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Miocene vertebrate faunas from Przeworno (Lower Silesia) and their geological setting

ABSTRACT: The preliminary results of geological and paleontological studies on newly found vertebrate faunas at Przeworno (Lower Silesia, Southwestern Poland) are presented. The older assemblage (Przeworno *I*) occurs in clay infilling of horizontal karst passage. This assemblage corresponds to swampy rain forest faunas and is similar in age to fauna of La Romieu (Upper Burdigalian). The younger assemblage, found in vertical fissure filled up from surface, is represented by fauna of woods of the park type, pointing to sawanna-like climate, and corresponding to younger Vindobonian faunas in age. In the paleontological part the six genera of mammals, including one new species of rhinoceros — *Aceratherium silesiacum* sp. n. Sulimski, are described. Moreover, a fragment of the cave, with siliceous flowstones, is described.

INTRODUCTION

The old marble quarry at Przeworno is situated on the foreland of the Sudety Mts, 50 km south from Wrocław (Figs 1 and 2); its location is defined by the coordinates 17°10′40″ of eastern longitude and 50°41′41″ of northern latitude.

In the course of geological investigations, the second co-author, noted the occurrence of fossil karst (Oberc 1966), and later on, in 1969, the occurrence of bone remnants in clay infilling of karst passage from the bottom of the quarry (locality Przeworno *I*). At the same time, the first co-author recorded the remnants of the cave with siliceous flowstones. In June 1970, J. Głazek together with Dr. S. Dyjor recorded the bone remnants in fissure from the western wall of quarry (locality Przeworno *II*). Further investigation and collection of bone material were performed by Sulimski and Głazek in 1970. Some paleontological material was collected independently by Prof. Dr. K. Kowalski and Dr. H. Kubiak in the fall of 1970.

The paleontological material described in the paper was collected in the upper part of locality Przeworno *II*, where an excavation was dug out (Pl. 1, Fig. 1), and from the quarry bottom (locality Przeworno *I*), where along with exploitation, bone material was collected in clays exposed (cf. Fig. 6).

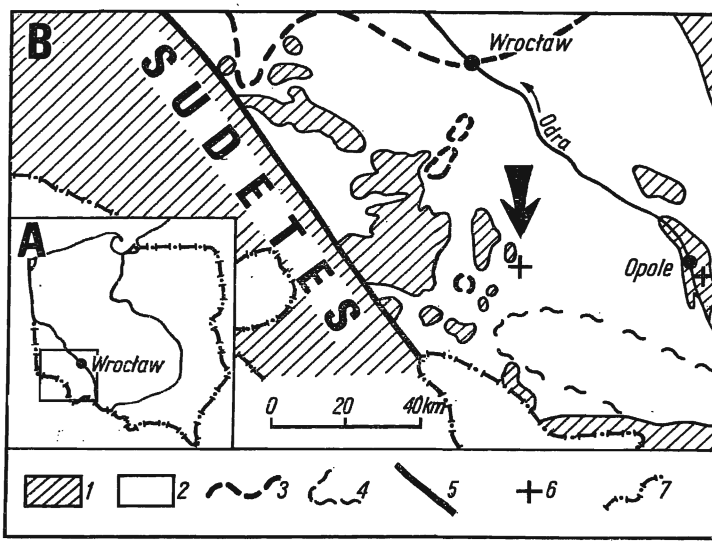


Fig. 1

General map of Poland (*A*) and geological sketch map of the discussed region (*B*)

1 pre-Tertiary substrate, *2* young Tertiary clays (mainly Poznań Formation), *3* extent of Miocene brown-coal formation, *4* extent of Lower Tortonian marine deposits within Eastern Sudetic foreland, *5* marginal Sudetic fault, *6* Miocene vertebrate faunas (the arrow marks Przeworno), *7* state frontier

Hitherto, the only locality of fossil terrestrial vertebrate faunas from Poland, similar in age and differentiation within the assemblage, was Opole (cf. Fig. 1), where in alluvial sediments rich vertebrate remains and terrestrial as well as fresh-water gastropods had been found. This locality was assigned to the younger Miocene (Sarmatian) by Wegner (1913), Ryziewicz (1961) and Kowalski (1967), to the older Miocene (Tortonian) by Krach (1958), or to the Middle Miocene by Andreae (1904). Moreover, single finds of terrestrial vertebrate remnants were reported from the Miocene clays (*e. g.* Roemer 1870; Wegner 1913, p. 210; Kościówko & Rembocha 1968, p. 155), a few of them was described and illustrated (*e. g.* Hensel 1859, Roemer 1870).

The present paper is jointly elaborated by the authors, except for paleontological description, performed exclusively by A. Sulimski. The thermal analyses were performed in the Institute of Geochemistry, Mineralogy and Petrology, Warsaw University, by means of Hungarian derivatograph of the type OD-102A, whereas X-ray diffractograms in the Laboratory of Geology, Polish Academy of Sciences, by means of French diffractometer Cristallobloc 31 produced by CGR.

The paleontological materials described or mentioned in present paper is housed in the institutes, for which the following abbreviations are used:

Institute of Geology, University of Wrocław (collection of J. Oberc) — *IGUWr*,

Institute of Geology, Warsaw University (collection of J. Głazek) — *IGPUW*,

Laboratory of Paleozoology, Polish Academy of Sciences (collection of A. Sulimski) — *Z. Pal.*

Acknowledgements. The authors thank Prof. Dr. R. Kozłowski for his interest and help in organizing field work; Dr. S. Dyjor for his help in field work and discussion on stratigraphic-paleogeographical problems, and Dr. A. Sadowska for performing pollen analyses, Dr. K. Szpila for thermal analyses and Dr. A. Wiewióra for X-ray analyses. Discussions with Prof. Dr. Z. Kielan-Jaworowska, Prof. Dr. S. Dżułyński, Prof. Dr. M. Młynarski, Doc. Dr. J. Kutek, Doc. Dr. A. Radwański and Dr. J. Grodzicki have been of great help for us. Prof. Dr. K. Kowalski kindly informed about vertebrate remnants found by him at Przeworno. Mrs. J. Skarżyńska, Mrs. D. Sławik, Mr. J. Chodnicki, J. Koziar, M. Sc., and Mr. W. Siciński helped in field works and/or in preparation of fossil material. Photos of vertebrate remains were made by Mrs. M. Czarnocka.

GEOLOGICAL AND GEOMORPHOLOGICAL SETTING

The quarry at Przeworno is situated on the edge of planated surface, undercut by stream, and elevated about 200 m a.s.l. and approximately 20 m above adjoining Holocene terrace of the Krynka river. The planated surface is built up of Pleistocene deposits, mainly connected with the Middle Poland (= Riss) Glaciation. Peaks of inselbergs, built up of crystalline rocks resistant to weathering, emerge in places from below the Pleistocene cover, whereas Tertiary clays, sands and gravels are exposed usually on slopes of inselbergs and in valley bottoms. The quarry is situated on the slope of crystalline inselberg, elevated 204.2 m a.s.l. (Fig. 2).

Rocks exposed in the quarry at Przeworno were mentioned in the begining of the 19*th* century. Discussion of previous papers, detailed description and sketch of the quarry were published by Oberc (1966). Moreover, the papers by Chmura (1967) and Wójcik (1968a), concerning crystalline formations, as well as papers by Dyjor (1968, 1970), Kościówko & Rembocha (1968), Oberc & Dyjor (1968, 1969) and Różycki (1968) on Tertiary formations are worth mentioning.

Crystalline formations

The quarry is situated in the zone of marble outcrops, 200 m wide. Toward the north, marbles plunge below the Jegłowa Formation (Oberc 1966).

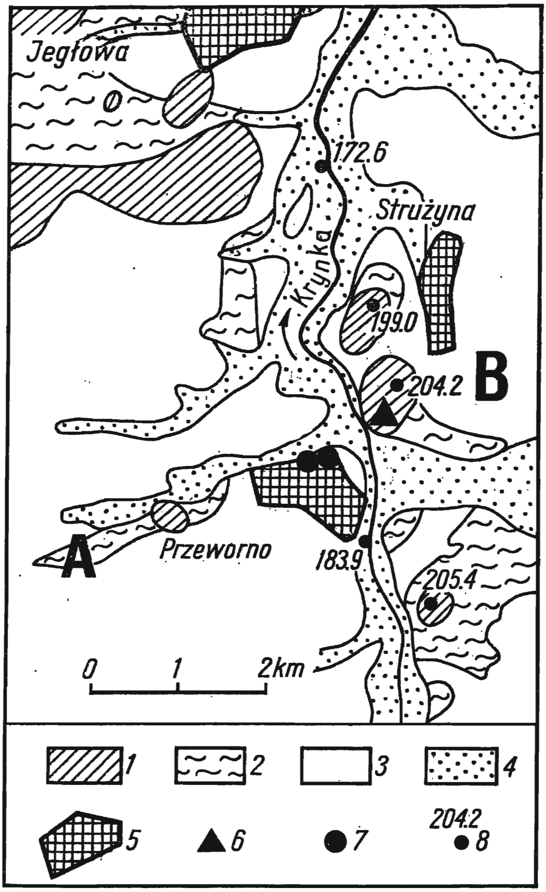


Fig. 2

Sketch map of the Przeworno area (partly after Wójcik 1968b)

1 crystalline substrate, 2 Tertiary clays, sands and gravels, 3 Pleistocene deposits, 4 Holocene deposits, 5 villages, 6 investigated locality of vertebrates at Przeworno, 7 drillings, 8 point and their altitude in meters; *A—B* line of section shown in Fig. 5

The metamorphic carbonate formation exposed in the quarry generally is NNE dipped. In its lowermost part, thick-bedded white marbles, strongly fractured and karstified occur (Fig. 3*A*). Upward, these marbles become darker and bedding is thinner; along with the increment in amount of graphitoid, pyrite, mica and epidote admixtures, the marbles gradually pass into fyllites (Chmura 1967). The marbles consist of calcite with small, 2.29 to 6.25%, admixture of dolomite, commonly greater in dark marbles (Pentlakowa & Wojno 1952).

The foliation in marbles is variable (Fig. 3*B*); however, its planes generally dip toward NE, varying from 30 to 60°. Similarly, lineation of grains, goffering and *b* axes of drag folds plunge at 20—40° NE. An axis of tectonic structure, part of which are marbles, ought to be similarly directed. Joint pattern of marbles is presented on diagram (Fig. 4), based on 215 measurements.

In the northern part of quarry, carbonate complex is overlied by strongly kaolinitized quartzites, quartzite and sericite schists, termed the Jegłowa Forma-

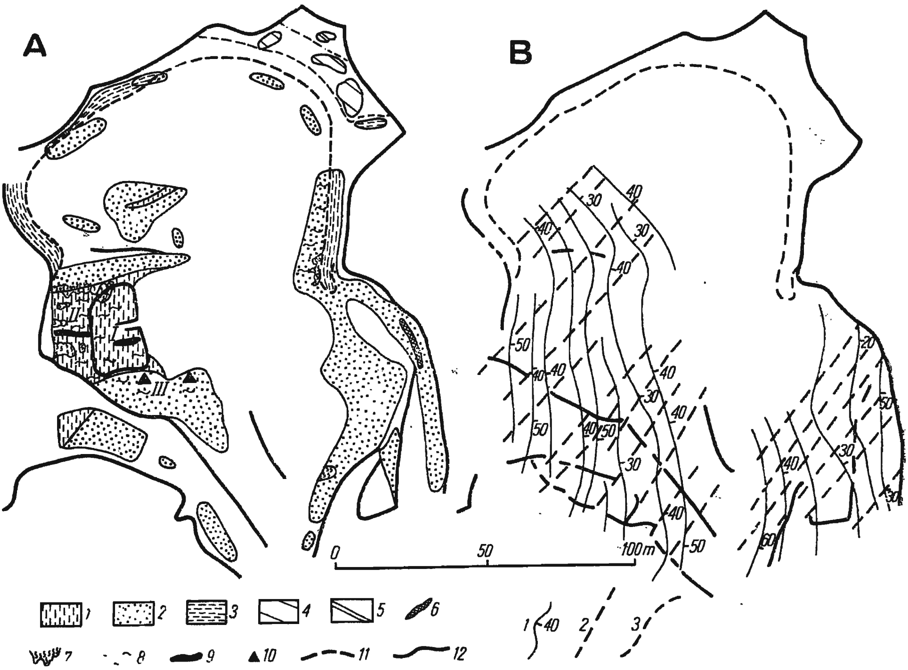


Fig. 3

Sketch maps of the Przeworno quarry (partly after Oberc 1966)

A Geologic map — Proterozoic(?): *1* white marbles, *2* dark marbles and carbonate shists; Jegłowa Formation (Lower and Middle Devonian?): *3* phyllites and sericite shists, *4* quartzitic shists, *5* quartzite; younger formations: *6* young Paleozoic aplite, *7* bigger karst forms filled with clays, *8* clays in fissures, *9* fissures filled with clays containing bones of vertebrates (*I* and *II* are the numbers of localities with vertebrate fauna), *10* remnants of caves with siliceous flowstones (*III* is a fragment discussed in the text), *11* tectonic contact, *12* escarpment. *B* Tectonic map — *1* strike and dip of foliation, *2* lineation, *3* boundary of marbles and Jegłowa Formation

tion by Oberc (1966). These beds are separated from marbles by a zone of tectonic loosening or overthrust. Foliation planes in the Jegłowa Formation are inclined 40—50° toward NW, whereas recrystallizational *B*-lineation and axes of mesofolds plunge approximately 20° SW. These orientations distinctly differ from those measured in underlying marbles. Dark marble from the eastern part of the quarry are penetrated by an aplite vein (Fig. 3*A*).

The age of rocks described is still disputable. Oberc (1966) assumed Proterozoic age for marbles, and recrystallization as well as deformation resulting from the Old-Assyntian movements. The Jegłowa Formation, discordantly overlying the marbles is probably Lower-Middle Devonian in age and has underwent metamorphosis in the course of the Old-Variscian movements (Oberc 1966, Wójcik 1968a).

The valley of the river Krynka is developed along wrench fault, which the crystalline formations of the eastern bank of Krynka river translocated about 1 km to the south (Oberc 1966).

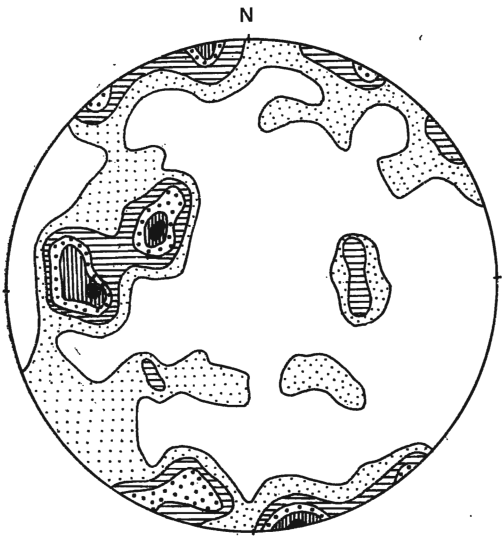


Fig. 4

Joints in marbles at the Przeworno quarry (215 measurements; contours of 2.3 — 4.6 — 6.9 — 9.2%)

Terrestrial formations

Post-Tertiary morphology of the crystalline substrate is very diversified in the region of Przeworno, similarly as in other parts of the Fore-Sudetic Block (cf. Różycki 1968). Crystalline rocks are covered by a regoliths commonly striped off on elevation and overlayed by younger deposits in depressions. Variegated regoliths gradually pass into kaolinitized rocks of the substrate. Depressions are filled up with clayey-sandy sediments of washing-out the waste. These sediments are represented by white, gray or dark kaolin clays with intercalations of coarse sandy material, and are sometimes of some importance as ceramic raw materials (Kościówko & Rembocha 1968, Wójcik 1968b).

These deposits were hitherto assigned to the Tertiary, or more precisely, to the Miocene (Kościówko & Rembocha 1968, Różycki 1968, Wójcik 1968b) on the basis of correlations with scanty and dispersed on a vast area paleofloristic data.

Clays, assigned to the Poznań Formation (Upper Miocene — Pliocene), overlay the erosional surface of sediments described above (Dyjor 1968, 1970).

The region of Przeworno is situated on the margin of the Poznań Formation, and outside the limits of the brown-coal-bearing formation assigned to the Older Tertiary (cf. Oberc & Dyjor 1968, 1969; Dyjor 1970), on the SE slope of the „Old--Tertiary" main European watershed (Teisseyre 1960), the course and pre-Upper Miocene age of which was precised by Oberc & Dyjor (1968, 1969).

