunę mięczaków — po raz pierwszy we wschodniej Polsce. Szczątki malakofauny występują w najniższych warstwach osadów, w przewarstwieniach ilastych. Oprócz malakofauny czwartorzędowej znaleziono w Teremcu liczną faunę mioceńską, redeponowaną z lokalnych wychodni w podłożu czwartorzędu. Wśród malakofauny czwartorzędowej przeważają gatunki ciepłolubne, ale występują równocześnie i gatunki zimnolubne.

Osady preglacjalne są wykształcone przeważnie w litofacjach piaszczystych i piaszczysto-żwirowych i wypełniają kopalną dolinę rzeczną o przebiegu niemal południkowym. Dolina ta znajduje się obecnie na wysoczyźnie międzydolinnej i jest całkowicie niezależna od współczesnej sieci dolinnej. Pomiary strukturalne w osadach preglacjalnych wskazują, że rzeka płynęła z południa na północ. Wykonane badania mineralogiczne, petrograficzne i geochemiczne pozwalają stwierdzić, iż rzeka preglacjalna istniała w środowisku klimatu ciepłego, półsuchego. Skałami macierzystymi dla osadów preglacjalnych były utwory mioceńskie i górnokredowe lokalnego podłoża czwartorzędu, a także — chociaż w znacznie mniejszym stopniu — skały krystaliczne Wołynia. Datowania osadów metodą TL wykazały, że ich wiek wynosi powyżej 800 tys. lat BP.