Eroded top of the Poznań Formation is covered in places by white kaolinitic gravels and sands, assigned to the uppermost Pliocene (cf. Dyjor 1966; Stachurska, Dyjor & Sadowska 1967), or directly by glacial deposits assigned generally to the Middle Poland (Riss) Glaciation (cf. Różycki 1963).

Before and after the deposition of the Poznań Formation, an extensive erosion and formation of valleys took place, which is confirmed by the results of boreholes from Przeworno (cf. Figs 2 and 5). The first of the wells, situated about 190 m a.s.l., was stopped in Quaternary deposits (boulder clays and sands) at depth of 96.0 m, whereas the second well, 5 m distant from the former, penetrated the Quaternary deposits at depth of 111.5 m and entered darkgray clays, presumably

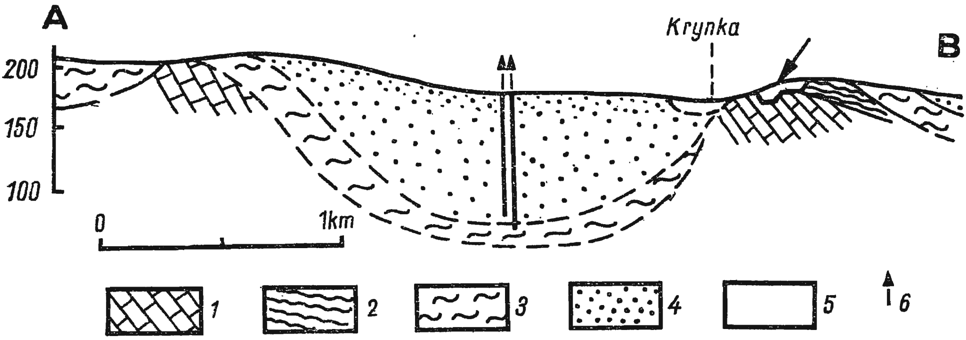


Fig. 5

Geological cross section of the area (cf. Fig. 2)

1 marbles, 2 Jegłowa Formation, 3 Tertiary clays, sands and gravels, 4 Pleistocene, mainly glacial deposits, 5 Holocene fluvial deposits, 6 drilling; the arrow marks the Przeworno quarry

corresponding to the Poznań Formation. Such thickness of the Quaternary cover is exceptional for the whole foreland of the Sudety Mts. However, thickness of that order was recorded previously in a few instances, N from Strzelin (*e.g.* Keilhack 1910). Such thick Quaternary cover was not found in the present Odra valley (cf. Szczepankiewicz 1959, Biernat 1960, Bossowski & Sawicki 1968), thus it seems that such deep erosion was connected with different river pattern and took place in times when drainage was directed toward the presumably neotectonic depressions, N of Strzelin, newly detected by Różycki (1968).

KARST FORMS AND THEIR INFILLINGS

Numerous fissures widened by corrosion and filled up with clays, form an irregular net on walls of the quarry at Przeworno. Differentiation and features of these forms will be illustrated below on the basis of a few examples.

Channel from the quarry bottom (locality Przeworno I)

In S part of lower exploitation level, on the depth of 20 m, a horizontal karst passage much higher than wide, was noted (Figs 3A, 6, 7). Passage walls are rounded, corroded. Infilling of passage consists of ligth-gray with greenish tint clays containing scattered bone remnants. Bone material is represented by isolated teeth and fragments of bones and tortoise shells. Moreover, some fragments of quartz and quartzites, commonly chemically corroded, and rare flat, rounded fragments of quartzitic and biotite schists were found. Bone remnants reach up to 10 cm in size, whereas fragments of quartzites up to 5 cm, and fragments of schists up to 1 cm only. The clay is completely devoid of calcium carbonate, but rich in quartz beside clay minerals, mainly kaolinite as well as in illite, which were stated by X-ray diffractogram. Pollens are absent.

Fig. 6

Conduit filled with bone--bearing clay in the bottom of the Przeworno quarry locality *I* (August 1970)

The ceiling of this passage is horizontal corrosion surface (Figs 6, 7), although this conduit is developed along fissure (strike 105°, dip 70°N). Material fills up channel completely but is unsorted and unstratified. However, general decrease of detrital material toward the top, as well as gradual passing of unstratified clays with detrital and bone material into clays devoid of coarse material and exhibiting slight lamination, was observed in narrowing fissures (Fig. 7).

Bone material is distinctly larger in size that rock detritus and is almost uniform in size. No smaller or larger bones were found. Some bones are well preserved, whereas others are strongly rounded. Therefore it may be assumed that bone material together with clays and rock fragments were transported on various distances.

Bones are very fragile, soft and crumble in fingers, commonly light-yellow coloured, whereas enamel is perfectly preserved, hard and blue coloured with pearl shade. Bones strongly react with HCl.

Marrow cavities and pores in spongy parts of bones are empty, except for inner surface covered with druse of fine rhomboedrons of yellow calcite. Occasionally, geopetal structures were noted in marrow cavities (Fig. 8).

There bones had to be transported in well-preserved form and clay material had limited possibilities to penetrate inside, thus pores and marrow cavities were filled up with water. This facilitated their transportation and resulted in their larger size than rock fragments with volume weight remarkably higher. The complete

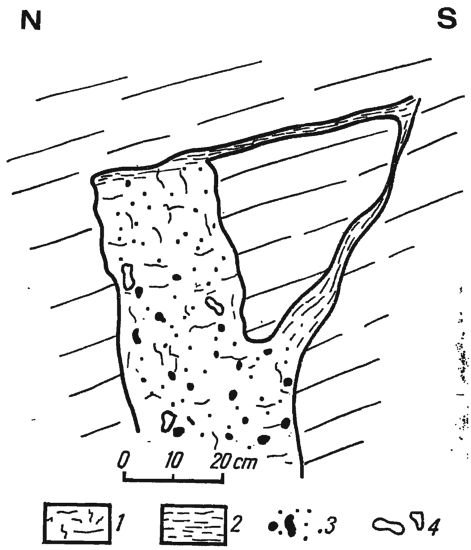


Fig. 7

Cross section of the conduit filled with bone-bearing clays at the Przeworno quarry locality *I*

1 nonstratified clays, *2* indistinctly stratified clays, *3* rock debris, *4* bones

lack of calcium carbonate in clay material infilling conduit proves that removal of soluted calcium carbonate exceeded dissolution. Occurrence of calcite in marrow cavities and in spongy parts of bones may be explained by infilling of these parts with solution of calcium carbonate during transportation. Such situation might have occurred in subtropical climate with distinct arid and humid seasons. During humid seasons, a quick flow of still aggressive water was removing calcium carbo-

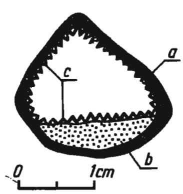


Fig. 8

Cross section of a bone showing the geopetal structure

a bone wall, *b* clay, *c* drusy calcite

nate dissolved outside the bones being transported together with solution infilling them. Only inside bones, highly concentrated solution might have been preserved. This solution had infiltrated slowly into the bones resting on the surface of deposits, during the arid season.

Fissures from the western wall of the quarry (locality Przeworno II)

In the middle part of the western wall of the quarry, a branching fissure filled up with bone-bearing clays, steeply cuts white marbles. The fissure, with extensions varies from 0.3 to 1.0 m in width and generally widens upward and extends up to 12 m down from the surface (Pl. 1, Figs 1—2). The infilling consists of greenish clay yielding rounded blocks and fragments of white marbles. Blocks, as well as fissure walls, are corroded and rusty coloured by hydrated ferrous oxides. Besides the blocks of white marbles, some blocks of dark marbles and carbonate fyllites from the cap-rock of the former, were found in clays. Margins of these fragments are also rusty coloured by the iron oxides. Moreover, there occur pebbles of quartzites and white quartz randomly distributed, their surface is devoid of coatings, slightly rounded, with discernible traces of corrosion.

Bone material is distributed in the whole fissure, but its amount, size and differentiation decrease downwards. Moreover, colour of deposits and appearance of bones changes distinctly in vertical profile. In the lower parts of fissure, bones are soft (butt still distinctly harder than the ones from Przeworno *I*), yellow-gray

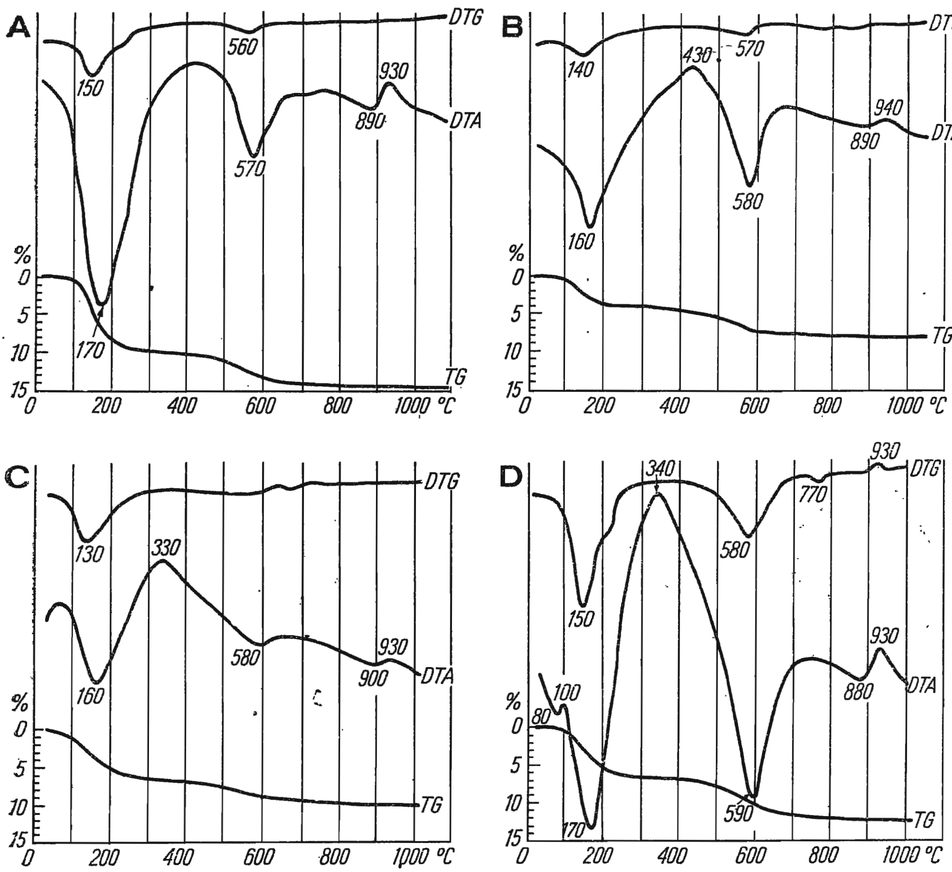


Fig. 9

Derivatograms of karst fillings

A greenish clay with traces of white silica; *B* greenish clay with bones — locality Przeworno *II*, lower part; *C* white, porous siliceous flowstone; *D* laminated clay with pollen grains. Conditions of measurements were as follows: weigth of samples — *A* 0.99008 g, *B* 0.9900 g, *C* 0.5780 g, *D* 0.9900 g; sensitivity of DTA and DTG — *A* and *B* 1/15, *C* and *D* 1/10; velocity of heating — 10°/min.

coloured and weakly react with HCl. In upper part of the fissure, bones are harder, also crumbled (Pl. 2, Fig. 1), variable in colour — brown, rusty or dark brown. These bones do not react with HCl and are strongly impregnated with hydrated ferrous oxides. Marrow cavities are filled up with clay when open, or empty with rusty coating of the oxides only. Enamel of teeth is dark brown, almost black. Pollens, similarly as in locality Przeworno *I*, have not been found.

Clay, filling up the fissure, is compact and does not becomes soaked. Derivatograph analysis of a clay sample (Fig. 9*B*) revealed that this clay consists mainly of hydromica (illite) with admixture organic matter; occurrence of opal is possible.

Occurrence of blocks of various, although nearby occurring rocks, and complete or broken and weakly rounded bones, as well as coprolites in the unstratified clay points to infilling by material pouring down or washed out from the surface (Pl. 2).

Fragments of cave with siliceous flowstones

Secondary silica, forming cherts in the interbed spaces and fractures within marbles, and impregnating greenish clays in fissures, is abundant in the southern part of the quarry, mainly in dark marbles. Occurrence of tawny, bandy chert, sometimes having white core among marbles was noticed from Przeworno already by Schumacher (1878).

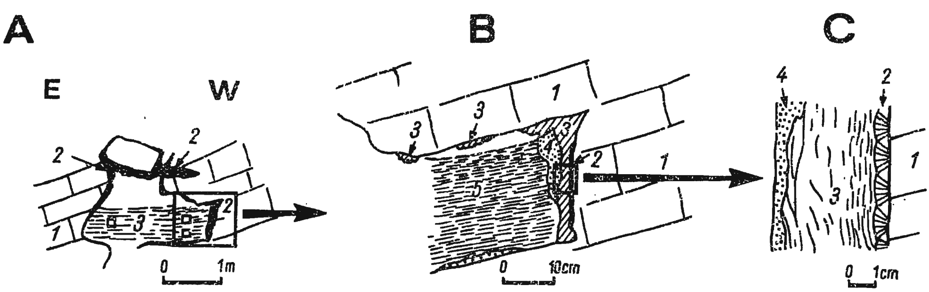


Fig. 10

Cross section of the cave with siliceous flowstones

A general scheme: *1* dark marbles, *2* flowstones, *3* laminated clay, squares marked the samples for pollen analysis. *B* western fragment of section: *1* dark marbles, *2* crystalline calcite, *3* dark siliceous flowstone, *4* white siliceous flowstone, *5* laminated clay. *C* fragment of the flowstone cover (explanation the same as in Fig. 10*B*); in dark siliceous flowstone marked are the traces of lamination (vertical)

In the same southern wall, on the upper exploitation level, two fragments of cave with siliceous flowstones, indentical as silica forming cherts in marbles and impregnating clays, are preserved (Fig. 10 and Pls 3, 4).

The most interesting is the fragment of the cave with ceiling and walls coated with brown silica (*III* on Fig. 3*A*). In places this silica covers calcite coa-

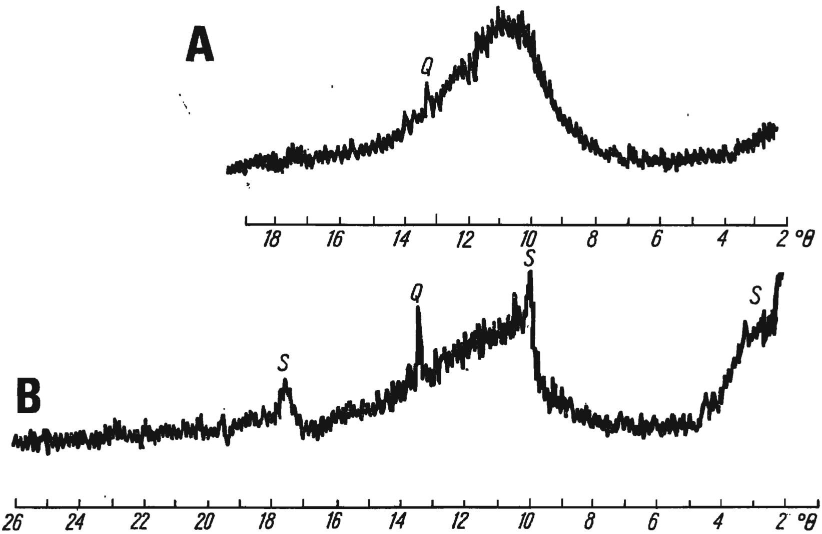


Fig. 11

X-ray diffractograms of siliceous flowstones

A dark compact, *B* white porous, *Q* quartz, *S* smectite ("montmorillonite")

tings. White, porous and light core occurs on the surface of silica. Lower part of cave chamber is filled with laminated clay (Fig. 10).

Tawny cherts are laminated parallel to walls of fissures and karst passages. X-ray analyses revealed that cherts consist of amorphous material, giving a wide zone of maximum of dispersed radiation on diffractogram about 11° Θ ($\Delta\Theta$ measured in half of height of maximum equals about 3.5° Θ), and weak line of quartz (Fig. 11*A*). Optical studies revealed that amorphous material contains mineral dust silt, concentrated in streaks and rare, coarse grains of detrical quartz.

The boundary of white core cuts primary lamination (Fig. 10; Pl. 4, Fig. 1). The white matter, according to diffractogram, consists of amorphous material with admixture of clay minerals of the smectite group („montmorillonite") and quartz (Fig. 11*B*); the occurrence of small amount of clay minerals was also confirmed by thermal analysis (Fig. 9*C*). Porosity, low specific gravity as well as oblique cutting of primary lamination indicate that the white matter originated as a results of etching of tawny silica. Presumably the etching solution brought a small amount of clay minerals of the smectite group into pores, which would be the case in low alkaline environment (cf. Degens 1965).

Clays filling up the channel are olive coloured, easy to soak, and softer and more plastic than greenish clays from fissures described above. They are laminated and lacking in detrital material. Deposition had to taken place in very low energy conditions, from the finest suspension. It is possible that the same water was etching the silica. Thermal analysis revealed that the clay is the mixture of mainly hydromica and smectite, with significant admixture of organic matter (Fig. 9*D*).

Only three out of about twenty samples studied by Dr. A. Sadowska, yielded some pollens (Table 1). According to her „the spectrum obtained is inconsistent and

Table 1

Percentage of sporomorfs in laminated clays from the Przeworno cave

determined by Dr. A. Sadowska

Sporomorfs	Samples		
	1	2	3
cf. *Anthoceros*	1	—	—
Sphagnum	1	—	—
Polypodiaceae	3	2.5	2.5
Pinus type *silvestris*	18.5	13	10
Pinus type *haploxylon*	4.5	3	8
Abies	1.5	—	—
Tsuga	0.5	0.5	—
Sciadopitys	0.5	0.5	—
Taxodiaceae-Cupressaceae	13.5	19	29
Sequoia	0.5	—	1
Cryptomeria	—	—	0.5
Salix	—	1	1.5
Betula	—	0.5	1.5
Alnus	0.5	1	—
Ostrya	0.5	0.5	2
Carpinus	0.5	1	2
Corylus	0.5	0.5	—
Fagus	7	1	1
Quercus	32	43	26
Castanea	—	1	—
Ulmus	7	11	9.5
Celtis	1	—	—
Tilia	—	—	0.5
Carya	1	—	0.5
Pterocarya	7	0.5	—
Engelhardtia	0.5	—	—
cf. *Eucommia*	1	—	0.5
Liquidambar	0.5	—	—
Rosaceae	0·5	—	—
Chenopodiaceae	0.5	—	—
Rhus	0.5	—	—
Vitaceae	—	0.5	—
Oleaceae	0.5	2.5	6.5
Gramineae	1	3	8
Monocotyledones indet.	0.5	—	—
Other indeterminatae	8.5	11.5	15.5

points that pollens were derived from different and contradictory environment. Here are represented elements of swampy forest (high percentage of Taxodiaceae--Cupressaceae, and pollens of *Salix, Alnus* and *Liquidambar*) as well as dry forest (*Quercus, Ulmus, Fagus, Pterocarya, Ostrya* and others). The pollen material was most probably derived from washing out... It may be stated that pollens are of the Tertiary and not older than the Middle Miocene age".

The above facts suggest that the cave, after its development, was partly filled up with siliceous flowstones, which originated simultaneously with secondary cherts from interbed spaces and fractures. Afterwards, a low alkaline solution flowed into the cave and etching of silica and fomation of white core begun. A deposition of laminated clays, similar in composition, appearance and pollen assemblage to the Poznań Clays (cf. Dyjor, Bogda & Chodak 1968), took place later on. Pollen asemblage got mixed presumably during transportation of the clay material of the Poznań Formation into karst conduits. Lack of Quaternary pollens confirms that it has taken place during the younger Tertiary times.

Other karst forms and their infillings

Besides the ones above described, numerous fissures widened by karst processes and infilled with clays, were noted in the quarry. The infilling consists of greenish clays, similar to that from localities *I* and *II*. Clays from fissures in the southern part of the quarry are more compact than those from northern part, what may result from impregnation with silica. On the western wall, pores in clays, are filled with white isotropic matter (Pl. 4, fig. 3), similar to white crust on siliceous flowstones. Such interpretation is confirmed by the thermal analysis (Fig. 9*A*), which revealed 10% loss of adsorbed water (maximum of reaction at 170° C), which is probably the sum lost by opal and clay minerals.

In the NE part of the quarry, karst forms have developed under the cover of the Jegłowa Formation, presumably along the plane of tectonic loosening between the carbonate and Jegłowa formations.

Distribution of karst forms at the Przeworno quarry is illustrated by a plan (Fig. 3*A*) and section (Fig. 12).

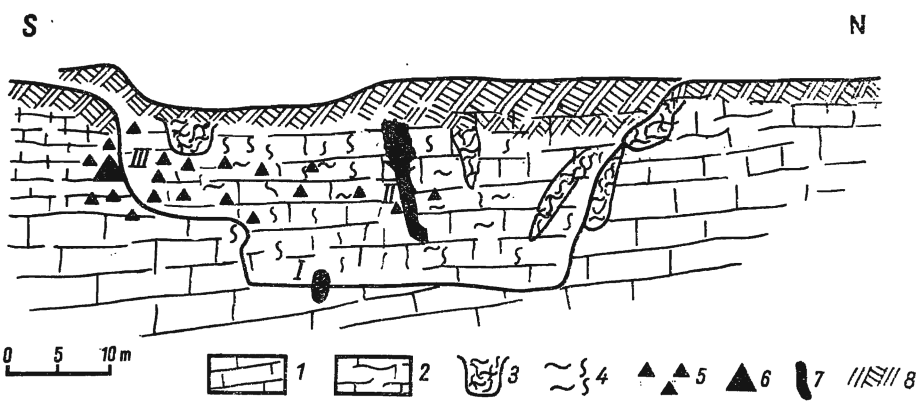


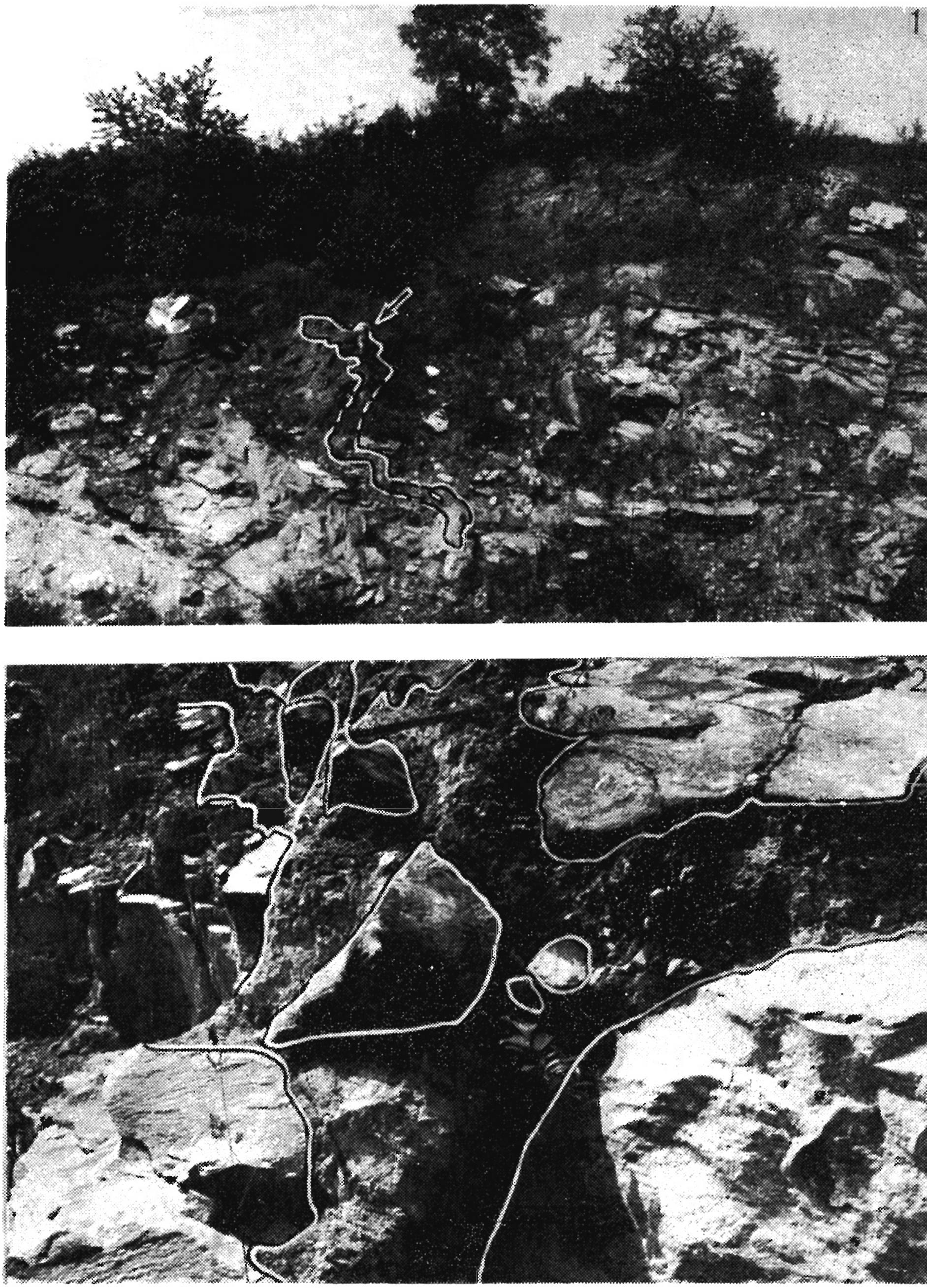
Fig. 12

Karst phenomena at the Przeworno quarry

1 white marbles, *2* dark marbles and carbonate phyllites, *3* bigger karst forms filled with greenish clays, *4* minute fissures filled with greenish clays, *5* traces of white silica in greenish clays, *6* cave with siliceous flowstones and pollen-bearing laminated clays, *7* bone-bearing greenish clay, *8* Pleistocene deposits and heaps

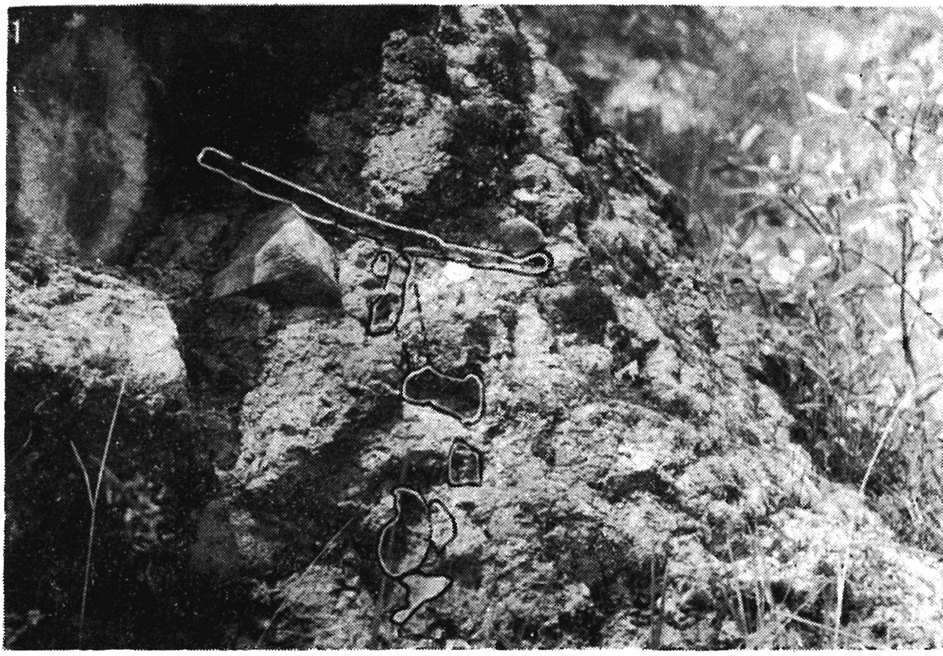
VERTEBRATE ASSEMBLAGES AND THEIR GEOLOGICAL SIGNIFICANCE

The above observations suggest the occurrence of two assemblages of vertebrates faunas, deposited in different geological conditions.



Fissure filled with bone-bearing clay, locality Przeworno *II*

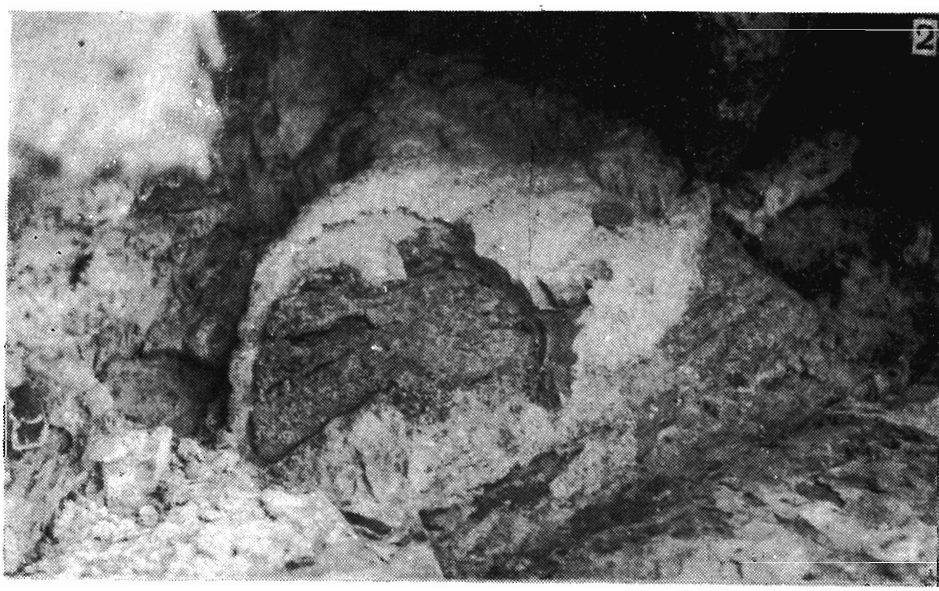
1 — General view of the west wall of the quarry; marked is the bone-bearing clay (the arrow shows the place of excavation in summer 1970).
2 — Detail showing branching of the fissure (marked are the boundaries between marbles and clays); line 52 cm long.



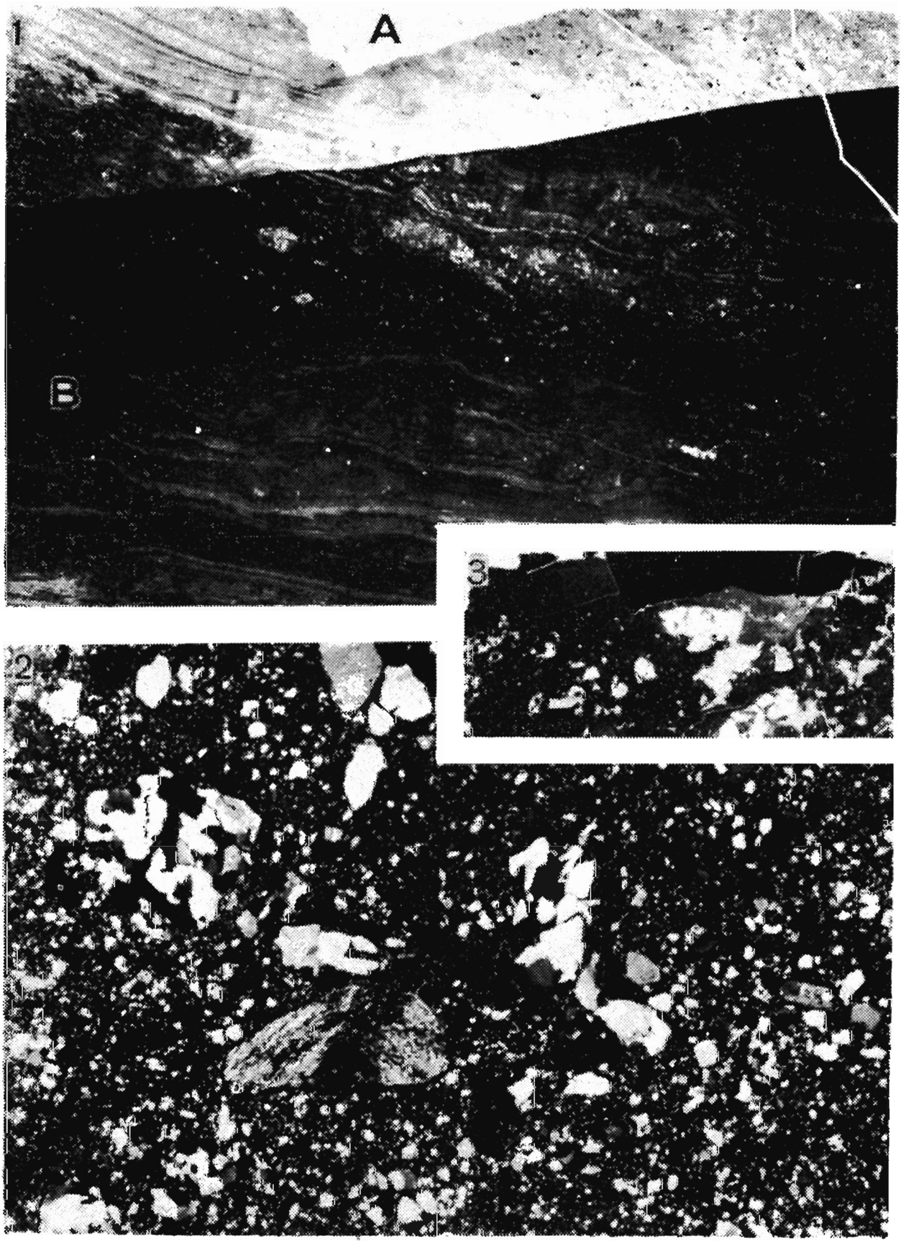
Details of the bone-bearing clay, locality Przeworno *II*

1 — Distribution of bones in the clay; breaks in bones are marked by a dotted line, whereas broken lines mark prolongation of bones into the clay or over its surface; coin diameter 3 cm.

2 — Lateral surface of a clay filling of the fissure.



Remnants of the cave with siliceous flowstone on the ceiling and wall (*1*), as well as on the bottom (*2*); coin diameter 3 cm



Thin sections of the karst fillings

1 — Siliceous flowstone — white porous (*A*) and dark compact (*B*); secondary origin of the white rim is evident as it cuts the primary lamination; transparent light, × 6.

2 — Bone-bearing clay from locality Przeworno *II;* metamorphic rock debris showing leached surface is visible; nicols crossed, × 5.

3 — Similar clay infiltrated by silica; transparent light, × 3.

Assemblage of the locality Przeworno I

Composition

Vertebrate fauna found in a karst passage in the bottom of the quarry, includes the following forms (described in systematic part):

Mustelidae gen, et sp. indet.,
Pseudailurus cf. *quadridentatus* (Blainville),
Aceratherium silesiacum sp. n. Sulimski,
Hyotherium aff. *soemmeringi* v. Meyer,
Dorcatherium cf. *crassum* (Lartet).

Moreover, some remnants of rodents of the family Castoridae, found by Prof. Dr. K. Kowalski in blocks of clays on the bottom of the quarry (written communication, Dec. 15, 1970), presumably belong here. Besides the mammalian remnants, numerous remains of a tortoise, ?*Geoemeda* sp., were found. Frequency of occurrence of particular forms is also important here, thus the dominace of tortoise remnants (shell fragments) and isolated rhinoceros teeth should be stressed.

Ecological remarks

Rhinoceroses of the genus *Aceratherium* Kaup are considered by some authors as inhabitans of swampy or near-water woods (*e.g.* Osborn 1898, p. 82; Mayet 1908). It is confirmed by occurrence of a large pig of the genus *Hyotherium* v. Meyer (cf. Stehlin 1899—1900). Primitive tragulid of the genus *Dorcatherium* Kaup, an ancestor of recent African tragulids, presumably lived in similar environment as its progeny of the genus *Hyaemoschus* Gray, *i.e.* nearby water (Walker 1964, p. 1380). Numerous fragments of tortoises with thick shells and remnants of beavers point also to humid, swampy environment. In such place, a large felid of the genus *Pseudailurus* Gervais, could occasionally hunt the other mammals.

Although assemblage from the locality Przeworno *I* is a necrocoenosis (cf. Davitashvili 1945, 1964), it corresponds approximately to a definite environment. It was swampy wood environment, with the cat *Pseudailurus* being the only co-burried accessory element.

Stratigraphical position

The forms described from Przeworno *I* do not constitute an assemblage allowing for univocal determination of its age. First of all, it is due to inprecise stratigraphical subdivision of the Miocene into „stages" (cf.

Cicha & Seneš 1968, Gabunia & Rubinstein 1968), which at present are rather lithostratigraphic than biostratigraphic units (cf. Table 2). Further difficulties result from the lack of the Proboscidea, a very characteristic element of succeeding vertebrate associations („niveaus") of the Miocene widely differenciated after Depéret (1906), and micromammals, more and more often applied to subdivision of the terrestrial Miocene (cf. Thenius 1959, Falbusch 1964, Wilson 1968). Since the „stage" names are of very limited significance and may arouse serious doubts, a more reasonable seems to be a correlation of the described fauna with established sequence of Miocene faunas (cf. Table 2). The table 2 is based mainly on sequence of Aquitaine faunas, occurring in a definite succession (cf. Roman & Viret 1934, Crouzel 1957, Bergounioux & Crouzel 1965), and sequence of which is established although various authors interprete the boundaries between particular „stages" differently. The position of a few other vertebrate faunas, considered as very important for Miocene stratigraphy in Europe (cf. Thenius 1959, Wilson 1968) and some micromammalian faunas (after Falbusch 1964, on which the age of Opole fauna was established by Kowalski 1967), is also given in that table.

In such a situation, the approximate age of the assemblage might be defined on the basis of stratigraphical ranges and evolutionary level of particular representatives of the groups with smaller stratigraphical significance.

Table 2

Supposed stratigraphical correlations of the Miocene in Europe

SOME STRATIGRAPHICAL "STAGES" AND THEIR BOUNDARIES			SUCCESSION OF THE VERTEBRATE FAUNA	
			EUROPE /except Poland/	POLAND
Pliocene		Pontian / Pannonian	Pikermi, Marktl	
MIOCENE	Upper	Vindobonian s.l.: Sarmatian	Sabadell, Giggenhausen	Opole
			St. Gaudens, Oggenhof	Opole; Przeworno II
	Middle	Vindobonian s.l.; Vindobonian s.s.: Tortonian	La Grive-St.Alban, Göriach	Przeworno II
			Simorre?	Przeworno II
		Helvetian	Sansan	Przeworno II; Przeworno I
			Castelnau d'Arbieu	Przeworno I
	Lower	Burdigalian	La Romieu	Przeworno I
			Estrepouy	Przeworno I
Oligocene		Aquitanian / Chattian	Laugnac, Frankfurt	

Compiled from the referenced papers (Depéret 1906, Gignoux 1950, Papp 1959, Thenius 1959, Falbusch 1964, Cicha & Seneš 1968, Gabunia & Rubinstein 1968, Wilson 1968) and modified by the authors. Position of the Opole fauna based on the papers by Wegner (1913), Krach (1958) and Kowalski (1967)

Occurrence of representative of Rhinocerotoidea (*Aceratherium*), which are the one of more stratigraphically significant Tertiary groups (Osborn 1900, Thenius 1959), seems the most important here.

Aceratherium silesiacum sp. n. is of a close affinity to *A. tetradactylum* Lartet and *A. platyodon* Mermier, which are known from older Miocene finds. A number of primitive features of that species enables to consider the Lower Miocene age of *A. silesiacum* sp. n. as an almost certain.

Pseudailurus quadridentatus (Blainville) is known from many localities of Miocene faunas of Western Europe since Burdigalian till Tortonian (Ginsburg 1961), *i.e.* Vindobonian *s.s.* Often it was recorded from the earlier Miocene and rarely from the late Miocene. Tooth P^4 found at Przeworno *I* is almost identical with teeth of *P. quadridentatus* (Blainville), described from Sansan (cf. Filhol 1891, Ginsburg 1961).

Hyotherium soemmeringi v. Meyer is known from southern France, varying in age since the Upper Burdigalian till the Lower Helvetian (cf. Bergounioux & Crouzel 1965). *Dorcatherium crassum* (Lartet) commonly occurs in the Miocene, particularly older Miocene deposits. Also remnants identified as Mustelidae gen. et sp. indet. exhibit a number of features common in early Miocene, and even Upper Oligocene forms.

Thus the whole identified material from Przeworno *I* indicates the early Miocene character of the assemblage, most probably corresponding to the Upper Burdigalian assemblage from La Romieu, and close to fauna from Sansan, which is perhaps more progressive in development. The age of the locality Przeworno *I* may be therefore defined as the Upper Burdigalian, keeping in mind that it is of the age closest to the age of the La Romieu fauna from the Aquitaine sequence.

Assemblage of the locality Przeworno II

Composition

Vertebrate fauna found in a karst fissures from western wall of the quarry includes the following forms (described in systematic part):

Pseudailurus lorteti Gaillard,
Hyotherium simorrense (Lartet),
Euprox furcatus (Hensel).

Moreover numerous bone remnants, belonging to postcranial skeletons were found. They are represented by bones of the extremities (commonly fragments, often with articular regions), fragments of ribs, scapulas and pelves; parts of brain negatives, presumably belonging to middle size carnivores (maybe to a felid of the genus *Pseudailurus* Gervais), and large bone fragments (15—16 cm in diameter), belonging probably to a representative of proboscidians of the Mastodontinae group, and representing parts of femur epiphyses and fragments of metatarsus were also identified. Quite abundant bone material belongs to closer unidentifiable ungulates, presumably artiodactylous. Among small remains, fragments of enamel rodent incisors, fine long bones of rodent or insectivore limbs were identified.

Bone fragments, belonging to other vertebrate, are represented by isolated shell fragments of middle sized tortoises, with very characteristic „cog" marginal zone, and scales of large lizards, presumably of the genus *Ophisaurus*.

Also, rather numerous coprolites, in part at least belonging to *Hyotherium* (Pl. 8, Fig. 7), were found.

Quantatively, *Euprox furcatus* (Hensel) predominates in the assemblage from Przeworno *II;* moreover, Suiformes and Felidae are quite common.

Ecological remarks

Small primitive cervulin, *Euprox furcatus* (Hensel) were close in appearance and life habit to recent fallow deer and roe-deer, thus it was a representative of forest fauna, inhabiting woods, probably of the park type. *Hyotherium simorrense* (Lartet), a small forest pig, lived presumably in the same way as recent wild boar (*Sus scrofa* L.). *Pseudailurus lorteti* Gaillard was a relatively large cat, similar in appearance and life habit to the caracal lynx, *Felis (Lynx) caracal* L., thus it was a forest form, inhabiting not too dense and humid woods.

The above conclusions are confirmed by occurrence of remnants of light shell tortoise, anguid and proboscidians. Preservation of excrements proves that suids were lived in place and the climate was relatively dry.

Generally, Przeworno *II* fauna points to forest or steppe-forest environment and warm savanna climate.

Stratigraphical position

The forms described comprise only a small part of far richer assemblage, which will give more data for age determinations of the locality in the future. However, an attempt to definite the age can be presented.

Pseudailurus lorteti Gaillard is known from the older Miocene faunas (La Romieu, Sansan — Bergounioux & Crouzel 1965) as well as younger ones (La Grive-Saint-Alban, Göriach, Simorre and others). *Hyotherium simorrense* (Lartet) is the common form of Middle and Upper Miocene faunas (La Grive-Saint-Alban, Simorre, Göriach); it was also recorded from Opole (Wegner 1913) and single forms were cited nearby Opole, at Okoły (Tauenzinow) and Domaradz (Damratsch) by Wegner (1913). *Euprox furcatus* (Hensel) was described (Hensel 1859) from Sośnicowice near Gliwice in Miocene clays assigned to the Upper Tortonian and then stated at Opole (Wegner 1913). This forms is quite common in younger Miocene faunas of Europe (La Grive-Saint-Alban, Vieux-Collonges and elsewhere). Thus the Przeworno *II* assemblage is similar to this one from Opole, but occurrence of *Pseudailurus lorteti* Gaillard may point to slightly older age than that of the latter. In comparison with western European faunas, it may correspond to La Grive-Saint-Alban (cf. Table 2), because *Pseudailurus lorteti* Gaillard still occurs and *Euprox furcatus* (Hensel) already appears. Generally, it may be stated that the fauna from Przeworno *II* corresponds to faunas of the younger Vindobonian from Western Eurôpe (La Grive-Saint-Alban, Göriach, Steinheim, Vieux-Collonges, and others). In comparison with the Opole fauna, this may be slightly older.

PALEOGEOGRAPHIC CONSEQUENCES

The data presented above enabled a more precise reconstruction of the paleogeographic development of the Przeworno region over a fairly long span of time. Three new stratigraphic mark-points obtained, although only roughly precise, made possible better dating of ancient active processes than hitherto. Moreover, the new data significantly modified certain suggestions concerning the paleogeography of a vast area and are an important supplement to data on development of karst processes in Poland during the Tertiary (cf. Głazek, Dąbrowski & Gradziński 1971).

Distribution, facial pattern and thickness of Upper Cretaceous deposits from the Sudetes and their foreland confirm that they were deposited also within the area of Przeworno. Upper Cretaceous marly sediments, over 370 m thick, are still preserved under cover of clays of the Poznań Formation, 20 km E from Przeworno (Bossowski & Sawicki 1968, Frąckiewicz & Bossowski 1970), whereas elsewhere they were eroded as a result of uplift movements, which began in the Coniacian (cf. Jerzykiewicz 1971) and continued probably until the Oligocene. In the Oligocene, uplift movements and erosion ceased on the Sudetes foreland.

In NW part of the foreland of the recent Sudetes, subsidence was manifested during the Oligocene, and caused sedimentation of the first brown-coal cycle (Oberc & Dyjor 1969), ended by Upper Oligocene (Ziembińska & Niklewski 1966) brown-coal measure (Głogów measure = 4 Lausitzer Flöz). Although uplift movements have ceased, the region of

Przeworno, situated further to south-east, was probably still subjected to denudation. However, with smaller morphological gradients, the chemical weathering presumably predominated and process of regolith formation begun.

The second cycle of brown-coal sedimentation, ended by so-called Ścinawa measure (= 3 Lausitzer Flöz), was preceeded by small reactivation of uplift movements and erosion (Oberc & Dyjor 1969). Deposition of that cycle extended further to the south and corresponds to the locality Przeworno *I* in age. On the area of Lower Lusatia (Niederlausitz) deposits of that cycle are assigned to „Burdigalian?" (Quitzow 1953, Papp 1959). They extend far to the north from Przeworno. The faunal assemblage of that time, *i.e.* locality Przeworno *I*, confirms that swampy environment extended far outside of contemporaneous brown-coal basin. Area of Przeworno represented in that time a very gentle elevation, generally covered with products of chemical weathering of siliceous rocks under tropical climate. In such humid tropical conditions, even a small marble lense form distinct elevation (cf. Głazek 1966, 1970). Within such lense of Przeworno, an underground flow pattern of surface waters must have originated. This flow pattern extended downward presumably just below a boundary of saturation zone. Waters must have been sufficiently aggressive to remove all calcium carbonate from bone-bearing clays. Such aggressiveness under tropical climate may be explained by participation of acids, originating in swampy neighbourhood in result of partial decomposition of organic matter. Final filling of the conduit resulted either from a spontaneous liquefaction of clays or from sedimentation in a siphon what led to the lack of stratification. The situation, in which the locality Przeworno *I* originated, is schematically presented in Fig. 13*A*.

Later on, uplift movements took place which caused acceleration of erosion. The climate changed into more arid and further evolution of organic world took place. New conditions are recorded by infilling of fissure with bone material — the locality Przeworno *II*. This infilling obviously was formed above groundwater table, mainly due to pouring or washing the waste with bone material into the fissure (Fig. 13*B*). Occurrence of faunal localities of that type is common for the calcareous uplands (cf. Tobien 1968). Moreover, it may be assumed that this is the phenomenon caused by more general factors, as uplifting movements which cause widening of fissures in calcareous massifs. Not the water, but uplifting movements and, eventually, mass movements — creeping of slopes undercut by erosion — are the main agent here. Such fissures are thereafter only modified, widened and partly infilled with deposits by water. Similar fissures were developed simultaneously along other sections of the Central Polish Uplands, also on areas built up of rocks resistant to karst phenomena (cf. Roniewicz 1962), but there they usually are subjected to quick infilling because the water does not enlarge them

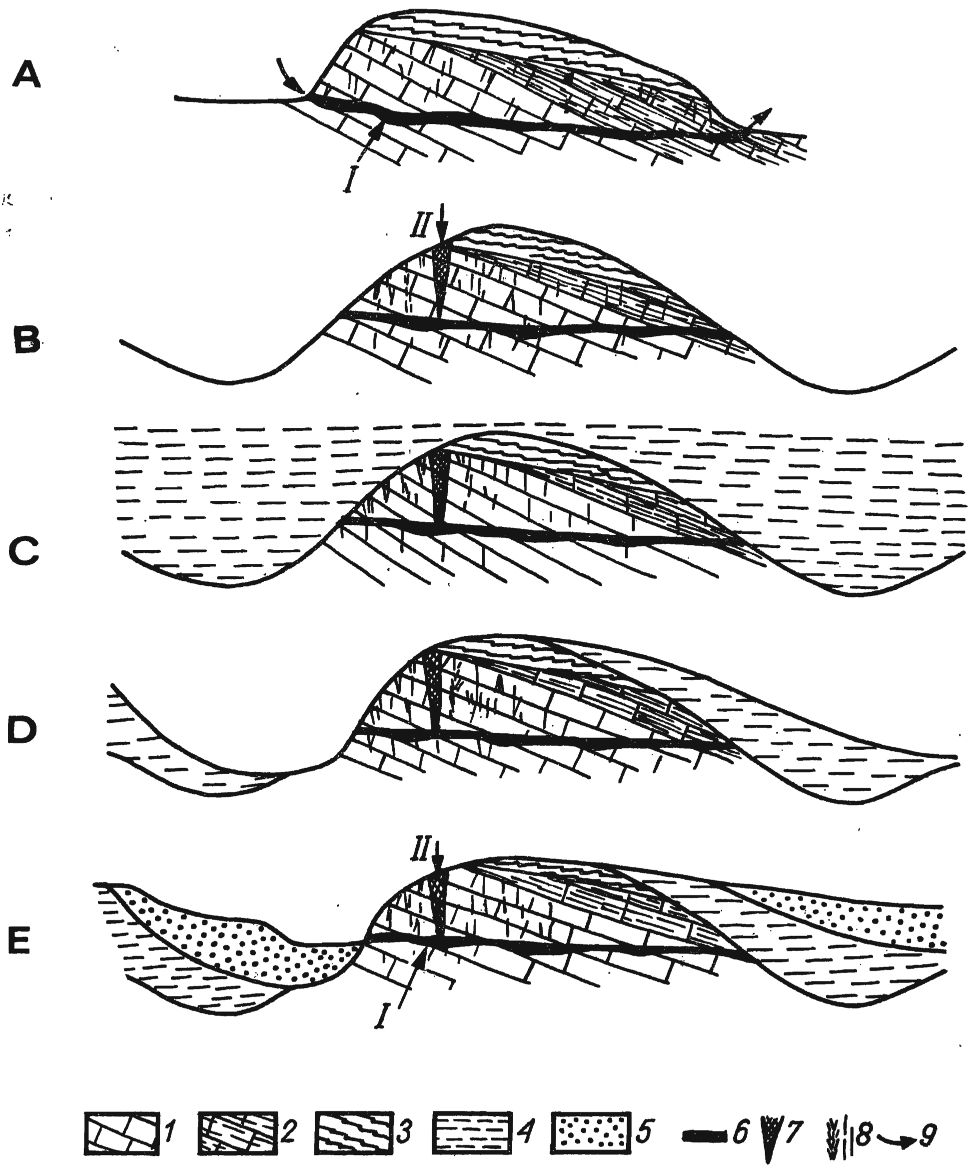


Fig. 13

Geological history of the discussed area at Przeworno

A Upper Burdigalian, *B* Vindobonian, *C* Lower Pliocene, *D* Pliocene/Pleistocene boundary, *E* Recent

1 white marbles, *2* dark marbles with carbonate phyllites, *3* Jegłowa Formation, *4* Poznań Formation (Young Neogene), *5* Pleistocene deposits, *6* Upper Burdigalian conduit (locality Przeworno *I*), *7* Vindobonian bone-bearing filling of the fissure (locality Przeworno *II*), *8* boneless fillings of fissures, *9* supposed trends of water circulation during the Upper Burdigalian by dissolution and there is no underground outflow, which decreases surficial washing out of waste in calcareous regions.

This period presumably corresponds to formation of huge sequence of detrital deposits of the third cycle of brown-coal sedimentation (Oberc & Dyjor 1969), ended with thick brown-coal measure (Lusatia measure = Lausitzer Unterflöz). This measure is assigned to the Middle Miocene (Ziembińska 1964, Ziembińska & Niklewski 1966). The concordance with age defined on the basis of vertebrate fauna is sufficient. Moreover, thus siliceous flowstones from Przeworno may correspond to formation of „quartzites" — sandstones strongly cemented with silica and which occur as lenses within brown-coal deposits (cf. Oberc & Dyjor 1969). This coincidence suggests paleogeographic conditions facilitating activation of silica on vast areas during weathering. This silica was either deposited in fissures and karst caverns of the substrate (Przeworno) or as cement of sandy sediments in the inland basin, to which it was transported by waters flowing down from more elevated areas. Activation of silica is possible in low alkaline environment, what would confirm by traces of chemical corrosion on quartz and quartzitic fragments and preservation of marble fragments. Indirectly it is confirmed by the lack of distinct exothermic effect on the DTA curve (cf. Fig. 9*B*) above 950°, which is typical for kaolinite, originating in acid environment. Formation of illite and activation of silica, together with preservation of marble fragments, are typical for conditions in which fissures underwent infilling. Most probably, it was an low alkaline environment (cf. Degens 1965).

Strong uplifting movements from the Sudetic region are recorded by a huge sequence of correlative detrital sediments (cf. Oberc & Dyjor 1969), thus fissures and their infilling are the result of uplift and differentiation of pre-Upper Miocene watershed in the paleogeography (cf. Oberc & Dyjor 1968, 1969). That watershed is a western extension of the meta-Carpathian arch (Głazek & Kutek 1970). This zone separated basin of the Carpathian foredeep from the brown-coal basin during the Lower Tortonian time. The Lower Tortonian sea of the Carpathian foredeep extended up to 20 km to S and SE from Przeworno, which than was situated on SE slope of main European watershed (cf. Fig. 1). The age of marine Miocene sediments was controversial (*e.g.* Quaas 1909, Michael 1910, Biernat 1964, Piwocki 1965); the most probable is the opinion of Krach (1958), who considered them as sediments of the Lower Tortonian basin, which transgreded onto the southern slopes of Central Polish Uplands (cf. Radwański 1968, 1969) and Moravian part of the Bohemian Massif (cf. Panoš 1964).

Afterwards, strong subsidence took place, resulting in formation of thick sequence of clays, over 200 m in thickness, on the eastern foreland of the Sudetes Mts. These clays belong to Upper Miocene-Pliocene Poznań Formation which still exhibits some marine influences (Dyjor 1968, 1970). The Poznań Formation entered area of pre-Upper Miocene watershed, previously eroded (cf. Fig. 13*C*), what was recorded in Przeworno by redeposition of laminated clays into the cave with older siliceous flowstones. It is uncertain, whether these clays were redeposited during sedimentation of that formation or when it was eroded, in the uppermost Pliocene (cf. Fig. 13*D*).

Further paleogeographic development, during the Pleistocene and Holocene, is out of scope of this paper. Recent morphology and geological structure (Figs 5 and 13*E*) is the result of a long paleogeographic evolution, continuing through the whole Cenozoic.

SYSTEMATIC PART

(by A. Sulimski)

Class **Mammalia** Linnaeus, 1758
Order **Carnivora** Bowdich, 1821
Superfamily **Feolidea** Simpson, 1931
Family **Mustelidae** Swainson, 1835
Mustelidae gen. et sp. indet.
(Fig. 14; Pl. 5, Figs 1—2, 5)

Material. — A left mandible with P_2, anterior part of P_4 crown, without ascending ramus (No. *IGUWr 1*); right calcaneum (*IGUWr 2*); right lower canine (*IGUWr 3*). All specimens from the locality Przeworno *I*.

Dimensions. — Length of the tooth row, measured on alveoli, about 38.5 mm, P_1—M_2 about 32.0 mm, M_{1-2} about 13.0 mm, P_{1-4} about 18.0 mm. Alveolar length and width, successively: P_1 — 1.5 and 1.5 mm, P_2 — 4.0 and 3.0 mm, P_3 — 5.0 and 4.0 mm, P_4 — 6.5 and 4.2 mm, M_1 — 9.0 and 5.0 mm, M_2 — 2.5 and 2.0 mm. Height of mandible below M_1 about 9.0 mm.

Description. — The left fragmentary mandible (Pl. 5, Fig. 1) displays considerable gaps in dentition (preserved are only P_2 and anterior part of P_4 crown) and ascending ramus. Mandible slender, fairly long. Judging by alveoli (Fig. 14), the canine was large and had a long, robust, laterally compressed root. P_1 onerooted, small, probably simple in crown structure; P_2 with two roots subparallel to the antero-posterior axis of mandible. Main cusp sloping anteriorly. P_3 was larger than P_2, had similarly arranged roots and probably a similar crown. P_4 also larger than P_3 and having two roots. A small basal cusp visible before protoconid; a clearly marked cingulum occurs on the outer side of crown. M_1 almost four times as large as M_2. Roots of M_1 large, laterally compressed and extended towards the middle of the crown base. M_2, on the other hand, has only one, small and short root. The crown of this tooth was probably strongly reduced. There are three mental foramina, the anterior under P_2, the middle under P_3 and the posterior under P_4. Masseteric crests distinct, their frontal termination reaching the posterior border of the alveolus of M_2. Ascending ramus of mandible starts before M_2 so that this tooth is situated obliquely to the alveolar margin.

The right calcaneum (Pl. 5, Fig. 2), here tentatively assigned, displays the character of a primitive mustelid, most similar in the structure of articular part and dimensions to this same bone in one of the representatives of the subfamily Lutrinae, perhaps of *Paralutra*.

The right lower canine (Pl. 5, Fig. 5) has also been tentatively assigned to Mustelidae. In contradistinction to calcaneum, this canine, having a long and robust root, may belong to a large representative of this family.

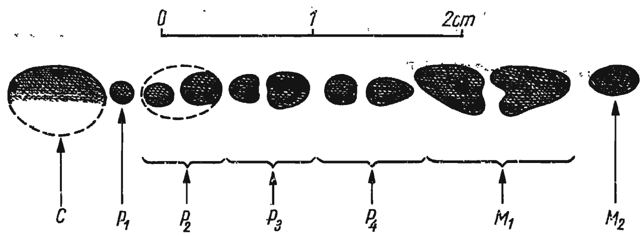


Fig. 14

Mustelidae gen. et sp. indet.; alveolar arrangement in the lower jaw (*IGUWr-1*)

Discussion. — The size and structure of mandible, alveolar arrangement (Fig. 14), number of teeth, as well as the structure of calcaneum and canine indicate that all the remains may belong to middle-sized mustelids. The lack, on mandible, of diagnostic characters, *i.e.*, molars and an ascending ramus with articular processes, as yet precludes an accurate determination of the systematic position of the remains from Przeworno or the assignment of all of them to one or three genera or species. From the number of teeth and alveoli (dental) formula ?3 1 4 2), one may only suppose that the mandible itself should be assigned to the genera *Ischyrictis* Helbing 1930, *Palaeogale* Meyer 1846 or *Martes* Frisch 1775, or also even to some of the genera of the family Viverridae Gray, *e.g.*, *Semigenetta* Helbing 1927 (cf. Helbing 1936, Viret 1929). For, in these genera, the numbers of teeth and alveoli are identical. Assuming, however, that M_2 in the specimen from Przeworno has one root, unfused of two others (Fig. 14), we may exclude from comparisons the first two genera in which this tooth has two roots and relatively well-developed crowns having talonids with more or less marked cusps. We may also omit the genus *Semigenetta* Helbing which, in addition to its dimensions which as a rule are larger, has a different structure of the mandible itself. Thus, the mandible from Przeworno is most similar to that in the genus *Martes* Frisch and seems to be more closely related to that in *M. filholi* (Depéret 1887), described from La Grive-Saint--Alban and Sansan (Depéret 1887, 1892; Viret 1933, 1951; Ginsburg 1961). In both forms, the dimensions of premolars and carnassials are much the same, differences being, however, recorded in the size of M_2. In the mustelid from Przeworno, the length and width of this tooth amounts to 2.5 and 2.0 mm and in *M. filholi* to 4.6 and 3.9 mm (cf. Mein 1958, Ginsburg 1961). Similar in the size of teeth and mandible is *M. munki* Roger 1900 (cf. Roger 1902—1904, Viret 1933, Villalta & Crusafont-Pairo 1943, Mein 1958). The length and width of M_1 and M_2 are in this species resp. 8.3 and 9.3 mm and 3.3 and 3.1 mm (according to Mein, *l.c.*, p. 44), while in the mustelid from Przeworno these figures are correspondingly lower: 9.0 and 2.5 mm. Also of interest is that the mandible from Przeworno resembles in general stucture that of the Oligocene species *Stenoplesictis cayluxi* Filhol 1882, described from phosphorites du Quercy (cf. Teilhard de Chardin 1915, Pl. 8, Fig. 14; Schlosser 1888, Pl. 8, Fig. 55, Pl. 9, Figs 37—40; Piveteau 1961, p. 754, Fig. 137). This concerns not only the size of mandible, but also the number of teeth, arrangement of alveoli and the reduction of a one-rooted M_2. It is not unlikely, therefore, that at Przeworno we may have to do with one of the representatives of the Stenoplesictinae characteristic of the Oligocene faunas. It is also in this case that the lack of a complete dentition and ascending ramus in the specimen from Przeworno does not allow one to assign it to this subfamily.

Superfamily **Canoidea** Simpson, 1931
Family **Felidae** Gray, 1821
Genus *PSEUDAILURUS* Gervais, 1848—1852
Pseudailurus cf. *quadridentatus* (Blainville, 1841)
(Pl. 5, Fig. 4)

Material. — A well-preserved, left P^4 from the locality Przeworno *I* (No. *IGUWr 4*).

Dimensions. — Length and width of P^4 amount to 21 and 10 mm.

Description. — The crown of P^4 has a robust protocone whose anterior cutting edge is directed strongly backwards. Paracone small but clearly visible. The inner projection, a tritocone, relatively large but with an only slightly marked tip. Deuterocone long, cutting, with two tips, the anterior one, a metacone, being higher than the posterior. The tooth has three roots, of which the posterior one is robust and laterally compressed and the remaining two, a buccal and a lingual root, are the same in diameter and length.

Discussion. — The structure of P^4 does not in principle depart from that of this same tooth in the genus *Pseudailurus* Gervais, 1848—1852 and the species *P. quadridentatus* (Blainville, 1841).

Pseudailurus quadridentatus has been mentioned from many Miocene localities of western and central Europe, such as, Orléanais (Mayet 1908), La Romieu (Roman & Viret 1934), Vieux Collonges (Mein 1958), Sansan (Filhol 1879, 1883, 1891; Ginsburg 1961), Valles Penedes (Villalta & Crusafont-Pairo 1943), Göriach (Hoernes 1882, 1893; Toula 1884; Hofmann 1892, 1893; Thenius 1949), Leoben (Zdarsky 1910), La Grive-Saint-Alban (Depéret 1892, Gaillard 1899, Viret 1951). This species is known from numerous more or less complete fragments of jaws and detached teeth displaying a rather considerable ontogenetic variability, but a small variability in the morphology of dentition.

According to Ginsburg (1961, p. 141), *P. quadridentatus* occurs from the Burdigalian to the Tortonian. Its Burdigalian mutation, described from La Romieu (Roman & Viret 1934) is smaller than the type representative of this species. The tooth from Przeworno is also somewhat smaller thant the type and rather corresponds in dimensions to the specimen from Sansan (cf. Ginsburg 1961, p. 137, Pl. 12, Fig. 3a—b). Thus, the presence of this upper carnassial would indicate the late-Burdigalian age of the locality Przeworno *I*.

The regions of thick, swampy forests, being the natural site of the rhinoceros *Aceratherium silesiacum* sp. n. and the tragulid *Dorcatherium crassum* (Lartet) might at the same time be a hunting area of *P. quadridentatus*. In its mode of life it rather resembled the large sabretoothed cats.

Pseudailurus lorteti Gaillard, 1899
(Pl. 5, Fig. 3)

1899. *Pseudaelurus lorteti* n. sp.; C. Gaillard, pp. 40—42, Pl. 1, Figs 2—3, 6.
1961. *Pseudailurus (Schizailurus) lorteti* Gaillard; L. Ginsburg, pp. 148—151, Pl. 12, Figs 5—8.

Material. — A left mandible with a preserved root and basal part of the canine and roots of P_3 and P_4, as well as with a worn crown of M_1; the specimen comes from the locality Przeworno *II* (No. Z. *Pal. M/IV-1*).

Dimensions. — Length of the tooth row measured from the posterior margin of the alveolus of C to the posterior part of the crown of M_1 amounts 41.0 mm; length of P_3—M_1 — 33.0 mm, of P_{3-4} — 20.0 mm; of P_4 — 11.0 mm, length and width of M_1 — 14.0 and 5.5 mm, anteroposterior diameter of the canine 9.0 mm, transversal diameter 6.5 mm depth of mandible under M_1, 19.0 mm.

Description. — This mandible of a gerontic individual is massive and, in the symphysal part, strongly elevated obliquely. The canine large, laterally strongly compressed. A short diasteme without traces of alveoli occurs between the canine and P_3. P_3 with two roots, the anterior being smaller than the posterior and slightly shifted lingually in relation to the anteroposterior axis of mandible. P_4 larger than P_3, with two roots equal in diameter and situated along the anteroposterior axis of the mandible. M_1 long, with a strongly worn trigonid. Paraconid, protoconid and talonid were probably equally developed as in the type specimen from La Grive-Saint-Alban (cf. Gaillard 1899, Pl. 1, Figs 2—3) and in the specimen from Sansan (Ginsburg 1961, Pl. 12, Fig. 7). A small, posterior denticle, that is, a vestigial talonid has been preserved on the crown of M_1. Of the two mental foramina, the anterior one is situated between C and P_3 and the posterior under P_3. Masseteric crests robust, in particular the lower one, in their anterior part they do not reach the posterior border of the crown of M_1. The preserved anterior part of the ascending ramus displays a rather considerable angle of posterior slope towards the alveolar margin. In the places of P_4 and M_1, mandible displays a strong, bilateral swelling. No submental flange, similar to that in the species of the subfamily Machairodontinae, occurs on the mandible.

Discussion. — *Pseudailurus lorteti* Gaillard was described from La Grive--Saint-Alban (Gaillard 1899) on the basis of fragmentary mandible and maxilla. The mandible, presented by Gaillard (*l.c.*, Pl. 1, Figs 2—3), belongs to a mature individual with still only slightly worn teeth, whereas that from Przeworno belongs to a gerontic individual (a strongly worn crown of M_1) and, therefore, they clearly differ in size. Besides, the mandible from Przeworno does not differ much from the type in the structure and arrangement of alveoli and teeth.

P. lorteti differs from *P. quadridentatus* in markedly smaller jaws and teeth and in a more primitive structure of crowns of premolars and carnassials (cf. Kretzoi 1938, Viret 1951, Ginsburg 1961, Piveteau 1961). This is also visible in the structure and proportions of upper carnassials and canines. According to Gaillard (1899, p. 42), *P. lorteti* is related to the Recent *Felis (Lynx) caracal* Linnaeus. Piveteau (1961) believes that the genus *Proailurus* Filhol (1879) and its descendant, *Pseudailurus* Gervais 1848—1952 may be assigned to primitive felids called „Paléo--Felides". In contradistinction to the machairodont-like character of *P. quadridentatus* (cf. Viret 1951, Ginsburg 1961), *P. lorteti* preserves more archaic features closer to the genus *Proailurus* Lartet. Its upper canines are shorter, less compressed and its mandible does not display the submental flange. In fact, it is not a mere simple reduction of *P. quadridentatus* as they once believed. This was the reason why the subgeneric name of *Schizailurus* was given by Viret (1951) to the species *P. lorteti* in order to distinguish the two forms. *P. lorteti* may be considered an ancestor of the Recent Eurasian representatives of the genus *Lynx*. It directly descends from the Oligocene *Proailurus lemanensis* Pomel. *P. lorteti* seems to be a digitigrade cat (Ginsburg 1961, p. 146).

In the size and structure of its teeth, *P. lorteti* is also similar to *P. turnauensis* (Hoerness 1882), described from Göriach and La Grive-Saint-Alban (Hofmann 1893, Gaillard 1899, Thenius 1949) and it is considered by some authors as a synonym of this species (Dehm 1950). Smaller dimensions and more slender shape of the mandible of *P. turnauensis* seem to indicate, however, its specific separateness.

P. lorteti Gaillard is a commonly known species occurring in many Middle and Late Miocene localities of western and central Europe. In addition to La Grive-Saint-Alban, it is noted in Sansan (Ginsburg 1961), in the Lower Helvetian of Pontlevoy (Stehlin & Helbing 1925), in the Burdigalian of Artenay, La Romieu, Valles Penedes and perhaps also at Neudorf (Roman & Viret 1934, Villalta & Crusafont-Pairo 1943, Thenius 1949, Ginsburg 1961).

The species *P. lorteti* Gaillard, much the same as *P. quadridentatus* (Blainville) has for the first time in Poland been recorded at Przeworno.

Order **Perissodactyla** Owen, 1848
Family **Rhinocerotidae** Owen, 1845
Subfamily **Aceratheriinae** Dollo, 1885
Genus *ACERATHERIUM* Kaup, 1832
Aceratherium silesiacum sp. n.

(Figs 15—17; Pl. 5, Figs 6—7; Pl. 6, Figs 1—5)

Holotype: the left P^2, a permanent tooth with an unworn crown (No. *IGUWr 6*), presented in Pl. 5, Fig. 6.

Referred specimens: In addition to the type, the left I^1 and I_2 (No. *IGUWr 5* and *11*), the right P^3 (No. *IGUWr 7*), the right P_4 or M_1 (No. *IGUWr 8*), the right M_1 or M_2 (No. *IGUWr 9*) and the left M_2 (No. *IGUWr 10*).

Derivation of name: Lat. *silesiacum* = Silesian, after Silesia, a region of Poland where this species was found.

Type horizon and locality: most likely the Upper Burdigalian; Przeworno quarry (locality *I*) near Strzelin, Silesia.

Diagnosis. — I^1 and I_2 strongly increased, massive. I^1 subtriangular in lateral profile, laterally compressed, without longitudinal fissures. I_2 with three cutting edges in the terminal part of crown. P^2 with an undeveloped protoloph. P^3 with a distinct crochet and poorly developed crista. Parastylar fold poorly developed. Lingual cingulum, very well-developed, with a not very high posterolingual cusp.

Dimensions. — Anteroposterior length of I^1 — 58.0 mm, width — 19.0 mm, length of the cutting surface — about 27.0 mm, length of root measured along the anterior margin — about 78.0 mm, length measured along the posterior margin of root — 50.0 mm, length of terminal cusp — 23.0 mm, width — 17.0 mm. P^2: length measured along the ectoloph — 35.0 mm, width — 37.0 mm, height of crown — 40.0 mm. P^3: length measured along the ectoloph — 36.0 mm, width — 41.0 mm, height of crown — 26.0 mm. P_4 or M_1: anteroposterior length — 43.0 mm, width — 30.0 mm, height of crown — about 27.0 mm. M_1 or M_2: anteroposterior length — about 42.0 mm, height of crown — about 33.0 mm. M_2: anteroposterior length — 46.0 mm, width 28.0 mm, height of crown — 22.0 mm.

Description. — The left I^1 (*1* in Fig. 15; Pl. 5, Fig. 7) complete, very large, subtriangular in lateral profile. Root laterally compressed. A slightly worn, terminal cusp occurs in the anterior part of crown and a cutting surface corresponding in length to the anteroposterior diameter of the lower I_2 — in the posterior part. The left I_2 (only the terminal part of crown) large, massive, subtriangular in outline in transverse section and with a rounded posterolabial edge (more or less at one-third of the height of crown as measured from the tip). The outline of crown more oval-subtriangular at the base of tooth (*1* in Fig. 16; Pl. 6, Fig. 2). P^2 (Fig. 17; Pl. 5, Fig. 6) with only the crown preserved, belonging to a mature individual (a permanent tooth with a still unworn crown). The outer wall of ectoloph almost completely flat with a very slight parastylar swelling or fold. Cingulum, gradually extending towards the posterior border of crown, occurs at the base in the posterior part of crown. It surrounds the crown posteriorly

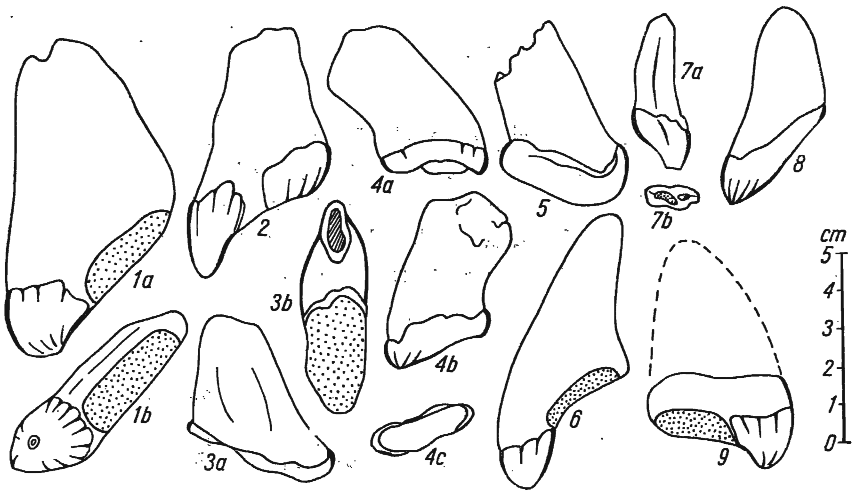


Fig. 15

Comparisons of the upper I^1 in the some different representatives of the Rhinocerotidae

1 *Aceratherium silesiacum* sp. n. — left I^1: *a* labial side, *b* occlusal view
2 *Brachypotherium* cf. *brachypus* (Lartet) — right I^1 from lingual side (after Roman & Viret, 1934, Pl. 10, Fig. 6)
3 *Brachypotherium* cf. *brachypus* (Lartet) — right I^1: *a* labial side, *b* posterior view (after Rinnert, 1956, Pl. 3, Fig. 6a—b)
4 *Aceratherium incisivum* Kaup — left I^1: *a* lingual side, *b* labial side, *c* occlusal view (after Hofmann, 1893, Pl. 10, Fig. 1a—c)
5 *Brachypotherium brachypus* (Lartet) — left I^1: from lingual side (after Depéret, 1887, Pl. 23, Fig. 3)
6 *Aceratherium incisivum* Kaup — left I^1 from labial side (reconstructed after Kaup's figure in Zittel, 1925, p. 138, Fig. 178)
7 *Brachypotherium stehlini* Viret (after Viret, 1958, p. 425, Fig. 60): *a* lateral view, *b* occlusal view (size unknown)
8 *Aceratherium minutum* Cuvier — right I^1 from lingual side (after Roman, 1912, p. 38, Fig. 11 and Pl. 6, Figs 3, 3a)
9 *Aceratherium copei* Osborn — right I^1 from labial side (after Osborn, 1898, p. 131, Fig. 34D)

and lingually, reaching the anterior side of crown and anterobuccal side of ectoloph to disappear gradually halfway the length of crown. A swelling is visible on the posterolingual part of cingulum. Protocone robust but separated from ectoloph. Prefosette well-developed, deep. Central valley between metaloph and protocone deep and open without traces of a bridge connecting lophs. A swelling (crista?) is marked on the anterior wall of metaloph. Postfossette deep and separated. Cingulum of the lingual part of crown granulated irregular. P^3 (only the crown preserved) with a crown worn down to halfway its height. Proto- and metaloph well developed, relatively slightly deflected posteriorly but parallel to one another. A small crochet is visible on metaloph and a crista is slightly marked on the inner wall of ectoloph. Much the same as on P^2, the cenral valley is deep and open and there is no bridge connecting lophs.

Lower cheek-teeth (Pl. 6, Figs 3—5) have on the buccal side a slight depression at the contact point of lophids. Enamel surface very delicately crenulate, like on the upper premolars. The robust roots of these teeth give ample evidence of their being permanent.

Discussion. — On the basis of the structure of the upper premolars, an upper and lower incisor and lower cheek-teeth, as well as in conformity with the systematic criteria, given by Osborn (1898, 1900), Abel (1910), Breuning (1923),

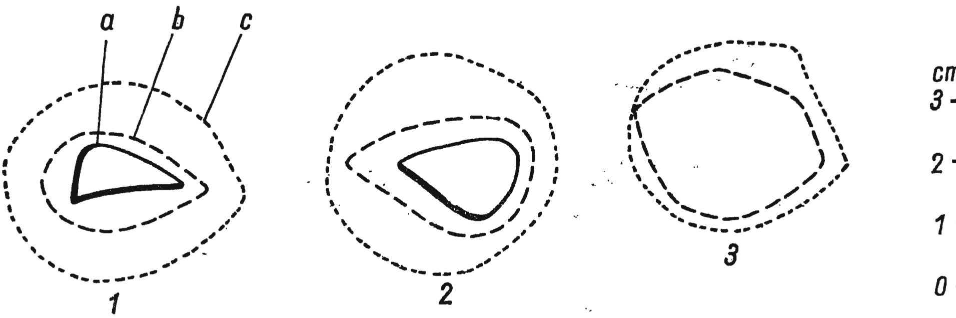


Fig. 16

Schematic cross sections of I_2

1 *Aceratherium silesiacum* sp. n., 2 *A. tetradactylum* Lartet, 3 *A. incisivum* Kaup (after Mermier, 1895, p. 30; Osborn, 1898, p. 134, Fig. 35)
a top section, *b* corp section, *c* root section

Viret (1958), Belayeva (1960, 1962), Radinsky (1966) and Heissig (1969), the remains from Przeworno have been assigned to the genus *Aceratherium* Kaup, 1832. The shape and size of the upper incisor (Fig. 15), the primitive structure of the upper premolars, in particular of P^2 (Fig. 17), the poorly developed parastylar fold on P^2 and P^3, the robust, granulated lingual cingulum with a distinct, posterolingual, subtriangular thickening (cf. Mermier 1895, 1896; Osborn 1898), as well as the transverse section of the lower incisor (Fig. 16; Pl. 6, Fig. 2) (cf. Mermier 1895, Osborn 1898), provided a basis for the assignment of these remains from Przeworno to the new species *silesiacum*.

In the structure of its upper premolars, *A. silesiacum* seems to be closely related to the Oligocene and Early Miocene primitive species *Aceratherium filholi* Osborn, *A. lemanense* Pomel, *A. platyodon* Mermier and *A. tetradactylum* Lartet in which the anterior premolars have a simplified structure marked by a strong development of the labial cingulum, frequently by the lack of a joint of lophs and an under-development of the lophs themselves (more frequently, of the protoloph). This also concerns a different degree of development of accessory folds on the inner walls of proto- and metaloph (crochet, antecrochet and crista) (cf. Mermier 1895, 1896; Osborn 1898, 1900).

A. silesiacum sp. n. displays aceratheric characters also in the structure of the upper and lower incisor. Its I^1 has a subtriangular lateral profile like that in *A. incisivum* Kaup (*6* in Fig. 15), *A.* (*Diceratherium*) *minutum* Cuvier or in *A. copei* Osborn (*8—9* in Fig. 15). In addition to its large size, this tooth displays a strong, lateral compression of the root with slight longitudinal depressions like those observed precisely in species of the genus *Aceratherium* Kaup.

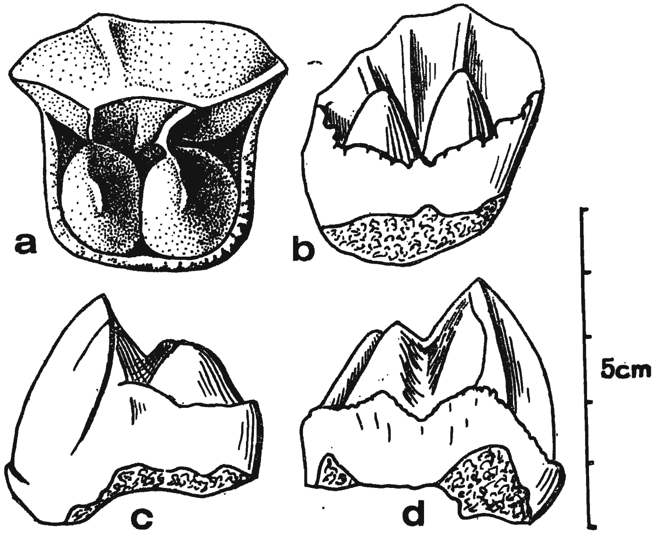


Fig. 17

Aceratherium silesiacum sp. n.; left P^2 (young individual, *IGUWr-6*)

a occlusal view, *b* lingual side, *c* mesial side, *d* distal side

Assuming such a structure of I^1 as typical of the genus under study, we should recognize the specimens described by Roman & Viret (1934) and Rinnert (1956) (*2—3* in Fig. 15) as *Brachypotherium* cf. *brachypus* (Lartet) belonging to the genus *Aceratherium* Kaup. On the other hand, I^1 described by Hofmann (*4* in Fig. 15) as *A. incisivum* Kaup should have been considered as a representative of the genus *Brachypotherium* Roger. Although such conclusions occur in comparing this tooth, the lack evidence for the correlation of this feature with, *e.g.*, the structure of premolars or a nasal part of skull, leaves this question open to discussion. This is mainly caused by the fragmentary state of the preservation of bone materials described in literature.

Regarding the general structure of I_2, its shape tand size are virtually they same or approximating those in several species of the genera *Aceratherium* Kaup, *Brachypotherium* Roger and *Diceratherium* Marsh. Substancial and distinct differences in the structure of this tooth were shown by Mermier (1895) on transverse sections through three sectors: a) terminal sector, b) corporal sector and c) radicular sector (Mermier, *l. c.*, p. 30; Osborn 1898, pp. 114—116, Fig. 26, as well as Fig. 16 in the text of the present paper). According to H. F. Osborn, on the basis, of these sections phyletic types may be found rather, than successive development stages (*l. c.*, p. 116). He divides the lower incisors of various species of rhinoceroses into the following three types: 1) suboval with an outer, sharp edge (here he assigns *A. tetradactylum* Lartet and *A. incisivum* (Kaup), 2) suboval with two sharp edges, an outer and an inner (*A. lemanense* Pomel only) and 3) subtriangular in the terminal part of its crown (here Osborn assigns *A. tridactylum* Osborn, *A. platyodon* Mermier and the genus *Diceratherium* Marsh). A transverse section of I_2 in *A. silesiacum* n. sp. (*1* in Fig. 16) displays a subtriangular profile in the terminal part, much the same as in *A. platyodon* Mermier. In the corporal section, this profile becomes more oval with only one posterior edge like that visible in *A. tetradactylum* Lartet. A transverse section through the radicular part (no root has been preserved in the specimen of *A. silesiacum*) was probably conspicuously oval and without a distinct edge. Thus, according to Osborn's type scheme, the tooth from Przeworno has composite characters, partly those of type 1 and partly those of type 3. In all the four species compared, that is, *A. silesiacum* sp. n., *A. tetradactylum* Lartet, *A. platyodon* Mermier and *A. tridactylum* Osborn, the transverse section of I_2 in the terminal and corporal parts is more or less subtriangular.

Order **Artiodactyla** Owen, 1848
Suborder **Suiformes** Jaeckel, 1911
Family **Suidae** Gray, 1821
Subfamily **Hyotheriinae** Cope, 1888
Genus *HYOTHERIUM* Meyer, 1834
Hyotherium aff. *soemmeringi* Meyer, 1834
(Pl. 6, Fig. 6)

Material. — A well-preserved, left I_1 from the locality Przeworno *I* (No. *IGUWr 12*).

Dimensions. — Length (height) of tooth with a root — 45.0 mm, length of root measured internally — 33.0 mm and externally — 28.0 mm, transverse width of crown — 7.0 mm.

Description. — I_1 having a large, laterally compressed root with lateral, longitudinal hollows. On the anterior and posterior side of crown, enamel reaches halfway the height of tooth. A distinct, longitudinal keel is visible on the distal side of crown, while small longitudinal grooves occur on the mesial side of crown.

Discussion. — The tooth from Przeworno is the closest in structure to the lower incisors of the species *Hyotherium soemmeringi* Meyer, but differs from I_1 of the type, described by Meyer (cf. Stehlin 1899—1900, Pl. 1, Fig. 5) from Georgensmünd in larger dimensions. They are similar to each other in the structure of crown (a distinct distal keel). A tooth, similar to I_1 from Przeworno, has also been cited by Hofmann (1889; fide Stehlin 1899—1900, p. 313) from Labitschberg near Gamlitz with an assignment to the species *H. soemmeringi* Meyer. A certain similarity in structure and size is also observed between the tooth from Przeworno and I_1 of *Listriodon lockharti* Pomel from La Romieu (Roman & Viret 1934, Pl. 3, Fig. 8), which, however, differ from each other in the transverse width of crowns. The tooth from Przeworno differs from the lower incisors of different species of the genus *Listriodon* Meyer in its markedly smaller size and a considerably narrower crown.

Despite a considerable similarity, the assignment of the tooth from Przeworno to *H. soemmeringi* Meyer is yet uncertain.

Hyotherium simorrense Lartet, 1851
(Pl. 6, Fig. 1; Pl. 7, Fig. 4)

1851. *Hyotherium simorrense* n. sp.; E. Lartet, Pl. 12, Figs 23—24.
1959. *Conohyus simorrensis* (Lartet, 1851); E. Thenius, p. 77.

Material. — A fragmentary left mandible with DP_4 (No. Z. *Pal. M/IV-2*), a fragmentary right mandible with M_3 (No. *IGPUW — Gł. P. 2. 1*), a few fragmentary long limb bones (as a rule with epiphyses), pelvic fragments, few metatarsal bones and a distal fragment of scapula. All the specimens come from the locality Przeworno *II*.

Dimensions. — Specimen No. Z. Pal. M/IV-2: length of DP_4 — 20.0 mm, anterior width (measured in proto-paraconid) — 7.0 mm, posterior width (in thalonid) — 9.0 mm, thickness of mandible below DP_4 — 12.0 mm. Specimen No. *IGPUW — Gł. P. 2. 1*: length of M_3 — 28.0 mm, anterior width — 16.0 mm, posterior width — 12.0 mm, height of crown in protoconid — 12.0 mm. Depth of mandible below M_3 — 45.0 mm, thickness in this same place — 25.0 mm. Width of ascending ramus below the condylar process — 36.0 mm. Height of ascending ramus — probably 105.0 mm, transverse width of the articular surface of condylar process — about 30.0 mm.

Description. — Specimen No. Z. *Pal. M/IV-2*: a young individual (Pl. 6, Fig. 7). A fragmentary mandible with the last milk-premolar preserved, belonging to the same species as a fragmentary mandible with M_3. DP_4 with all main cusps well-developed and relatively high. Accessory thickenings occur in depressions separating twin-arranged main cusps. A fairly wide talonid closes a well-developed, accessory, posterior cusp. Main cusps are markedly notched by small, accessory grooves. Alveoli for DP_3 are visible before DP_4.

Specimen No. *IGPUW — Gł. P. 2. 1*: an adult individual. A fragmentary right mandible with preserved M_3 and an almost complete ascending ramus with a condylar process. M_3 large, with well-developed main cusps. Not very sharp ridges, running from cusp tops towards crown center, are visible on proto- and paraconid, the same as on meta- and hypoconid. These ridges form pseudolophs connecting the main cusps. This type of dentition is met with in the genus *Listriodon* Meyer (cf. Bergounioux & Crouzel 1967, Fig. 12B). A basal cingulum, surrounding bases of the anterior main cusps, occur in the anterior part of crown. No cingulum occurs on the lingual side of crown and that on the buccal side is very poorly developed. Accessory thickenings or cusps, folds and hollows, forming a delicate sculpture of the wearing surface of crown are visible between the main cusps, particularly on talonid. The fragment of mandible preserved is massive, in particular in the alveolar part. Ascending ramus fairly wide and not very high. Angular process poorly developed, wide (a rather primitive feature) and rounded. Coronoid process not preserved, but, judging by its base preserved, it was low and rather blunt. Condylar process displays a wide articular surface. Anterior margin of ascending ramus begins just behind the posterior border of M_3. Attachment of the hyomandibular muscle distinct, forming a thick, prominent list. Judging by the structure of mandible, the skull was not very long, with a small prognathism.

Discussion. — *Hyotherium simorrense* Lartet was described from the Miocene deposits of Simorre. This species is also known from several other Middle and Upper Miocene localities in western Europe, including Simorre, Saint-Gaudens--Valentine, Sansan, Villafranche d'Astarac, La Grive-Saint-Alban, Göriach (Depéret 1892, 1906; Gaillard 1899; Hofmann 1893, and others). It also occurs in the Miocene finds from south Germany, Switzerland and Austria, such as Günzburg, Heggenbach, Biberach, Steinheim, Leoben, etc. (Schlosser 1898, 1902; Fraas 1870; Stehlin 1899—1900; Thenius 1959). *H. simorrense* Lartet is also known from the territory of Poland from a few localities in the environs of Opole (Roemer 1870, Pl. 48, Figs 12—14; Stehlin 1899—1900, Pl. 6, Figs 24 and 26; Wegner 1913, Pl. 12, Figs 23—24).

The fragmentary mandible from Przeworno, in particular its molar, is almost identical with M_3 presented by Stehlin (*l. c.*, Pl. 1, Fig. 9). This concerns not only the arrangement of the main cusps and cingulum, but also the shape of crown in the talonid part. According to J. Viret (1961, p. 914), *H. simorrense* Lartet does not belong to the genus *Conohyus* Pilgrim 1926. The latter is closer to primitive representatives of the genus *Palaeochoerus* Pomel, 1847.

On the specimen from Przeworno, M_3 displays additional characters which relate it to M_3 in the genus *Listriodon* Meyer. These are clearly visible ridges running from the tips of main cusps to the center of crown (pseudolophs). The structure of the ascending ramus is, however, indicative of a closer relationship rather to the genus *Palaeochoerus* Pomel, particularly in the structure of the angular process (cf. Viret 1961, p. 913, Fig. 26).

Suborder **Ruminantia** Scopoli, 1777
Superfamily **Traguloidea** Gill, 1872
Family **Tragulidae** Milne-Edwards, 1864
Genus *DORCATHERIUM* Kaup, 1833
Dorcatherium cf. *crassum* (Lartet, 1851)
(Pl. 7, Figs 1—3; Pl. 8, Fig. 1)

Material. — A fragmentary left maxilla with M^{2-3} (No. *IGUWr 13*), a right M^1 (No. *IGUWr 15*), a left P_3 (No. *IGUWr 16*) and two left M_3 (No. *IGUWr 14*). In addition, this species includes: a calcaneum, fragments of pelvic and scapules and ribs, long limb bones and a left upper canine (here assigned only provisionally). All specimens from Przeworno *I*.

Dimensions. — Length of M^{2-3} — 21.0 mm, length and width of M^1 — 12.2 and 13.4 mm, of M^2 — 13.0 and 14.0 mm, of M^3 — 14.0 and 15.0 mm, length of both M_3 — 18.0 mm, their anterior width — 8.0 and posterior — 5.5 mm, length and width of P_3 — 10.2 and 3.2 mm, length of calcaneum — 54.0 mm, width of its sustentacular part — 17.5 mm, length of the upper canine — about 42.0 mm, width of its radicular part — 12.0 mm, thickness of the root of canine — 5.5 mm.

Description. — The fragmentary maxilla with M^{2-3} belongs to a young individual (crowns of molars only slightly ground). M^2 and M^3 with well developed para- and mesostyles. A robust and wide cingulum is visible on the lingual side, in particular under the protocone. Proto- and hypocone display a fairly distinct difference in size, more strongly emphasized in M^3. No accessory elements such as crests, running towards the center of crown, occur on proto- and hypocone. The inner walls of para- and metacone are delicately crenulated. A similar, but more delicate sculpture is observed on outer walls of crowns. The right M^1 belongs to an immature individual but has more strongly worn tips and less distinct sculpture of enamel. Except for its smaller size and the structure of cusps and styles, it does not differ from the previous teeth. The last two lower molars have the enamel identical in character with that of upper molars and a more simplified structure of cusps and crests.

The rest of the bone remains such as, calcaneum, left upper canine, scapular fragment (distal part), etc. are here assigned only tentatively. The canine from Przeworno as compared with that, described by Rinnert (1956, Pl. 1, Fig. 4), is markedly layer and more robust.

Discussion. — The dimensions and structure of upper and lower teeth are within limits of a fairly extensive variability of an average size of the tragulid *Dorcatherium crassum* (Lartet, 1851, fide Rinnert 1956, p. 11). Values of length, varying for M_3 from 18.0 to 20.5 mm, are given by Rinnert (*l. c.*, p. 10). Such values are also displayed by other species of the genus *Dorcatherium* Kaup such as, *D. naui* Jaeger and *D. vindoboniense* Meyer. These two species are assigned by Rinnert (1956) to *D. crassum* as it synonyms. The identity of *D. vindoboniense* and *D. crassum* has also been suggested by Hofmann (1893) and Roger (1902). Using the name *D. crassum*, Rinnert (*l. c.*, p. 11) means form of a size transitional between *D. penekei* (a large species) and *D. guntianum* (a small species). The dimensions of the specimens from Przeworno are contained within the limits given by Rinnert (*op. cit.*). The lack of such skeleton elements as antlers (a character considered by some authors as diagnostically important) prevents the writer from an ultimate assignment of the remains from Przeworno to the species *D. crassum.*

PL. 5

1-2, 5 — Mustelidae gen. et sp. indet.; *1* left lower jaw with P_2 and anterior part of P_4 (*a* lingual side, *b* buccal side), *2* right calcaneous, *5* right lower C (lingual side); lacality Przeworno *I*, Upper Burdigalian. *3* — *Pseudailurus lorteti* Gaillard; left lower jaw with basal part of C, much wearing M_1 and P_{3-4} roots (old individual; *a* occlusal view, *b* lingual side, *c* buccal side); Przeworno *II*, Vindobonian. 4 — *Pseudailurus* cf. *quadridentatus* Blainville; left P^4 (*a* buccal side, *b* occlusal view); Przeworno *I*, Upper Burdigalian. 6—7 — *Aceratherium silesiacum* sp. n.; *6* left P^2 (young individual — holotype; *a* antero-lingual view, *b* buccal side, *c* occlusal view), *7* left I^1 (*a* labial side, *b* lingual side); Przeworno *I*, Upper Burdigalian

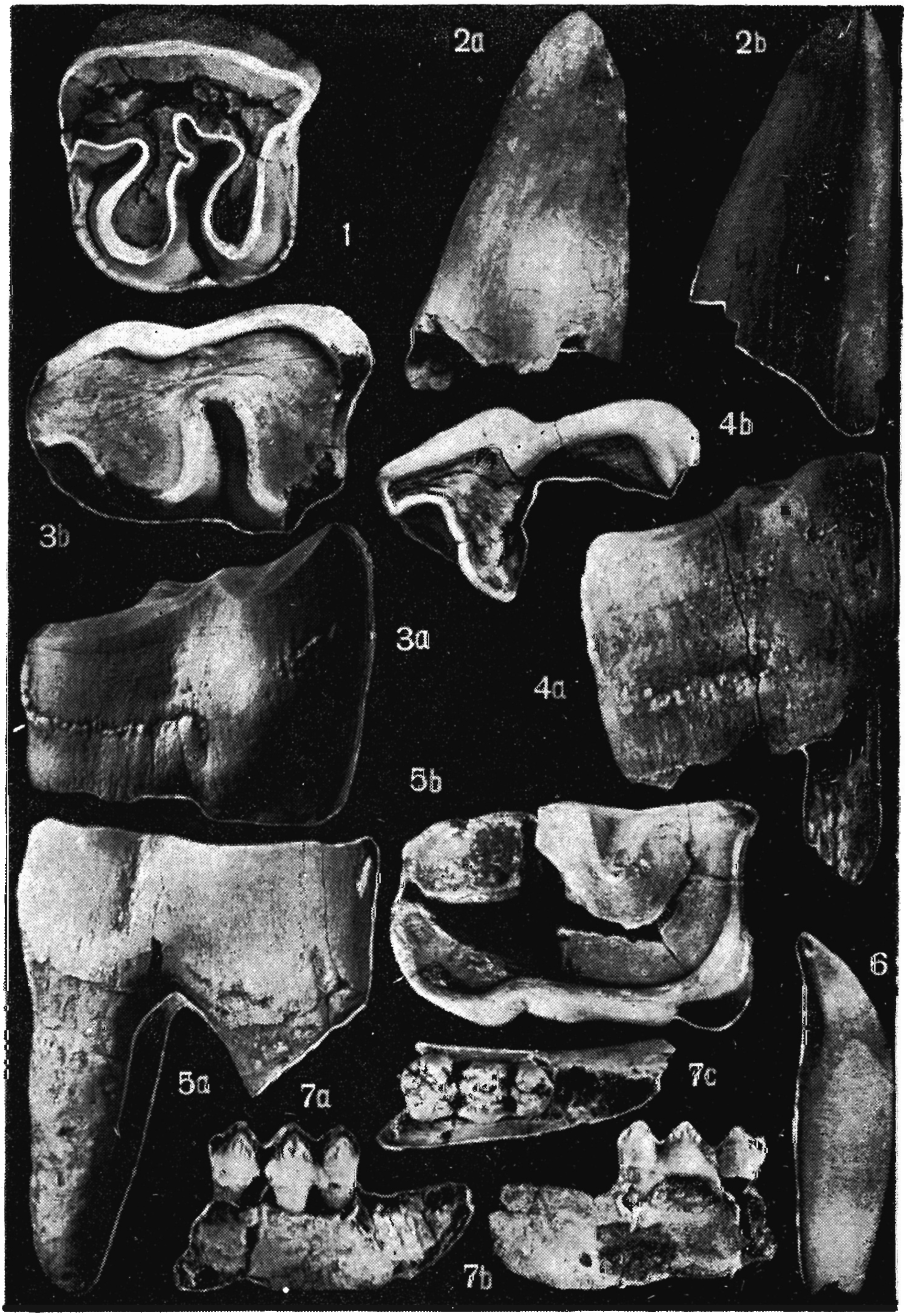
All figures of nat. size

PL. 6

1-5 — *Aceratherium silesiacum* sp. n.; *1* right P^3 (occlusal view), *2* left I_2 (*a* lingual side, *b* labial side), *3* right P_4 or M_1 (*a* buccal side, *b* occlusal view), *4* right M_1 or M_2 (*a* buccal side, *b* occlusal view), *5* left M_2 (*a* buccal side, *b* occlusal view); locality Przeworno *I*, Upper Burdigalian. *6* — *Hyotherium* aff. *soemmeringi* v. Meyer; left I_1 (lingual side); Przeworno *I*, Upper Burdigalian. *7* — *Hyotherium simorrensis* Lartet; fragment of left lower jaw with DP_4 (young individual; *a* lingual side, *b* buccal side, *c* occlusal view); Przeworno *II*, Vindobonian

All figures of nat. size


1a
1b
4a
5
3a
4b
3b
2
3c
6a
6b
7a
7b
6c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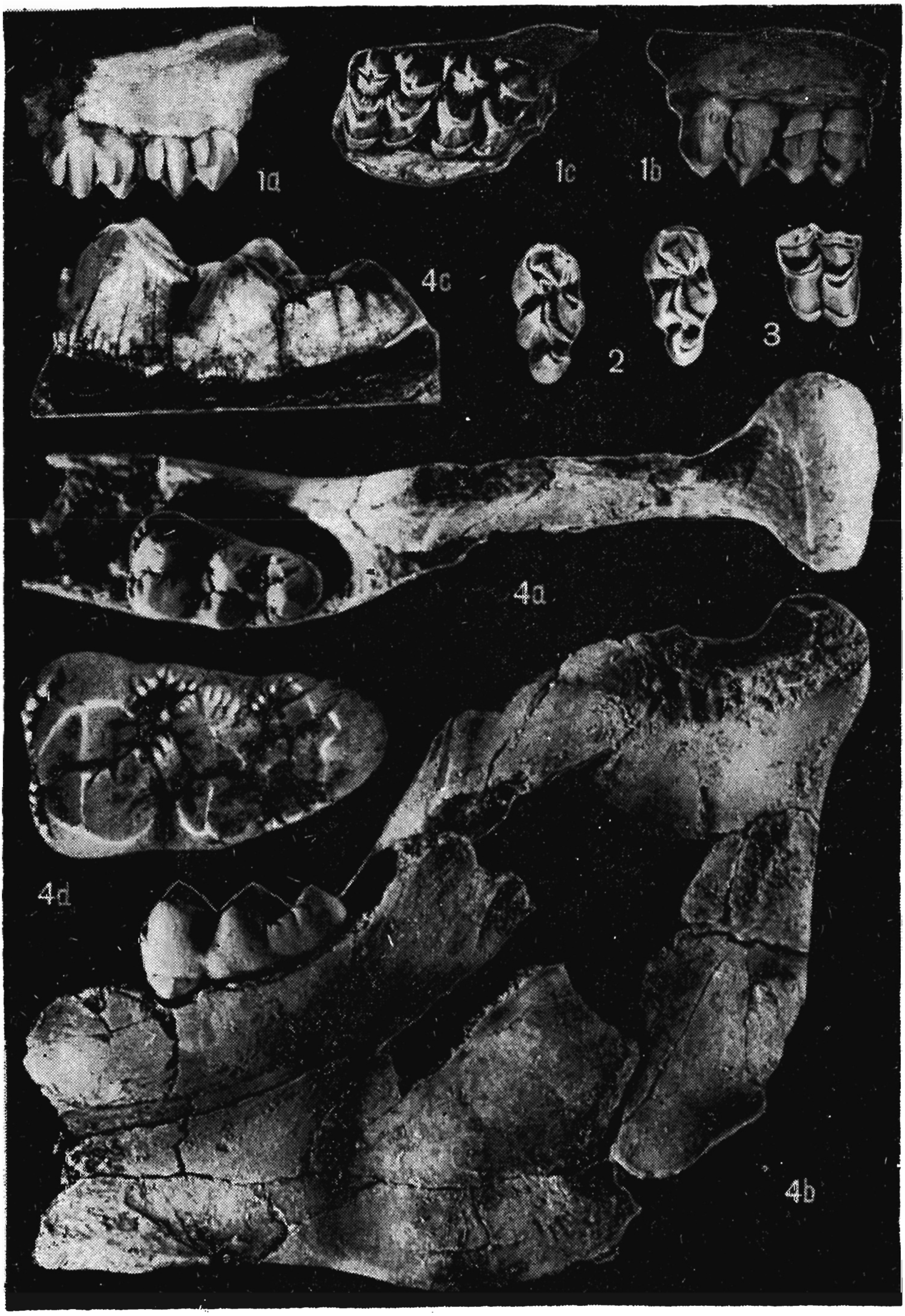
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4a
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1a
3b
4b
1b
3c
4c
2c
2a
2b
5b
7
5a
6

Superfamily **Cervoidea** Simpson, 1931
Family **Cervidae** Gray, 1821
Subfamily **Cervulinae** Sclater, 1870
(= **Muntiacinae** Pocock, 1923)
Genus *EUPROX* Stehlin, 1928
Euprox furcatus (Hensel, 1859)
(Pl. 8, Figs 2—6)

1859. *Prox furcatus* n. gen., n. sp.; R. Hensel, p. 251, Pl. 10, Figs 1—2, 5—6.
1887. *Dicrocerus furcatus* (Hensel); Ch. Depéret, p. 259, Pl. 12, Fig. 15.
1913. *Dicrocerus furcatus* Hensel, 1859; R. Wegner, p. 249, Pl. 14, Figs 9—25, Text-fig. 28.
1928. *Euprox furcatus* (Hensel, 1859); H. G. Stehlin, p. 245, Figs 1—3, 7a.
1958. *Euprox furcatus* (Hensel, 1859); P. Mein, pp. 96—97.
1961. *Euprox furcatus* (Hensel 1859); J. Viret, p. 1010.

Material. — A right maxilla with P^4—M^3 (No. *IGPUW — Gł. P. 2. 4*), a fragmentary left maxilla with P^3—M^1 (No. *IGPUW — Gł. P. 2. 5*); a fragmentary left mandible with DP_{2-4} (No. *IGPUW — Gł. P. 2. 6*), a right mandible with M_{1-3} (No. *IGPUW — Gł. P. 2. 7*), a fragmentary left maxilla with M^{2-3} (No. *IGPUW — Gł. P. 2. 8*). In addition, fairly numerous fragmentary long bones, pelvic fragments, fragmentary ribs and metatarsal bones. All the specimens from Przeworno *II*.

Dimensions. — Vide Table 3 and 4.

Description. — Fragmentary maxillas with the teeth preserved correspond in size and morphology to the same bone fragments described by Hensel (1859), Depéret (1887), Hofmann (1893), Wegner (1913), Mein (1958) and Viret (1961). The sizes of teeth are within the variability limits of *Euprox furcatus* (Hensel). This

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PL. 7

1-3 — *Dorcatherium* cf. *crassum* (Lartet); *1* fragment of left upper jaw with M^{2-3} (*a* labial side, *b* buccal side, *c* occlusal view), *2* two left M_3 (occlusal view), *3* right M^1 (occlusal view); locality Przeworno *I*, Upper Burdigalian. 4 — *Hyotherium simorrensis* Lartet; fragment of right lower jaw with M_3 (*a* occlusal view, *b* lingual side) and M_3 of the same individual (*c* lingual side, *d* occlusal view); Przeworno *II*, Vindobonian

All figures of nat. size (except 4*c*—*d* — × 2)

PL. 8

1 — *Dorcatherium* cf. *crassum* (Lartet); left P_3 (*a* lingual side, *b* occlusal view); locality Przeworno *I*, Upper Burdigalian. 2-6 — *Euprox furcatus* (Hensel); *2* fragment of left upper jaw with P^3—M^1 (*a* buccal side, *b* lingual side, *c* occlusal view), *3* fragment of right lower jaw with DP_{2-4} (*a* lingual side, *b* occlusal view, *c* buccal side)), *4* fragment of right upper jaw with P^4—M^3 (*a* occlusal view, *b* buccal side, *c* lingual side), *5* right lower jaw with M_{1-3} (*a* buccal side, *b* lingual side), *6* fragment of left upper jaw with M^{2-3} (occlusal view); Przeworno *II*, Vindobonian, 7 — three fragments of coprolites probably of *Hyotherium* sp.; Przeworno *II*, Vindobonian

All figures of nat. size

Table 3

Upper dentition (in *mm*)

IGPUW — Gł. P. 2		4	8	5
Length of P^4—M^3		46.0	—	—
„ of M^2—M^3		25.5	25.0	—
„ of P^3—M^1		30.0	—	32.0
Length	of P^3	10.0	—	10.5
Width		11.0	—	11.0
Length	of P^4	9.0	—	9.0
Width		11.0	—	11.5
Length	of M^1	12.0	—	12.0
Width		9.5*	—	13.0
Length	of M^2	13.0	13.0	—
Width		14.5	14.0	—
Length	of M^3	*c.* 13.0*	13.0	—
Width		*c.* 13.0*	14.0	—

* Damaged crowns.

also concerns fragments of mandibles and their dentition. A "paleomeryx" fold on premolars and molars is yet rather poorly developed. Likewise, the inner (lingual) cingulum on upper molars is less strongly developed than on the teeth of *Dorcatherium crassum* (Lartet). Milk dentition, preserved on specimen No. *IGPUW — Gł. P. 2. 6* does not display any considerable differences in structure and size as compared with corresponding teeth, described by Mein (1958, pp. 96—97) from Mont Ceindre = Vieux Collonges.

Discussion. — *Euprox furcatus* (Hensel) was first described by Hensel (1859, p. 261, Pl. 10, Figs 5—6; Pl. 11, Figs 8—9), from the locality Sośnicowice (Kieferstadtel) in Silesia, as *Prox furcatus*. A fairly detailed description of dentition and antlers of this species was given by this author (*op. cit.*), who, at first, tended to assign to this species also the *Dicrocerus* Lartet, 1837, but, later on, on the basis of the structure of lower premolars and antlers, he recognized the two genera as separate ones. The species *Prox furcatus* Hensel was also included by Depéret (1887) to the synonymy of *Dicrocerus elegans* Lartet, 1851, but finally he found that *D. elegans* differed from *D. furcatus* (Hensel) in a more robust structure, larger size and less distinct "paleomeryx fold" and thus he hinted that those were, however, different species of this same genus. M^3 on the specimen, described by Depéret (*l. c.*, Pl. 12, Fig. 15), is identical with that on the specimens from Przeworno. It is not, therefore, unlikely that the specimens, described by Depéret as *D. elegans* Lartet, at least in part belong to *Euprox furcatus* (Hensel). Hofmann (1893) cited from Göriach specimens which be assigned to *Dicrocerus furcatus* (Hensel) (*l. c.*, p. 68, Pl. 12, Figs 14 and 17), considering the generic name *Prox* as a synonym of

Table 4
Dimensions of mandibles and dentition (in *mm*)

IGPUW. No. Gł. P. 2	7	6
Length of M_1—M_3	42.0	—
Length of DP_2—DP_4	—	32.5
Length of DP_2	—	8.0
Width of DP_2	—	4.2
Length of DP_3	—	10.0
Width of DP_3	—	4.5
Length of DP_4	—	14.5
Width of DP_4	—	5.5
Length of M_1	11.0	—
Width of M_1	8.0	—
Length of M_2	13.0	—
Width of M_2	9.0	—
Length of M_3	17.0	—
Width of M_3	8.0	—
Height of mandible below M_2	18.0	—
Thickness in the same place	10.0	—
Anteroposterior width of ascending ramus	27.0	—
Height of ascending ramus	46.0	—
Lateral width of coronoid process	11.0	—

the genus *Dicrocerus*. Of the same opinion is Zittel (1925, p. 199, Fig. 275) who, at the same time, considers the genus *Procervulus* Gaudry as a synonym of the genus *Dicrocerus* Lartet. The dentition coming from Steinheim, which he described, is almost identical with that of the specimens from Przeworno. The generic separateness of *Dicrocerus* Lartet and *Euprox* Stehlin was settled by Stehlin (1928) on the basis of the structure of antlers. Despite their partial similarity to the specimens, described as *Procervulus dichotomus* (Gervais, 1849), the specimens from Przeworno undoubtedly belong to the species *Euprox furcatus* (Hensel).

In Rinnert's opinion (1956, pp. 13—17), *Procervulus dichotomus* at least partly corresponds in its features to the species *Dicrocerus furcatus* (Hensel) and, therefore, he assigns to this species, as synonyms, the specimens, described by Rütimeyer (1883), some of those mentioned by Roger (1902—1904) and those, described from Leoben by Zdarsky (1910). Rinnert (1956) also believes that the specific separateness of the forms of the "*Dicrocerus furcatus*" type, based on the characters of their antlers, is uncertain. Fairly distinct differences in the structure of premolars and their proportions as compared with molars occur, however, between the species *Procervulus dichotomus* (Gervais) and *Euprox furcatus* (Hensel).

FINAL REMARKS

Both new localities discovered at Przeworno are the oldest Tertiary terrestrial vertebrate faunas in Poland. Comprehensive studies of these localities will make it possible to characterize climatic and paleogeographic conditions which existed at this time and which determined formation, or destruction and alteration of mineral raw material deposits which occur in surroundings. There arises a new possibility of stratigraphic correlations of the terrestrial Miocene in the area of Middle Europe, where in comparison with Western, Southern and even Eastern Europe, a number of known localities of vertebrate faunas older than Pliocene, is extremely low (cf. Thenius 1959).

The list of species represented is not closed. Further studies should significantly enlarge material from the younger locality Przeworno *II*. The locality Przeworno *I* is not so promising. The material, which will be obtained from the locality Przeworno *II* should contain skulls and jaws with teeth, the full systematic diagnosis of which will be possible. Further finds of more complete remnants in the older locality Przeworno *I* seems improbable, and only further isolated teeth and rounded, small fragments of bones may be expected to be found there.

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MIOCEŃSKIE ZJAWISKA KRASOWE I FAUNY KRĘGOWCÓW W PRZEWORNIE

(Streszczenie)

Przedmiotem pracy jest wstępne opracowanie geologiczno-paleontologiczne dwu nowych, różnowiekowych stanowisk faun kręgowców mioceńskich w Przewornie na Dolnym Śląsku (fig. 1—3 i 5). Fauny te występują w iłach wypełniających formy krasowe rozwinięte w silnie ztektonizowanych marmurach (fig. 3*B* i 4).

Starszy zespół kręgowców (Przeworno *I*) występuje w postaci pojedynczych zębów i fragmentów kostnych w poziomym kanale krasowym wypełnionym iłami (fig. 3*A*, 6—8 i 12—13). Zespół ten składa się głównie ze szczątków żółwi i nosorożców. Jest to fauna tropikalna lasu błotnistego, zbliżona wiekiem do fauny z La Romieu (górny burdygał). Wskazuje ona na okres, gdy przedpole Sudetów stanowiło bagnistą równinę, na której w części północnej tworzył się pokład węgla zwany ścinawskim (*por.* Dyjor & Oberc 1969).

Młodszy zespół kręgowców (Przeworno *II*) występuje w pionowej szczelinie zasypanej z powierzchni (fig. 3*A*, 9*B*, 12—13; pl. 1—2). Zespół ten składa się głównie z jeleniowatych, świniowatych i kotowatych. Jest to fauna lasów typu parkowego

wskazująca na klimat sawannowy. Wiekiem odpowiada ona młodszym faunom windobońskim (np. La Grive-Saint-Alban, Göriach). Fauna ta datuje okres dźwigania się wału metakarpackiego (*por.* Głazek & Kutek 1970), który odgrywał rolę głównego europejskiego działu wód rozdzielającego zlewnię środkowoeuropejskiego basenu burowęglowego od zlewni zanikającego zbiornika geosynkliny karpackiej, a następnie zapadliska przedkarpackiego (*por.* Teisseyre 1960; Oberc & Dyjor 1968, 1969).

Ponadto stwierdzono fragmenty jaskini (fig. 9*A, C, D,* i 10—12; pl. 3—4) z naciekami krzemionkowymi, wypełnionej później iłami laminowanymi, typu formacji poznańskiej (*por.* Dyjor 1968, 1970; Dyjor, Bogda & Chodak 1968). Tworzenie się tych nacieków odpowiada prawdopodobnie okresowi tworzenia się „kwarcytów" wśród mioceńskich piasków trzeciego cyklu sedymentacji burowęglowej (*por.* Oberc & Dyjor 1969).

W części systematycznej pracy A. Sulimski opisał szczątki ssaków przynależne do 6 rodzajów (por. fig. 14—17; pl. 5—8), w tym jeden nowy gatunek nosorożca — *Aceratherium silesiacum* sp. n.

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